NORTH CAROLINA LEADERSHIP FORUM

Policy Memos for North Carolina Leadership Forum

2017-2018: How can North Carolina can best meet the future energy needs of its residents and businesses?

Position papers submitted by the North Carolina Justice Center, the John Locke Foundation, 350.org, Duke Energy, the Sierra Club, and the NC Sustainable Energy Association

TABLE OF CONTENTS

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Policy Recommendations to Address the Energy Needs of North Carolinians Living In Poverty

I. Introduction

Over 1.5 million people in our state live in poverty. For them, unlike for high income and middle income North Carolinians, paying the monthly energy bill is a constant challenge. It means making decisions every month that may include whether or not to pay for medications, food, rent, and other essentials. To address this problem, North Carolina must create policies and programs in the energy sector that help low-income North Carolinians have access to affordable energy. It is already the policy of the state to "promote adequate, reliable and economical utility service to all of the citizens and residents of the state,"[1] however, it is indisputable that we are falling woefully short when it comes to making energy bills economical for low-income rate payers. By making energy bills affordable, we can not only significantly improve the quality of life for low-income North Carolinians, but we can also improve educational, health, and other related outcomes.[2] [3]

II. Poverty In North Carolina

When we look at poverty data in North Carolina, we can consider a variety of measures. In 2016, the most recent year for which data is available, 15.4 percent or 1,563,000 North Carolinians were living in poverty.[4] For a family of four in 2016, that is an annual income of less than $24,300. Poverty in North Carolina is not evenly

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[1] North Carolina General Statute 62-2 (a) (3)

[2] Snyder, Lynn and Baker, Chris. Affordable Home Energy and Health: Making the Connections. 01 June 2010. https://assets.aarp.org/rgcenter/ppi/cons-prot/2010-05-energy.pdf

[3] Smith, Lauren et al. A Child Health Impact Assessment of Energy Costs and the Low Income Home Energy Assistance Program. 01 April 2007. http://www.pewtrusts.org/en/~/media/assets/external-sites/health-impact-project/massachusettslowincomeenergyassistanceprogram.pdf

[4] 2016 American Community Survey Report Number: ACSBR/16-01

distributed, 30 counties in North Carolina have poverty rates above 20 percent.[5] (see Appendix 1)

When we consider energy burden (the percent of income used to pay for energy), in 2016, 1,455,000 households paid 6 percent or more of their income for energy.[6] For families between 50 percent and 100 percent of the federal poverty level, 16 percent of their income paid for energy.[7] (see Appendix 2)

High energy burdens also contribute to overall housing burden, which is the primary cause of homelessness in the United States. For example, many extremely low-income renters (people with incomes at or below 30% of area median income) spend more than half of their income on rent and utilities.[8] This extreme energy and housing burden make these families vulnerable to falling behind on rent and subsequently facing eviction and homelessness.

North Carolina has one of the highest percentages in the United States of children under 18 years of age who are food insecure on a regular basis: in N.C. almost 1 in 4, or 24.6 percent.[9] Between 2010 and 2016 North Carolina regularly ranked among the top ten states with the highest percentage of citizens experiencing food shortages; over 1,764,000 or nearly one in six.[10]

Taken all together, we can see why for so many people in our state the decision between heating a home or feeding a child is tragically common.

III. Solutions

A. Energy Efficiency as a Resource

To address energy poverty, North Carolina should aggressively deploy energy efficiency (EE) measures in all sectors to reduce consumption, lower demand, and thereby lower energy costs for all ratepayers. North Carolina currently ranks only 31st in the nation in deploying EE measures.[11] This is in part because of inadequate or inaccessible utility and state administered EE programs and failing to maintain

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[5] Ibid

[6] Fisher, Sheehan & Colton; Public Finance and general Economics; Belmont, MS April 2017

[7] Ibid

[8] National Low Income Housing Coalition. Housing Spotlight, Vol 4, Issue 1, August 2014. The Affordable Rental Housing Gap Persists. http://nlihc.org/sites/default/files/HS_4-1.pdf

[9] NC Food Banks - Data is from 2014 Hunger in America Study, by Feeding America and the Food Hardship in America 2015 Report from the Food Research and Action Center.

[10] Ibid

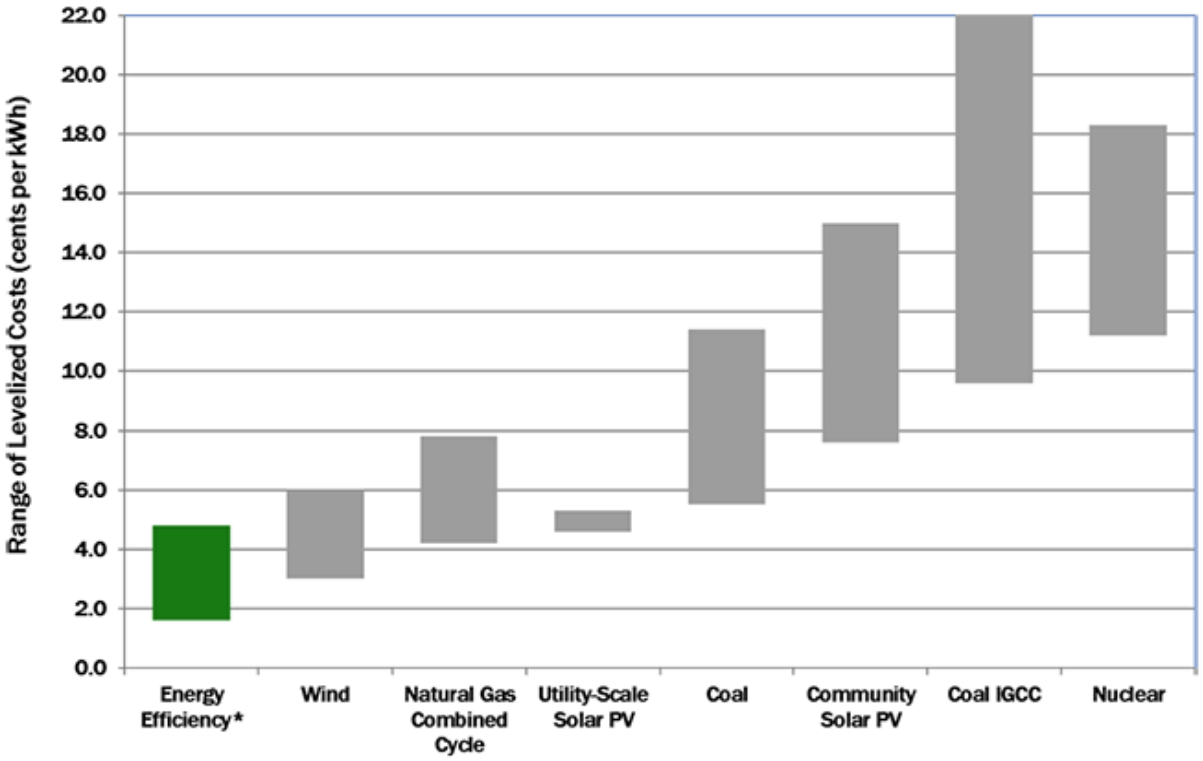
[11] Berg, Weston; et al. The 2017 State Energy Efficiency Scorecard. 01 Sept. 2017 ACEEE

modern building codes, as addressed in the sections below. Before constructing any new generation facility, we should deploy EE to the full extent possible, especially given that it is the lowest-cost resource for meeting our energy needs.[12]

As stated in a recent ACEEE report:

"Energy efficiency investments aimed at reducing energy waste cost utilities two to five cents per kilowatt hour (an average of about three cents), while generating the same amount of electricity from sources such as fossil fuels can cost two to three times more. It isn't a surprising result that energy efficiency continues to stack up as the lowest-cost resource. Recent research from ACEEE found that even among utilities achieving the highest levels of electricity savings from efficiency, the cost of saved energy has remained consistently low. Lawrence Berkeley National Laboratory (LBNL) has found similar results."[13]

Levelized Cost of Electricity Resources



*Notes: Energy efficiency program portfolio data from Molina 2014; All other data from Lazard 2017. High-end range of coal includes 90% carbon capture and compression.

[12] Molina, Maggie. New data, same results – Saving energy is still cheaper than making energy. 01 Dec. 2017 https://aceee.org/print/21346

[13] Ibid

B. Rate Design

Other states recognize that in order to address energy poverty it is necessary to develop programs that reduce utility bills to affordable levels while also reducing disconnections, utility credit and collection costs, and improving health and safety.[14] These programs can be divided into three types. The first are discount programs, where the cost of energy is lowered for low-income ratepayers. California and Massachusetts have this type of program.[15] Second are payment plan programs, where utility bills are capped at a predetermined percentage of household income, such as are offered in Ohio, Colorado, and Illinois.[16] Finally, there are tiered discount programs, which are a hybrid of discount and percentage of income plans such as those programs offered in New Hampshire and Indiana.[17] By adopting these types of programs, North Carolina could immediately help make energy bills more affordable for low-income ratepayers.

C. Housing Trust Fund

The North Carolina Housing Finance Agency administers the NC Housing Trust Fund that helps fund the construction of energy efficient affordable housing for low-income communities and has created over 32,000 homes and apartments, over 21,000 jobs, and $140 million in tax revenue.[18] Increasing investments in the fund will increase the availability of affordable, energy efficient housing, immediately benefitting low-income communities.

D. Improving Existing and Developing New EE Programs

North Carolina's utilities offer multiple EE programs, but many are inaccessible to low-income communities because participation requires an up-front investment. For example, a low-income homeowner cannot benefit from an appliance rebate program for the purchase of a new, energy efficient heat pump water heater because they cannot afford the upfront cost of the appliance. In this instance, policy makers could subsidize the purchase amount to allow low-income homeowners to participate.

Inclusive financing options, like tariffed on-bill financing, could also help homeowners and potentially renters pay for EE improvements. Additionally, these types of programs help reach homeowners who do not meet the income

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[14] States include AL, AR, AZ, CA, LA, MA, NH, NJ, OH, PA, TN, TX, and WV.

[15] For example in CA, program participants receive a 30-35% discount on their electric bill and 20 % on natural gas.

[16] For example the PIPP plus program in OH assists those at 150 % of the federal poverty level or lower by limiting energy payments to $10 or 10 % of gross monthly household income whichever is greater if all electric or gas and electric.

[17] In NH eligibility is set at 200 % of Federal Poverty Level for its fuel assistance program.

[18] NC Housing Finance Agency. Housing Impacts 2016 Report on Achievements. 2017 http://www.nchfa.com/sites/default/files/page_attachments/2017%20Report%20on%20Achievements%20FINAL.pdf

requirements for subsidized programs but still cannot afford the upgrades themselves.

In multifamily properties, more needs to be done to address the landlord-tenant split incentive problem, where property owners do not have a vested interest in lowering energy consumption because they do not pay the power bill; and tenants cannot make efficiency improvements to the structure or appliances.[19] We need programs that address this challenge to meet the needs of low-income tenants in multifamily settings. One study estimates that multifamily EE programs could "eliminate up to 35% of the energy burden on low-come families".[20]

E. Smart Meters and Prepay

With the advent of smart meters, both consumers and utilities will be able to take advantage of new opportunities. These include more sophisticated Demand Side Management (DSM) programs where utilities are better able to control the time and intensity of energy consumption by turning on or off certain home systems at critical times. For example, hot water heaters can be controlled to run off-peak and thereby reduce peak demand.

Ratepayers will also be able to monitor consumption in real time and thereby be more aware of energy use decisions and consumption potentially leading to increased conservation.

