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North Carolina's experiences over the last twenty years epitomize ongoing ambivalence over clean energy policy in Southeastern states. In 2007, under an era of one-party state governance, S.B. 3 provided for the first Renewable Portfolio Standard in the Southeast and gave hopeful advocates a reason to expect accelerating transformation of the state utility landscape. However, in 2010, both state chambers, though not the governorship, flipped, affirming the priorities of newly energized national partisan and business groups in state elections. A very modest clean energy bill, passed in 2017 under such split-state leadership, seemed a harbinger of a less progressive era. Nevertheless, a bill directing the state to cut emissions from power production by 70% by 2030 passed in 2021; the same bill also requires carbon neutrality in power production by 2050. How different are the organizational landscapes through which these pieces of legislation came about? More importantly for clean energy efforts throughout the state, how significant was that historical switch in legislative leadership in 2010? Through interviews and archival research, I describe and compare the two landscapes, finding that a widespread acknowledgement of the need for cleaner sources of energy, the power of the office of the state executive, and increasing clean energy entrepreneurship throughout the state provided a way forward. Results may be consequential, especially for other Southern states facing the decarbonization revolution with monopoly utilities systems intact.

ECOSYSTEMS OF MEANING: CLIMATE CHANGE LEGISLATION AND SUBNATIONAL NETWORKS

by

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CHAPTER I: INTRODUCTION

Standing before colleagues, family members, judges, and honorary guests on January 24, 2007, the powerful, just-re-elected President Pro Tem of the North Carolina State Senate, Senator Marc Basnight, offered remarks on all major bills being introduced in the new session. About upcoming work in the committee on environment and energy, Basnight noted:

> … I remember ten years ago when I first heard about, and John Garrou chairs our committee on behalf of the Senate, the Global Warming Committee, and I was a bit skeptical, not just ten years ago, but five years ago, and most of the science community was more skeptical than I that nothing was occurring that man was affecting. But boy, have you seen a shift in those ideas and thoughts. Now it took some time to better understand very difficult and frightening predictions that water would be on the State Capital because of global warming and because of man. So the frightening statements have leveled off and are not quite as aggressive in language as we have seen in years past, but now I have come to the conclusion, and unless someone can help me defeat that belief, that we are creating much of this problem. I come to that conclusion because so many people print their positions that we can read and understand, and more and more people are doing so. And if we don't take some actions that can create less of the use of carbons that are creating the greenhouse gases in our environment, if we don't protect those particular concerns, if we error, what a God-awful effect it will have on North Carolina…I cringe at the thought of the Outer Banks being underwater. I don't believe it will occur. I believe America will follow the lead of many and we heard the President of the United States say last night that Global Warming is real and it is here and we have to make energy changes. One of the recommendations that Duke Power, the CEO for Duke

> Power and many other companies in this Country [sic], made was that we reduce carbons in America by the year 2050 by the present load by eighty-percent. If I remember those figures properly, Senator Hartsell, I believe that he was recommending that we move by twenty-percent in the next ten years of the existing reduction. (Senate Journal, 2007, p. 16).

The movement to which Senator Basnight was referring was the multi-year-long process that preceded the introduction of a Renewable Energy Portfolio Standard (REPS) for North Carolina, an approach to reducing carbon emissions multiple states were considering. By 2006, twenty-two states had passed legislation to introduce either voluntary or mandatory renewable energy portfolio standards into their energy systems, and although the allotment and enforcement mechanisms varied widely, another six would do so in 2007, a high-water-mark year for passage. It would be another seven years, however, before any other state in the Southeast found the legislative means to support passage of a REPS; North Carolina was, therefore, fairly unusual in the region.

In most other ways, however, the state energy system in 2007 was like most of its regional neighbors. A majority of the state's consumers derived their energy from a monopoly investor-owned utilities (IOU), Duke Energy or Progress Energy, overseen by the state public utility commission. Neither IOU had initially supported the introduction of a REPS, as it bound them to increase stepwise the percentage of energy derived from specific renewable sources, and those familiar with negotiations noted how utilities were, in any struggle, nearly implacable. In Duke's Annual Report for 2006 (Form 10-K), greenhouse gases were only mentioned in tandem with a section on risk, as complying with environmental laws and regulations could cost the company "significant expenditures" (Duke Energy Corp, 2007, p. 30). Did Senator Basnight then

perhaps misremember in his remarks, when he mentioned the Chairman of Duke Power recommending 80% cuts to carbon emissions? Had negotiators misunderstood Duke's intentions? Nevertheless, given these conditions, further reductions seemed on the horizon.

However, in 2010, Republicans won a historic majority in the NC General Assembly, as in many other state assemblies. For the first time since 1870, both the NC House and Senate held Republican majorities, and priorities for the new majority were primarily focused on supporting businesses and cutting government regulation, an orientation the new President Pro Tem, Senator Philip Berger, summarized in his short remarks introducing a new era:

> It is time for a different philosophy in State government, one that will return North Carolina to its rightful place as the Southeast's leader in job creation, education, transportation, and quality of life. Just as working families and small businesses have to make difficult decisions and tighten their belts to make ends meet, we, as a state, will also have to tighten our belt to put our financial house in order. State government and state employees will have to do more with less as we work to right-size state government. It's not going to be easy but streamlining state government will pay dividends in the long run. Today is a new day for North Carolina with a new vision for our State's future. We will lead North Carolina on a path of smaller, smarter, more efficient government. We will reduce spending, balance our budget, and reform North Carolina's regulatory environment to make our State a better place to live, to work, to raise a family, and to start and grow a business (Senate Journal, 2011, p. 12).

In the ensuing years, Republicans held onto both majorities and priorities. Nationally, on their first day in office, members of the Tea Party-emboldened new Republican House majority introduced three different bills to curb powers of the Environmental Protection Agency (EPA)

and limit its ability to mitigate the effects of climate change (Goldenberg, 2011). For more than a decade, mitigation legislation rarely appeared to motivate state legislation. It was therefore surprising that NC House Bill 951, enacted in 2021, dictated that the Utilities Commission should "take all reasonable steps" to ensure the state reduce carbon emissions, as measured in 2005, by 70% by 2030. By 2050, the enacted Carbon Plan dictated, 100% of emissions should be eliminated, ensuring a carbon neutral future for the state.

Political science and public policy research have amply documented variables by which partisanship correlates with, interacts with, and attenuates support for climate change legislation at national and subnational levels. Less focus has been placed on the non-legislative environment or landscape within which such changes take place, although, arguably, it matters as much or more. Socio-technical transitions theory (Geels, Sovacool, Schwanen, and Sorrell, 2017) contends that how landscapes, regimes, and niche innovations interact is anything but predetermined – depending on their timing, niche innovations can settle or unsettle political regimes, can seem revolutionary, evolutionary, or fizzle out. Hommels (2008) uses three case studies in city planning to illustrate the obduracy of urban forms; similar questions can also be addressed about the degree of obduracy to which *social* forms and interactions around clean energy advocacy in state politics may be consigned. From the perspective of clean energy advocacy, how different are the organizational landscapes through which two very different pieces of state climate change legislation came about? These questions are particularly relevant in an era when increasing proportions of political power are being remitted to states, and while many Democratic-majority states with strong clean energy leadership have been extensively studied, we know slightly less about resoundingly purple ones, such as North Carolina. Despite the federal subsidies and tax credits the recently passed federal Inflation Reduction Act (2022)

offers for lifting renewable energy projects off the ground, accounting for the power of states to leverage, to ease, or block the larger decarbonization transition these projects are meant to augur is only beginning. What can the emergence of existing clean energy laws tell us about the types of hurdles future measures are likely to encounter in an environment that must contend with both the monopoly utility and pro-business regulatory conditions that tend to permeate Southeastern states? In line with Jordan, Wurzel and Zito's (2013) recognition that policy is not merely about top-down government, but also "horizontal forms of self-coordination or governance" (p. 155), this dissertation maps some of the "political debates, contested solutions, and competing visions of the future" (Marquardt, 2024) the energy transition project in one U.S. state has laid bare. This work is therefore organized as follows. Chapter 2 describes the theoretical orientation behind much of the policy work that has been done in this space. Chapter 3 examines the methods used in the projects; Chapter 4 discusses aspects of the electrical and energy generation system that may be useful to understand this research. Chapter 5 notes some relevant geographic and political aspects of the state. Finally, in Chapter 6, I discuss North Carolina's experiences and how these map onto some of the issues raised in the socio-technical transitions literature.

