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## The Third Wave of Electrification: A Normative Tool Against Climate Change

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# JOURNAL ON EMERGING TECHNOLOGIES

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### THE THIRD WAVE OF ELECTRIFICATION: A NORMATIVE TOOL AGAINST CLIMATE CHANGE

*Elizabeth L. Adams*

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# THE THIRD WAVE OF ELECTRIFICATION: A NORMATIVE TOOL AGAINST CLIMATE CHANGE

Elizabeth L. Adams\*

*Regulation involves the human adjustment of resources to accomplish humanly established ends. Regulation is limited and guided both by what we want and by what we are willing to give in order to get what we want. To say that there are no immutable laws of regulation is not to say that regulation is, by nature, amorphous, loose, aimless, adrift. It can be just as purposeful and tight and firm as we care to make it. The point is that regulation and regulatory policies must be made; they are not revealed to us, nor do we discover them.*

Ben W. Lewis

*Utility Regulation: New Directions in Theory and Policy*<sup>1</sup>

*“Such technological developments are too often understood as irresistible, when in fact people shape the form of the electrical system as they incorporate it into everyday life. Electrification mixed cultural, economic, and technical factors.”*

David E. Nye

*Electrifying America: Social Meanings of a New Technology, 1880-1940*<sup>2</sup>

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<sup>1</sup> BEN W. LEWIS, *UTILITY REGULATION: NEW DIRECTIONS IN THEORY AND POLICY* 212, 215 (William G. Shepherd & Thomas G. Gies eds., 1966). Lewis was an economics professor who held prominent economics positions during the Roosevelt Administration, including Chief Economist for the Office of Price Administration (OPA) and Chief Economist for the Consumer Counsel Division in the U. S. Department of Interior.

<sup>2</sup> DAVID E. NYE, *ELECTRIFYING AMERICA: SOCIAL MEANING OF A NEW TECHNOLOGY, 1880-1940* 27 (MIT Press, 4th prtg. 1995). Nye is a Senior Research Fellow at the Charles Babbage Institute and the History of Science and Technology program at the University of Minnesota and Professor Emeritus of American Studies at the University of Southern Denmark. Professor Nye is the 2005 recipient of Leonardo da Vinci Medal and is a Pulitzer Prize nominee. He was also knighted by the Queen of Denmark in 2014.

## INTRODUCTION

Over the last 150 years, American use of electricity moved from theory to engineering and from a luxury product to a necessary good, redefining how we understand our individual and collective relationship with power along the way. The way we have historically discussed electricity and used it to accomplish public objectives tracks several “waves” of electrification as a social construct. These new waves, while distinct, share a common element: each began at the intersection of innovation and investment, where experience stretched our understanding of the benefits electricity could deliver to the public. The first wave of electrification can be categorized in terms of technology and basic delivery, with the public understanding electricity as a luxury item. The second wave formed as society gained insight into the socioeconomic benefits that accompanied electricity, transitioning from a luxury good to a basic right. The belief that electrification is a necessity to be extended to all citizens was a hallmark of the Progressive Era and facilitated widespread investments in America’s energy infrastructure. This article posits that the United States is now entering a third wave of electrification, one where we understand electricity not only as a universal service, but also as a mechanism for positive societal outcomes, namely the transition to a lower carbon future.

Part I evaluates the first two waves of electrification, starting with the introduction of electricity as a consumer product and transitioning to electrification as a basic right. Part II discusses the American regulatory framework which provides for government oversight of areas deemed to be “of the public interest.” Electric public utilities have participated in and been shaped by this public interest tradition through investments in energy infrastructures that deliver power to the public. Although public utilities and electric power providers operate today within a patchwork of regulatory regimes—including a mix of regulated and deregulated markets in the United States—this article focuses on the common ancestry of electric utilities as understood by the early twentieth century progressive framework of regulated public utilities.<sup>3</sup> Part III evaluates the rhetoric emerging around climate change and how an increasingly common understanding of climate risk is redefining public interest to include decarbonization. Part IV argues that this public discourse paired with the potential for electricity to move society towards a lower-carbon future signals the third wave of

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<sup>3</sup> William Boyd, *Public Utility and the Low-Carbon Future*, 61 UCLA L. REV. 1614 (2014) (provides a comprehensive evaluation of the public utility tradition and suggests that a revitalized notion of the public utility, as it was understood by progressive advocates, has a critical role in securing a low-carbon future).

electrification as a social construct. Specifically, Americans are moving from their understanding of electricity access as a basic right to a mechanism for the delivery of a more sustainable future. Here, in the third wave of electrification, electricity is no longer an end itself but rather a means to a greater societal purpose: decarbonization.

### I. ELECTRIFICATION: HISTORIC SOCIAL CONTEXT

Electrification is a litmus test for a society's economic and social health. The relationship between the American people and electricity, individual and collective, is intertwined with the history of the country's development and prosperity. Since its introduction, electricity has defined how Americans live, work, communicate, and understand our relationships with the broader community. "Electricity became not only the dominant technology of modern times but also the basis for redefining the nature of American abundance."<sup>4</sup> At its most basic, "electrification" is defined as powering through electricity.<sup>5</sup> But the American understanding of electrification carries a much deeper, more significant meaning, one that has evolved throughout the country's shared history. Professor David E. Nye, celebrated academic, author, and expert on the evolution of technology, believes that electrification and its role in history cannot be understood without evaluating it in social contexts.

Electrification is not an implacable force moving through history, but a social process that varies from one time to another and from one culture to another. In the United States electrification was not a "thing" that came from outside society and had an "impact"; rather, it was an internal development shaped by its social context.<sup>6</sup>

The common understanding of electrification, and more importantly, how society describes the end-goal pursued by the provision of electricity, has tracked important moments through history. The first wave of electrification occurred when electricity became a product available to the public and transitioned to the second wave when electricity access became a basic right due to the socioeconomic benefits of electricity. Understanding the social and legal context of these first two waves provides context to the ways in which the United States may grapple with this third wave of electrification.

In the first wave of electrification, electricity was originally understood as the physical delivery of electric power. In its early days, electricity was available in limited public spaces typically in urban areas. From 1880 to

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<sup>4</sup> MAURY KLEIN, *THE POWER MAKERS: STEAM, ELECTRICITY, AND THE MEN WHO INVENTED MODERN AMERICA* 16-17 (2008).

<sup>5</sup> *Electrification*, OXFORD DICTIONARY OF ENGLISH (3d ed. 2010).

<sup>6</sup> NYE, *supra* note 2, at ix.

1910, electricity transitioned from a single incandescent lightbulb to a public experience, limited to theaters, street lighting, world's fairs, streetcars, department stores, and amusement parks.<sup>7</sup> From 1910 to 1930, electrification in homes increased. In 1910, ten percent of American homes had electricity.<sup>8</sup> By 1930, the majority of urban homes had electricity.<sup>9</sup> Electricity was understood only as an individual product and supporting infrastructure was built to serve single customers with single production facilities.<sup>10</sup> "The first decades of electrification was fragmented and individualized; each electrical plant was built as an isolated unit to serve a particular need."<sup>11</sup> Electricity's rapid expansion redefined how Americans interacted with home and work.<sup>12</sup> As demand grew and technology evolved, the economics of producing and delivering power to a greater population made centralized generation the more efficient grid design.<sup>13</sup>

The transition from the first to the second wave of electrification occurred largely because electricity evolved from an elite product available for the wealthy to a product Americans understood as a common good.<sup>14</sup> The development of electrification evolved hand-in-hand with American social expectations of electricity service. Initially, the economics of electrification limited electricity access to certain discrete geographic locations, typically urban city centers and areas of concentrated wealth. Technical advancements and the expansion of electric companies allowed the grid to expand, reaching new customers in new ways. Extending the reach and use of electricity coincided with social movements and public rhetoric through which Americans came to recognize electrification as a basic right instead of a luxury good.<sup>15</sup>

The shift is most evident in rural electrification, a social and political movement to extend affordable electricity access to rural populations, often farming communities. In the early 1900s, electricity access grew rapidly in urban and industrialized areas while remaining stagnant in locations further from city-centers. The electrification gap translated to other gaps in economic opportunity and quality of life. City businesses were able to use electric lights, clocks, control devices, motors, and machinery to increase productivity. Urban dwellers had access to electric lights, clothes

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<sup>7</sup> *Id.* at 382.

<sup>8</sup> *Id.* at 239; *see also* GRETCHEN BAKKE, *THE GRID: THE FRAYING WIRES BETWEEN AMERICANS AND OUR ENERGY FUTURE* 44-45 (2016).

<sup>9</sup> NYE, *supra* note 2, at 239.

<sup>10</sup> BAKKE, *supra* note 8, at 44.

<sup>11</sup> NYE, *supra* note 2, at 139.

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

<sup>13</sup> *See* MARTIN G. GLAESER, *PUBLIC UTILITIES IN AMERICAN CAPITALISM* 54-55 (1957).

<sup>14</sup> *See* BAKKE, *supra* note 8, at 47.