With smart meter deployment, many utilities in the United States have also created pre-pay programs. These programs, which require consumers to pay for service in advance, can sometimes allow customers more control over their energy consumption. However, pre-pay programs often hurt low-income rate payers. In some jurisdictions, for example, consumers must pay a transaction fee for using the service each time they make a payment – essentially paying to pay – which significantly increases costs since low-income rate payers are found to pay multiple times in any given month.[21] Any prepay programs administered in North Carolina should include significant consumer protections and ensure that low-income ratepayers are not harmed.

F. Maintain a Modern and Cost Effective Building Code

North Carolina's Building Code Council has failed to adopt the 2015 International Energy Conservation Code (IECC), which has been shown to be cost effective for the

[19] ACEEE. A Regulator's Guide for Multifamily Energy Efficiency. https://aceee.org/sector/state-policy/toolkit/regulator-s-guide

[20] Ibid

[21] Howat, John. Rethinking Prepaid Utility Service Customers at Risk. 01 June 2012. National Consumer Law Center.

state in a recent analysis.[22] By failing to maintain a modern code, North Carolina is falling further behind in EE while risking future increases in construction costs due to utilizing less standard building materials. Inefficient building codes also create inefficient housing, increasing the need for government programs to address the energy inefficiency over time.

G. Expand Weatherization, Energy Efficiency and Urgent Repair Programs

North Carolina could expand current weatherization, energy efficiency and urgent repairs programs that serve low-income ratepayers. For example, Duke Energy runs an excellent program, "The Helping Home Fund" that has helped thousands of low-income ratepayers in Duke's territory.[23] These programs help lower energy bills while improving the quality and safety of existing housing stock.

H. Conclusion

Energy poverty in North Carolina is a tragic reality in our state for thousands of families. Fortunately there are, as outlined above, multiple proven policies the state can deploy to address this problem.

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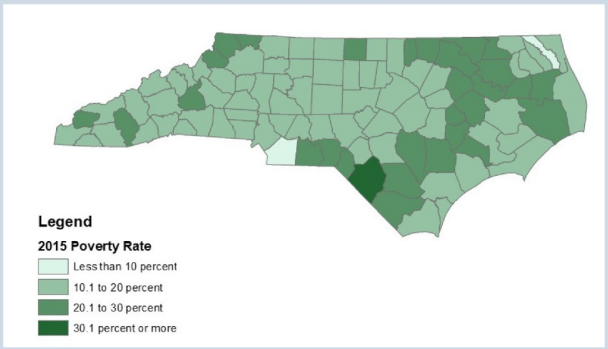
[22] Mendon, VV; et al. Cost-Effectiveness Analysis of the Residential Provisions of the 2015 IECC for North Carolina. 01 Feb. 2016 Pacific Northwest National Laboratory.

[23] Susser, Jonathan. Advanced Energy Helps Evaluate Duke Energy's Helping Home Fund. 20 Feb 2018. https://www.advancedenergy.org/2018/02/20/advanced-energy-helps-evaluate-duke-energys-helping-home-fund/

Appendix 1

30 Counties had Poverty Rates Above 20 Percent



Appendix 2

The Home Energy Affordability GAP in NC 2016

Fisher, Sheehan & Colton; Public Finance and general Economics; Belmont, MS April 2017

Poverty Level	Home Energy Burden	Number of Households
Below 50%	29%	286,539
50 -100%	16%	371,583
100 – 125%	11%	207,464
125 – 150%	9%	205,764
150 – 185%	7%	274,888
185 – 200%	6%	109,098
	Total < 200%	1,455,336

What Should North Carolina Do About Energy Poverty?

Position Paper for the North Carolina Leadership Forum • March 2018

By **Jon Sanders,** Director of Regulatory Studies

Energy is a basic human necessity. Regardless of income, we all need it. Still, numerous studies have shown people to be vulnerable in general to energy-price increases. When energy prices rise, people reduce their usage somewhat, but not as much as the price increased. This problem is heightened among the poor. Researchers use the term "energy poverty" to denote people who spend 10 percent of their household income or more on energy. In North Carolina, studies have found that **lower-income households spend greater than 20 percent of their household income on energy,** and many spend considerable more than that.[24]

The poor are more vulnerable to energy price increases than the general public, especially in the long run. Wealthier energy consumers are more able to make relatively expensive up-front investments in weatherization and energy-efficiency improvements that pay for themselves in the long run, but such things are often beyond a poor family's capability.

The housing that poor families can afford tends to be far less energy-efficient. Moreover, many poor families are renters rather than homeowners. As renters, they may not have much choice in HVAC systems, choice in appliances, access to rooftop solar, etc. Their landlords also have little incentive to invest in such things, since the benefits from such improvements would not accrue to them but to their tenants. The practical effect is that the poor pay more per square foot for energy and have little ability to change that.

For energy policy, this disparity has several implications. Anything that causes energy prices to increase has an especially adverse effect on the poor. Also, as long as energy consumers in North Carolina are assigned to a monopoly utility and have no choice in energy provider, it is paramount to protect poor consumers by resisting rate hikes. Policymakers should take extra care to make sure their policies "first do no harm" to poor consumers, even when those policies might serve the interest of other groups.

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[24] See discussion in Adam Chandler, "Where the Poor Spend More Than 10 Percent of Their Income on Energy," The Atlantic, June 8, 2016, https://www.theatlantic.com/business/archive/2016/06/energy-poverty-low-income- households/486197. Cf. Eugene M. Trisko, "Energy Cost Impacts on NC Families, 2015," American Coalition for Clean Coal Electricity, January 2016, http://www.americaspower.org/wp-content/uploads/2016/02/NC-Energy-Cost- Analysis-116R.pdf.

For example, in order to incentivize consumers to install rooftop solar panels, the state lets utilities offer rebates to those who do — and recover those costs via rider on electricity bills.[25] The unintended consequence of this policy is to fund an option available mostly to wealthy homeowners by raising rates on poor homeowners and renters. A similar dynamic can play out with rebate programs for energy efficiency upgrades, where even the discounted up-front costs is out of reach for low-income households.

State policies intended to promote renewable energy resources can also work at cross-purposes by requiring that utilities derive energy from renewable sources at levels beyond what market operations would warrant, in which case costs and therefore prices are higher than necessary. Even though renewable energy has no fuel costs, its production is intermittent, creating problems for electricity-grid management. Battery-storage technology or some other technological breakthrough may someday catch up, and as it does utilities will change over to them as a consequence of seeking the lowest-cost means of delivering service (indeed, when such technology is truly available for implementation, they'll likely go faster than any mandate would require). Trying to rush this changeover by statute or regulation will create system stresses, inefficient (more expensive) uses of backup-generation sources, and greater costs overall.[26]

Along with preventing unnecessary energy price increases in a monopoly-utility environment, policymakers can promote existing programs to help lower-income families afford electricity. These can include bill-assistance programs, programs to fund weatherization, and funds to expand energy-efficiency upgrades. Such programs should be transparent, so that the voting public can ensure they are not misused as well as encourage their expansion if the programs can be shown to deliver value at a reasonable cost. These government programs should also be widely known to eligible consumers. Therefore, such programs need to be financed with on- budget government appropriations approved by elected officials, not hidden in regulatory mandates, and they need to be effectively marketed to potential beneficiaries. The Congressional Research Service estimates that only 22 percent of eligible families avail themselves of the federal Low Income Home Energy Assistance Program (LIHEAP), for example.[27]

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[25] North Carolina Session Law 2017-192, https://www.ncga.state.nc.us/gascripts/BillLookUp/BillLookUp.pl?Session=2017&BillID=h589&submitButton=Go.

[26] See Charles Frank, "Why the Best Path to a Low-Carbon Future Is Not Wind or Solar Power," Planet Policy, Brookings, May 20, 2014, https://www.brookings.edu/blog/planetpolicy/2014/05/20/why-the-best-path-to-a-low- carbon-future-is-not-wind-or-solar-power; Thomas F. Stacy and George S. Taylor, "The Levelized Cost of Electricity from Existing Generation Resources," Institute for Energy Research, June 2015, http://instituteforenergyresearch.org/wp-content/uploads/2015/06/ier_lcoe_2015.pdf; "The Energy Report: A Snapshot of North Carolina's Energy Portfolio Seven Years After Session Law 2007-397," North Carolina Department of Environment and Natural Resources, March 2015, http://portal.ncdenr.org/c/document_library/get_file?uuid=369122bb-0ed1-4974-b62c-3efec5930ff9&groupId=14.

[27] See discussion at Dan Boyce and Jordan Wirfs-Brock, "High Utility Costs Force Hard Decisions For The Poor," Inside Energy, May 8, 2016, http://insideenergy.org/2016/05/08/high-utility-costs-force-hard-decisions-for-the-poor.

Finally, policymakers could allow utilities to offer an option similar to voluntary-contribution options available on income taxes[28] so that ratepayers could choose to contribute to bill assistance or energy-efficiency upgrades for lower-income households. Such programs would require explicit transparency and appropriate oversight, of course, but they would create another way people can choose to help lower-income families afford electricity. Such an idea would effectively give consumers a two-for-one chance to serve the public good if they place a high personal value on energy efficiency: they can assist their low-income neighbors who may be living in energy poverty while also helping to finance the substitution of lower energy demand, through efficiency gains, for the additional generating capacity these consumers might oppose on environmental grounds.

Publicizing government programs and making opt-in policies available on power bills may be reasonable steps to take. But they don't diminish the importance of keeping down the actual cost of producing and delivering electricity in North Carolina. When rates go up, thanks to environmental mandates or other regulatory interventions, the burden is greater on North Carolinians with low incomes. They have fewer options for responding to price hikes and fewer discretionary dollars to devote to paying the bill for policy mistakes made by well-meaning but misguided state leaders.

[28] See, e.g., North Carolina General Statutes § 105-269.5 and § 105-269.7, https://www.ncga.state.nc.us/gascripts/statutes/statutelookup.pl?statute=105.

Should North Carolina Adopt Policies to Combat Climate Change?

Position Paper for the North Carolina Leadership Forum • March 2018

By **Jon Sanders,** Director of Regulatory Studies

The announcement last June that the United States would withdraw from the Paris climate accord led to greater discussions about what states could do about man-made climate change. For policymakers in North Carolina and elsewhere, there is a clear decision rule: only adopt policies for which **the expected benefits exceed the expected costs.** The freedoms and finances of North Carolinians should not be used for political signaling or expended on fanciful projects. Few if any climate-change policies available to state leaders would meet such a basic test.