CHAPTER II: LITERATURE REVIEW AND THEORETICAL PERSPECTIVES

In general, a project such as this one might be said to draw mostly on the concept of policy diffusion in the public policy and political science literature. Public policy analysis frequently has, in the past, relied on such elements. The orthodoxy of policy diffusion entails mimicry of a specific form of policy between institutions or regions,"… a process of learning or emulation during which decision makers look to other cities, states, or countries as models to be followed or avoided. Diffusion occurs, in other words, when the likelihood that an innovation will be adopted in jurisdiction A is significantly affected by the existence of that innovation in jurisdiction B" (Karch, 2007, p. 3). Scholarship on policy diffusion, transfer, or learning is voluminous, especially in policy and political science quarters, but is also key to debates between economic geographers, involving, among others, Peck (2011), who disagrees with much early theorizing on the topic of policy learning or transfer. The diffusionist argument suggests that the richest and best-equipped states create policies, which are then passed down to or emulated by the rest. (Research such as Walker's [1969] analysis of state adaptations of various policies, in which he assigns each state an "innovation score" (p. 882) depending on the speed with which each state snatches up innovative policies, are typical.) According to Peck's critical policy view, states are not simply laboratories in which rational decision-makers seek out the policies that match a predetermined set of problems that must be solved. And more geographically centered approaches merely create a more forgiving version of a faulty model. An intensive investigation of the organizational networks across which policies are communicated can shed light on policy diffusion without falling into a generalizing trap. Key to understanding the various meanings of the energy transition is to acknowledge that the creation of policies is affected by more than legislatures, and in more venues than those they occupy. "Venues" means that policies are

rendered through a potentially iterative process that may include legislative, administrative, and judicial decisions either in sequence or concurrently, where decisions may be affected by various sets of interests (Jourdain, Hug, and Varone, 2017), all of which pertains to the research here.

This project aims to contribute to sociotechnical transitions systems theory. Geels (2014), Geels, Sovacool, Schwanen, and Sorrell (2017), Geels and Schot (2007), Sovacool, Martiskainen, Hook, and Baker (2019), and Bulkeley (2010) suggest a way to understand the recalcitrance of policy efforts to decarbonize. In Geels and Schot's (2012) formulation, a multilevel perspective argues that social changes depend not on civic or interest group pressures, but on timely shifts occurring in three different layers of the sociotechnical system. The sociotechnical landscape "…forms an exogenous environment…involving macro-economics, deep cultural patterns, [and] macro-political developments….Changes at the landscape level usually take place…over decades..." (p. 400). Socio-technical regimes, on the other hand, includes the "patterning of technological development" constructed and maintained by "scientists, policy makers, users and special-interest groups" (p. 400) Finally, niche innovations "…are developed by small networks of dedicated actors, often outsiders or fringe actors" (p. 400). Whether innovations fail to break through, are absorbed by the regime, or destabilize it depends on the degree of change that is co-occurring within regimes and landscapes.

Naturally, landscapes and regimes counter system changes, often by incorporating niche innovations in a way that doesn't threaten stability. Geels (2014) suggests that corporations and political regimes work together to push back against transitions. Economic and political elites dominate our expectations about what is worthy, so that groups formed for other ostensible reasons – environmental groups, consumers, unions, or academic entities – tend to be heard less frequently and on topics that are consistently more narrowly defined. This research, an

investigation into networks formed around similar issues before and after substantial changes in both landscapes and regimes, discloses to what degree the soft power of other groups, especially business groups, whether associated with utilities or with the renewable energy industry, have named and promoted the problem, its prognosis and its solution.

In her study of unbuilding, Hommel attempted to introduce elements of urban studies within sociotechnical transitions theory. She notes that "…urban artifacts that are remnants of earlier planning decisions whose logic is no longer applicable may prove to be annoying obstacles to urban innovation" (2005, p. 10). In her descriptive rendering of planning decisions, Hommel uses the notion of obduracy as "a major stumbling block in processes of urban socio-technical change" (p. 19), but also uses her three case studies to refute several more simpleminded explanations for obduracy, some of which can be applied to the current project.

Among these, the first is the knowledge that change is expensive, which is why change tends not to occur in urban systems. Hommel argues that lack of financial capital can both be a reason for unbuilding and to refrain from doing so, and that costs in themselves are socially determined and constructed. Her second refuted idea is that it is possible to assume that there are no clear ideas about what should or shouldn't be done. And even when there are, consensus is no guarantee of action. Third, she refutes the idea that power is monolithic; merely because powerful agents cannot simply create change because they desire it. Hommel suggests a "'relational' conception of power" (Bijkerts, 1995b), attributing power to certain individuals, but with a power balance that experiences frequent changes. Finally, city structures themselves resist change. Hommel argues that materiality cannot be a reason for staticity; studies must take culture and materiality together: "Obduracy, then, cannot be explained only be reference to the solidity of concrete and the physical properties of technologies; a wide range of cultural factors come

into play" (p. 20). I utilize some of Hommel's strategies for thinking about obdurate physical forms to understand the obduracy of the social forms, rituals, norms, and roles that pertain to the negotiations which precede the passage of the bills in question.

CHAPTER III: METHODS

Most findings were ascertained through using document analysis. Helpfully – and unusually, for archival research – nearly all of the legislative and NC Utilities Commission materials needed for a rigorous analysis could be found online and were often, given public records law, neatly organized and categorized. Executive branch statements and non-NCUC judicial decisions were posted on designated websites or sometimes covered by local or state newspapers, and I accessed Duke Power shareholder statements online. In order to stay abreast of fluctuating regional and national energy conversations around policy, I eventually subscribed to multiple newsletters and mailing lists, including from utility-focused Energy Central, as well as to the Southeast and National newsletters from the Energy News Network. I further subscribed to notices from Inside Clean Energy and Rewiring America, as well as from more mainstream publications, including The New York Times' *Climate*, The Guardian's *Green*, and Bloomberg's *Green* newsletters. State or regional newsletters I subscribed to included those from the News and Observer's political blog *Under the Dome*, from the NC Clean Technology Center, host of the nationally recognized Database of State Incentives for Renewables & Efficiency (DSIRE), and from the NC Sustainable Energy Association, an interest, trade, lobbying, and policy organization.

To supplement archival research, personnel involved with various legislative attempts were identified via their participation in or attendance at the annual State Energy Conferences in Raleigh or through mention in the aforementioned types of documents. Attempts to find potential respondents at public protests or performance were limited by the circumscription of public, non-virtual activity characteristic of a post-pandemic society; few such meetings occurred during the study period. To take greatest advantage of all possibilities, I nevertheless found relevant

nonprofits meeting in or near the capital region, but as these gatherings were more likely to be social rather than policy-oriented in nature, I chose to attend sparingly. As green activism and energy policy interests frequently converge, and as I was hoping to meet with activists who participate especially in such actions, I also attended the first entirely in-person Poor People's March on and rally at the Capitol held since the pandemic, on March 2nd. Beginning in 2013 and led by Dr. William Barber, II, this march had been a massive annual undertaking, spurred in part by the success of Moral Mondays, a series of weekly assemblies begun as popular counterpoints against the rightward turn in state politics. In 2024, turnout for the march and rally was substantial but still below pre-pandemic levels; the environment, while a literal rallying topic in previous years, this year appeared more marginal beside the problems of low-wage work and election-year concerns. In the end, I found most respondents via cold calls and snowball sampling.

I interviewed five respondents, all of whom had professional knowledge of the creation, negotiation, passage, and/or take-up by the Utilities Commission of state energy or climate change bills from 2002 to 2021. Each consented to and was interviewed via teleconference software or over the phone. These interviews, with an average length of slightly over one hour, were recorded and transcribed[1]. Most respondents derived from one key informant, who first requested permission from their associates to forward me names and phone numbers. Apart from the reciprocal nature of interaction with this one respondent, interviewees were not identified to one another. Potential respondents were offered multiple opportunities to decline participation. In accordance with the project application to UNCG's Institutional Review Board, all

[1] Contact with respondents was handled according to the protocols and procedures approved by the UNCG Institutional Review Board in FY23-45.

respondents were assured of confidentiality and yet advised of its potential limits. Because some respondents still perform or can be identified by politically sensitive work, and in order to further hinder frivolous identification of respondents, I assigned pseudonyms and concealed workplace, education, and other traceable information. I also explicitly chose not to use certain specific quotes and omitted speech patterns that seemed too readily identifiable.

CHAPTER IV: EVOLUTION OF THE POWER SYSTEM

This research primarily concerns a study of policy landscapes and networks affecting one state. With a federal government and national interest groups newly energized around climate change issues, it would be fair to wonder why we should concern ourselves with state networks of stakeholders in clean energy development, and networks in North Carolina at that. A foray into the historical, geographic, and regulatory contexts of the electricity sector can perhaps better explain why these questions matter here.

While electricity in North America is sold in both wholesale and retail forms, electricity production and use can be broken into three basic geographic and structural components: generation, transmission, and distribution. *Generation* refers to the production of electricity, whether through combustion of fossil fuels, capture of controlled nuclear fission, uptake of solar radiation, the capture of wind, water, or tidal power, or a combination of several methods, while *transmission* refers to the movement of energy along high-voltage lines between generating stations and transformers. Finally, *distribution* entails the dispersal of electricity from high-voltage transformers to end use.

What makes these simple concepts confusing is that oversight and enforcement is fractured amongst state and national governments. *Generators* are usually regulated by state public utility commissions (PUC). Because high-voltage *transmission* lines by definition traverse long distances, these are regulated by the Federal Energy Regulatory Commission. Finally, *distribution* from transformers and onward into residences, industry, and commercial entities is regulated by state PUCs.

FERC has no authority to affect prices set by each utility; neither can a PUC, despite appeals from the public, order an IOU to add multi-state high-voltage transmission lines in order

to ease congestion on the grid. IOUs, such as Duke Energy or Dominion Energy, thus must have experience dealing with regulators at many layers of government.