<sup>15</sup> NYE, *supra* note 2, at 304.

irons, vacuum cleaners, electric refrigerators, and other electric appliances.<sup>16</sup> Rural dwellers could not take advantage of these electric technologies, nor could they reasonably expect to do so in any near-term timeframe.<sup>17</sup> Electricity access created a noticeable socioeconomic gap between Americans living in urban and rural communities. "The contrast between city and country only worsened in the 1930's when electrical consumption per household rose rapidly in the cities, while farmers continued to use outhouses, read by kerosene lamps, and cool themselves with palm-leaf fans."<sup>18</sup> It was against this backdrop that the way Americans discussed electricity changed from luxury to basic necessity. President Franklin D. Roosevelt (FDR) championed rural electrification as both a basic right and a mechanism to promote economic growth in the heartland. "Cold figures do not measure the human importance of electric power in our present social order," FDR proclaimed.<sup>19</sup> "Electricity is no longer a luxury, it is a definite necessity."<sup>20</sup>

The American people began to understand the economic and social gaps related to electrification, or lack thereof. By the 1930s, approximately 90% of urban populations had electricity, but only 10% of rural communities had access.<sup>21</sup> Electrification carried significant benefits for agricultural businesses. "Farmers found that cows produced more milk if an electric pump provided them with a constant supply of fresh water in their stalls, and some [farmers] also reported that cows were more contented when the radio was playing."<sup>22</sup> Electricity enabled farmers to do less physical work and allowed for larger operations using the same amount of human capacity.<sup>23</sup> Despite these benefits, America's rural and agricultural electrification lagged behind other developed countries. In 1935, for each electrified American farm, eight more remained unelectrified.<sup>24</sup> This was much lower

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<sup>16</sup> *Id.* at 303.

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

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

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

<sup>20</sup> *Id.* at 304 (cited in DAVID C. COYLE, RURAL ELECTRIFICATION ADMIN. ELECTRIC POWER ON THE FARM: THE STORY OF ELECTRICITY, ITS USEFULNESS ON FARMS, AND THE MOVEMENT TO ELECTRIFY RURAL AMERICA 85 (1936)).

<sup>21</sup> See, e.g., *Rural Electric Cooperatives*, MEASURING THE COOPERATIVE ECON.: THE U. OF WISCONSIN CTR. FOR COOPERATIVES, <https://mce.uwcc.wisc.edu/utilities-overview/rural-electric-cooperatives> (last visited Dec. 15, 2019); *Rural Electrification Administration*, THE ROOSEVELT INST. BLOG (Feb. 25, 2011), <https://rooseveltinstitute.org/rural-electrification-administration>; ROBERT T. BEALL, RURAL ELECTRIFICATION, *in* FARMERS IN A CHANGING WORLD: YEARBOOK OF AGRICULTURE 1940 793 (1941), <https://naldc.nal.usda.gov/download/IND43893747/PDF>.

<sup>22</sup> NYE, *supra* note 2, at 293.

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

<sup>24</sup> *Id.* at 299.

than Holland, Denmark, France, and Germany, all of which boasted rates of farm electrification in excess of 85%.<sup>25</sup>

The hallmark of FDR's presidency was the New Deal—a series of public work projects, financial reforms, and regulatory programs established to restore economic stability and prosperity to the American people in the midst of the Great Depression.<sup>26</sup> FDR made the electrification of rural, farming communities a major tenet of his revitalization efforts and New Deal legislation. Social and then legislative demands for more widespread rural electrification became necessary to provide an equal playing field, giving all Americans a “fair chance” at economic prosperity. The physical delivery of affordable electricity access became synonymous with its accompanying socioeconomic benefits like increased economic prosperity and improved quality of life.<sup>27</sup> Created by executive order in 1935 and affirmed by Congress in 1936, Rural Electrification Act (REA) codified this shift and enacted financing structures and administrative assistance to ensure that affordable electric power was available for all Americans.<sup>28</sup> Realizing FDR's vision for widespread electricity access required collaboration across federal, state, and local political entities and constant vigilance to ensure the prices being charged were proper and just.<sup>29</sup> FDR believed that electricity was a necessity and basic right for all American citizens, and his rhetoric and legislation helped shape the country's understanding of

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

<sup>26</sup> See generally 2 ARTHUR M. SCHLESINGER, *THE COMING OF THE NEW DEAL: 1933-1935*, THE AGE OF ROOSEVELT (2003).

<sup>27</sup> BEALL, *supra* note 21, at 793.

<sup>28</sup> Exec. Order No. 7,037 (1935); Rural Electrification Act of 1936, 7 U.S.C. § 904 (stating that the REA is authorized “to make loans . . . for the purpose of financing the construction and operation of generating plants, [and] electric transmission . . . lines or systems . . .”). See, e.g., *Caver v. Cent. Ala. Elec. Coop.*, 845 F.3d 1135, 1138 (11th Cir. 2017) (discussing the history of the Rural Electrification Act); *City of Stilwell, Okla. v. Ozarks Rural Elec. Coop. Corp.*, 79 F.3d 1038, 1044 (10th Cir. 1996) (discussing the purpose of the Rural Electrification Act as to extend electricity to rural areas with affordable rates and area coverage).

<sup>29</sup> The REA recognized the important role that states played in making rural electrification a reality. See, e.g., *Ark. Elec. Coop. Corp. v. Ark. Pub. Serv. Comm'n*, 461 U.S. 375, 386 (1983) (“[T]he legislative history of the Rural Electrification Act makes abundantly clear that, although the REA was expected to play a role in assisting the fledgling rural power cooperatives in setting their rate structures, it would do so within the constraints of existing state regulatory schemes.”); *Simmons v. W. Fla. Elec. Coop. Ass'n Inc.*, No. 5:15-cv-321-RH-GRJ, 2016 WL 7408852, \*1 (N.D. Fla. Dec. 22, 2016) (the REA does not preempt state regulation of rural electric cooperatives, so that the states may regulate a cooperative's rates); *Cessna v. REA Energy Coop., Inc.*, 258 F. Supp. 3d 566 (W.D. Pa. 2017), *aff'd*, 753 F. App'x. 124 (3d Cir. 2018) (finding that Congress had not legislated so comprehensively in the field of rural electric cooperatives that there was no room for state regulation).



electrification accordingly. In a 1938 speech dedicating an electric cooperative in rural Georgia, FDR emphasized that “[e]lectricity is a modern necessity of life and ought to be found in every village, every home, and every farm in every part of the United States.”<sup>30</sup> Decades later, John F. Kennedy celebrated the progress of rural electrification, crediting electricity with narrowing the standards of living in between urban and rural populations. Kennedy said that rural electrification “shows what can be done when the government and the people, working closely together, work in the common interest.”<sup>31</sup> Within thirty years of the enactment of the REA, nearly 1.5 million miles of power lines had been built to serve 20 million rural Americans.<sup>32</sup> By the late 1950s, electrification had reached over 95% of rural farms.<sup>33</sup>

## II. THE PUBLIC INTEREST TRADITION

Since its introduction, American electrification has been primarily a private enterprise subject to public oversight through regulation.<sup>34</sup> These private enterprises made investments on behalf of the public. The companies delivering electricity became known as “public utilities,” a legal fiction<sup>35</sup> for businesses providing goods or services that are “affected with the public interest.”<sup>36</sup> As the American experience with electrification evolved in the late 1800s and early 1900s, so too did the public interest tradition.

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<sup>30</sup> NYE, *supra* note 2, at 324 (citing *President Roosevelt, at REA Celebration, Says Every Farm Should Have Electricity*, RURAL ELECTRIFICATION NEWS, Sept. 1938, at 3).

<sup>31</sup> President John F. Kennedy, Address at the University of North Dakota (Sept. 25, 1963), in PUBLIC PAPERS OF THE PRESIDENTS OF THE UNITED STATES, JOHN F. KENNEDY, 1963, 715-719, <https://quod.lib.umich.edu/p/ppotpus/4730928.1963.001/771?rgn=full+text;view=image>.

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

<sup>33</sup> GLAESER, *supra* note 13, at 99.

<sup>34</sup> NYE, *supra* note 2, at 139-40 (discussing how the decentralized structure of American government and ability for private entities to access capital set up the basic framework for U.S. public utility framework).

<sup>35</sup> GLAESER, *supra* note 13, at 8 (“In its most extended sense the term *public utilities* is designated to cover certain industries which in the course of time have been classified apart from industry in general and have likewise been distinguished from governmental services with which, however, they are often intimately related. The basis of the classification is essentially economic and technological, although the meaning of the term is derived from the law.”); see also, CHARLES F. PHILLIPS, JR., *THE REGULATION OF PUBLIC UTILITIES* 117 (3d ed. 1993) (“The public utility status generally has been conferred on an industry that possesses those distinct economic characteristics which indicate that administrative, as opposed to market, regulation can improve the industry’s economic performance.”).

<sup>36</sup> PHILLIPS, *supra* note 35, at 4 (“There is a high degree of public interest attached to the services rendered by public utilities; this fact is the primary legal basis of regulation.”).

The legal foundation of the public interest tradition was established through a series of Supreme Court cases between 1876 and 1934. The first and second wave of electrification set up the progressive framework for regulated public utilities that provided power to the people and cemented the public interest in electricity as a common good or universal right in the American conscious.