Justifying a policy response at any level of government requires strong evidence that satisfies the following conditions: 1) the rate of global climate change exceeds natural variation and is primarily the result of human action such as greenhouse-gas emissions; 2) this enhanced rate of climate change will have net-negative consequences; 3) practical policies to reduce significantly the rate of climate change are available; and 4) the benefits of those climate-change reductions would be greater than the cost of implementing those policies. In public debate, advocates often devote much of their attention to debating the first and, to some extent, the second conditions. The far-bigger problem for advocates of large-scale governmental response is that **they lack compelling evidence that their preferred policies would satisfy the third and fourth conditions.**

In 2014, Secretary of State John Kerry told an audience at the Johns Hopkins School of Advanced International Studies that even if everyone in America stopped driving, planted a dozen trees apiece, and "if we somehow eliminated all of our domestic greenhouse-gas emissions, guess what? That still wouldn't be enough to counteract the carbon pollution coming from China and the rest of the world."[29] Kerry was making the case for an all-in approach to reducing greenhouse-gas emissions. But even the Paris accord didn't approximate such an approach. As The New York Times pointed out in November 2017, "no major industrialized country is currently on track to fulfill its pledge" for how much it would cut its greenhouse gas emissions by 2030, and even if they all were, those pledges wouldn't go far enough,

[29] U.S. Secretary of State John Kerry, "Remarks on U.S.–China Relations," Johns Hopkins School of Advanced International Studies, Washington, D.C., November 4, 2014, https://2009- 2017.state.gov/secretary/remarks/2014/11/233705.htm.

so the world would "still be on pace to warm well in excess of two degrees Celsius over preindustrial levels."[30]

For policymakers in the United States, it is even harder to meet the criteria of significance (how much would the policy reduce climate change from the baseline?) and net benefit (are the effects of that reduction large and positive enough to offset the cost?). According to the Environmental Protection Agency's own model, if the U.S. reduce its greenhouse-gas emissions to zero by the year 2050, the average global temperature in the year 2100 would be just 0.1°C — one-tenth of a degree — lower than would otherwise be the case.[31] That's so small as to be scarcely detectable against the statistical background noise, and obviously too small to have any discernible benefits.

To move from a national or international perspective to what one might call a "micro-micro- level," the State of North Carolina covers about 27 one-hundred-thousandths (0.00027) of the surface of the Earth.[32] State policies aimed at reducing greenhouse gas emissions within its borders could have no conceivable effect on global climate at all. At best, if they were reciprocated by other states, there might be a detectable but clearly insignificant effect.

On the other side of the ledger, such policies would consume scarce resources best devoted to other needs, including more proximate environmental challenges, while harming economic growth by unnecessarily raising the cost of energy generation and distribution. Economic growth helps drive environmental improvement.[33] As people become wealthier overall, life expectancies extend, and productivity increases, people are increasingly able to make choices that produce cleaner environments and reward providers of cleaner, more-efficient goods and services. Meanwhile, technological advances continue to produce cleaner and more-efficient outcomes. The economy becomes more service-based than industry-based, with more productive activities shifting into services (much lower emissions) from the industrial and manufacturing sectors.

These factors are already underway. Emissions from energy generation have been falling in North Carolina. From 2000 to 2016, carbon dioxide emissions fell 33.8

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[30] Brad Plumer and Nadja Popovich, "Here's How Far the World Is From Meeting Its Climate Goals," The New York Times, November 6, 2017, https://www.nytimes.com/interactive/2017/11/06/climate/world-emissions-goals-far-off- course.html.

[31] Robert P. Murphy, Patrick J. Michaels, and Paul C. Knappenberger, "The Case Against a U.S. Carbon Tax," Policy Analysis No. 801, Cato Institute, Washington, D.C., Oct. 17, 2016, https://www.cato.org/publications/policy- analysis/case-against-us-carbon-tax

[32] North Carolina covers 53,819 square miles of the Earth's 196.9 million square miles.

[33] See, e.g., Bruce Yandle, Maya Vijayaraghavan, and Madhusudan Bhattarai, "The Environmental Kuznets Curve: A Primer," PERC Research Study 02-1, Property and Environmental Research Center, May 2002, https://www.researchgate.net/publication/238343560_The_Environmental_Kuznets_Curve_A_Primer, and David I. Stern, "The Rise and Fall of the Environmental Kuznets Curve," World Development, Vol. 32, No. 8, pp. 1419– 1439, 2004, http://www.steadystate.org/wp-content/uploads/Stern_KuznetsCurve.pdf.

percent, nitrogen oxide emissions fell 74.2 percent, and sulfur dioxide emissions fell 90.6 percent.[34] Similar reductions are being realized by the United States and 34 other nations.[35] Recent research has hailed this "decoupling" of emissions from GDP growth as an "important juncture"[36] for the planet and an overturning of the conventional thinking that economic growth necessarily required a tradeoff of environmental health. They are due largely to a combination of economic growth, technological change, the rise of a service economy, and changes in consumer preferences.[37]

The most-important explanation for emission declines has been the transition to natural gas- based electricity generation replacing coal-based generation. From 2000 to 2016, the share of North Carolina's electricity generation from nuclear, hydroelectric, biomass, and renewables had gone up only slightly. During the same timeframe, generation from coal fell by over half, from 62.1 percent in 2000 to 28.6 percent in 2016, while generation from natural gas rose dramatically, from 0.9 percent to 30.0 percent.[38] This change came about because of the unforeseen decline in natural-gas prices owing to technological change in recovering gas.

State policymakers should focus on more immediate and local environmental issues. These include agricultural runoff, waste storage, stormwater drainage, hazardous-waste management and cleanup, inspections, air-quality monitoring, and bonding and insurance requirements to protect against third-party damages. They also involve mitigating impacts and recovering any damages from the GenX and coal ash discharges into rivers and groundwater. The benefits and costs of policies tackling these higher-priority challenges in North Carolina can be more readily observed, debated, and adjusted within our state. Needs can change, assumptions can change, and policies and programs thought effective or necessary may prove not to be so — or more effective ones may be found and adopted. Policymakers would be wiser to

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[34] Calculations from data provided by the U.S. Energy Information Administration, "North Carolina Electricity Profile 2016," https://www.eia.gov/electricity/state/northcarolina.

[35] Devashree Saha and Mark Muro, "Growth, carbon, and Trump: State progress and drift on economic growth and emissions 'decoupling,'" The Brookings Institution, December 8, 2016, https://www.brookings.edu/research/growth-carbon-and-trump-state-progress-and-drift-on-economic-growth-and- emissions-decoupling. See also Sophie Yeo and Simon Evans, "The 35 Countries Cutting the Link Between Economic Growth and Emissions," Carbon Brief, April 5, 2016, https://www.carbonbrief.org/the-35-countries- cutting-the-link-between-economic-growth-and-emissions.

[36] Saha and Muro, op. cit.

[37] Saha and Muro, op. cit.

[38] U.S. EIA, "North Carolina Electricity Profile 2016," op. cit. The other numbers: an additional 0.7 percent from nuclear (which was the lion's share overall of generation overall at 32.7 percent), an additional 0.8 percent from hydroelectric (3.4 percent total), an additional 0.4 percent from biomass (0.5 percent total), and an additional 2.6 percent from solar (and 2.6 percent total, a late increase over its 0.6 percent share in 2014, reflecting the increase in the state Renewable Energy Portfolio Standards requirement in 2015).

"buy local," as it were, when it comes to policies to address environmental quality issues.

North Carolina Leadership Forum Discussion Paper: Working Towards a Lower Carbon Future for North Carolina

Introduction

The North Carolina Leadership Forum, hosted by Duke University's Sanford School of Public Policy, provides a venue for North Carolina leaders to discuss the nature of key challenges, to understand different points of view about how to address them, and to advance mutually acceptable solutions that improve the lives of North Carolinians. In 2017-2018, the Forum is focused on the question, "How can North Carolina best meet the energy needs of its residents and businesses?" Dialogue has centered on the challenge of providing energy services that are reliable, affordable, and clean.

This paper informs forum discussion of strategies to further reduce carbon dioxide (CO_2) emissions in North Carolina. It describes two strategies to advance that objective while also promoting reliability and affordability:

(1) **Modernizing the Grid:** Grid modernization lowers emissions by facilitating greater renewable energy integration and enhancing energy efficiency through new tools for customers to manage their energy use—while improving reliability and resiliency against extreme weather events; and

(2) **Accelerating Electric Vehicle Deployment:** Electrifying the transportation sector reduces emissions of CO_2 and pollutants that contribute to smog; unlocks cost savings for electric vehicle drivers and all electricity customers; and supports economic development in our communities.

A Strong Platform for a Smarter, Cleaner Energy Future

North Carolina is well-positioned to meet the growing expectations of residents and businesses that energy sources be reliable, affordable, and clean. Electricity prices in North Carolina are already among the lowest in the United States.[39] At the same time, more than half of Duke Energy's generation in the Carolinas now comes from zero CO_2 emissions sources—including nuclear, hydropower, and solar—placing the state's electricity generation among the cleanest in the nation. North Carolina is a

[39] U.S. Energy Information Administration, "Rankings: Average Retail Price of Electricity to Residential Sector, November 2017", https://www.eia.gov/state/rankings/?sid=US#/series/31.

national leader in solar energy.[40] As of 2015, North Carolina ranked 14th in the nation for lowest CO_2 emissions per capita, reflecting the low emissions intensity of electricity generation in the state.[41]This means that any future carbon constraint will impact our state less than other states with a more emissions-intensive energy mix.

Duke Energy recognizes that climate change is a key issue for many of our stakeholders and shareholders, and—for more than a decade—we have been anticipating and planning for a future that includes a constraint on CO_2 emissions. Between 2005 and 2017, CO_2 emissions from our generation fleet fell by 31 percent enterprise-wide and nearly 37 percent in the Carolinas. After dramatically outpacing our 2010 voluntary goal of 17 percent below 2005 levels by 2020, in 2017 we established a new goal: reduce fleet-wide CO_2 emissions to 40 percent below 2005 levels by 2030.

Shifting from Coal Generation to Cleaner-Burning Natural Gas

Low-cost natural gas has enabled Duke Energy—and the United States electricity sector as a whole— to cost-effectively reduce reliance on higher-emitting coal-fired generation. Since 2011, Duke Energy has retired more than 30 coal-fired generating units in the Carolinas, including all of our older un- scrubbed units. We plan to retire five more coal-fired units in the next six years, including units at Asheville in 2019 and Allen in 2024. In addition, we are investing in dual-fuel systems that enable our newer coal-fired units to cost-effectively use cleaner-burning natural gas. Natural gas, which now makes up about one quarter of our generation in the Carolinas, emits about half of the CO_2 as coal. To address concerns about methane and climate, we became a founding partner of the Environmental Protection Agency's voluntary Natural Gas Star Methane Challenge program, focused on reducing methane emissions from natural gas distribution.

Investing in Cleaner Energy

Through prudent, economic investments Duke Energy is committed to advancing affordable, reliable and clean energy in North Carolina. Second only to California in installed solar capacity, we have approximately 2,500 megawatts (MW) of solar connected to our grid in North Carolina and expect to have 6,800 MW connected by 2024. The Southern Alliance for Clean Energy recognized Duke Energy Carolinas and Duke Energy Progress for meeting nearly one percent of sales with energy

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[40] Solar Energy Industry Association, Top 10 Solar States, https://www.seia.org/research-resources/top-10-solar-states

[41] U.S. Energy Information Administration, "Energy-Related Carbon Dioxide Emissions by State 2000-2015," January 22, 2018, https://www.eia.gov/environment/emissions/state/analysis/

efficiency in 2016 and reaching a nationally recognized benchmark for success.[42] In 2017, we announced plans to install North Carolina's two largest battery-storage systems—a $30 million investment—to provide frequency response and other grid support services as part of the Western Carolinas Modernization Plan. And in 2018, we are developing new solar rebate, leasing, and community solar programs under House Bill 589 to expand customer access to renewable energy. We are also working to safely extend the lives of our existing nuclear plants, which in 2017 contributed 51% of our generation in the Carolinas.

Supporting Collaborative Energy Policy Initiatives

Duke Energy believes that the future for cleaner energy is bright as we work with state regulators and other stakeholders to transition to a smarter energy grid in a way that balances reliability and affordability for customers. We have supported key energy policy initiatives in the last 15 years, including the Clean Smokestacks Act,

Senate Bill 3 and, most recently, House Bill 589.[43] Building on this strong platform, we see grid modernization and accelerating transportation electrification as key opportunities to advance low carbon objectives while enhancing reliability, security, and resiliency; unlocking cost savings for residents and businesses; and supporting economic development in our communities.