That for much of the country, a monopoly corporation long provided all generation, transmission, and distribution is no accident. Historically, engines powered by coal and steam were the basis for industrialization and the metropolitan domains it brought into existence, but as Nye (2001) argues, the growth of large energy systems is even more implicated in the growth of the *corporation*.

> The huge capital requirements…made the corporate form of organization virtually mandatory. Furthermore, corporations were instruments by which capital could be concentrated for large projects, many of which were inseparable from the intensification of energy use (p. 104).

In some major U. S. cities before 1900, General Electric and Westinghouse quickly moved to demonstrate that the economies of scale possible in energy provision were best left to corporations without competition, arguing that electricity provision be considered a "natural" monopoly (Nye, 2001; Flores-Espino, Tian, Chernyakhovskiy, Mercer and Miller, 2016). The two firms aggressively bought up smaller companies, and in an unusual move, shared patents to avoid costly court operations, creating an early and effective electrification oligopoly, though one eventually dominated by Westinghouse (Nye, 2001). A necessary proximity between generator and retail customer reflected the technical limitations of using Direct Current (DC) at the time, as energy lost to resistance through heat circumscribed the potential radius of a service territory.

The introduction of both AC and high-voltage transformation were key to creating the energy landscape still recognizable today. It meant, first, that a generator could serve a larger

swath of territory, and second, that generators located at a distance from one another could now provide mutual backups in case of failures or need for planned excess load. These interventions meant that the North American utility landscape until the 1970s or 1980s grew to be deeply but not exclusively imprinted by single entities (known as franchises) which owned outright the means of generation and distribution for an entire service territory (Flores-Espino, Tian, Chernyakhovskiy, Mercer and Miller, 2016). Aside from these regulated monopolies, historical utilities also comprised two other forms: not-for-profit utilities and so-called "power pools". The former included municipal utilities and federal hydropower initiatives, such as the TVA, as well as rural electrification cooperatives, while the latter were comprised of regional member utilities that allowed a central operator to determine generation and transmission capacity, giving up much control to this third party (FERC, 2020).

Efforts at energy liberalization in the 1990s coincided with an era of higher commodity prices and abating energy subsidies (Pollitt, 2012), which, to this day, informs debates about deregulation outcomes (Joskow, 2007). The disastrous deregulation of the energy industry in California led in 2001 to rolling blackouts; many blame the vigor of the successful recall of then-Governor of California Grey Davis on the energy crisis. Not surprisingly, in other states, appetites for deregulation dampened. Lessons from California have led some energy economists to argue that a monopoly – which in its strictest sense pertains only to the unique transmission and distribution lines – should, in the absence of complete liberalization, extend also to the generation of electricity (Joskow, 1997).

Federal actions after both the energy crises and deregulation movements had repercussions on energy markets. In the 1970s, movements to split the three energy functions further diversified the energy landscape. The Public Utilities Regulatory Policy Act (PURPA) of

1978 encouraged *efficient co-generation*, a means of capturing energy from heat arising incidentally during industrial or commercial processes, and, more importantly, the use of renewable energy (FERC, 2020). Enthusiastic responses to PURPA from the utility industries in California, Texas, and Massachusetts encouraged the Federal Energy Regulatory Commission to consider how the three functions of power generation could be further sundered (FERC, 2020), and in 1996, it began to encourage competition in wholesale electricity (Order 888, 1996; Order 889, 1996). Independent generators could connect to wholesale markets to sell energy outside a traditional service territory. The entities created here, the Regional Transmission Organizations (RTOs), which cover/ed several states, or an independent system operator (ISO), often covering smaller multi- or within-state regions, were an offspring of the power pool (FERC, 2020). The intent here was to allow emerging producers of alternative energy and independent energy producers to establish themselves more firmly. FERC orders 888 and 889 also mandated that transmission line owners declare publicly when lines became available for other providers. Today, about two-thirds of Americans currently live in areas where transmission is controlled by an RTO, although few of them fall within the Southeast.

Particularly in this region, while distributed energy resources and community projects could diminish the advantages bestowed by economies of scale, innovative approaches and technologies are working against an intransigent path dependence. This does not mean, however, that vertically integrated utilities provide all energy throughout these areas. Recall that other forms of utilities exist; for instance, electric membership cooperatives (EMCs) provide electricity throughout the Southeast. In Florida, EMCs provide electricity to about 15% of the population (Florida Public Service Commission, 2020; Florida Municipal Energy Association, 2022). Moreover, when backup generation is needed, even investor-owned utilities must purchase

energy generated by other providers. Importantly, however, the reverse tends to be true more regularly – investor-owned utilities regularly generate and sell power to municipal utilities and cooperatives. Recent figures demonstrate that nationally, energy production from investor-owned utilities far outpaces that from other ownership forms. In 2014, at sixty percent, the vast number were publicly owned, slightly more than a quarter were electric cooperatives, and fewer than ten percent were investor-owned (Flores-Espino, Tian, Chernyakhovskiy, Mercer and Miller, 2016). However, investor-owned utilities, while thus far less numerous, sold more than half of all electricity, public utilities only around fifteen percent, and cooperatives just over a tenth (Flores-Espino, Tian, Chernyakhovskiy, Mercer and Miller, 2016).

In November of 2022, major IOUs in the Southeast, including Duke, Southern Company (serving Georgia, Alabama, and Mississippi), Dominion Energy South Carolina, and the TVA launched their own RTO, the Southeast Energy Exchange Market (SEEM), across ten states. The original idea for SEEM included the idea of free transmission services within its footprint, and the potential for trading in renewables. In reality, the Market excluded numerous organizations from participating (including those drawing on distributed generation, such as from rooftop solar installations), resulting in low trade volumes, nearly all of it by utilities. The future of SEEM appears in doubt as a federal judge has placed the market on hold for discriminatory practices (Guidi and Carmody, 2023).

Given all the above, questions about policy at the state instead of the regional level might still seem unproductive. Transmission in North America is subject to over one-hundred different balancing authorities that frequently cross state lines, within twelve North American Electric Reliability Corporation (NERC) regional entities, which in turn fall within one of the four, even larger, NERC Interconnection regions. Smaller balancing authorities ensure adequate supply and

demand; their structure depends on a degree of integration between generators, market mechanisms, and the authority itself. At the federal level lies the Federal Energy Regulatory Commission led by five political appointees whose task it is to ensure that electricity rates remain "just and reasonable," and to approve but not write reliability standards for the electric grid (Federal Power Act, 2018). To do so, FERC relies on NERC, with its 8 regional groups, who themselves monitor compliance. Federal law dictates that NERC must consider the stakeholders affected, while remaining independent from "users, owners, and operators of the bulk power system" (FERC, n.d., p. 6).

The rest of the country more recently learned more about interconnections when the grid throughout the independent Texas Region, ERCOT, in the winter of 2021 experienced shortages and blackouts caused by winterization failures (Gold, 2022). North Carolina is part of the Eastern Interconnection and lies within the remit of the Southeastern Reliability Corporation (SERC), headquartered in Charlotte. Its board of directors includes representatives or stakeholders from all seven sectors affected and regulated by SERC, including the investor-owned utility, federal/state, cooperative, municipal, marketer, merchant electricity generator, and ISO/RTO reliability coordinator sectors; the investor-owned utilities (IOUs) offering power to most of North Carolina are certainly eligible for the board (SERC Board of Directors, 2021). But the board has only since 2021 begun to be represented also by so-called independent board members, in addition to designated stakeholders. The entities represented here are of course regulated by SERC and NERC, but other representatives also sit on various committees and task forces whose findings and decisions make up SERC's reason for being. This is true for the interconnections, as well. For instance, considering the future of transmission through the EIPC (Eastern Interconnection Planning Collaborative) which includes North Carolina; their concerns,

expressed in various memoranda and letters, hinge on educating the lawmakers who create policy affecting energy producers (EIPC, 2021). While it thus might look like North Carolina's power provisioning is fractured and subject to multiple regional or intrastate oversight channels, the line between the regulator and the regulated here appears somewhat porous. NERC summarizes oversight of the regional entities like SERC this way:

> NERC provides industry-wide perspective and oversight, and the Regional Entities have unique features and activities that serve the needs of their regional constituents while ensuring that industry follows NERC Reliability Standards. And while NERC and the Regional Entities play different roles in delivering ERO [Electric Reliability Organization] Enterprise programs, these roles are equally important and complementary, allowing the ERO Enterprise to work as one synchronous machine—effectively, efficiently, and collaboratively (NERC, 2022).

As a result of historical trajectories, the U.S. energy system is thus somewhat fractured both in operation and oversight entities. Moreover, Fox-Penner (2010) notes that the four axia of this tangled current system in which monopolies are embedded are certain to conflict with the bedrock principles needed to construct an energy grid for the future. The energy system we have currently depended on aggregating the largest possible numbers of consumers through the grid, and use of economies of scale for producers. More importantly, however, energy producers encouraged higher levels of energy consumption, offering lower rates for greater demand, as well as the need to ensure that "intense political interaction would gain stability and protection from regulation" (Fox-Penner, 2010, p. 2). In its place, the emerging energy system will instead depend on decentralized forms of control, including through the Smart Grid, energy production and supply networks that shift away from fossil fuels, and incentives for energy conservation

rather than consumption. No wonder he suggests the challenge is like “building our entire airplane fleet, along with our runways and air traffic control system, while the planes are all up in the air” (p. 6). What particular metaphorical airplane challenges this entails for North Carolina is tackled in the next chapter.