*Munn v. Illinois*, the first of several landmark cases regarding the framework for American public utilities, set the tone by establishing government oversight over a certain classification of businesses.<sup>37</sup> Relevant to that case, the Illinois legislature established regulation for grain elevators and warehouses in the early 1870s.<sup>38</sup> Munn and his business partner refused to comply with the regulations and were found guilty of non-compliance with the state regulations.<sup>39</sup> On appeal to the United States Supreme Court, the Justices evaluated the constitutionality of the Illinois regulation and considered whether the state could regulate a private business.<sup>40</sup> This seminal case established that private property could be subject to government control, like the Illinois regulation, if such property is “clothed with a public interest.”<sup>41</sup> Chief Justice Waite wrote:

Property does become clothed with a public interest when used in a manner to make it of public consequence, and affect the community at large. When, therefore, one devotes his property to a use in which the public has an interest, he, in effect grants to the public an interest in that use, and must submit to be controlled by the public for the common good, to the extent of the interest he has thus created.<sup>42</sup>

This decision allowed for regulation of businesses where “the whole public has a direct and positive interest.”<sup>43</sup> The Court held that the determination of what was “clothed with a public interest” was a factual question for the judiciary based on the nature of business.<sup>44</sup> As the question presented in *Munn* was a matter of first impression for the Court, the holding was informed by longstanding traditions in common law, social science, and religion in order to meet new “development[s] of commercial progress.”<sup>45</sup>

Subsequent cases continued to evaluate the contours of businesses affected by public interest. In *German Alliance Insurance Co. v. Lewis*—a case

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<sup>37</sup> See *Munn v. Illinois*, 94 U.S. 113 (1876).

<sup>38</sup> *Id.* at 113.

<sup>39</sup> *Id.* at 118-19.

<sup>40</sup> *Id.* at 123.

<sup>41</sup> *Id.* at 126.

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

<sup>43</sup> *Id.* at 133.

<sup>44</sup> *Id.* at 132.

<sup>45</sup> *Id.* at 133; see also PHILLIPS, *supra* note 35, at 89-93 (discussing the antecedents and traditions that informed the American public interest concept).

upholding the regulation of the fire insurance business—the Court reasoned that although every human transaction has some relation to the public interest, regulation must be connected to “something of more definite consequence[.]”<sup>46</sup> Justice McKenna explicitly pointed to the provision of light, from gas or electricity, as an example of a business where the public interest “justifies regulatory legislation.”<sup>47</sup> In its determination that the fire insurance business, too, was affected with the public interest and subject to regulation, the Court reasoned that regulation was justified because fire insurance was “practically a necessity[.]”<sup>48</sup> This decision expanded the public interest tradition to tangible property to include intangible services, like insurance.<sup>49</sup>

In the 1920s and the early 1930s, the Supreme Court viewed regulation as exclusive to public utilities, effectively narrowing the public interest tradition.<sup>50</sup> In 1923, the Court began limiting the regulatory reach of states over businesses in *Charles Wolff Packing Co. v. Court of Industrial Relations*.<sup>51</sup> In the 1920s, the Kansas legislature passed regulation over food and clothing manufacturing, transportation, and public utilities.<sup>52</sup> This far-reaching regulation touched most businesses, and was the broadest application of the public interest tradition.<sup>53</sup> In evaluating the constitutionality of the Kansas regulation, the Court held that legislative declarations of public interest are not conclusive.<sup>54</sup> The Court held that businesses clothed in the public interest must have “a peculiarly close relationship between the public and those engaged in it [to] raise implications of an affirmative obligation on their part to be reasonable in dealing with the public.”<sup>55</sup> The Kansas regulation was ruled unconstitutional, and the Court provided a more stringent test of public interest: “the thing which gave the public interest was the indispensable nature of the service and the exorbitant charges and arbitrary control to which the public might be subjected without regulation.”<sup>56</sup> The Court, however, once again affirmed that electric utilities were the type of business that was affected with a public interest making those

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<sup>46</sup> *German Alliance Ins. Co. v. Lewis*, 233 U.S. 389, 406 (1914).

<sup>47</sup> *Id.*

<sup>48</sup> *Id.* at 414.

<sup>49</sup> PHILLIPS, *supra* note 35, at 102.

<sup>50</sup> PAUL J. GARFIELD & WALLACE F. LOVEJOY, *PUBLIC UTILITY ECONOMICS* 9 (1964).

<sup>51</sup> *Charles Wolff Packing Co. v. Court of Indus. Rel.*, 262 U.S. 522 (1923).

<sup>52</sup> *Id.* at 524.

<sup>53</sup> GLAESER, *supra* note 13, at 208.

<sup>54</sup> *Charles Wolff Packing*, 262 U.S. at 536.

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

<sup>56</sup> *Id.* at 538.

businesses subject to regulation and oversight.<sup>57</sup> Subsequent cases held that regulation on the basis of the public interest tradition should be limited to utilities.<sup>58</sup>

The provision of electric service has consistently and unambiguously been deemed clothed in the public interest. Electric public utilities have thus been subject to some of the most extensive public regulation. All United States electric utilities share a common legal ancestry as centralized, regulated monopolies designed to respond to societal needs or act on behalf of the “public interest.”<sup>59</sup> However, determinations of what constitutes the “public interest” are amorphous, fact-based, and open to the discretion of decision-makers which leaves open the potential for decarbonization efforts to be enveloped in the public interest tradition.

### III. EMERGING RHETORIC AROUND CLIMATE CHANGE AND HOW AN INCREASINGLY COMMON UNDERSTANDING OF CLIMATE RISK IS REDEFINING PUBLIC INTEREST TO INCLUDE DECARBONIZATION

#### A. *Public Language*

Current discussions surrounding the need for responsive climate action echo the public interest tradition that has shaped the regulation of electric

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<sup>57</sup> *Id.* at 535-36 (In the majority opinion, Chief Justice Taft divided industries affected with a public interest into three classes: (1) common carriers, including railroads and public utilities, (2) certain occupations with historic links to public interest like “keepers of inns, cabs, and gristmills,” and (3) businesses that have “a peculiar relation to the public . . . [where] the owner by devoting his business to the public use, in effect grants the public an interest in that use and subjects himself to public regulation[.]” Although that court’s definitions of businesses affected with the public interest are intentionally ambiguous, Chief Justice Taft cautioned against being overly liberal with the public interest distinction. “In a sense, the public is concerned about all lawful business because it contributes to the prosperity and well being of the people. . . . but the expression ‘clothed with a public interest,’ as applied to a business, means more than that the public welfare is affected by continuity or by the price at which a commodity is sold or a service rendered.”).

<sup>58</sup> See *Tyson & Brother-United Theatre Ticket Offs., Inc. v. Banton*, 273 U.S. 418 (1927); *Williams v. Standard Oil Co. of La.*, 278 U.S. 235 (1929); *Frost v. Corp. Comm’n*, 278 U.S. 515 (1929); *New St. Ice Co. v. Liebmann*, 285 U.S. 262 (1932). Cf. *Nebbia v. New York*, 291 U.S. 502, 517 (1934) (holding that a non-utility enterprise could be clothed in the public interest if it affected the health and prosperity of the people). See also BARBARA H. FRIED, *THE PROGRESSIVE ASSAULT ON LAISSEZ FAIRE: ROBERT HALE AND THE FIRST LAW AND ECONOMICS MOVEMENT* 175 (1998) (“After *Nebbia*, the Court never again interfered with a legislature’s decision about which enterprises were regulable.”).

<sup>59</sup> Today, the provision of electric power operates in a complicated patchwork of regulation in a mix of regulated and deregulated markets. This article does not seek to comment on current regulatory regimes or market designs.

utilities for generations. Public vocabularies—shared or common language used repeatedly in regard to a particular topic or issue—provide both a tool to shape public opinion and an indicator of societal perception of an issue. Responsive actions required to meet collective carbon goals will demand widespread collaboration across sectors and stakeholders. An ability to communicate effectively across stakeholders requires a common understanding or language. The existence of public language around environmental issues is necessary to allow complex issues to be framed and discussed in accessible ways. Further, a public vocabulary around climate change can shape responsive action and facilitate adoption/participation. Responsive actions will be added to that public vocabulary as they are better understood and adopted.

Public vocabularies emerge through participation and can be designed by borrowing from existing traditions. Two critical components of a public language are the language itself and the underlying values that are reflected. As discussed above, the language leaders are using to discuss climate change is increasingly converging, a bellwether of a public language. Repeated and common use of particular words and phrases can either heighten effectiveness or unintentionally blunt their impact depending on the specific language utilized for communications.<sup>60</sup> For example, in May of 2019, The Guardian announced that it had updated its style guide to introduce terms that more accurately describe the environmental crises it reports on.<sup>61</sup> This new style guide requires that “climate emergency, crisis or breakdown” be used instead of “climate change.”<sup>62</sup> Guardian Editor-in-Chief Katharine Viner explained “[w]e want to ensure that we are being scientifically precise, while also communicating clearly with readers on this very important issue. . . . The phrase ‘climate change’, for example, sounds rather passive and gentle when what scientists are talking about is a catastrophe for humanity.”<sup>63</sup> The recent language utilized to describe global warming and climate change emphasizes the urgency and magnitude of the crisis.

Patterns across this type of language signal how the populous is

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<sup>60</sup> See *Study Shows IPCC is Underselling Climate Change*, U. OF ADELAIDE (Mar. 19, 2019), <https://www.adelaide.edu.au/news/news105862.html> (“A new study has revealed that the language used by the global climate change watchdog, the Intergovernmental Panel on Climate Change (IPCC), is overly conservative – and therefore the threats are much greater than the Panel’s reports suggest.”).

<sup>61</sup> Damian Carrington, *Why the Guardian is Changing the Language it Uses About the Environment*, THE GUARDIAN (May 17, 2019, 5:39 AM), <https://www.theguardian.com/environment/2019/may/17/why-the-guardian-is-changing-the-language-it-uses-about-the-environment>.

<sup>62</sup> *Id.*

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

speaking about and understanding climate change and its associated risks. Furthermore, this shared language is also reflective of shared, core values. Specifically, there is: (1) an emphasis on carbon reduction as a common, societal goal and (2) concern of equitable or just transition to a low-carbon future. These values mirror the public interest tradition woven in the fabric of U.S. public utility regulation. The public vocabulary emerging around climate change borrows language and values from that public interest tradition, providing comprehension and guidance on how responsive action might be taken on behalf of society.