A Modernized Grid is the Foundation of Affordable, Reliable, and Clean Energy

"[The] grid of the future will help the United States take full advantage of the range of available energy sources and technologies that will help meet its climate change goals. These sources and technologies include energy efficiency; energy storage; carbon capture, utilization, and storage; electric vehicles; microgrids and other distributed technologies; and nuclear, natural gas, and renewable energy generation."

– U.S. Department of Energy Quadrennial Energy Review, April 2015

The United States Department of Energy's Quadrennial Energy Review, released in 2015, identifies grid modernization as an essential element in achieving the broad goals of promoting affordable, reliable, and clean electricity.[44] Modernization can

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[42] Southern Alliance for Clean Energy, "Duke Energy Leads the Southeast on Energy Efficiency," October 2017, http://blog.cleanenergy.org/2017/10/12/southeast-energy-efficiency-2017/.

[43] The 2002 Clean Smokestacks Act played a significant role in retiring older, less efficient, and higher emitting coal-fired units. Senate Bill 3 created North Carolina's renewable energy portfolio standard, which remains the only such standard in the Southeast. House Bill 589, enacted in 2017, will double the utility scale solar capacity installed in North Carolina in the next three years and expand access to rooftop and community solar.

[44] United States Department of Energy, Quadrennial Energy Review: Chapter 3 Energy Storage, Transmission, and Distribution Infrastructure, April 2015, https://www.energy.gov/sites/prod/files/2015/08/f25/QER%20Chapter%20III%20Electricity%20April%202015.pdf

enable lower-carbon electricity while offering multiple additional benefits such as improved reliability and system efficiency, enhanced resiliency to protect the grid against physical and cyber threats, improved cybersecurity, and greater consumer control over how and when to use energy.

Intelligent grid technologies enable energy management systems that can help integrate the expansion of more renewable and distributed energy resources — like solar panels, and battery storage and electric vehicles — and help empower customers to manage the energy used in their homes and businesses, helping them save energy and money and lowering their carbon footprint.

At the same time, grid modernization will provide essential resilience and security benefits against severe weather impacts and the very real threat of physical and cyber attack. A reliable grid is essential to the security and economic prosperity of communities and the state. And a modernized grid will help to avoid power outages by intelligently re-routing power to minimize impacts to customers, as well as speed restoration when outages do occur. Improvements in reliability translate into real cost savings for residential and business customers, which can, in turn, help the state's economy.

Power/Forward Carolinas, Duke Energy's 10-year grid modernization initiative, leverages advanced data to drive strategic, targeted investments that improve reliability, enable the expanded use of solar and other clean energy, and provide customers with intelligent information to help them make smart energy choices and save money. These investments will also bring benefits to North Carolina, including nearly 14,000 new jobs and more than $1 billion in taxes to benefit communities and provide business and residents with an electric grid that is smarter, more reliable and more secure.[45]

Driving Toward Lower Emissions and Costs with Electric Transportation

The United States transportation sector now emits more CO_2 than the electricity sector, reflecting the shift toward cleaner-burning natural gas and renewables.[46] With more than half of Duke Energy's North Carolina generation now coming from zero-CO_2-emissions sources, increasing electric transportation has the potential to further reduce emissions of CO_2 and other pollutants from the transportation sector while saving customers money.

Electric vehicles cost less to operate and maintain than conventional vehicles and—because transportation is the second largest expense for the average U.S. has the

[45] EY Quantitative Economics and Statistics, "North Carolina impacts of Duke Energy's Power/Forward grid improvement program," November 2017, http://starw1.ncuc.net/NCUC/ViewFile.aspx?Id=d5ef1697-24fc-4462-b578-bda9b7585ca3

[46] United States Energy Information Administration, Power sector carbon dioxide emissions fall below transportation sector emissions, January 19, 2017, https://www.eia.gov/todayinenergy/detail.php?id=29612

potential to save North Carolinians money.[47] The Union of Concerned Scientists estimates that Duke Energy's North Carolina customers can save up to approximately $800 per year on fuel costs alone by switching to an electric vehicle.[48] These fuel cost savings remain in state rather than flowing to out of state oil companies, reducing reliance on fuel imports and providing an economic stimulus to the state. In addition to the declining cost of new electric vehicles, a robust secondary market has developed where dependable used electric vehicles can be purchased in the same price range as conventional vehicles affordable to consumers across the income spectrum.

Beyond the personal cost savings to electric vehicle owners, electric vehicle charging can save North Carolina electricity consumers money by helping to keep electricity rates low. With smart incentives for electric vehicle drivers, electric vehicle charging can occur during times of low electricity demand and spread the fixed costs of grid infrastructure over a larger volume of electricity sales. In aggregate, this additional utilization of our grid can help put downward pressure on electricity rates for all residents and businesses.[49]

Access to charging infrastructure remains an important barrier to widespread electric vehicle adoption. States across the country are now focused on expanding access to electric vehicle charging infrastructure to unlock the multiple benefits of electric transportation. Opportunities for North Carolina include establishing an electric vehicle deployment goal and aligning policy incentives to drive charging infrastructure deployment and accelerate electric vehicle adoption.

Conclusion

North Carolina's energy future is bright. With below-average electricity prices and emissions and policies in place to support continued investment in clean energy, the state is well-positioned to meet the expectations of residents and businesses for energy that is reliable, affordable and clean. North Carolina's history of broad stakeholder collaboration on clean energy policies has made the state a national leader, and there are opportunities ahead where the state can continue to advance the goals of affordable, reliable, and clean. Two such opportunities are modernizing the grid and accelerating electric vehicle deployment. These strategies can advance the objective of reducing CO_2 emissions while enhancing reliability, improving affordability, empowering customers to manage their energy use and cost, and investing in our communities.

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[47] U.S. Department of Energy, "Saving Money with Electric Vehicles," September 16, 2015, https://www.energy.gov/energysaver/articles/saving-money-electric-vehicles

[48] Union of Concerned Scientists "Going from Pump to Plug" 2017, www.ucsusa.org/EV-savings

[49] Ceres and MJ Bradley & Associates, "Accelerating Investment in Electric Vehicle Charging Infrastructure: Estimated Needs in Selected Utility Service Territories in Seven States," November 2017, https://www.ceres.org/resources/reports/accelerating-investment-electric-vehicle-charging-infrastructure

A Pathway to a Cleaner Energy Future in North Carolina

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Prepared for the Sierra Club, August 2017

This summary has been adapted by the Sanford School of Public Policy for the purposes of discussion at the North Carolina Leadership Forum. For the entire report, please visit: https://content.sierraclub.org/coal/sites/content.sierraclub.org.coal/files/1626_NC-AllinOne_Report_02_x1a_pages.pdf

The state of North Carolina is at a crossroads regarding its energy future, facing two dramatically different paths. Duke Energy, the main electricity provider in the state, calls for 5,617 MW of new fossil and nuclear capacity between 2018 and 2028 in its preferred resource plans. Under this "Business-As-Usual" (BAU) vision, fossil fuel and nuclear generation are front and center in meeting electricity demand. Although renewable energy and energy efficiency are required to supply 12.5% of the utility's sales by 2021, Duke Energy does not plan to add any utility-owned solar or wind capacity to the grid; does not plan to meaningfully increase energy efficiency levels (which under Duke's plans will meet, at most, 0.5% of electricity demand); and plans to utilize only a very small amount of demand response programs.

In dramatic contrast to Duke Energy's fossil fuel-reliant vision, The Greenlink Group (an energy research firm) has evaluated a cleaner energy pathway, whereby 23% of electricity demand is met by resources such as energy efficiency, distributed and utility-scale solar, wind, hydroelectric power, demand response, and energy storage technologies. In this Cleaner Energy Plan, none of the new fossil and nuclear capacity that Duke Energy has proposed to construct over the next ten years will be needed, and the seven coal plants currently on Duke's system will be retired between 2018 and 2027 because they are unnecessary to meet system demand. The results of this study suggest that the Cleaner Energy Plan will not only maintain the reliability of the grid and make electricity service more affordable for North Carolinians, it will reduce the environmental impact associated with electricity production.

Designing a Clean Energy Future

The Cleaner Energy Plan evaluated in this study begins with realistic electricity consumption and peak demand forecasts that align with those of other energy system modeling experts and recent North Carolina history. The results

demonstrate that Duke Energy severely overestimated both consumption and demand growth.

The realistic growth rates of the Cleaner Energy Plan eliminate some of the utilities' justification for the construction of new generating assets. Furthermore, the Cleaner Energy Plan introduces cost-effective automated demand response programs and energy efficiency programs, further deepening the reductions in electricity consumption and peak demand. In addition, the Cleaner Energy Plan would also take full advantage of economical renewable and energy storage technologies, lowering the emissions intensity of the electricity supply.

The proposed clean energy measures would fundamentally alter the dynamics of electricity demand and supply in North Carolina. Their substantial impact on Duke Energy's resource mix manifests in three ways. First, under the Cleaner Energy Plan, more-likely consumption and peak demand levels diminish the argument for new fossil and nuclear capacity. Additionally, all existing coal-fired generating capacity can be retired in a 10-year period, reducing system costs without jeopardizing grid reliability. Finally, the machine learning-powered simulation results show that clean energy plays an important role in meeting demand and keep the grid reliable.

The Clean Energy Future Is Economically Wiser

The Cleaner Energy Plan will deliver tangible financial benefits to North Carolina electricity ratepayers. The reduction in customer electricity demand due to energy efficiency, demand response, and distributed renewable sources translates to lower overall consumption and lower electricity bills. Despite modest beginnings, the savings ramp up quickly and eventually reach a cumulative savings of $5.4 billion for Duke Energy customers. Relative to the BAU, residential customers will see an average $101 reduction in their annual electricity bills; non-residential customers will experience a $611annual electricity bill saving.

Jobs, incomes, and GDP are all higher in the Cleaner Energy Plan than in the BAU. Under the Cleaner Energy Plan, employment would increase, ranging from 109,000 to 157,000 job-years between 2018 and 2028. Incomes would experience a net increase of $4.8 billion to $7.7 billion, while North Carolina's GDP increases by $3.7 billion to $8.2 billion. Overall, economic development is accelerated dramatically under the Cleaner Energy Plan.

The Cleaner Energy Plan Transforms The Grid

A significant fuel mix change will occur for Duke Energy's centralized-generating system over the course of the next decade. Compared to the BAU scenario, the Cleaner Energy Plan creates a significant shift away from coal, nuclear, and combined cycle gas generation towards clean energy resources such as solar, wind, and battery storage. Coal-fired power plants are phased out entirely by 2027. While combined cycle gas plants play a smaller role under the Cleaner Energy Plan, combustion turbine gas units will generate more electricity under this scenario than

under the BAU. Overall gas use, however, is lower under the Cleaner Energy Plan than under the BAU.

In contrast to the diminishing role of fossil generation, clean energy resources experience tremendous growth under the Cleaner Energy Plan, meeting 23% of the total Duke Energy system load in 2028. Solar becomes the largest clean energy source in the Cleaner Energy Plan, producing nearly 16 million MWh of electricity in 2028, more than twice as much as its 2028 contribution in the BAU scenario. New wind capacity in northeastern North Carolina and wind energy purchases from transmission projects make wind the second largest clean energy resource in the State. Energy efficiency's contribution to reducing electricity demand will ramp up from its current level of 0.4% to 4% by 2028, a ten-fold growth. Albeit small in energy terms, demand response programs come at a critical time when power reductions help to maintain operational reliability and cost-effectiveness. The aggressive pursuit of energy efficiency and demand response will also reduce peak load on the Duke Energy system by 18% in 2028. Altogether, clean energy resources become a substantial component of North Carolina's energy mix.