CHAPTER V: NORTH CAROLINA

Relevant Geographic Attributes

The physical landscape of North Carolina renders it vulnerable to the effects of climate change. For agricultural production, such as the Christmas tree farming economy of western portions of the state (NC State College, 2020), climate change represents one of a set of overlapping challenges. The coastal economy, affecting tourism and commercial ports alike, as well as inland farming and residential areas located on the low-lying Coastal Plain, may not be entirely underwater, but they *are* likely to be hampered by sea level rise that by 2050, with increasing certainty, is predicted at between 10 and 12 inches; damaging flooding is predicted to occur ten times as often as today (Sweet et al, 2022).

As a further reminder of the challenges of farming during climate change metamorphoses, in 2023 the Agricultural Research Service of the USDA updated its Plant Hardiness Zone Map (PHZM), which reflects average annual extreme minimum temperatures, captured in 10-degree blocks, and numbered from 1a, where the lowest average temperature is -60 F, to 13b, with a lowest temperature of 60 F. Widrlechner, Daly, Keller, Kaplan (2012) noted at the last such updates the onset of progressive warming, starting in the 1960s and 1970s, when plant hardiness zone standard measures coalesced, diplomatically acknowledging that “clearly, the world's climate is dynamic” (p. 8). Prior to the most recent updates, the 2012 PHZM covered about half of North Carolina in zones up to 7b, where the lowest temperature is 5 degrees F; in the 2023 version, zones 8a and 8b, with temperatures at their nadir at 10 F and 15 F, respectively, predominate.

While North Carolina contains no uranium, it has “commercially important occurrences of coal” (NC DEQ, n.d.) and significant amounts of natural gas in Triassic basins (FracTracker,

2023), and although hydraulic fracturing as well as oil exploration became possible in 2014, while Governor McCrory was in office (Carmichael, n.d.), no wells are currently producing.[2] More importantly, it is potentially rich in renewable resources, including onshore and offshore wind energy, hydroelectric power, and solar generation (U.S. EIA, 2019). North Carolina is also part of the Carolina Tin-Spodumene Belt, a source of lithium (Swanson, 2013) that has become newly relevant to battery production, and the state has substantial biomass to burn (U.S. EIA, 2019).

The Electricity Sector

Reduction of fossil fuels use is part of the drive to decarbonize. The NC Governor's Clean Energy Plan (NC DEQ, 2019) has two overriding state aims: "reduce electric power sector greenhouse gas emissions by 70% below 2005 levels [by 2030], [and] attain carbon neutrality [by 2050]" (p. 52). However, over the last two decades, the state electricity sector has seen only a slight decrease in consumption of nonrenewable fuels, such as natural gas, petroleum, and uranium, that mostly do not naturally occur in the state, while consumption of the energy sources most abundant in the state - wind and solar energy – have experienced limited growth. While coal consumption fell between 2005 and 2018, most of the deficit this created was met by an increase in the consumption of natural gas, decreasing but not eliminating GHG emissions. also demonstrate a growing reliance on nuclear power. According to the Governor's Carbon Plan, coal-fired plants dominated electricity generation until 2012, but by 2020, many had been retired and replaced by gas- or nuclear-powered plants, and the newest figures show that the latter now hold a slight edge in overall electricity production (U.S. EIA, 2021).

2 Natural gas and petroleum *are* presumed to exist along the NC coast, but the area is subject to a federal drilling moratorium until June 2032 (U. S. Energy Information Agency, 2021).

Thus, past the dates indicated above, by 2020, NC generated 34% of power through nuclear energy (U.S. EIA, n.d.), and a year later was one of the top state producers of electricity generated this way (U.S. EIA, 2021). By comparison, in 2020, renewable resources had grown from less than 5% in 2005 to providing only about 16% of electricity in the state. Of the latter, about 7% derived from solar energy, 5% from hydroelectric power, 2% through the burning of biomass, and less than one percent through wind energy (US EIA, 2021).

These reductions echo the progress and choices made nationally in the power sector. Wiser et al (2021) describe how **actual** energy generation in 2020 was 52% lower than that **projected** by the Energy Information Administration in 2005. This is a remarkable feat, explained as a result of several factors. First, demand was less than projected; while one might assume COVID-19 as a significant contribution to this decline, the authors' calculations suggest the impact of the pandemic was minimal. Second, energy generation from renewable forms of energy was 79% more than projected. Finally, and more to the points above, generation from natural gas was 112% over the projected and combustion of coal and oil was 70% less than projected. This is in line with North Carolina's experiences, where coal-burning power generators are being replaced by those burning natural gas. Crucially, however, as careful as this analysis was, it included only plant stack emissions; were natural gas leaks ("upstream," in production) being considered, it seems likely that emissions would not have seen such cuts (p. 6).

North Carolina remains a substantial consumer of electricity. The residential sector uses by far the greatest amount of electricity in NC, placing the state within the top five of electricity consumed for residential use. More than half of state residents also use electricity for heating (U.S. EIA, n.d.). The focus of this project is on the power-generating sector because it is one of the highest emitters of greenhouse gas (GHG) emissions.

The GHG inventory performed as part of the Governor's Carbon Plan demonstrated some consistent historical trends. In 1990, the greatest emitters of greenhouse gases in North Carolina were the transportation and electricity generating sectors; thirty years later, that is still true. Although emissions from both have fallen, those from transportation are now slightly higher than those in the electric power sector (NC DEQ, 2022, p. 3). North Carolina isn't alone in seeing these two types of emissions switch order – nationally, the transportation sector now emits the most greenhouse gases.

Undeniably, however, both technology and policy innovation in this sector is seeing significant movement, boosted both by the November 2021 federal Infrastructure, Investment, and Jobs Act and the 2022 Inflation Reduction Act. Moreover, as the country electrifies, energy infrastructure will need to be able to both account for the conversion of current electrification needs and the additional strain of widespread electrification – leading to a change in demand by as little as 115% or as much as 170% by 2050 (Larson et al, 2021; Klein, 2022).

The North Carolina Utilities Commission

By statute, the General Assembly directs the work of the North Carolina Utilities Commission (NCUC). Its precursor, the Railroad Commission, was founded in 1891 to regulate railroad, telegraph, and steamboat companies (North Carolina Utilities Commission [NCUC], 2021); today, this legislative-judicial hybrid overseer organization regulates some provisions in the areas of transportation, water and wastewater, telecommunications, natural gas, and electricity, as mandated by the Public Utilities Act (NCUC, 2021). But some of its most consequential tasks include ruling on the rate schedules that Duke Energy and Dominion Energy (as well as some rare university utility providers) can demand of its customers (NCUC, 2021).

The NCUC does not, however, regulate municipal electric utilities nor electric membership cooperatives (EMCs).

While the Federal Energy Regulatory Commission (FERC) indirectly oversees wholesale energy prices for sales that cross states lines (Cleary, Palmer, and Aagard, 2021), state public utility commissions or boards control retail energy rates for IOUs. Integrated Resource Plans (IRPs) submitted biannually to the NCUC by the IOUs describe the companies' plans and how they will be funded – among much else, they detail proposed new construction, how electric load will be met, the requested size of rate increases, and the rate of return on new construction. As a quasi-judicial body, the Commission can subpoena witnesses and documents for examination under oath, and any decision by the Commission is considered legally binding, though, like most court decisions, it may be appealed (NCUC, 2021). While attorneys for each company are present at the public hearings that precede rulings, so, frequently, are individual NC residents, representatives of environmental groups, and a unique set of representatives of the people.

In 1977, as the energy crisis of the 1970s led to demands for advocacy in difficult ratepayer environments (Hirsh, 1999, p. 171), Governor Jim Hunt, like many other state executives, created the office of the Public Staff (Public staff, n.d.), whose task is to "represent the interests of the using and consuming public" (NCUC, 2021). Finally, the seven members of the NCUC are appointed by the governor and confirmed by the NC General Assembly for six-year terms. The NCUC's findings are independent, but the Commission's power can be limited by the legislature. It must also provide an annual report to the Governor and is overseen by the General Assembly's Joint Legislative Utility Review Committee.