### *B. Climate Change: Snapshot of Current Status*

Greenhouse gases, once released into the atmosphere, remain in the atmosphere for hundreds of years where they trap heat and gradually warm the planet, causing global warming.<sup>64</sup> This phenomenon is commonly referred to as climate change because the warming due to these atmospheric gases has the ability to impact immediate weather patterns and the longer-term climates of regions.<sup>65</sup> Greenhouse gases are released into the atmosphere due to natural factors (referred to as natural climate variability) or as a result of human activity (referred to as anthropogenic contributions).<sup>66</sup> Over the past few decades, the scientific research community has

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<sup>64</sup> *Sources of Greenhouse Gas Emissions*, U.S. ENVTL. PROT. AGENCY, <https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions#t1fn1> (last visited Jan. 11, 2020).

<sup>65</sup> Weather and climate are distinct but related concepts. See *Cryosphere Glossary Definition of "Weather"*, NAT'L SNOW & ICE DATA CTR., <https://nsidc.org/cryosphere/glossary/term/weather> (last visited Mar. 20, 2020) (defining weather as the day-to-day state of the atmosphere in a specific location with short-term variation (in minutes to weeks)); *Cryosphere Glossary Definition of "Climate"*, NAT'L SNOW AND ICE DATA CTR., <https://nsidc.org/cryosphere/glossary/term/climate> (last visited Mar. 20, 2020) (defining climate as the statistical synthesis of weather over a greater region spanning a longer time period (typically thirty years)); Trends or cycles of variability in climate serve as indicators of possible longer-term or more permanent climate changes, See 2 U.S. GLOBAL CHANGE RES. PROGRAM, 2018: IMPACTS, RISKS, AND ADAPTATION IN THE UNITED STATES: FOURTH NATIONAL CLIMATE ASSESSMENT (D.R. Reidmiller et al. eds., 2018), <https://nca2018.global-change.gov> [hereinafter FOURTH NATIONAL CLIMATE ASSESSMENT]; *Climate Change*, U.S. GLOBAL CHANGE RESEARCH PROGRAM CLIMATE CHANGE GLOSSARY, <https://www.global-change.gov/climate-change/glossary> (last visited Apr. 23, 2020) ("Climate change encompasses both increases and decreases in temperature, as well as shifts in precipitation, changing risk of certain types of severe weather events, and changes to other features of the climate system.").

<sup>66</sup> INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: SYNTHESIS REPORT. CONTRIBUTION OF WORKING GROUPS I, II AND III TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (Core Writing Team, R.K. Pachauri, and A. Reisinger, eds., 2007).

concluded that the warming of the world's climate systems is largely attributable to human activity.<sup>67</sup> The most recent U.S. National Climate Assessment—peer reviewed by hundreds of scientists and climate experts over a four-year period—determined that “[g]reenhouse gas emissions from human activities are the only factors that can account for the observed warming over the last century; there are no credible alternative human or natural explanations supported by the observational evidence.”<sup>68</sup> Moreover, this human-caused warming is occurring at a more rapid rate than ever experienced in the past 65 million years of paleoclimate records.<sup>69</sup>

The effects of climate change are palpable. The world is experiencing record levels of greenhouse gas concentrations in the atmosphere, a wake of historic and high-impact weather events, and the warmest global temperatures on record.<sup>70</sup> Three separate global agencies have confirmed that the decade from 2009 to 2019 marked the warmest decade on record.<sup>71</sup> Global warming and resulting long-term climate change create risk to

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<sup>67</sup> *Scientific Consensus: Earth's Climate is Warming*, NASA, <https://climate.nasa.gov/scientific-consensus> (last visited Mar. 20, 2020) (citing, e.g., J. Cook et al., *Consensus on Consensus: A Synthesis of Consensus Estimates on Human-Caused Global Warming*, 11 ENVTL. RES. LETTERS (NO. 4) 6 (2016) (“The number of papers rejecting AGW [Anthropogenic, or human-caused, Global Warming] is a miniscule proportion of the published research, with the percentage slightly decreasing over time. Among papers expressing a position on AGW, an overwhelming percentage (97.2% based on self-ratings, 97.1% based on abstract ratings) endorses the scientific consensus on AGW.”); see also J. Cook, et al., *Quantifying the Consensus on Anthropogenic Global Warming in the Scientific Literature*, 8 ENVTL. RES. LETTERS (NO. 2) 1 (2013); William R. L. Anderegg et al., *Expert Credibility in Climate Change*, 107 PROCEEDINGS OF THE NAT'L ACAD. OF SCI. (NO. 27) 12107-09 (2010); P. T. Doran & M. K. Zimmerman, *Examining the Scientific Consensus on Climate Change*, 90 EOS TRANSACTIONS AM. GEOPHYSICAL UNION, (NO. 3) 22 (2009); Naomi Oreskes, *The Scientific Consensus on Climate Change*, 306 SCI. 1686 (2004).

<sup>68</sup> *Our Changing Climate*, FOURTH NATIONAL CLIMATE ASSESSMENT, *supra* note 65, available at [nca2018.globalchange.gov/chapter/2](https://nca2018.globalchange.gov/chapter/2).

<sup>69</sup> JONATHAN WOETZEL ET. AL, MCKINSEY GLOBAL INST., CLIMATE RISK AND RESPONSE: PHYSICAL HAZARDS AND SOCIOECONOMIC IMPACTS 8 (2020) [hereinafter MCKINSEY CLIMATE REPORT].

<sup>70</sup> WORLD METEOROLOGICAL ORG., PROVISIONAL STATEMENT ON THE STATE OF THE GLOBAL CLIMATE IN 2019 1 (2019); *2019 Concludes a Decade of Exceptional Global Heat and High-Impact Weather*, WORLD METEOROLOGICAL ORG. (Dec. 3, 2019), <https://public.wmo.int/en/media/press-release/2019-concludes-decade-of-exceptional-global-heat-and-high-impact-weather>; Alejandra Borunda, *Past Decade Was the Hottest on Record*, NAT'L GEOGRAPHIC (Jan. 15, 2020), <https://www.nationalgeographic.com/science/2019/12/the-decade-we-finally-woke-up-to-climate-change/#close>.

<sup>71</sup> U.S. agencies, National Aeronautics and Space Administration (NASA) and National Oceanic and Atmospheric Administration (NOAA), along with United Kingdom's Met Office utilized different data sets and methodologies to reach similar conclusions for the last decade. See Matt McGrath, *Climate Change: Last Decade Confirmed as Warmest on Record*, BRITISH BROADCASTING CORP. (Jan. 15, 2020), <https://www.bbc.com/news/science-environment-51111176>.

ecosystems and human systems alike. Climate change and accompanying weather events put existing infrastructure, economic markets, and social structures at risk.<sup>72</sup> Our human systems today were built upon a relatively static understanding of climate.<sup>73</sup> The National Climate Assessment, a joint effort between the Environmental Protection Agency (EPA), NOAA, and the U.S. Global Change Research Program, emphasizes the interconnected nature of climate risks and human impacts: "Climate change affects the natural, built, and social systems we rely on individually and through their connections to one another. These interconnected systems are increasingly vulnerable to cascading impacts that are often difficult to predict, threatening essential services within and beyond the Nation's borders."<sup>74</sup> The National Climate Assessment further warns that these impacts will not be experienced equally: disenfranchised and marginalized communities are at a greater risk disruption and harm from climate change.<sup>75</sup> This disproportionate risk means that securing an equitable future requires awareness and prioritization of action on behalf of those more vulnerable.<sup>76</sup>

The research and the projected impacts of climate change are causing people from diverse backgrounds to elevate discourse around climate change to a global level and call the world to action. Young people like Greta Thunberg are carrying the mantle: the Swedish teenager who began a "School Strike for Climate" in August 2018 and inspired millions to "join the global climate strike on September 20, 2019, in what was the largest climate demonstration in human history."<sup>77</sup> Thunberg has been a featured speaker at the U.N., the World Economic Forum, and was named as Time Magazine's Person of the Year.<sup>78</sup> The youth of today are not only starting movements for climate change, they are also changing our language to reflect the climate change crisis: "[a]fter noticing a hundredfold increase in its usage, lexicographers at Collins Dictionary named Thunberg's pioneering idea, climate strike, the word of the year."<sup>79</sup> António Guterres, the Secretary-General of the United Nations, recently cautioned that the world is dangerously close to sleep walking past a point of no return, and challenged

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<sup>72</sup> INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2014: SYNTHESIS REPORT. CONTRIBUTION OF WORKING GROUPS I, II AND III TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (Core Writing Team et al., eds., 2014).

<sup>73</sup> MCKINSEY CLIMATE REPORT, *supra* note 69.

<sup>74</sup> FOURTH NATIONAL CLIMATE ASSESSMENT, *supra* note 65, at 26.

<sup>75</sup> *Id.* at 25.

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

<sup>77</sup> Charlotte Alter et al., *Time Person of the Year: Greta Thunberg*, TIME (Dec. 4, 2019), <https://time.com/person-of-the-year-2019-greta-thunberg>.

<sup>78</sup> *Greta Thunberg: What Does the Teenage Climate Change Activist Want?*, BBC NEWS (Feb. 28, 2020), <https://www.bbc.com/news/world-europe-49918719>.