The Cleaner Energy Plan Benefits The Public and The Environment

In addition to electricity bill savings, job creation, and GDP growth, the Cleaner Energy Plan also achieves a suite of social and environmental benefits. Emissions of carbon dioxide (CO2), sulfur dioxide (SO2), nitrogen oxides (NOx), particulate matter, ammonia, and volatile organic compounds (VOCs) are lower in the Cleaner Energy Plan than the BAU scenario. Cumulatively, over 160 million metric tons of CO2 emissions will be avoided between 2018 and 2028, equivalent to the expected emissions of 3.4 million cars over the same period. Similarly, across the other six pollutants, nearly 47% of the emissions will be avoided.

In addition to better air quality, 53 billion gallons of water consumption is avoided due to the retirement of water-intensive coal-plants and the avoided operations of a new nuclear unit.

A cleaner electricity supply leads to a suite of social, environmental, and economic benefits such as better public health, fewer crop failures, and lower extreme-weather-related risks to the economy. The avoided CO2 emissions alone produce about $3.6 billion social, environmental, and economic benefits globally (valued using the U.S. Interagency Working Group Social Cost of Carbon). Overall, the Cleaner Energy Plan reduces total damages from electricity generation by $21 billion between 2018 and 2028, a 45% decline from the BAU scenario.

Because many pollutants travel across state and national borders, the public health benefits due to a cleaner grid in North Carolina can be enjoyed in and beyond the state. Adult mortality declines by 1,200, nearly 900 hospital visits for issues like asthma and cardiovascular disease are avoided, and society benefits from the added productivity of 93,000 missed work days being added back to the economy.

A Cleaner Energy Future, A Better Future

The Cleaner Energy Plan designed in this study is a much more attractive development pathway for North Carolina. Economic opportunities are greatly expanded, environmental damage is much reduced, and social outcomes are significantly better than under the BAU trajectory. It is also significantly more cost-effective than the BAU case. The cumulative net monetary benefits achieved in the Cleaner Energy Plan associated with the full complement of costs and benefits totals at $59 billion to $100 billion dollars. Overall, these results suggest the Cleaner Energy Plan represents a more desirable and sustainable future for North Carolina, its businesses, and its residents.

North Carolina Leadership Forum Discussion Paper: Promoting Affordable, Reliable, and Clean Energy through Effective Regulation, Collaborative Policymaking, and Smart Investments

Introduction

The North Carolina Leadership Forum (NCLF), hosted by Duke University's Sanford School of Public Policy, provides a venue for state leaders to discuss the nature of key challenges, to understand different points of view about how to address them, and to advance mutually acceptable solutions that improve the lives of North Carolinians. In 2017-2018, NCLF is focused on the question, "How can North Carolina best meet the energy needs of its residents and businesses?" Participant dialogue has centered on the challenge of providing energy services that are reliable, affordable, and clean.

This paper informs NCLF discussion of electricity regulation. It begins by describing how cost-of- service regulation and collaborative energy policies have worked together to position North Carolina as a national leader in affordable, reliable, and clean energy. Next it explains why, in other states, restructuring and third-party sales have confused consumers and frustrated state policy goals. Finally, it argues that grid modernization can better promote affordable, reliable, and clean energy.

North Carolina is a Leader in Affordable, Reliable, and Clean Energy

As a national leader in reliable, affordable, and clean energy, North Carolina's energy future is bright. Electricity prices in North Carolina are among the lowest in the nation.[50] North Carolina is a national leader in solar energy.[51] More than half of Duke Energy's generation in the Carolinas now comes from zero-emission sources. As of 2015 North Carolina ranked 14th in the nation for lowest carbon dioxide emissions per capita, reflecting the relatively low emissions intensity of electricity generation.[52]

Cost-of-service regulation and collaborative energy policy initiatives have played an important role in positioning North Carolina's electricity sector as a leader in

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[50] U.S. Energy Information Administration, "Rankings: Average Retail Price of Electricity to Residential Sector, November 2017", https://www.eia.gov/state/rankings/?sid=US#/series/31.

[51] Solar Energy Industry Association, Top 10 Solar States, https://www.seia.org/research-resources/top-10-solar-states

[52] U.S. Energy Information Administration, "Energy-Related Carbon Dioxide Emissions by State 2000-2015," January 22, 2018, https://www.eia.gov/environment/emissions/state/analysis/

affordable, reliable, and clean energy. Under cost-of-service regulation, public utilities such as Duke Energy Progress and Duke Energy Carolinas have a mandate to serve all customers within an exclusive service territory. The North Carolina Utilities Commission (NCUC) sets electricity prices based on prudently incurred costs to provide that service plus a reasonable rate of return. State regulation of public utilities protects consumers and preserves state oversight of the electricity system that powers lives and the economy.

Cost-of-service regulation has worked in tandem with collaborative energy policy initiatives—such as the Renewable Energy and Energy Efficiency Portfolio Standard established in 2007 by Senate Bill 3 and programs to expand solar energy under the 2017 Competitive Energy Solutions for NC Act (House Bill 589)—to protect residents and businesses while modernizing North Carolina's energy infrastructure and expanding access to new technologies.

Restructured Electricity Markets have Under-Delivered on Their Promises

Between 1995 and 2002, several states—beginning with California and New York—adopted policies to restructure the electricity sector. While some observers refer to these policies as "deregulation," restructured electricity markets remain highly regulated. In fact, restructuring replaced state regulation of vertically-integrated utilities with federal regulation of regional wholesale markets and continued state regulation of electricity distribution. In those states, transmission owners turned over operation of their transmission lines to regional transmission organizations that operate the federally-regulated wholesale markets. State-regulated distribution utilities and, in some states, competitive electricity retailers, purchase electricity at wholesale rates and pass those costs on to retail customers. Customers pay for the underlying infrastructure to deliver the power plus the wholesale price of power.

Electricity restructuring has, in large part, been "a disappointment" relative to the promises made by some advocates as described by a 2015 review by experts at the University of California Berkeley's Haas School of Business.[53] Prices in restructured markets are determined by the most expensive generators needed to meet electricity demand, which are often fueled by natural gas. During the mid- to-late 2000s, when natural gas prices reached historic highs, electricity prices climbed rapidly in restructured states and many of those states examined or took steps to re-regulate electricity generation.[54]

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[53] Severin Borenstein & James Bushnell, "The U.S. Electricity Industry 20 Years After Restructuring," University of California Berkeley Haas School of Business, May 2015, https://ei.haas.berkeley.edu/research/papers/WP252.pdf

[54] Kaye Scholler LLP, "State Analysis of Restructuring and Re-Regulation," Final Report to the Maryland Public Service Commission, 2008, http://www.psc.state.md.us/wp-content/uploads/Kaye-Scholer_Final-Report_State-Analysis-and-Survey-on- Restructuring-and-Reregulation-for-the-MD-PSC.pdf

Although the shale gas revolution has dramatically lowered natural gas prices (and therefore wholesale electricity prices), states with restructured markets still face higher electricity prices than states that maintain cost-of-service regulation (figures 1 and 2). Transmission-constrained areas of states such as New Jersey and Maryland face even higher prices, and those prices have not led to investment in new generation to provide price relief for consumers.[55] State policymakers have pursued out-of-market mechanisms to attract new generation and lower prices for consumers, but federal jurisdiction over wholesale electricity sales has limited state authority.

Demonstrating that competitive wholesale markets for electricity can also frustrate other energy policy goals, states such as Massachusetts, Connecticut, and Rhode Island are increasingly relying on out- of-market mechanisms like long-term power purchase agreements to procure renewable energy.[56] Illinois and New York have similarly adopted out-of-market policies to retain existing nuclear generation, having concluded that competitive wholesale markets do not properly value the zero- emissions, fuel diversity, and reliability attributes of those resources.[57] These out-of-market mechanisms are creating challenges and eroding competitive price signals in RTO markets.[58]

Retail competition has proven an even bigger disappointment. Many observers expected competitive electricity retailers to introduce time-varying pricing and other billing innovations to give consumers more choice about when and how they use energy, but those innovations have not materialized.[59] Instead, competitive retail providers have often caused confusion for electricity consumers.[60] A recent

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[55] State Power Project, "Maryland and New Jersey: Commerce Clause and Supremacy Clause Challenges to States' Incentives for New Gas-Fired Generation," Harvard Environmental Policy Initiative, (accessed March 3, 2018), https://statepowerproject.org/states/maryland-and-new-jersey/

[56] ISO New England, "Accommodating State Energy Policy Goals within the Competitive Marketplace," Accessed March 3, 2018, https://www.iso-ne.com/about/regional-electricity-outlook/grid-in-transition-opportunities-and-challenges/public-policies-and- markets

[57] National Conference of State Legislatures, "State Options to Keep Nuclear in the Mix," January 2017, http://www.ncsl.org/Portals/1/Documents/energy/StateOptions_NuclearPower_f02_WEB.pdf

[58] Federal Energy Regulatory Commission, "Notice of Technical Conference: State Policies and Wholesale Markets," May 1-2, 2017, https://www.ferc.gov/CalendarFiles/20170303172159-AD17-11-000TC.pdf

[59] Borenstein & Bushnell, supra note 4.

[60] Jennifer Abel, "Third-party energy providers can be a poor choice: Illinois utility board warns residents of 'rip-offs,'" Consumer Affairs, May 14, 2014, https://www.consumeraffairs.com/news/third-party-energy-providers-can-be-a-poor-choice-051414.html; Kerith Gabriel, "Energy Scammed: Don't get shocked by door-to-door sales reps," Philadelphia Weekly, November 30, 2016, http://www.philadelphiaweekly.com/arts/energy-scammed-don-t-get-shocked-by-door-to-door/article_e1adf78a-b721-11e6- 8db0-4b9f2f94e022.html; David Martin, "Some customers say they're 'legally robbed' by deregulated power," Aljazeera America, March 26, 2015, http://america.aljazeera.com/watch/shows/america-tonight/articles/2015/3/26/deregulated-electricity- fraud.html; Jordan Blum, "Texas Utilities Commission decries 'deceptive', confusing electricity marketplace," Fuel Fix, June 9, 2016, https://fuelfix.com/blog/2016/06/09/texas-utility-panel-decries-deceptive-confusing-electricity-marketplace/

study by the New York Public Service Commission found that those who signed up for a competitive provider paid nearly $820 million more for electricity and gas than if they had stayed with their local company, and that some competitive providers engaged in "outright fraud."[61]

Third Party Sales Leave Consumers Unprotected

A third-party sale is when a non-utility sells electricity directly to a retail customer, typically a homeowner or a commercial or industrial business. Under North Carolina law, (G.S. 62-110.2), a non- public utility may not legally sell electricity directly to an existing retail customer, or to a new retail customer of a public utility.

Proponents of third-party sales argue that allowing customers to negotiate directly with third-parties will expand access to renewable energy. However, policies already exist in North Carolina to support renewable adoption, including the Renewable Energy and Energy Efficiency Portfolio Standard and House Bill 589. These policies have made North Carolina second in the nation for installed solar capacity and will double installed solar over the next five years. House Bill 589, enacted in 2017, expands customer access to solar through rebate programs, solar leasing, and community solar.