Conservative Interest Group Influence

Aside from Duke's unique role, there is an additional structural reason to examine state energy networks, which derives from the work of Hertel-Fernandez (2019). Federal policies around clean energy and climate change had long been considered permanently stuck, as multiple presidential administrations were unable to secure Congressional votes. Nevertheless, climate change activists argued that passage of such policies belonged at the federal level, since state-level or regional policies could cause unequal distribution of costs and uncertainty around effectiveness and enforcement, and activists in progressive climate change groups (such as the Sunrise movement, to pick a recent and vigorous example) tend to concentrate on maintaining a presence in D. C. while creating chapters around the country. Indeed, the climate-facing portions of the Inflation Reduction Act mimic in parts the proposed "Green New Deal," itself a reference to an era when federal legislation decisively reshaped national social and economic outcomes. Voters, too, tend to be more interested in national offices and national representatives, preferring to remain blithe about state actors and policies, which reflects in depressed voter turnout for state and local in so-called "off-year" elections. A key point impeding state lawmakers is that their work as representatives is often part-time; their staff may be small or nonexistent, substantially hampering lawmakers' own abilities to research and write legislation. In addition to their usual work, they must somehow squeeze in time on committees, field constituent calls, and raise funds for re-election. Into this vacuum stepped a new kind of national organization, the American Legislative Exchange Council (ALEC), willing to help state lawmakers network with business leaders, craft sympathetic model legislation, and research and suggest talking points to navigate potential roadblocks (Hertel-Fernandez, 2019).

ALEC does not outright deny that climate change is occurring, but much of the language on materials available questions the scientific basis and hence import. Proposed climate change-related model policies and resolutions tend to focus on the need to maintain fossil fuel-generated power, and, as is the case with ALEC more generally, on the sanctity of free markets and limiting government regulation, especially that of the EPA. For example, one proposed model resolution would call for an interstate research commission to study climate change, "as a great deal of scientific uncertainty surrounds the nature of these prospective changes, and the cost of regulation to inhibit such changes may lead to great economic dislocation" (ALEC, 2017). Delay through casting doubt on the scientific bases of climate change has a long and successful history within groups practicing climate change denial (Dunlap and McCright, 2012). Communication around energy terms renewable sources of energy "dangerous" and "unreliable." ALEC works because business leaders pay for membership and get a chance to meet state legislators who can sponsor interesting bills; legislators, who pay lower or no fees, get access to vetted copy ready for bill introduction and sponsorship, as well as the chance to make useful financial contacts and opportunities to meet likeminded legislators. Hertel-Fernandez (2019) found, through innovatively applying plagiarism software, that ALEC's model legislation is frequently introduced in state legislatures. It is not clear whether Duke remains a corporate ALEC member, as neither organization published this information, but as late as 2018, its top corporate lobbyist was (Downey, 2018). The policy positions taken by ALEC and members of the Republican party frequently overlap, and after Republicans engineered a strategic victory to seize control of the NC legislature in 2010, understanding the significance of strategies like those of ALEC – and the networks that both result from and make them up – would seem highly relevant. There are no parallel liberal versions of ALEC.

CHAPTER VI: LEGISLATIVE AND REGULATORY STRUGGLE

Setting a Precedent with the Clean Smokestacks Act

Several interviews clarified that, while the REPS requirement was a novelty and unusual for the time, it was in line with the more substantial political changes that had occurred after passage of a previous bill, the Clean Smokestacks Act, the notion of which was, for a number of reasons, unique. In 1970, the Clean Air Act required the federal Environmental Protection Agency (EPA) to use scientific measures to set standards for air pollution. What resulted was the National Ambient Air Quality Standards for six so-called "criteria" pollutants, which included ozone, particulate matter, carbon monoxide, lead, nitrogen oxides, and sulfur dioxide (U.S. EPA, 2024). Both of the latter contribute to the formation of smog and to acid rain, which can destroy or malform crops and other plant life; human exposure to nitrogen oxides causes and worsens respiratory infections. Although an extreme value, such as a "peak, 1-hour" concentration of nitrogen dioxide between 1975 and 1980 could be as high as 400 ppb in Los Angeles and across California, "recurrent NO2 hourly concentrations in excess of 140 ppb were quite common nationwide in 1975 to 1980" (U.S. EPA, 1982, p. 1-36). The greatest sources of nitrogen oxides were, according to the same EPA report, "mobile combustion and fossil-fuel power generators," although "industrial processes and agricultural operations produce minor quantities" (U.S. EPA, 1982, p. 5-1). Today, NAAQ standards for nitrogen oxides is 100 ppb, but measurements over the last two decades refer to measures at or below half that (EPA, 2023). Thus, the Clean Air Act had specific and demonstrable repercussions, although a number of unanticipated effects also became apparent. Andrews (2013) succinctly described the problem:

> The Clean Air Act of 1970 established strict technology-based standards for reducing air pollution from new fossil-fueled electric power plants and other

> stationary sources, but it left existing sources unregulated, on the assumption that they would gradually be retired and replaced by more modern and well-controlled plants. Three decades later, however, most of these older and dirtier plants were still in operation, owing at least in part to the greater costs of building new plants with more expensive controls….(p. 882).

How was this allowed? Andrews (2013) further explains that

> the 1970 Clean Air Act… "grandfathered" existing emissions sources, leaving emissions from existing power plants unregulated unless they were forced to clean up by state governments under state specific SIP [n.b: State Implementation Plan] mandates. Amendments enacted in 1977 required that any preexisting stationary source that was modified or upgraded in ways that might increase emissions must also install emissions control technology similar to a new source ("new source review," or NSR); but in the absence of such modifications, preexisting sources could continue polluting (p. 886).

While the Clean Air Act limited nitrogen oxides only during the summer and had set no limits on sulfur oxides in existing plants, proposals in the Clean Smokestacks Act of 2002 in NC set specific emissions limits on nitrogen oxides and sulfur oxides from all new *and* existing power generators within the state. This would entail a sharpening of the federal limits and therefore resulted in disagreements over cost recovery. As Andrews (2013) explains, ratepayer groups representing industrial consumers at the time, and the two investor-owned utilities, Duke Energy and Progress Energy, were not thrilled at the prospect of paying for new equipment. Happily, negotiators in the office of the new Governor suggested an exchange of sorts.

Because interest rates had fallen during the recession, large investor-owned utilities had begun collecting higher rates of return than the Utilities Commission, strictly speaking, allowed.

Ordinarily, this should have meant a lengthy deliberation in front of the Commission, in order to cut energy costs for consumers. However, negotiators for the Governor suggested freezing energy rates, in exchange for support for the bill. The IOUs would thus be able to use recent returns to pay for generator upgrades, while also avoiding a difficult and protracted set of hearings before a regulator. When environmental advocacy groups pushed for it, the final bill further bound IOUs not to sell emissions allowance credits to any upwind polluters outside the state, as that would essentially nullify the bill's intent.

In these negotiations, a pattern that would repeat itself later became clear. The IOUs stood to lose significantly by agreeing to basic terms, so the agreement had to include a significant concession. In FY 2002-2003, Duke had earned a windfall of around $100 million, an amount it ordinarily should have returned to ratepayers (Mildenberg, 2003). Such a pattern was also obvious to one of the respondents:

> They agreed to do these pollution controls, and, in agreeing to that, they get to be party to controlling pollution, which have been identified, [Duke] got to apply over-earnings to capital investment, which, the way the system works in North Carolina, [with] capital investments, they are authorized by the Utility Commission to do cost recovery for those capital investments, plus a return on investment. …[T]hat was, for them, the same thing as when they build a power generation plant, and they make money on that because they recoup their investment in that power plant plus the return on investment which is set by the North Carolina Utilities Commission…
>
> [T]he pattern I've seen is that the utility….will see it in their own self-interest to make some compromises in order to get things that they want…

For clean energy purposes, a more salutary outcome of the Clean Smokestacks Act was the creation of the Climate Action Plan Advisory Group, which grew out of the Division of Air Quality's mandate to study emission and render recommendations to the General Assembly. However, of the 56 policies recommended, none were adopted (Conlin, n.d.).

In 2005, Duke Power instituted net metering, as required by the NCUC (Order amending net metering policy, 2009). Net metering provided retail energy consumers an incentive to generate their own energy through solar photovoltaic, biomass, wind, and micro-hydro projects, but most residential customers utilize rooftop solar. As long as the project met certain criteria, including a limit on size, any excess energy not used on the spot or stored in battery form could be sold back to the utility for energy bill credits (Order amending, 2009).

Changes between 2007 and 2021

In 2011, Republican majorities set to work creating a new set of goals for the state budget. Cuts and reallocations to programs were accompanied by changes in statute and policy to immediately centralize power further within the General Assembly. The will to prioritize business interests had been clear from the moment of swearing in at the legislature. Education, health, and the environment were especially targeted for cuts or changes. What surprised some was the freedom with which new majority also began rearranging divisions within departments. Thus, the Department of Environment and Natural Resources lost nearly 100 staff and two key divisions, Forest Resources and Soil & Water Conservation, to the Department of Agriculture and Consumer Services. The Division of Environmental Health, formerly the division responsible for establishing, among other concerns, point source pollution controls to mitigate inadequate residential septic systems, was split up between various agencies.