<sup>79</sup> Alter, *supra* note 77.



this generation to not be remembered for fiddling while the planet burned.<sup>80</sup> Secretary Guterres urged that we must:

[S]ee some incremental steps towards sustainable business models, but nowhere near the scope and scale required. What we need is not an incremental approach, but a transformational one. We need a rapid and deep change in the way we do business, how we generate power, how we build cities, how we move, and how we feed the world. If we don't urgently change our way of life, we jeopardize life itself. . . . [E]nsure that the transition to a green economy is a just transition – one that recognizes the need to care for the future of negatively impacted workers, in terms of new jobs, lifelong education, and social safety nets. . . . The only solution is rapid, ambitious, transformative action by all – governments, regions, cities, businesses and civil society, all working together towards a common goal.<sup>81</sup>

Shortly thereafter, Pope Francis chastised fellow world leaders for not doing enough to address climate change and urged that responsive action must “bring the whole human family together to seek a sustainable and integral development[.]”<sup>82</sup>

Care for our common home ought to be a concern of everyone and not the object of ideological conflict between different views of reality or, much less, between generations. . . . The protection of the home given to us by the Creator cannot be neglected or reduced to an elitist concern. Young people are telling us that this cannot be the case, for at every level we are being urgently challenged to protect our common home[.]<sup>83</sup>

This type of rhetoric is increasing across sectors and disciplines.

In short, the world is coming to increasingly understand that any attempt to pause or halt further global warming will require widespread action to reduce greenhouse gas emissions. Without substantial global action to reduce carbon emissions, we are expected to experience rising sea levels, increases in drought conditions, and more extreme and erratic weather events.<sup>84</sup> “The future of Earth’s climate after the next decade is dependent

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<sup>80</sup> António Guterres, United Nations Secretary-General, Remarks at Opening Ceremony of UN Climate Change Conference COP25 (Dec. 2, 2019), <https://www.un.org/sg/en/content/sg/speeches/2019-12-02/remarks-opening-ceremony-of-cop25>.

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

<sup>82</sup> Pope Francis, *Encyclical Letter Laudato Si* ¶13 (May 24, 2015), [http://w2.vatican.va/content/dam/francesco/pdf/encyclicals/documents/papa-francesco\\_20150524\\_enciclica-laudato-si\\_en.pdf](http://w2.vatican.va/content/dam/francesco/pdf/encyclicals/documents/papa-francesco_20150524_enciclica-laudato-si_en.pdf).

<sup>83</sup> Pope Francis, Address to the Members of the Diplomatic Corps Accredited to the Holy See for the Traditional Exchange of New Year Greetings (Jan. 9, 2020), [http://w2.vatican.va/content/francesco/en/speeches/2020/january/documents/papa-francesco\\_20200109\\_corpo-diplomatico.html](http://w2.vatican.va/content/francesco/en/speeches/2020/january/documents/papa-francesco_20200109_corpo-diplomatico.html).

<sup>84</sup> INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, 2018: SUMMARY FOR POLICYMAKERS. IN: GLOBAL WARMING OF 1.5°C. AN IPCC SPECIAL REPORT ON THE IMPACTS OF GLOBAL WARMING OF 1.5°C ABOVE PRE-INDUSTRIAL LEVELS AND RELATED GLOBAL GREENHOUSE GAS EMISSION PATHWAYS, IN THE

on the cumulative amount of long-lived greenhouse gases emitted by humans. That means the planet will continue to warm until net-zero emissions are reached.”<sup>85</sup> World organizations and a critical mass of countries have committed to aggressive goals to decrease emissions. In December of 2015, 196 countries agreed to the Paris Agreement during a United Nations Climate Change Conference where the signatories agreed to work to limit global temperature rise to below 2 degrees Celsius, aiming for 1.5 degrees Celsius.<sup>86</sup> In 2018, IPCC released a special report on the impacts of global warming of 1.5 degrees Celsius above pre-industrial levels.<sup>87</sup> That report found that if greenhouse gas emissions continue at the current rate, the atmosphere will warm up by as much as 1.5 degrees Celsius above pre-industrial levels by 2040.<sup>88</sup> Stabilization of global warming will require unprecedented efforts to cut global emissions in half by 2030 in order to avoid some of the worst global outcomes predicted.<sup>89</sup>

President Donald Trump’s administration has walked back the United States’ commitments to these global goals, most notably by announcing an intent to withdraw from the Paris Agreement in 2017 and formally withdrawing in 2019.<sup>90</sup> A tendency toward inaction is not a feature unique to the current administration or a given political point of view, affiliation, or party; inaction can be attributed to the complexities and scope of the issue. Climate change presents a complex problem, perhaps the most complex in human history. It is intergenerational, operates at various societal levels and is global in scope, making it susceptible to “passing the buck” to future generations or waiting for others to take action and responsibility.<sup>91</sup>

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CONTEXT OF STRENGTHENING THE GLOBAL RESPONSE TO THE THREAT OF CLIMATE CHANGE, SUSTAINABLE DEVELOPMENT, AND EFFORTS TO ERADICATE POVERTY (V. Masson-Delmotte et al., eds., 2018), [https://www.ipcc.ch/site/assets/uploads/sites/2/2019/05/SR15\\_SPM\\_version\\_report\\_LR.pdf](https://www.ipcc.ch/site/assets/uploads/sites/2/2019/05/SR15_SPM_version_report_LR.pdf) [hereinafter SUMMARY FOR POLICYMAKERS].

<sup>85</sup> MCKINSEY CLIMATE REPORT, *supra* note 69, at 55.

<sup>86</sup> Paris Agreement to the United Nations Framework Convention on Climate Change, Dec. 12, 2015, T.I.A.S. No. 16-1104.

<sup>87</sup> SUMMARY FOR POLICYMAKERS, *supra* note 84, at 4.

<sup>88</sup> *Id.* at 6.

<sup>89</sup> *Id.*

<sup>90</sup> Donald Trump, Statement by President Trump on the Paris Climate Accord, White House (June 1, 2017), <http://www.whitehouse.gov/the-press-office/2017/06/01/state-statement-president-trump-paris-climate-accord>. Formal notice to withdraw was submitted to the United Nations on November 4, 2019. See Lisa Friedman, *Trump Serves Notice to Quit Paris Climate Agreement*, N.Y. TIMES (Nov. 4, 2019), <https://www.ny-times.com/2019/11/04/climate/trump-paris-agreement-climate.html> (reporting that the notice to the U.N. allows the President to officially pull the United States out of the Paris Agreement the day after the 2020 election. The United States would still be allowed to attend negotiations but would be a non-participant, downgraded to observer status).

<sup>91</sup> STEPHEN M. GARDINER, A PERFECT MORAL STORM: THE ETHICAL TRAGEDY OF CLIMATE CHANGE, 103-40 (2013).

Cognitive and psychological barriers to action are expected when humans are faced with complex, long-term dangers like those that arise in the climate crisis.<sup>92</sup> Climate change presents challenges for nonscientists: climate change is a complex, technical issue presenting abstract, distant dangers that even experts struggle to identify.<sup>93</sup> The scale and scope of response can be daunting, potentially requiring over \$18 trillion U.S. dollars in investments to shift from conventional, fossil-fuel powered energy to clean, lower-carbon technologies.<sup>94</sup> The complexity of the issue is further compounded by the fact that climate risks present technical, scientific, moral, ethical, and financial challenges all of which may be implicated in any responsive action.<sup>95</sup>

Public acknowledgement of climate change in America is trending upwards and private institutions are increasingly making their own commitments to combat climate change. The majority of Americans believe that climate change is impacting their local community, pointing to long periods of unusually hot weather, severe weather events like floods, fires, intense storms, coastal erosion, damage to plant life and wildlife habitats, or severe droughts and water shortages as evidence of impact.<sup>96</sup> In fact, as of 2019 approximately 60% of Americans are “alarmed” or “concerned” about global warming—a figure that has doubled in the last five years.<sup>97</sup> A

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<sup>92</sup> See generally Elke Weber, *The Influencers of Choice and Decision Making*, in *ECOLOGY, ETHICS, AND INTERDEPENDENCE: THE DALAI LAMA IN CONVERSATIONS WITH LEADING THINKERS ON CLIMATE CHANGE* 177-200 (2018) (discussing climate inaction as a public-goods dilemma, analyzing the crisis as a tragedy of the commons as defined by ecologist Garrett Hardin and cognitive and psychological barriers to action).

<sup>93</sup> *Id.* at 179-82.

<sup>94</sup> Pritil Gunjan, *Sector Integration Is Essential for Decarbonization*, NAVIGANT BLOG (Dec. 12, 2019), <https://www.navigantresearch.com/news-and-views/sector-integration-is-essential-for-decarbonization>.

<sup>95</sup> GARDINER, *supra* note 91, at 339-394.

<sup>96</sup> CARY FUNK & MEG HEFFERON, PEW RES. CTR., U.S. PUBLIC VIEWS ON CLIMATE AND ENERGY 5 (2019) (survey finding that 62% of Americans say that climate change is affecting their local community either a great deal or some with the following percentages indicating these impacts are evinced by the following: long periods of unusually hot weather (79%), severe weather such as floods and intense storms (70%), harm to animal wildlife and their habitats (69%), damage to forests and plant life (67%), droughts and water shortages (64%), more frequent wildfires and coastal erosion (56%)); see also CLIMATE CHANGE IN THE AMERICAN MIND, *infra* note 99, section 7.4, at 26 (survey finding that 72% of Americans think that global warming is happening, and a majority of Americans (56%) think that extreme weather poses a risk to their community and are worried about harm to their local area resulting from extreme heat (64%), droughts (60%), flooding (58%), and/or water shortages (54%)).