As demonstrated by other states' experience with non-utility electricity providers— including New York's admission that consumers overpaid for electricity and natural gas by nearly $820 million— allowing third-party sales can expose consumers to several risks, including:

- **Lack of oversight or protection of customers:** Third party sales without responsible limits create an entity that operates like a utility but has none of the oversight or regulation to protect customers found in a regulated utility like Duke Energy.
- **Lack of oversight on pricing:** Rates and services provided by a utility are reviewed by the NCUC to ensure fairness to all customers. The NCUC also ensures that the service is least cost, a required of North Carolina utilities. Third-party sales are not subject to this oversight. Prices determined by companies engaged in third-party sales are not regulated.
- **Doesn't necessarily guarantee better outcomes for our customers:** Third-party sales do not necessarily translate into cost savings for customers, particularly in states like North Carolina where electric rates are already low. Additionally, third-party customers must still rely on their utility and use the same infrastructure as everyone else for delivery and billing.

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[61] Jeff Platsky, "At Risk: NY Reviews Electric, Gas Free-Choice Program; Consumers Ended Up Paying More," Gannett News, February 9, 2018, https://www.pressconnects.com/story/news/2018/02/09/risk-ny-groundbreaking-program-allowing-customers- select-electric-gas-suppliers/302146002/

Grid Modernization Promotes Affordable, Reliable, and Clean Energy

Efforts to promote affordable, reliable, and clean energy would be better served by a focus on modernizing North Carolina's grid. Intelligent grid technologies—such as those included in Power/Forward Carolinas, Duke Energy's 10-year project to modernize the grid—can leverage advanced data analytics to drive strategic investments that (1) improve reliability, reduce outages, make the grid more resilient against severe weather impacts, and protect against physical and cyber attacks; (2) provide customers with more information and control over their energy use and options for saving energy and money; and (3) enable more clean, renewable energy and technologies such as battery storage and microgrids.[62] At the same time, grid modernization represents an important economic development opportunity for North Carolina communities.

Improving Reliability and Resiliency: Upgrades to North Carolina's grid—such as those included in the Power/Forward Carolinas initiative—can harden the system against storms and outages and make the grid safer and more resilient against cyber-attacks and physical threats. For example, self-healing grid technology self-identifies problems and reroutes power, decreasing both the number and duration of outages.[63]

Promoting Affordability through Bill-Lowering Tools: Grid modernization can also streamline utility billing functions, reducing administrative costs and give customers more bill-lowering tools. For example, technologies such as smart meters can provide customers with better information and more options for managing their energy use, such as providing usage information and identifying the most cost effective investments to improve efficiency.[64] This information can also enable new and innovative programs—including innovative rate plans—that help customers save money by shifting their energy use to periods of lower energy demand. In addition, digital billing platforms can allow customers to take simple steps to manage their energy costs like choosing their own bill date to make costs more predictable—a key concern for fixed and low income customers.

Enabling More Clean, Renewable Energy: North Carolina's electricity grid has been built and maintained over the past century to exploit economies of scale, resulting in power generated by large central power plants and delivered to residents' homes and businesses. Grid modernization technologies provide greater visibility into the distribution system and enable the two-way flow of electricity, helping to integrate

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[62] United States Department of Energy, Quadrennial Energy Review: Chapter 3 Energy Storage, Transmission, and Distribution Infrastructure, April 2015, https://www.energy.gov/sites/prod/files/2015/08/f25/QER%20Chapter%20III%20Electricity%20April%202015.pdf

[63] Massoud Amin, "The Self-Healing Power Grid: Modernizing the Grid Means More then Being Smart," IEEE, November 4, 2013, http://theinstitute.ieee.org/ieee-roundup/members/achievements/the-selfhealing-power-grid

[64] Smart Grid Consumer Collaborative, "Smart Grid Economic and Environmental Benefits: A Review and Synthesis of Research on Smart Grid Benefits and Costs," 2013, http://smartenergycc.org/wp-content/uploads/2013/10/SGCC-Econ-and-Environ-Benefits-Full-Report.pdf

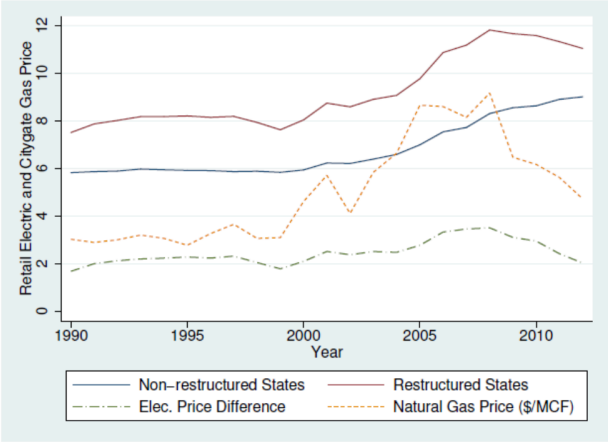

Figure 1. *Source: Borenstein & Bushnell 2015*

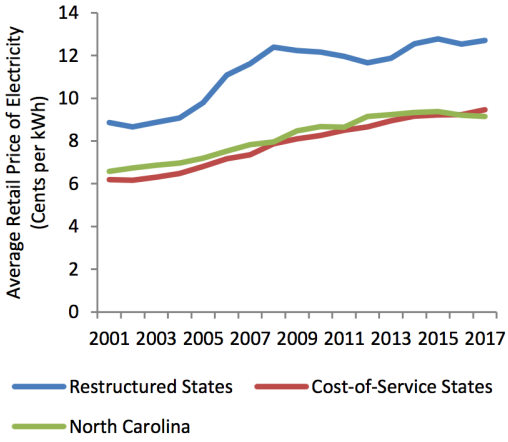

Figure 2. *Source: EIA*

more renewable and distributed resources—like solar, battery storage, and electric vehicles.[65]

Investing in North Carolina's Future: Finally, grid modernization can provide important economic benefits to North Carolina. Power/Forward Carolinas is a 10-year initiative that will transform the infrastructure that powers the lives of North Carolina's communities. Improving reliability, reducing the number and duration of outages and making the grid more resilient will ensure that North Carolina's power grid can continue to be the backbone of a thriving state and growing economy. This initiative will result in nearly 14,000 new jobs and more than $1 billion in taxes to benefit communities and provide business and residents with an electric grid that is smarter, more reliable and more secure.[66]

Conclusion

Cost-of-service regulation and collaborative energy policies have worked together to position North Carolina as a national leader in affordable, reliable, and clean energy. In other states, restructuring and third-party sales have confused consumers and frustrated state policy objectives. Electricity prices are higher in states that have pursued restructuring policies and federal regulation of wholesale electricity markets has limited state authority to promote affordability, reliability, and increasingly clean energy. Grid modernization is a better pathway to promote the objectives of affordable, reliable, and clean through enhanced reliability and resiliency; increased efficiency, choice, and bill-lowering tools; better integration of renewable energy; and investment in North Carolina's economy.

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[65] Jonathan Blansfield and Adam Cooper," Grid Modernization Technologies: Key Drivers of a Smarter Energy Future" Edison Foundation Institute for Electric Innovation, May 2017, http://www.edisonfoundation.net/iei/publications/Documents/Final_Grid%20Modernization%20Technologies_IEI%20White%20Paper.pdf

[66] EY Quantitative Economics and Statistics, "North Carolina impacts of Duke Energy's Power/Forward grid improvement program," November 2017, http://starw1.ncuc.net/NCUC/ViewFile.aspx?Id=d5ef1697-24fc-4462-b578-bda9b7585ca3

March 24, 2018

Regulatory Reform: a position paper for fellow participants in the 2018 North Carolina Leadership Forum

The NC Leadership Forum participants voted "deregulation" a top issue to delve into during our March session in Asheville. In preparation for discussion of regulatory reform of which "deregulation" is one general option, the following position paper is provided by Ivan Urlaub, Executive Director of the NC Sustainable Energy Association. For continuity, NCLF pre-read materials are heavily referenced.

A vertically integrated monopoly electric utility is responsible for power generation, transmission, and distribution. Electricity is an essential service and, until recently, was thought to be best provided by a regulated monopoly. Recent technological and market shifts warrant investigation into this assumption.

> "All regulation is incentive regulation…[meaning] every regulation imposed by government creates limitations on what the utility can do; but also gives the utility incentives to act in ways that may or may not promote the public interest. Given any set of regulations, utilities will take those actions that most benefit their principal constituencies – shareholders and management – while meeting the requirements of the regulations."[67]

The position of this paper, consistent with national utility sector trends, is that NC's current Cost Plus Regulatory model is inconsistent with shifting public interests and does not meet NC's policy objectives.

Why might "deregulation" be an issue for North Carolinians?

Discussion of electric utility regulatory reform is not new to NC. In 1997, the General Assembly established the Study Commission on the Future of Electric Service in NC. The Study Commission was charged with examining the cost and adequacy of electric service in the state and to explore issues involved in providing retail competition. In April 2000, the Study Commission unanimously recommended NC move to fully competitive retail electric service, but not full deregulation. However, later that year, the Study Commission received negative feedback on restructuring

[67] Regulatory Assistance Project. Electricity Regulation in the U.S.: A Guide. p.7

in California and ultimately no legislation was introduced to implement the retail choice recommendations.[68]

North Carolina's intensifying public discussion of "deregulation" is rooted in the fact that an investor owned utility (IOU) is motivated to act in the interests of its shareholders and managers. NC's traditional regulatory model has unintentionally facilitated a divergence in the interests of customers and regulated utilities, primarily around cost and options. Consumer discontent is intensifying, as evidenced by the growing number and diversity of parties involved in North Carolina Utilities Commission proceedings. This paper assumes most consumers mean "different could be better" when using the word "deregulation." Determining what needs to change to align around a "better" solution will require a complex conversation with a great diversity of perspectives and needs addressed.

This paper does not directly address rural electric membership cooperatives (EMCs) or municipal utilities because both are consumer-owned and governed. Thus, a growing subset of EMCs and municipal utilities are innovating their business models to align with customers' needs without legislative or regulatory intervention. However, Duke Energy is the primary wholesale power provider to over 100 smaller NC utilities, which means this issue is of material consequence to nearly all NC consumers.

An informed dialogue on what should be different starts with our current electricity regulatory model.

Background

The Utilities Commission has broad jurisdiction over IOUs and limited jurisdiction over EMCs and municipal utilities. It regulates all aspects of IOUs, including rates, services, and operations. The Utilities Commission establishes monopoly service territories and is tasked with ensuring that utilities provide adequate and reliable service. The Utilities Commission also oversees the development of new generation, and utilities must permission before new generation can be built.

The present Utilities Commission evolved from the North Carolina Railroad Commission, which was originally formed in 1891 and was granted control over electricity in 1913. However, the Public Utilities Act of 1963 fundamentally overhauled the Utilities Commission, including giving it the power to regulate electricity generation starting in 1965. Since then, NC has operated within a traditional cost of service, or cost plus, regulatory model.

[68] North Carolina Utilities Commission, Electric Industry Restructuring.

If asked, most would say public policy requires electricity to be reliable, affordable, and safe. In fact, between 1963 and 2007, the policy of NC has expanded to encompass twelve policy objectives:[69]

1) Provide fair regulation in the public interest;

2) Promote the inherent advantage of regulated utilities;

3) Assure adequate, reliable, and economic service;

4) Assure resources meet future needs including conservation and demand response;

5) Provide just and reasonable rates consistent with long-term management and conservation;

6) Assure rates are fair to both customers and utilities;

7) Encourage and promote harmony between utilities, their users, and the environment;

8) Foster protection of public health, safety, and general welfare;

9) Adjust regulated supply to account for independent power production;

10) Cooperate with other states and Federal government;

11) Facilitate extension of natural gas service to unserved areas; and

12) Promote the development of renewable energy and energy efficiency through the Renewable Energy and Energy Efficiency Portfolio Standard (REPS).