More importantly, the budget contained a trigger to force any new rules written by various agencies and offices of the Executive Branch, including the Departments of Environment and Natural Resources, of Agriculture and Consumer Services, and of Labor, to be no more stringent than applicable or analogous federal laws or rules. These provisions were so important that they were also embedded in a more comprehensive section of the Regulatory Reform Act 2011 (SB 781), which lessened executive agencies' authority in contested cases. For the purposes of this research, the most crucial portion of SB 781 "… prohibited certain enumerated agencies authorized to implement and enforce environmental laws from adopting rules for the protection of the environment or natural resources that imposed standards and limitations that were more restrictive than those imposed by an analogous federal law or rule, unless the rule responded to an emergency, a specific law, a change in budgetary policy, or a court order" (Cochrane-Brown, 2011). Governor Perdue's veto of SB 781 was overridden. In the same session, SB 709, which would have practically ordered the Governor to actively seek out and develop any energy resources found within the state, within coastal waters, and on the adjacent continental shelf, did not survive past the Governor's veto.

Passage of the Renewable Energy Portfolio Standard, SB 3

By 2007, twenty-eight states had already passed or were passing their own Renewable Energy Portfolio (Lyon and Yin, 2010; Stokes, 2020), beginning with the Iowa Alternative Energy Law in 1983, which decreed that the two main investor-owned utilities needed to draw 105 megawatts of electricity derived from renewable sources. Iowa's case illustrates how purple states do not all follow a particular pattern. The state renewable energy industry did not sustain an expected boost and little if any renewable energy became part of the energy stream. While today Iowa is a leader in wind energy, second only to Texas, a lack of enforcement mechanisms

in the AEL led to very slow growth of the industry. Tax credits for production and supply of renewable energy in many purple states do, however, receive bipartisan support. Support for clean energy differs from support for other environmental causes. The current senior U. S. Senator from Iowa, Chuck Grassley, on whom the League of Conservation Voters (2023) bestowed a lifetime pro-environment score of 18%, in a February 2024 editorial for a major Des Moines newspaper, proudly touted his support for the Wind Energy Incentives Act, noting that "clean energy sources account for 60% of Iowa's electricity production" (Grassley, 2024). Since passage, many states have retrenched their RPS obligations (Stokes, 2020), and two – Kansas and West Virginia in 2015 - eliminated the RPSs they had established only a few years earlier (Barbose, 2021; Stokes, 2020).

Nevertheless, the major clean energy accomplishment of the North Carolina General Assembly 2007-08 session was the NC Renewable Portfolio Standard. One of the goals of the NC RPS was to encourage the growth of the sustainable energy industry, ensuring that additional clean energy generation units come online, rather than allow the utilities to buy energy generated from renewable source from outside the state or the region. Such justifications are not merely assumed; they were written into the language of SB 3, as passage will "provide greater energy security through the use of indigenous energy resources available within the State [and] encourage private investment in renewable energy and energy efficiency" (Section 1, 62-2(a)(10)). A snowball effect of the REPS could mean that, "…by increasing the required amount over time, the REPS can put the electricity industry on a path toward increasing sustainability" (Lyon and Yin, 2010, p. 133). Barbose (2021) notes that unlike a few other states, North Carolina has consistently met all of its obligated compliance targets for the RPS through 2019, including the limits on out-of-state credits, which are meant to stimulate in-state investment in

renewable energy production (Lyon and Yin, 2010). That investment has been considerable and growing, as Petrusa, Tilley, and Gonzalez (2021) demonstrate. In 2007, investment totaled 26.2 million; in 2020, it was $1.6 billion. Since the passage of SB 3 in 2007, clean energy's contribution to the Gross State Product has totaled $ 22.5 billion, while nearly $20 billion has been invested in developing clean energy. The state incentives total approximately one-thirteenth of this figure.

It should be noted that party alone is not the sole determinant of support for regulation or clean energy, or for belief in climate change. During its time as majority Democratic, the General Assembly served as a backdrop for the contentious intra- and inter-party disagreements between what Luebke (1998), a longtime member of the NC General Assembly, described as modernizers and traditionalists. Modernizers represented a business orientation, were concerned with the growth of the state's economy, and sought to make government regulations fall in line with the changes needed for progress, without thereby becoming *progressive*. Traditionalists, on the other hand, identified more with the agronomic and small-town culture of rural North Carolina, eschewing the social and economic changes rippling through the state. Luebke identified modernizer Democrats as the dominant group in the Assembly; it was to them that most of its Democratic governors belonged. A comparative difference between individual members of the legislature should be assumed; all interviewees noted and named Republican members of the legislature who worked hard to pass climate or energy legislation. After 2010, numerous attempts at eliminating or weakening the REPS were introduced but failed to pass.
Several interviewees described the monopoly IOU as an unusually strong competitor against which regulators and consumer allies were unevenly matched. One regulatory issue during the interval between 2007 and 2021 illustrates this. As market conditions for rooftop solar

installation companies began improving, small solar companies established footholds in North Carolina. When some companies began vertically integrating, allowing for quick installation and, as one interviewee reported, maintaining the means to ensure processes for "…financing to development to procurement, construction, [and] engineering…", the state became one of those with the most installations of solar energy. At the same time, state interest groups negotiated and attained a standard power purchase agreement for federal PURPA qualifying facilities for systems under five MW of power. As solar installers could not themselves interconnect to the grid, the IOU maintained a queue for such projects. The wait for interconnection slowed to more than 900 days, threatening the continued existence of solar installers. HB 589, signed into law in 207, resolved the wait issue and offered a rebate program for solar installation.

Yet again, however, this deal threatened a nascent, albeit different industry. The resulting statute also included an 18-month wind moratorium, delaying, eventually by years, two different wind projects (Eckley, 2017). After years of additional delays, prompted by the concern that windmill construction might be in the flight path of military flights, a finding which advocates assessed as possible delay tactics, one of the projects, Timbermill Wind, received a permit from the DEQ; construction of the windmills is ongoing, as the farm is expected to be operational in 2025 (Allen, 2024). Timbermill Wind will be the second utility-scale onshore wind farm in the state, following the first, an Amazon wind farm in Perquimans and Pasquotank counties.

Passage of "Energy Solutions for North Carolina," HB 951

Abele (2021) described the most important parts of the 2021 bill, including changes to solar resets, to the relationship between consumers and time-of-use (TOU) rates, to solar installation rebates, and to permanent fees unaffected by energy installation. While there is much

consternation within the solar installation industry about the 2021 law, industry analysts argue it defused potential roadblocks that advocates and utilities encountered in South Carolina during contentious negotiations over the Solar Choice net metering program (Abele, 2021).

According to the 2017 bill, net metering rates needed to be revisited by all parties by 2027, but there was additional incentive to do so now. Perhaps predictably, the most heavily contested issues involved how utilities termed and offered those credits; what makes the 2021 energy bill so significant are the substantial changes it introduced. Annually, energy bills sent to net metering customers of the IOUs include a reset of the credits accrued that year, along with refunds; however, the 2021 bill phased out such resets and credits now included much more complex time-of-use calculations, allowing for non-peak periods, off-peak, and discount periods. Time-of-use rates incentivize clean energy deployment and energy storage, as the primary reason for storage at the moment is in case of power outages; when the retail cost of kilowatt hours remains the same regardless of the hour of the day or type of energy source deployed, consumers have no incentive to attenuate their use of energy or change energy use patterns in significant ways.

Most importantly, however, according to interviews, Duke wrested a valuable concession from the negotiations: the right to bring multi-year rate cases before the NCUC, controlling more clearly the retail price of energy. This had been another long-sought prize, as rate cases, with their established but lengthy and cumbersome procedures, including the need to allow for consumer comments, made justifying rate increases particularly challenging; the unpredictable nature of requesting rate changes before a regulatory body also introduced notions of risk into Duke shareholder statements.

Lessons and Conclusions

Both questions about policy diffusion and notions of obduracy in social forms, processes, and roles tend to imply a certain degree of staticity. In most legislatures, this, for many years, took the form of a Democratic majority and leadership, that rewarded incumbency and the kind of political apprenticeship with which much of the parliamentary systems of the world function. The rules are often arcane; for newcomers, they tend to require some study. If, in 2010, the majority did not remain the same, then to what degree did the social forms in which they interacted in official capacities change consequentially? Rules for each biannual long session are decided by vote at the very beginning of each session, but there were other rule changes that perhaps mattered more. One of these pertained to the unusual process of separation of power within the state. The Rules Review Commission is composed entirely of legislative appointments, but they review rules meant to be adapted by the executive branch and the departments it oversees. The power of the executive is thus, through these and other means, significantly circumscribed in the state.

Nevertheless, the administration of a particularly active Governor, Roy Cooper, an advocate for clean energy and for the environment even when he was Attorney General of the state, underscored just how much could be done with somewhat limited powers. His administration is marked by the first Carbon Plan in the state, as well as ambitious goals. To what degree those goals are likely to be met remains to be seen.

A third, no less important brake on the a reversion to pre-2007 clean energy mandates has been the widespread adoption of clean energy by small entrepreneurs. North Carolina's impact on solar adoption has been significant, and several interviewees noted with satisfaction that

hearing from local business, and understanding their significance to the local economy, made an impact on their designated representative, whatever their affiliation.

Current outlook for clean and renewable energy legislation continues to be in flux, mostly thanks to the national discourse on the environment. Nevertheless, the ongoing challenges between, legislation, regulators, consumers, and the regulated certainly warrant further investigation.