<sup>97</sup> ANTHONY LEISEROWITZ ET AL., YALE U. AND GEORGE MASON U., CLIMATE CHANGE IN THE AMERICAN MIND: NOVEMBER 2019 (2019), [https://climatecommunication.yale.edu/wp-content/uploads/2019/12/Climate\\_Change\\_American\\_Mind\\_November\\_2019b.pdf](https://climatecommunication.yale.edu/wp-content/uploads/2019/12/Climate_Change_American_Mind_November_2019b.pdf).

significant portion of the American public believes that they will be harmed by climate change and also believe that others, namely future generations and marginalized populations, will be exposed to greater harm.<sup>98</sup> Approximately two-thirds of adults surveyed across diverse demographics believe that the U.S. government is doing too little to reduce the effects of climate change and to protect air quality.<sup>99</sup>

### *C. Corporate Action in Response to Climate Change*

Climate change is causing private and commercial actors to change the way they conduct business in the absence of government actions. Since the United States' withdrawal from the Paris Agreement, private and commercial enterprises have taken a more active role in promoting and committing to aggressive carbon reduction targets. Health care organizations, cultural institutions, businesses, investors, educational institutions, and faith groups have committed to reduce greenhouse gas emissions in pursuit of the Paris Agreement goals, regardless of government participation. Over 3,800 leaders, including 2,000 businesses and investors, joined a coalition to continue marching in unison towards the Paris Agreement goals.<sup>100</sup> Companies across industries are making aggressive commitments to decarbonization.

A brief survey of these commitments evidences alignments in purpose and approach; businesses must play a role in decarbonization and major transformations are needed to move us towards a lower-carbon future. Microsoft's President Brad Smith asserted "[i]f we don't curb emissions, and temperatures continue to climb, science tells us that the results will be catastrophic," before detailing the company's commitment to remove more carbon from the atmosphere than it emits, making it carbon-negative by

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<sup>98</sup> *Id.* at 15 (finding that Americans think they will be harmed by global warming (43%) but that most harms will be suffered by others. Americans are most likely to think that plant and animal species (73%) and/or future generations of people (72%) will be harmed a "moderate amount" or a "great deal" by global warming. About half or more also think people in developing countries (68%), the world's poor (66%), people in the U.S. (65%), people in their communities (51%), and/or their family (49%) will be harmed).

<sup>99</sup> FUNK & HEFFERON, *supra* note 96 ("About two-thirds of U.S. adults (67%) say the federal government is doing too little to reduce the effects of climate change, and similar shares say the same about government efforts to protect air (67%) and water quality (68%) - findings that are consistent with results from a 2018 [Pew] Center survey.").

<sup>100</sup> See *President Trump Wants Out - We Are Still In*, WE ARE STILL IN, <http://www.wearestillin.com> (last visited Mar. 20, 2020) (We Are Still In is a joint declaration of support for climate action, signed by more than 3,800 CEOs, mayors, governors, college presidents, and others).

2030.<sup>101</sup> Amazon has pledged to reach carbon-neutrality by 2040 in its new Climate Pledge and committed to be powered entirely by renewable energy resources by 2030.<sup>102</sup> Walmart launched “Project Gigaton” aimed at reducing one gigaton of greenhouse gas emissions from their supply chain by 2030.<sup>103</sup> Along with several companies, Dow is lobbying for legislation to create prices and limits on carbon emissions.<sup>104</sup> Dow’s Chief Executive Officer Jim Fitterling stated that “climate change has serious consequences for the planet and society if left unaddressed,” further warning that “we are approaching a limit in reductions that cannot be achieved through traditional incremental improvements.”<sup>105</sup>

Heightened focus on climate change and decarbonization reductions also impacts traditional finance structures and market behavior. Moody’s Investor Services, the financial research arm of the bond-rating company, has recognized “the growing interplay between environmental and social forces will have a transformative impact on the credit quality . . . and will likely translate into balance sheet and/or business model realignment for industry players.”<sup>106</sup> Beyond the utility sector, climate change and sustainability efforts impact investment strategies and decisions, causing some of the world’s largest institutional investors to change long-standing business practices. Each year, Larry Fink, the Chief Executive Officer of BlackRock, the largest asset manager in the world, pens a letter to other CEOs. His 2020 letter made headlines because of its focus on climate change as an investment risk.<sup>107</sup> Questions about the physical and financial impacts of climate

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<sup>101</sup> Brad Smith, *Microsoft Will Be Carbon Negative By 2030*, MICROSOFT (Jan. 16, 2019), <http://blogs.microsoft.com/blog/2020/01/16/microsoft-will-be-carbon-negative-by-2030>.

<sup>102</sup> Press Release, Amazon, Amazon Co-Founds The Climate Pledge, Setting Goal to Meet the Paris Agreement 10 Years Early (Sept. 19, 2019), <http://press.aboutamazon.com/news-release-details/amazon-co-founds-climate-pledge-setting-goal-meet-paris>.

<sup>103</sup> *Project Gigatron*, WALMART SUSTAINABILITY HUB, <https://www.walmartsustainabilityhub.com/project-gigaton> (last visited Apr. 23, 2020).

<sup>104</sup> Press Release, World Resources Institute, Leading U.S. Businesses Call on Congress to Enact a Market-Based Approach to Climate Change (May 15, 2019), <https://www.wri.org/news/2019/05/release-leading-us-businesses-call-congress-enact-market-based-approach-climate-change>. Dow, along with PG&E, DuPont, and BP started the CEO Climate Dialogue to advocate for market mechanisms to address climate change; see CEO CLIMATE DIALOGUE, [www.ceoclimatedialogue.org](http://www.ceoclimatedialogue.org) (last visited Apr. 19, 2020).

<sup>105</sup> THE DECADE TO DELIVER: A CALL TO BUSINESS ACTION: U.N. GLOBAL COMPACT-ACCENTURE STRATEGY 2019 CEO STUDY ON SUSTAINABILITY, 50 (2019) [hereafter ACCENTURE Report].

<sup>106</sup> *Id.*; Jeffery Ryser, *Race to Zero*, S&P GLOBAL PLATTS 50 (Dec. 2018) <https://www.plattsinsight.com/insight/race-to-zero>.

<sup>107</sup> Larry Fink, *A Fundamental Reshaping of Finance*, BLACKROCK, <https://www.blackrock.com/corporate/investor-relations/larry-fink-ceo-letter> (last

change “are driving a profound reassessment of risk and asset values. . . . [causing] changes in capital allocation more quickly than we see changes to the climate itself. In the near future (and sooner than most anticipate) there will be a significant reallocation of capital.”<sup>108</sup> Mr. Fink further warned that social equity needs to be kept in the forefront of transformation:

We need to be mindful of the economic, scientific, social and political realities of the energy transition. Governments and the private sector must work together to pursue a transition that is both fair and just – we cannot leave behind parts of society, or entire countries in developing markets, as we pursue the path to a low-carbon world.<sup>109</sup>

BlackRock is not alone in its perception of climate change and its impact on financial markets and world economies. Its view is widely shared by other institutional investors; over 630 investors managing in excess of \$37 trillion U.S. dollars in investments have taken a similar stance and committed to action on climate change by signing the Global Investor Statement.<sup>110</sup> The Global Investor Statement reiterates full support for the Paris Agreement and specifically calls for increased government action to “accelerate the low carbon transition and to improve the resilience of our economy, society and the financial system to climate risks.”<sup>111</sup>

Discussions about climate change and specific commitments to decarbonization occur against a broader backdrop of sustainability and community as core business values. The climate change commitments of private and commercial enterprises signal a departure from a Milton Friedman viewpoint that corporations have sole responsibility to shareholders to a more holistic perspectives of value, one that believes the market incentivizes sustainability, defined, in part, as social and environmental responsibility. Trade organizations and individual companies are making sustainability central to their corporate strategies and believe that doing so will unlock economic growth in the future. A comprehensive study on 1000 chief executive officers from global corporations indicates that an overwhelming

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visited Mar. 20, 2020); Dieter Holger & Maitane Sardon, *BlackRock Joins World's Largest Investor Group on Climate Change*, THE WALL ST. J. (Jan. 9, 2020, 1:25 PM), <https://www.wsj.com/articles/blackrock-joins-worlds-largest-investor-group-on-climate-change-11578594349>.

<sup>108</sup> Fink, *supra* note 107.

<sup>109</sup> *Id.*

<sup>110</sup> Global Investor Statement to Governments on Climate Change, THE INV. AGENDA (Dec. 2019), <https://theinvestoragenda.org/wp-content/uploads/2019/12/191201-GIS-GCC-FINAL-for-COP25.pdf> (developed by The Investor Agenda which is a collaborative initiative to accelerate and scale up the investor actions that are critical to tackling climate change and achieving the goals of the Paris Agreement with the aim of keeping average global temperature rise to no more than 1.5 degrees Celsius).

<sup>111</sup> *Id.*

majority of leaders believe that sustainability is a critical component to strategy and growth.<sup>112</sup> Corporate leaders believe that businesses can be instrumental in reaching sustainability goals.<sup>113</sup> Leveraging business to move society towards collective sustainability goals requires a shift in the traditional American commercial mindset. In August of 2019, nearly 200 chief executives belonging to the Business RoundTable issued a statement aimed at redefining the purpose of a corporation, focusing on sustainable, holistic value creation for customers and communities.<sup>114</sup>

These institutions, whether religious, commercial, educational, or political, are engaging in climate action with a belief that such action is in the public's interest. Across these diverse sectors, leaders point to broader, more holistic societal concerns as they relate to climate change and responsive action. Intentional and deliberate efforts are being made to converge around a shared language and leverage pre-existing values to drive solutions and behavior. The values reflected in that shared language indicate a focus for responsive climate action as necessity for all.