What trends motivate dialogue on regulatory reform for electric utilities in NC?

Eight factors diminish the inherent advantages of continuing with traditional cost-plus regulation for NC's three IOUs, Duke Energy Progress (DEP), Duke Energy Carolinas (DEC), and Dominion Energy North Carolina (DENC). There is a rising sense that the current regulatory model leads the IOU, and possibly the regulator, to make decisions that result in unnecessary rate increases and significantly higher bills.

1. **Utility preferences are shifting.** In a recent survey of utility professionals, only 8% of those working for IOUs believe traditional cost of service is an appropriate regulatory model for the 21st century. In contrast, 51% say the most appropriate regulatory model for the future is "cost of service regulation

[69] N.C. Gen. Stat. § 62-2.

with a mix of performance-based regulation" and 38% say "predominately performance based."[70]

2. **Electric load growth is stalling, likely to remain flat.** Building new generation is no longer able to support earnings that satisfy investors. This is complicated by difficulty justifying new investments in large generation facilities. Contrasting DEC's summer peak load forecast from each integrated resource plan (IRP) since 2008 against the actual load reveals a consistent overstatement of load, and thus the need to supply load.[71]

3. **Anticipated rise in electricity rates and bills.** In 2017, both DEC and DEP requested rate increases to recover costs associated with coal ash remediation, abandoning a planned nuclear power plant, and other recent capital investments. The utilities also announced a combined $13.8 billion grid investment and DEC proposed a rider for accelerated recovery of expenses. The Utilities Commission granted an average rate increase of 6% for DEP and is expected to rule in May 2018 on DEC's request. Duke Energy has told shareholders that it expects multiple rate cases in NC through 2022.[72]

4. **Potential wholesale market load shift.** While many EMCs and municipal utilities buy wholesale power from North Carolina IOUs, that could change as their power purchase agreements, which often limit the amount of electricity these utilities can self-generate, expire. As prices for distributed energy resources (DER) and energy storage continue to decline, it will become increasingly appealing for EMCs, municipal utilities, and even commercial and industrial customers to have more wholesale and self-generation options. EMCs and municipal utilities have less regulatory barriers than IOUs to shifting their business models in response to evolving customer expectations and to benefit from DERs. In this direction, some EMCs now offer community solar.[73]

5. **Cost dynamics.** Similar to changing wholesale market providers, rising retail electricity rates and bills and declining prices for DER and storage will force regulators to confront whether electric service remains a natural monopoly in light of technological change."[74] While how many customers will completely defect from the grid is unknown, there will be increasing "load defection" and self- generation in response to the traditional utility business model and Cost

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[70] 2018 State of the Electric Utility, Utility Dive. https://www.utilitydive.com/library/2018-state-of-the-electric- utility-survey-report/

[71] Source: DEC Rebuttal Testimony, Docket No. E-7 Sub 1134

[72] Duke Energy. Fourth Quarter 2017 Earnings Review and Business Update. Slide 16

[73] America's Electric Cooperatives. Community Solar.

[74] Regulatory Assistance Project. Electricity Regulation in the U.S.: A Guide. 2016. P.10

Plus Regulation.[75]

6. **Technology dynamics.** Traditional utility business model processes and regulations cannot keep up with the accelerating pace of shifting technological and market conditions while maintaining competitive pricing. For example, "the traditional utility function of electricity distribution is being rapidly transformed into a complex net load management function involving thousands of points of power supply and millions of points of power delivery. Fully integrating this fast-developing mosaic of resources requires a distribution system capable of measuring and responding to information from both system operators and consumers."[76] Consumer acceptance of a modernized distribution system will likely require a transparent Integrated Distribution Planning process that considers low cost DER solutions, determines the level of investment by assessing portfolio effects and obtaining competitive bids. This requires a transparent sharing of system needs and opportunities with both customers and developers so customers can see how their needs are met at legitimate and affordable prices.

7. **Non-utility actors are more nimble, agile, adaptive, and innovative on shorter timelines and at lower costs.** Even under Cost Plus Regulation, non-utility actors have developed (primarily energy efficiency and solar) assets that provide or save electricity at or below the utilities' avoided cost (the cost the utility otherwise would have incurred to generate electricity). These non-utility actors have deployed over 3,000 MW of solar and 208 MW of wind in NC.[77] Recent legislation established a Competitive Procurement of Renewable Energy (CPRE) process that gives DEC and DEP more control over the location of non-utility generation while still harnessing the entrepreneurial character of non-utility actors to develop generation below avoided cost. Energy storage and EVs are likely next.

8. **Evolving customer interests are unsatisfied.** Customers do not see utilities as meeting their evolving needs while their rates are increasing to pay for legacy issues.

NC has six general regulatory models to consider in addition to our current model

Electricity regulation falls into two categories: 1) regulated and 2) restructured. On the spectrum of these frameworks, NC is between traditional Cost Plus Regulation

[75] RMI. The Economics of Load Defection.

[76] Regulatory Assistance Project. Electricity Regulation in the U.S.: A Guide. 2016. p.92

[77] https://energync.org/maps/

and what this paper calls Cost Plus+ Regulation – our traditional approach with significant adjustments to accommodate 21st century trends.

Diagram 1. Spectrum of frameworks for regulation of electric IOUs

Regulated: vertically integrated IOUs				Restructured: Distribution-only IOUs		Full Competition
Cost Plus (NC 2017)	Cost Plus + (tweaks to NC)	Different Utility Compensation	Limited Competition	Wholesale Competition	Retail Competition	NY REV

Cost Plus Regulation. Regulators use a cost of service approach to determine just and reasonable rates for electric service, allocating the aggregate costs of providing electric service plus a fair rate of return for the utility across the customer classes (generally, residential, commercial, and industrial).[78] This approach can create a fear of innovation and can lead to higher costs for five reasons: 1) it lacks a process to reveal more cost effective options; 2) it encourages "gold plating" known as the Averch-Johnson effect; 3) it creates a "throughput incentive" where utilities have a short-term incentive to increase sales to increase profits; 4) it foregoes innovative approaches that would result in systemic cost avoidance or reduction, such as transparent Integrated Distribution Planning, and 5) the complexity of options since 2010 exceeds the capacity and availability both of the regulator and consumer advocate to fully vet within procedural timelines.

Changing the utility compensation model. This is a way to "encourage innovation while protecting consumers from imprudent expenditures."[79] Approaches include: "decoupling" revenues from sales volume to remove "disincentive for utilities to embrace energy efficiency and other measures that reduce consumer usage" by changing rates to ensure utility recovers its approved revenue;[80] "performance-based ratemaking" that "ties growth in utility revenues or rates to a metric other than costs" creating an incentive to increase profits by constraining costs; and a combination of decoupling and performance based ratemaking. There are three degrees of decoupling: full, limited, and partial.[81] An argument can be made that Duke Energy is partially decoupled due to how it recovers costs for its energy efficiency programs.

Limited competition. Adopting mechanisms to partially open regulated markets to limited competition can the most cost-effective options are transparently identified and selected. Examples can include: "distribution-only direct access rates" that

[78] Regulatory Assistance Project. Electricity Regulation in the U.S.: A Guide. 2016. p.5, 86

[79] Regulatory Assistance Project. Electricity Regulation in the U.S.: A Guide. 2016. p.87

[80] Regulatory Assistance Project. Electricity Regulation in the U.S.: A Guide. 2016. p.89, 142

[81] Regulatory Assistance Project. Electricity Regulation in the U.S.: A Guide. 2016. p.143

allow industrial users to purchase power in the wholesale market from competitive suppliers; "'needs based" or "competitive power supply procurement" is where the utility either submits the lowest cost bid or buys from the lowest cost bid to meet a system need; and allowing non-utilities to sell power for charging electric vehicles.[82]

Restructuring allows wholesale market competition and/or retail market competition. To restructure, regulated utilities divest their power plants, turning them into distribution-only utilities and eliminating vertically integrated utilities.[83] In restructured markets, it is helpful to have a regional transmission operator (RTO) or independent system operator (ISO) who manages fair access to the transmission system to manage reliability and "foster competitive neutrality in wholesale electricity markets."[84]

Restructuring distribution markets. New York's Reforming the Energy Vision (NY REV) is attempting to solve the problem of flat load growth coupled with rising peak demand, which has caused overall system efficiency to decline to a 51% load factor. New York has concluded that if they increase their load factor to 59% by 2025, "ratepayers will save $1.7B to $2.6B annually versus business as usual."[85] New York is placing an emphasis on localized customer choice as a means to more cost-effective energy innovation.

Conclusion. Status quo regulation is no longer the best approach for satisfying the policy objectives and consumer needs of North Carolina. Factors identified here indicate that waiting to identify and align around a "better" framework based on shared vision and mutual benefit will come at a rising cost for all.

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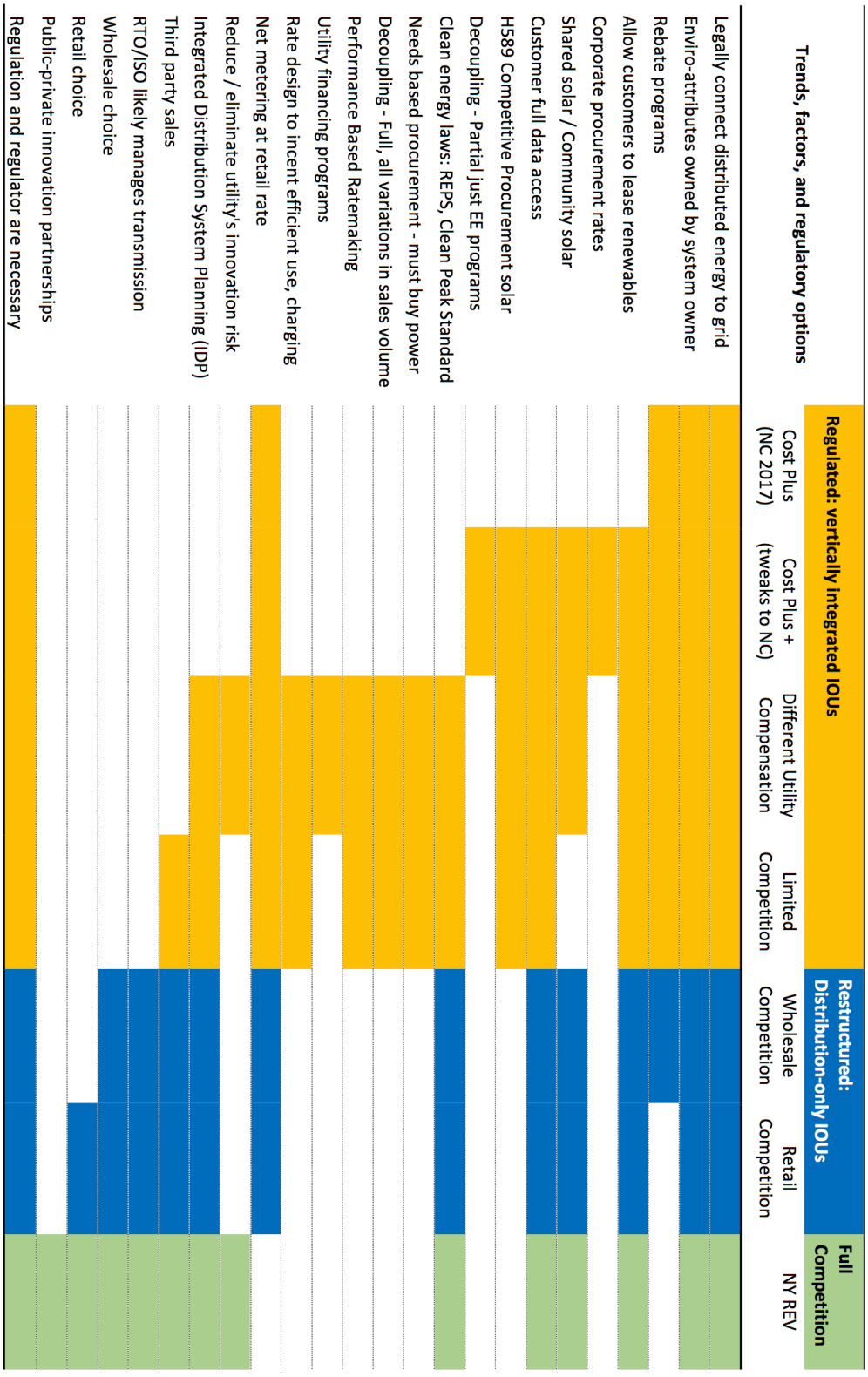
[82] Regulatory Assistance Project. Electricity Regulation in the U.S.: A Guide. 2016. p.13, 73, 90