REFERENCES

Abele, M. (Host). (2021, December 20). Finding NEM (2.) (No. 61) [Audio podcast episode]. In *The Squeaky-Clean Energy Podcast*. NCSEA. https://podcasts.apple.com/us/podcast/episode-61-finding-nem-2-0/id1463229314?i=1000545531606

American Legislative Exchange Council. (2017, November 16). *Interstate Research Commission on Climatic Change Act.* https://alec.org/model-policy/interstate-research-commission-on-climatic-change-act/

Barbose, G. L. (2021, February). *U.S. renewables Portfolio Standards 2021 status update: Early release. RPS compliance data* [Spreadsheet]. Lawrence Berkeley National Lab, Berkeley, CA.

Bulkeley, H. (2010). Cities and the governing of climate change. *Annual Review of Environment and Resources*, *35*(1), 229–53. https://doi.org/10.1146/annurev-environ-072809-101747

Cleary, K., Palmer, K., and Aagard, T. (2021). FERC 101: Electricity regulation and the Federal Energy Regulatory Commission. *Resources for the Future.* https://www.rff.org/publications/explainers/ferc-101-electricity-regulation-and-the-federal-energy-regulatory-commission/

Conlin, B.C. (n.d.) *A strategy for addressing climate change in the North Carolina Legislature.* https://dukespace.lib.duke.edu

Curliss, A., and Jarvis, C. (2014, 13 August). McCrory misstated Duke Energy holdings, sold stock after coal-ash spill. *The News & Observer.* https://www.newsobserver.com/

Downey, J. (2018, 28 March). Duke Energy won't comment on top state lobbyists' membership in controversial group. *Charlotte Business Journal.* https://www.bizjournals.com/charlotte/news/2018/03/28/duke-energy-won-t-comment-on-top-state-lobbyists.html

Duke Energy Corp. (2007, 3 March). *Form 10-K (Annual Report).* https://d18rn0p25nwr6d.cloudfront.net/CIK-0001326160/8100e2ca-8061-4d1b-bc2e-7f6ec92a8399.pdf

Duke Energy. (n.d.). *About Duke Energy.* https://www.duke-energy.com/our-company/about-us

Dunlap, L., Cleary, K., & Palmer, K. (2020, 3 March). Electricity 101: Terms and Definitions [Explainer]. *Resources for the Future.* https://www.rff.org/publications/explainers/electricity-101/

Dunlap, R. E., and McCright, A. M. (2012). Organized Climate Change Denial. In J. S. Dryzek, R. B. Norgaard, and D. Schlosberg (eds), *The Oxford Handbook of Climate Change and Society.* https://doi.org/10.1093/oxfordhb/9780199566600.003.0010.

Durand, F., and Nelles, J. (2013). Binding cross-border regions: An analysis of cross-border governance in Lille-Kortrijk-Tournai Eurometropolis. *Tijdschrift voor Economische en Sociale Geografie, 105*(5), 573–590. DOI:10.1111/tesg.12063

Eastern Interconnections Planning Collaborative. (2021). EIPC. https://eipconline.com/

Eckley, A. (2017). Investment Impacts of HB589. *Competitive Energy Solutions for North Carolina.* https://energync.org/investment-impacts-of-hb589-competitive-energy-solutions-for-north-carolina/

Federal Energy Regulatory Commission [FERC]. (2020). *Energy primer A handbook of energy market basics.* https://www.ferc.gov/sites/default/files/2020-06/energy-primer-2020_Final.pdf

Federal Energy Regulatory Commission [FERC]. (n. d.). *Electric Reliability Primer.* https://www.ferc.gov/sites/default/files/2020-04/reliability-primer_1.pdf

Federal Power Act. 16 U.S.C. 791a et seq. (2018). https://www.ferc.gov/sites/default/files/2021-04/federal_power_act.pdf

Flores-Espino, F., Tian, T., Chernyakhovskiy, I., Mercer, M., and Miller, M. (2016). *Competitive electricity market regulation in the United States: A primer. NREL/TP-6A20-67106* [Technical Report]. National Renewable Energy Laboratory. http:/www.osti.gov/scitech

Florida Municipal Electric Association. (2022). *Benefits of Public Power.* https://www.flpublicpower.com/benefits-of-public-power

Florida Public Service Commission. (2020). *Facts and Figures of the Florida Utility Industry* [Report]. http://www.psc.state.fl.us/Files/PDF/ Publications/Reports/General/Factsandfigures/April%202020.pdf

Fox-Penner, P. (2010). *Smart power: Climate change, the Smart Grid, and the future of electric utilities.* Washington, DC: Island Press.

FracTracker. (2023). *Oil & Gas Activity in North Carolina.* https://www.fractracker.org/map/us/north-carolina/

Furuseth, O.J. (1997), Restructuring of hog farming in North Carolina: Explosion and implosion. *The Professional Geographer*, *49*, 391-403. https://doi.org/10.1111/0033-0124.00086

Gaul, C. & Carley, S. (2012). Solar set asides and renewable electricity certificates: Early lessons from North Carolina's experience with its renewable portfolio standard. *Energy Policy, 48*, 460–469. http://dx.doi.org/10.1016/j.enpol.2012.05.043

Geels, F. W. (2014). Regime resistance against low-carbon transitions: Introducing politics and power into the multi-level perspective. *Theory, Culture & Society 31*(5), 21–40. https://doi.org/10.1177/0263276414531627.

Geels, F. W., and Schot, J. (2007). Typology of Sociotechnical Transition Pathways. *Research Policy, 36*(3), 399–417. https://doi.org/10.1016/j.respol.2007.01.003.

Geels, F. W., Sovacool, B. K., Schwanen, T., and Sorrell, S.(2017). Sociotechnical Transitions for Deep Decarbonization. *Science 357*(6357), 1242–44. https://doi.org/10.1126/science.aao3760.

Gold, R. (2022, February). The Texas electric grid failure was a warm-up. *Texas Monthly*. https://www.texasmonthly.com/news-politics/texas-electric-grid-failure-warm-up

Glückler, J., and Doreian, P. (2016).Editorial: Social network analysis and economic geography—positional, evolutionary and multi-level approaches. *Journal of Economic Geography, 16*, 1123–1134. doi:10.1093/jeg/lbw041

Guidi, N., & Carmody, C. (2023, 23 Nov.). The Southeast Energy Exchange Market launched a year ago. It still isn't delivering on its promises. *Utility Dive.* https://www.utilitydive.com/news/southeast-energy-exchange-market-clean-power-ferc-spp-miso/700502/

Hertel-Fernandez, A. (2019). *State capture: How conservative activists, big businesses, and wealthy donors reshaped the American states – and the nation.* New York: Oxford University Press.

Hirsh, R. F. (1999). *Power loss: The origins of deregulation and restructuring in the American electric utility system.* Cambridge, MA: MIT Press.

Hubbell, B., & Welsh, R. (1998). An examination of trends in geographic concentration in U.S. hog production, 1974–96. *Journal of Agricultural and Applied Economics, 30*(2), 285-299. doi:10.1017/S1074070800008294

Jones, J. (2020, 13 July). Three years since HB589 was signed into law: How are we doing? *North Carolina Sustainable Energy Association.* https://energync.org/hb5893-3yearann/

Jordan, A., Wurzel, R. K.W., and Zito, A. R. (2013). Still the century of 'new' environmental policy instruments? Exploring patterns of innovation and continuity." *Environmental Politics, 22*(1), 155-173.

Joskow, P. L. (2007). Regulation of natural monopoly. In A. M. Polinsky and S. Shavell (Eds.), *Handbook of Law and Economics, Volume 2*. Elsevier, B. V.

Joskow, P. L. (1997). Restructuring, competition and regulatory reform in the U.S. electricity sector. *Journal of Economic Perspectives, 11*(3), 119–138.

Jourdain, C., Hug, S., & Varone, F. (2017). Lobbying across venues. *State Politics & Policy Quarterly, 17*(2), 127-153. https://www.jstor.org/stable/10.2307/26654470

Karch, A. (2007). *Democratic laboratories: Policy diffusion among the American states.* University of Michigan Press. Retrieved April 15, 2022.

Klein, E. (2022, 20 September). *The single best guide to decarbonization I've heard: The energy expert Jesse Jenkins walks me through the path to our climate goals.* [Podcast]. https://www.nytimes.com/2022/09/20/opinion/ezra-klein-podcast-jesse-jenkins.html?showTranscript=1

Larson, E., Greig, C., Jenkins, J., Mayfield, E., Pascale, A., Zhang, C., Drossman, J., Williams, R., Pacala, S., Socolow, R., Baik, E. J., Birdsey, R., Duke, R., Jones, R., Haley, B., Leslie, E., Paustian, K., and Swan, A. (2021). *Net-Zero America: Potential pathways, infrastructure, and impacts, final report summary.* Princeton, NJ.

Luebke, P. (1998). *Tarheel Politics 2000.* Chapel Hill: UNC Press.