#### IV. BENEFICIAL ELECTRIFICATION AS THE THIRD WAVE OF ELECTRIFICATION

Climate science and research has determined that deep decarbonization is required across sectors to achieve collective emissions goals.<sup>115</sup> "Deep decarbonization" refers to the reduction of greenhouse gas (GHG) emissions over time to a level consistent with limiting global warming to 2°C or less.<sup>116</sup> Deep decarbonization will require conversion of source generation

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<sup>112</sup>ACCENTURE REPORT, *supra* note 105, at 23. (finding that 99% of CEOs with \$1 billion+ in annual revenues believe sustainability will be important to the future success of their business).

<sup>113</sup> *Id.* at 43 (finding 71% of leaders believe that business can play a critical role in contributing to collective sustainability goals with increased attention and action).

<sup>114</sup> *Business Roundtable Redefines the Purpose of a Corporation to Promote 'An Economy That Serves All Americans'*, ROUNDTABLE (Aug. 19, 2019), <https://www.business-roundtable.org/business-roundtable-redefines-the-purpose-of-a-corporation-to-promote-an-economy-that-serves-all-americans> (signatures updated Sept. 2019 and Dec. 2019); see also Alan Murray, *America's CEOs Seek a New Purpose for the Corporation*, FORTUNE (Aug. 19, 2019, 4:30 AM), <https://fortune.com/longform/business-roundtable-ceos-corporations-purpose>.

<sup>115</sup> Shelley Welton & Joel Eisen, *Clean Energy Justice: Charting an Emerging Agenda*, 43 HARV. ENVTL. L. REV. 307, 316 (2019) ("Taking seriously the science and international commitments surrounding climate change would require eighty percent decarbonization of the United States economy by 2050, complete decarbonization by 2100, and electrifying the entire economy.").

<sup>116</sup> JAMES H. WILLIAMS, BENJAMIN HAYLEY & RYAN JONES, POLICY IMPLICATIONS OF DEEP DECARBONIZATION IN THE UNITED STATES, 2 U.S. 2050 POLICY REPORT 8 (2015), [http://deepdecarbonization.org/wp-content/uploads/2015/11/US\\_Deep\\_Decarbonization\\_Policy\\_Report.pdf](http://deepdecarbonization.org/wp-content/uploads/2015/11/US_Deep_Decarbonization_Policy_Report.pdf).

to lower carbon resources and electrification across all sectors.<sup>117</sup>

Electric utilities are already reducing the carbon footprint of their operations, modernizing generation fleets, incorporating more renewable resources in the grid, and committing to significant greenhouse gas reduction goals. By the end of 2018, carbon emissions from the electric utility industry had declined over 25% from 2005 levels.<sup>118</sup> “Nationwide, today’s power sector emits the same amount of carbon dioxide (CO<sub>2</sub>) as it did a generation ago, in 1993, although it produces nearly 30% more electricity annually. This positive trend is due in large part to cleaner generation resources.”<sup>119</sup> Between 2007 and 2015 the electric power sector saw a significant switch from coal-fired generation to natural gas generation, as well as the deployment of large amounts of renewable energy.<sup>120</sup> This increase in natural gas generation since 2005 is primarily a result of the continued cost-competitiveness of natural gas relative to coal.<sup>121</sup> Natural gas accounted for 34% of total electricity generation in 2016, surpassing coal to become the leading generation source nation-wide. The U.S. Energy Information Administration (EIA) anticipates continued growth in natural gas and renewable generation resources: EIA’s Annual Energy Outlook for 2020 projects renewable generation (like wind and solar) will surpass nuclear and coal generation in the U.S. by 2021 and may surpass natural gas generation by 2045.<sup>122</sup>

Utilities and power providers remain committed to continued transition to cleaner, more efficient generation, elevating commitments to greenhouse gas reductions beyond the emissions reductions already achieved. Financial research companies and institutional investors believe that electric utilities are best positioned to achieve decarbonization by 2030.<sup>123</sup> The

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The DDPP is a global collaboration of energy research teams focused on studying actions required to limit global warming aligned with the goals of the Paris Agreement. The DDPP is led by the Institute for Sustainable Development and International Relations (IDDRI) and the Sustainable Development Solutions Network (SDSN). The United States is a member and all citations to the DDPP is to the U.S. specific report.

<sup>117</sup> *Id.* at 10.

<sup>118</sup> See *Climate*, EDISON ELEC. INST., <https://www.eei.org/issuesandpolicy/environment/climate/Pages/default.aspx> (last visited Mar. 20, 2020).

<sup>119</sup> DAVID FARNSWORTH, JESSICA SHIPLEY, JIM LAZAR, & NANCY SEIDMAN, THE REG. ASSISTANCE PROJECT, BENEFICIAL ELECTRIFICATION: ENSURING ELECTRIFICATION IN THE PUBLIC INTEREST 10 (2018), <https://www.raponline.org/wp-content/uploads/2018/06/6-19-2018-RAP-BE-Principles2.pdf> [hereafter THE REG. ASSISTANCE PROJECT].

<sup>120</sup> *Id.* at 34.

<sup>121</sup> *Today in Energy*, U.S. ENERGY INFO. ADMIN. (Dec. 18, 2017), <http://www.eia.gov/todayinenergy/detail.php?id+30872>.

<sup>122</sup> U.S. ENERGY INFO. ADMIN., ANNUAL ENERGY OUTLOOK 2020 WITH PROJECTIONS TO 2050 (Jan. 29, 2020), <https://www.eia.gov/outlooks/aeo/pdf/AEO2020%20Full%20Report.pdf>.

<sup>123</sup> Jeffrey Ryser, *U.S. Utilities Race to Slash Emissions as ESG Reporting Takes Off*, S&P GLOB. PLATTS (Dec. 4, 2019), <https://www.spglobal.com/en/research-insights/articles/us-utilities-race-to-slash-emissions-as-esg-reporting-takes-off>.



Edison Electric Institute (EEI) represents 90% of the investor-owned utility (IOU) industry providing electricity to approximately 220 million Americans.<sup>124</sup> Over 60% of EEI's members have publicly committed to greenhouse gas reduction goals.<sup>125</sup> These greenhouse gas reductions are publicly attributed as responding to customer demand and/or acting as stewards of a sustainable future. Both motivations are couched in terms of "public interest" and frequently discussed in terms of public or collective benefits. For example, American Electric Power (AEP) has committed to a 70% reduction in greenhouse gas emissions by 2030 and 80% by 2050 from 2000 levels with additional aspirations of being emissions-free by 2050.<sup>126</sup> AEP has made these commitments with both customers and investors in mind: "Our customers want us to partner with them to provide cleaner energy and new technologies, while continuing to provide reliable, affordable energy. Our investors want us to protect their investment in our company, deliver attractive returns and manage climate-related risk. This long-term strategy allows us to do both."<sup>127</sup> Dominion Energy has halved its emissions since 2005 and committed to an 80% reduction by 2050.<sup>128</sup> Dominion has attributed its actions to customer demand: "You asked for cleaner energy, and we listened. We're committed to achieving net zero emissions through long-term investments in the new and emerging technologies of tomorrow."<sup>129</sup> Duke Energy is striving for a 50% reduction in greenhouse gas emissions in comparison to its 2005 levels and net-zero carbon emissions by 2050 in pursuit of decarbonization as a common goal: "We know our customers want clean energy at an affordable price, so we want to allow time for good dialogue among regulators, customers, communities,

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<sup>124</sup> *Members List*, EDISON ELEC. INST. (Dec. 2019), [https://www.eei.org/about/members/uselectriccompanies/Documents/memberlist\\_print.pdf](https://www.eei.org/about/members/uselectriccompanies/Documents/memberlist_print.pdf).

<sup>125</sup> Beyond the companies identified above, the following EEI members have made greenhouse gas reduction goals as of January 22, 2020: AES, Allete, Alliant, Ameren, Avangrid, Avista, CMS Energy, DTE Energy, Evergy, Eversource, Exelon, Green Mountain Power, Hawaiian Electric, Idaho Power, Madison Gas & Electric, Montana-Dakota Utilities, National Grid, NiSource, Northwestern, OG&E, PG&E, Pinnacle West, PNM Resources, Portland General Electric, PPL, PSEG, Puget Sound Energy, Southern California Edison, Southern Company, Tennessee Valley Authority, Vectren, WEC Energy Group, and Xcel Energy (data on file with the author).

<sup>126</sup> *Carbon & Climate*, AMERICAN ELECT. POWER, <http://www.aepsustainability.com/environment/carbon> (last visited Apr. 19, 2020) (AEP serves approximately 5.4 million customers across 11 states.).

<sup>127</sup> *AEP to Reduce Carbon Emissions by 80 Percent, Add 8,360 MW in Renewables*, POWER ENG'G (Feb. 7, 2018), <https://www.power-eng.com/2018/02/07/aep-to-reduce-carbon-emissions-by-80-percent-add-8-360-mw-in-renewables>.

<sup>128</sup> DOMINION ENERGY, <https://sustainability.dominionenergy.com> (last visited Apr. 19, 2020) (Dominion serves 7.5 million electric and gas customers across 18 states).