[83] Regulatory Assistance Project. Electricity Regulation in the U.S.: A Guide. 2016. p.13

[84] Regulatory Assistance Project. Electricity Regulation in the U.S.: A Guide. 2016. p.21

[85] New York State Energy Planning Board. New York State Energy Plan, Volume 1. 2015.

Diagram 2. Which regulatory frameworks are a fit for current trends, factors and regulatory options



How Should North Carolina Respond to the Electrification of Vehicles?

Position Paper for the North Carolina Leadership Forum • March 2018

By **Jon Sanders**, Director of Regulatory Studies

Electric vehicles (EVs) are an emerging automotive choice powered by rechargeable batteries and are renowned for quiet operation, no need for gasoline, and therefore no emissions or air pollution. Currently EVs make up about one percent of automobile purchases, but they have the potential to be a disruptive technology in the auto industry.

Questions about what the state can do to accommodate EVs run the gamut from disincentives to incentives to some challenges that are unique to EVs. With respect to consumer choice, however, the answer is clear: treat EVs like other consumer products. Protect competition in the market on behalf of consumers and sellers and make no unnecessary interferences with it.

This approach would entail removing and preventing government disincentives against EVs. In recent years, automobile-dealer lobbies have supported state statutes and regulations to hinder the EV manufacturer Tesla's in-state sales by blocking its online sales model.[86] They have also successfully opposed legislation that would have expanded the amount of in-state dealerships Tesla could open.[87] In 2016, owing to objections from nearby auto dealers, the North Carolina Division of Motor Vehicles denied Tesla's application to sell electric cars at its new store in Charlotte after allowing sales at Tesla's Raleigh store.[88] These obstructions are indefensible.

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[86] Senate Bill 327, 2013-2014 Session of the North Carolina General Assembly, https://www.ncga.state.nc.us/gascripts/BillLookUp/BillLookUp.pl?Session=2013&BillID=S327; see discussion at Associated Press, "Bill Squeezing Out Tesla Passes NC Senate," The Winston-Salem Journal, May 13, 2013, http://www.journalnow.com/business/business_news/local/bill-squeezing-out-tesla-passes-nc- senate/article_46a0c3a6-bc40-11e2-b853-0019bb30f31a.html.

[87] House Bill 617, 2016-2017 Session of the North Carolina General Assembly, proposed Senate Committee on Commerce and Insurance substitute (not posted), https://www.ncga.state.nc.us/gascripts/BillLookUp/BillLookUp.pl?Session=2017&BillID=H617&votesToView=all; see discussion at Fred Lambert, "Tesla's direct-sale bill is shelved in North Carolina," Elektrek, June 23, 2017, https://electrek.co/2017/06/23/tesla-direct-sale-bill-north-carolina.

[88] David Boraks, "N.C. Says Tesla Can't Sell Cars At Charlotte Store," WFAE-FM, May 25, 2016, http://wfae.org/post/nc-says-tesla-cant-sell-cars-charlotte-store.

Beyond a generous federal tax incentive worth $7,500 for purchasing an EV,[89] some states have added government incentives boosting EVs. So far, North Carolina has not joined them.[90] Research has shown that federal and state tax rebates and credits for EVs amount to a wealth transfer from lower-income residents to some of the state's wealthiest, since the latter are far more likely to purchase EVs.[91] A July 2015 working paper for the National Bureau of Economic Research found that tax credits for EVs had an "extreme" distributional effect in which "the top income quintile has received about 90 percent of all credits."[92]

Removing anticompetitive policies that protect established automobile dealerships and avoiding unfair tax rebates for EV purchases would properly protect competition in the auto market, allowing producers and consumers to offer and purchase the technology according to their own needs, preferences, and priorities. The advent of EVs presents some unique challenges to policymakers, however. For example, while one of the primary reasons that consumers purchase EVs is that they run on rechargeable batteries rather than expensive gasoline or diesel, the "simple matter" of plugging them in to the grid for recharging is not so simple.

States and localities trying to provide public charging stations have hit some unforeseen legal obstacles. For example, the North Carolina Department of Transportation had to abort its pilot program of placing charging stations along interstate rest stops because federal law permits the state to collect money at rest stops only from vending machines.[93] State law is also vague on whether requiring a fee to use a charging station would run afoul of the legal definition of a public utility in North Carolina, which includes providing electricity to the public for "compensation."[94] And, of course, not charging for electricity would not only provide an unfair benefit to EV owners, it would also be an added expense to governments providing the stations.

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89 Which will being a stepwise phase-out for each manufacturer upon the sale of its 200,000th EV, a prospect that incentivizes some gaming, as can be inferred from this industry publication article: "US Federal $7,500 Electrical Vehicle Credit Expiry Date By Automaker," InsideEVs, January 21, 2017, https://insideevs.com/us-federal-7500-ev- credit-expiry-date-by-automaker-estimates.

90 Kristy Hartman and Emily Dowd, "State Efforts to Promote Hybrid and Electric Vehicles," National Conference of State Legislatures, September 26, 2017, http://www.ncsl.org/research/energy/state-electric-vehicle-incentives-state- chart.aspx. North Carolina's HOV lane exception for EVs would qualify as an incentive, but the only HOV lane in the state is along I-77.

91 Dana Rubin and Evelyne St-Louis, "Evaluating the Economic and Social Implications of Participation in Clean Vehicle Rebate Programs," Transportation Research Record: Journal of the Transportation Research Board, Volume 2598, 2016, http://trrjournalonline.trb.org/doi/abs/10.3141/2598-08.

92 Severin Borenstein and Lucas W. Davis, "The Distributional Effects of U.S. Clean Energy Tax Credits," The National Bureau of Economic Research, NBER Working Paper No. 21437, July 2015, http://www.nber.org/papers/w21437.

93 Will Michaels, "NCDOT Removes EV Charging Stations From Rest Stops," WUNC, June 7, 2013, http://wunc.org/post/ncdot-removes-ev-charging-stations-rest-stops.

94 North Carolina General Statutes, § 62.3(23)a.1., https://www.ncga.state.nc.us/gascripts/statutes/statutelookup.pl?statute=62.

Sometimes these obstacles can be avoided, such as by assessing a fee on the parking spot next to the charging station, but others remain, including varying lengths of charging time required and the difficulty of keeping other cars from parking in an EV charging station's parking place. These things are problems now, while EV ownership is still very low. How much of a problem will they pose when the rate of EV ownership is much higher?

What about charging at home after work? That is the most likely option for consumers, but also the one with the most potential impact on electric grids — especially as the EV ownership rate increases along with the likelihood of households owning more than one EV.[95] The early evening hours are increasingly the most stressful hours on the grid. One reason is that many people arrive home during this period and begin turning on appliances. Another reason for electric-grid stress is that this period coincides with a steep dropoff in solar generation, meaning that utilities need

to ramp up and bring readily dispatchable traditional resources like nuclear and natural gas quickly back online.[96] There are numerous policy (and consumer) options being debated — time- of-use pricing, consumption scheduling, adaptive chargers, etc. — but all would generally try to shift EV charging load to off-peak overnight hours.[97]

EVs also present a free-rider problem to road use, since they don't contribute to the collection of motor-fuels excise taxes to fund upkeep and construction of roads, highways, bridges, and overpasses. To account for this, state policymakers assessed an additional $130 fee on licensing of EVs.[98] It's an imperfect workaround to an already imperfect system — as the average fuel efficiency of traditional vehicles has gone up, the amount drivers pay per mile of road they use has gone down. Again, to the extent EVs becomes a large share of the vehicles traversing North Carolina

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[95] Compare the electricity requirements of an EV household to a non-EV household, as illustrated in Eric Loveday, "Average Hourly Electricity Usage—EV Households Vs Non EV Households," InsideEVs, August 1, 2014, https://insideevs.com/average-hourly-electric-usage-ev-households-versus-non-ev-households.

[96] See, e.g., the system load resource stack forecast for January 2020 in Kendal Bowman, Comments of Duke Energy Corporation to the Federal Energy Regulatory Commission's Technical Conference Concerning Implementation Issues Under the Public Utility Regulatory Policies Act of 1978 (PURPA), Docket No. AD16-16- 000, presented to the U.S. Federal Energy Regulatory Commission, June 17, 2016, viewable at https://www.ferc.gov/CalendarFiles/20160617152411-Bowman, %20Duke%20Energy%20-%20Long%20paper.pdf, p.3.

[97] For a sampling of discussions see, e.g., Henry Fountain, "How to Charge Millions of Electric Cars? Not All at Once," The New York Times, April 24, 2013, http://www.nytimes.com/2013/04/25/business/energy- environment/preparing-for-the-power-demands-of-an-electric-car-boom.html; Chris Develder, Matthias Strobbe, Klaas De Craemer, and Geert Deconinck, "Charging electric vehicles in the smart grid," Smart Grids from a Global Perspective, February 16, 2016, pp 147-161, viewable at https://pdfs.semanticscholar.org/8e4f/18bba97e04ff389754beb0bbc05ed3933727.pdf; Alessandro Di Giorgio, Francesco Liberati, and Silvia Canale, "Electric vehicles charging control in a smart grid: A model predictive control approach," Control Engineering Practice, Volume 22, January 2014, https://www.sciencedirect.com/science/article/pii/S0967066113001871, pp. 147–162.

[98] North Carolina Division of Motor Vehicles, "License Fees," https://www.ncdot.gov/dmv/fees.

roads and streets, some other revenue model, perhaps based on power consumed or miles travelled, will have to be implemented to ensure the adequacy and the fairness of the highway-financing system.

In summary, North Carolina policymakers should certainly take steps to accommodate the likely spread of EVs. These steps include eliminating restrictions on the scale or manner of EV sales and offering or allowing private vendors to offer charging stations on suitable public properties such as rest stops and public parking lots. However, state policymakers need not and should not subsidize the adoption and use of EVs. In fact, as EVs become more popular, policymakers will have to modify the pricing and operation of the electrical grid as well as the system for financing streets and roads to make sure EV operators are paying their fair share of the system's cost.