Lyon, T. P., & Yin, H. (2010). Why do states adopt renewable portfolio standards? An empirical investigation. *The Energy Journal, 31*(3), 133-157. http://dx.doi.org/10.2139/ssrn.1025513

Marin, A., & Wellman, B. (2014). Social network analysis: An introduction. In P. Carrington & J. Scott (Eds.), *The SAGE handbook of social network analysis* (pp. 11-25). SAGE Publications Ltd, https://dx.doi.org/10.4135/9781446294413

Marquardt, J. (2024). How Greens turn gray: Green Party politics and the depoliticization of energy and climate change. *Frontiers in Political Science,* 5. https://doi.org/10.3389/fpos.2023.1301734

Marshall, D. J. & Staeheli, L. (2015). Mapping civil society with social network analysis: Methodological possibilities and limitations. *Geoforum, 61,* 56-66. http://dx.doi.org/10.1016/j.geoforum.2015.02.015

Maynor, J. (1980). *Duke Power: The first seventy-five years.* Albany, NY: Delmar.

Mische, A., & White, H. C. (1998). Between conversation and situation: Public switching dynamics across network-domains. *Social Research, 65,* 695-724.

Mitchneck, B., Mayorova, O. V., and Regulska, J. P. (2009). Conflict displacement: Isolation and integration in Georgia. *Annals of the Association of American Geographers,* 99(5), 1022–1032

National Association of State Utility Consumer Advocates (NASUCA). (n.d.). *Who we are.* https://www.nasuca.org/about-us/

NC State College of Natural Resources. (2020, 8 Dec.). NC State's Christmas Tree Genetics Program: Keeping our Christmases merry and bright. *Forestry and Environmental Resources.* https://cnr.ncsu.edu/fer/news/2020/12/christmas-tree-genetics/

North American Electric Reliability Corporation. (2022). *ERO Enterprise| Regional Entities: NERC.* https://www.nerc.com/AboutNERC/keyplayers/Pages/default.aspx

North American Electric Reliability Corporation. (2022a). *ERO Enterprise| Regional Entities: NERC Regions Map.* https://www.nerc.com/AboutNERC/keyplayers/Pages/default.aspx

North American Electric Reliability Corporation. (2022b). *ERO Enterprise| Regional Entities: NERC Balancing Authority Areas (As of October 2019).* https://www.nerc.com/AboutNERC/keyplayers/Pages/default.aspx

North Carolina Department of Environmental Quality. (2022, January). *North Carolina Greenhouse Gas Inventory, 1990-2030.* https://deq.nc.gov/energy-climate/climate-change/greenhouse-gas-inventory

North Carolina Department of Environmental Quality. (n.d.). *Oil and Gas Program Geologic Assessment.* https://www.deq.nc.gov/energy-climate/oil-and-gas-program/oil-and-gas-program-geologic-assessment

North Carolina Department of Environmental Quality. (2019, October). *North Carolina Clean Energy Plan: Transitioning to a 21st Century Electricity System.* https://deq.nc.gov/energy-climate/climate-change/greenhouse-gas-inventory

North Carolina Sustainable Energy Association [NCSEA]. (2022). *Interactive maps.* https://energync.org/maps/

North Carolina Utilities Commission [NCUC]. (2021). *About the NC Utilities Commission.* https://www.ncuc.net/Aboutncuc.html

Oglesby, C. (2021, March 24). 'This plan is a lie': Biogas on hog farms could do more harm than good. *Southerly/Scalawag magazine.* https://southerlymag.org/2022/03/24/biogas-could-do-more-harm-than-good-hog-industry/

Nye, D. E. (2001). *Consuming power: A social history of American energies.* Cambridge, MA: MIT Press.

Order amending net metering policy, Docket No. E-100, SUB 83. (State of North Carolina Utilities Commission, 2009, March 1). https://starw1.ncuc.gov/NCUC/ViewFile.aspx?Id=f1b29a03-4445-4930-9dfd-14682ceb368e

Ouzts, E. (2020, 24 February). End Duke Energy's monopoly in North Carolina? It's complicated. *Energy News Network.* https://energynews.us/2020/02/24/end-duke-energys-monopoly-in-north-carolina-its-complicated/

Peck, J. (2011). Geographies of policy: From transfer-diffusion to mobility-mutation. *Progress in Human Geography, 35*(6), 773–797. DOI: 10.1177/0309132510394010

Petrusa, J., Tilley, A., & Gonzalez, M. (2021). *Economic impact analysis of clean energy development in North Carolina—2021 Update.* Research Triangle Institute. https://energync.org/wp-content/uploads/2021/06/NCSEA_2021_Final_06222021.pdf

Pollitt, M. G. (2012). The role of policy in energy transitions: Lessons from the energy liberalisation era. *Energy Policy 50*, 128–137. doi:10.1016/j.enpol.2012.03.004

Public Staff, North Carolina Utilities Commission. (n.d.). *About us.* https://publicstaff.nc.gov/about-us

Radil, S., Flint, C., and Chi, S. (2013). A relational geography of war: Actor–Context interaction and the spread of world war. *Annals of the Association of American Geographers, 103*(6), 1468–1484.

Romankiewicz, J., Bottorff, C., and Stokes, L. C. (2020).The dirty truth about utility climate pledges. *Sierra Club.* https://www.sierraclub.org/sites/www.sierraclub.org/files/blog/Final %20Greenwashing%20Report%20%281.22.2021%29.pdf

SERC Board of Directors. (2021, 23 March). *Amended and restated bylaws of SERC Reliability Corporation.* https://www.serc1.org/docs/default-source/about-serc/governance/sercreliabilitycorporationbylawseffectivejanuary-1-2021.pdf

SERC Reliability Corporation. (2020). Board of Directors. SERC Reliability Corporation. https://www.serc1.org/about-serc/governance

Sovacool, B. K., Martiskainen, M., Hook, A., and Baker, L. (2019). Decarbonisation and its discontents: A critical energy justice perspective on four low-carbon transitions. *Climatic Change, 155,* 581–619. https://doi.org/10.1007/s10584-019-02521-7.

Stokes, L. C. (2020). *Short Circuiting Policy : Interest Groups and the Battle Over Clean Energy and Climate Policy in the American States.* New York, NY: Oxford University Press.

Swanson, S. E. (2012). Mineralogy of spodumene pegmatites and related rocks in the tin–spodumene belt of North Carolina and South Carolina, USA. *The Canadian Mineralogist*, *50*(6), 1589-1608.

Sweet, W.V., Hamlington, B.D., Kopp, R.E., Weaver, C.P. , Barnard, P.L., Bekaert, Brooks, W., Craghan, M., Dusek, G., Frederikse, T., Garner, G., Genz, A.S., Krasting, J.P., Larour, E., Marcy, D., Marra, J.J., Obeysekera, J., Osler, M., Pendleton, M., Roman, D., Schmied, L., Veatch, W., White, K.D., and Zuzak, C. (2022). Global and regional sea level rise scenarios for the United States: Updated mean projections and extreme water level probabilities along U.S. coastlines. *NOAA Technical Report NOS 01.* National Oceanic and Atmospheric Administration, National Ocean Service. https://oceanservice.noaa.gov/hazards/sealevelrise/noaa-nostechrpt01-global-regional-SLR-scenarios-US.pdf

U.S. Department of Agriculture. (2017). *North Carolina Agricultural Statistics.* Raleigh, NC: U.S. Department of Agriculture, National Agricultural Statistics Service, and North Carolina Department of Agriculture & Consumer Services. https://www.nass.usda.gov/Publications/AgCensus/2017/

U. S. Energy Information Agency. (2021). *North Carolina: Profile Analysis.* https://www.eia.gov/state/analysis.php?sid=NC

U. S. Energy Information Agency. (2019b). *State Energy Data System, Table C1, Energy Consumption Overview: Estimates by Energy Source and End-Use Sector.* https://www.eia.gov/state/seds/

U. S. Energy Information Agency. (n. d.). *Electricity Data Browser.* Net generation for all sectors (thousand megawatt hours), North Carolina, 2001-20. https://www.eia.gov/electricity/data/browser/

U.S. EPA. (2024). *Reviewing National Ambient Air Quality Standards (NAAQS): Scientific and technical information.* https://www.epa.gov/naaqs

U. S. EPA (2022, Jan 13). *In Reply Refer to: EPA Complaint No. 05RNO-21-R4* [Letter addressed to Blakely Hildebrand, Staff Attorney, Southern Environmental Law Center https://www.southernenvironment.org/wp-content/uploads/2022/01/2022.01.13-Final-CP-Acceptance-Ltr.-EPA-Complaint-No.-05RNO-21-R4-NCDEQ-copy.pdf

Walker, J. (1969). The diffusion of innovations among the American states. *American Political Science Review, 63*(3), 880-899. https://doi.org/10.

Widrlechner, M. P., Daly, C., Keller, M., and Kaplan, K. (2012). Horticultural applications of a newly revised USDA Plant Hardiness Zone Map. *HortTechnology, 22*(1), 6-18.

Wiser, R. H., Millstein, D., Rand, J., Donohoo-Vallett, P., Gilman, P., & Mai, T. (2021). *Halfway to zero: Progress towards a carbon-free power sector.* Lawrence Berkeley National Lab, Berkeley, CA.

Yeoman, B. (2022, Jan 23). EPA to investigate North Carolina biogas for discrimination. *FERN's AG Insider.* https://thefern.org/ag_insider/epa-to-investigate-north-carolina-biogas-for-discrimination/