<sup>129</sup> *Clean Energy*, DOMINION ENERGY, <https://www.dominionenergy.com/our-promise#clean-energy> (last visited Apr. 19, 2020).

shareholders and us as we work toward this common goal[.]”<sup>130</sup> NextEra and Southern Company are positioning themselves as stewards of a sustainable future for customers and shareholders. NextEra believes that:

Eras are defined by the people who power them, and at NextEra Energy, our teams are writing a bright script for an American Energy Era that is affordable, efficient and clean. Through investment and innovation, we are solving the world's toughest energy challenges as we prove that a sustainable energy future is not only possible, but also beneficial to our shareholders.<sup>131</sup>

NextEra aims to reduce carbon emissions 67% from 2005 levels by 2025.<sup>132</sup> Entergy's commitment to a 50% reduction in emissions intensity below 2000 levels by 2030 is a reflection of the utility's role in decarbonization.<sup>133</sup> Entergy believes that it will help to lead a regional transformation to a low-carbon economy through its investments in clean generation and partnering with customers for electrification.<sup>134</sup> All of these companies, however, indicate that a utility's ability to reach or surpass these goals is dependent, in part, on regulatory treatment.

The power sector has already significantly reduced its GHG emissions, becoming a leading actor in the fight against climate change. Now, electrification of end uses allows for a higher potential in GHG emissions reduction as a result of both energy savings (due to the higher efficiency of electricity-based technologies) and an increasing share of renewables in electricity generation.

Emissions reduction goals, such as those set in the Paris Agreement, cannot be met solely by reduced GHG emissions. The production of electricity currently accounts for approximately 28% of greenhouse gas

<sup>130</sup> Erin Culbert, *Duke Energy Sets Sights on Net-Zero Carbon by 2050*, ILLUMINATION (Sept. 17, 2019), <https://illumination.duke-energy.com/articles/duke-energy-sets-sights-on-net-zero-carbon-by-2050>, (Duke serves 7.7 million customers across six states); Duke's greenhouse gas commitments can be found online. *Environment*, DUKE ENERGY, <https://www.duke-energy.com/our-company/environment/global-climate-change> (last visited Apr. 19, 2020).

<sup>131</sup> Jim Robo, *Sustainability CEO's Letter*, NEXTERA ENERGY, <http://www.investor.nexteraenergy.com/sustainability> (last visited Apr. 19, 2020).

<sup>132</sup> *Our Environment*, NEXTERA ENERGY (2020), <http://www.nexteraenergy.com/sustainability/environment.html> (last visited TBD) (NextEra serves over 5.5 million retail customers and also owns a competitive energy business, NextEra Energy Resources, LLC).

<sup>133</sup> *Climate Scenario Analysis and Evaluation of Risks and Opportunities*, ENTERGY (Mar. 2019) at i, <https://www.entergy.com/userfiles/content/environment/docs/EntergyClimateScenarioAnalysis.pdf>, (Entergy serves approximately 2.9 million customers across 4 states).

<sup>134</sup> *Id.* at iii.

emissions in the United States.<sup>135</sup> Deep decarbonization require electrification across all sectors.<sup>136</sup> The transportation sector generates the largest share of emissions in the United States, accounting for nearly 29% of greenhouse gases in 2017, covering emissions from cars, trucks, ships, trains, and planes.<sup>137</sup> Industrial activity, like emissions from chemical or manufacturing plants, produce another 22% of emissions.<sup>138</sup> And, approximately 11% of the country's emissions originate from commercial and residential buildings.<sup>139</sup>

Today, electrification is most commonly used in discussions as the application of electric powered end-use technology as a substitute for direct-use fossil-fuel or non-energized processes.<sup>140</sup> Examples include vehicles or trucking fleets, marine vessels, locomotives, material handling equipment, cranes, forklifts, pumps, billboards or signage, and home appliances like induction cooking devices and electric heat pumps.<sup>141</sup> Replacing fossil-fuel end-use technologies with electric end-use technologies can result in several customer benefits like reduced maintenance, more efficient workplaces, and less noise pollution. Electrification typically results in significant localized emissions reductions. Electrification is critical to secure a low-carbon future and provides an opportunity for public utilities to connect customers to affordable, clean resources.<sup>142</sup> The magnitude of impact will be a function of the adoption rate of electric end-use technologies, the

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<sup>135</sup> U.S. ENVTL. PROT. AGENCY, EPA 430-R-19-001, THE U.S. INVENTORY OF GREENHOUSE GAS EMISSIONS AND SINKS: 1990-2017, (2019) <https://www.epa.gov/sites/production/files/2019-04/documents/us-ghg-inventory-2019-main-text.pdf>. The United States Environmental Protection Agency (EPA) prepares the official U.S. Inventory of Greenhouse Gas Emissions and Sinks to comply with existing commitments under the United Nations Framework Convention on Climate Change (UNFCCC).

<sup>136</sup> WILLIAMS, HARLEY & JONES, *supra* note 116, at 10. The DDPP is a global collaboration of energy research teams focused on studying actions required to limit global warming aligned with the goals of the Paris Agreement. The DDPP is led by the Institute for Sustainable Development and International Relations (IDDRI) and the Sustainable Development Solutions Network (SDSN). The United States is a member and all citations to the DDPP is to the U.S. specific report.

<sup>137</sup> THE U.S. INVENTORY OF GREENHOUSE GAS EMISSIONS AND SINKS, *supra* note 135. The United States Environmental Protection Agency (EPA) prepares the official U.S. Inventory of Greenhouse Gas Emissions and Sinks to comply with existing commitments under the United Nations Framework Convention on Climate Change (UNFCCC).

<sup>138</sup> *Id.*

<sup>139</sup> *Id.*

<sup>140</sup> ELEC. POWER RESEARCH INST., U.S. NATIONAL ELECTRIFICATION ASSESSMENT (Apr. 2018) <http://mydocs.epri.com/docs/PublicMeetingMaterials/ee/000000003002013582.pdf> (reduction ranging from 19% to 67%) [hereafter USNEA].

<sup>141</sup> *Id.*

<sup>142</sup> WORLD ECON. FORUM, FOSTERING EFFECTIVE ENERGY TRANSITION (Mar. 2019), [http://www3.weforum.org/docs/WEF\\_Fostering\\_Effective\\_Energy\\_Transition\\_2019.pdf](http://www3.weforum.org/docs/WEF_Fostering_Effective_Energy_Transition_2019.pdf).

efficiency of those technologies, and the emissions profile of source generation.<sup>143</sup> Depending upon the emissions profile of the source generation, electrification can also result in societal emissions reductions. This means electrification as it is understood today compounds the emissions impact of utility investments in cleaner, more efficient generation. Research shows that converting non-utility industries to electricity is key to societal decarbonization.<sup>144</sup> Industry analyses indicate that substituting electric technologies for fossil-fuel end-use technologies could achieve societal emissions reductions as high as 60%.<sup>145</sup> Accordingly, a new wave of electrification is introduced, where electrification is understood as an important tool in the climate action toolbox.

Electrification that achieves environmental objectives by resulting in net lower emissions has been referred to as beneficial electrification, strategic electrification, or efficient electrification.<sup>146</sup> This new wave of

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<sup>143</sup> Although not discussed in depth in this article, newer electric technologies may also be more efficient than their fossil-fuel counterparts. For example, air source heat pumps powered by utility-scale natural gas generation consumes half as much energy as an efficient at-home natural gas furnace. USNEA, *supra* note 140.

<sup>144</sup> Jurgen Weiss et al., *Electrification: Emerging Opportunities for Utility Growth*, BRATTLE (Jan. 2017), [https://brattlefiles.blob.core.windows.net/files/7298\\_electrification\\_emerging\\_opportunities\\_for\\_utility\\_growth.pdf](https://brattlefiles.blob.core.windows.net/files/7298_electrification_emerging_opportunities_for_utility_growth.pdf) [hereafter BRATTLE REPORT]; see also Keith Dennis, *Environmentally Beneficial Electrification: Electricity as the End-Use Option*, 28 ELEC. J., Issue 9, 100-12 (Nov. 2015).

<sup>145</sup> BRATTLE REPORT, *supra* note 144, at 1, 8.

<sup>146</sup> USNEA, *supra* note 140, at 8 (reduction ranging from 19% to 67%); USNEA, *supra* note 140 at 5 (defining beneficial electrification as electrification that “yield[s] a range of efficiencies—lower cost, lower energy use, reduced air emissions and water use, improved health and safety for customer’s workers coupled with the opportunity for gains in productivity and product quality, and increased grid flexibility and efficiency.”); Environmental and Energy Study Institute, a non-partisan, non-profit created to inform the debate and decision-making on energy and environmental policies with the goal is to accelerate the transition to a new, low-emissions economy based on energy efficiency and renewable energy defining electrification as “replacement of direct fossil fuel use (e.g., propane, heating oil, gasoline) with electricity in a way that reduces overall emissions and energy costs. There are many opportunities across the residential and commercial sectors. This can include switching to an electric vehicle or an electric heating system – as long as the end-user and the environment both benefit.” *Beneficial Electrification: An Access Clean Energy Savings Program*, ENVTL & ENERGY STUDY INST., [eesi.org/electrification/be](http://eesi.org/electrification/be) (last visited Apr. 23, 2020); THE REG. ASSISTANCE PROJECT, *supra* note 119, at 17 (defining beneficial electrification as meeting one or more of the following conditions without adversely affecting the other factors: (1) saves consumers money over the long run; (2) enables better grid management; and (3) reduces negative environmental impacts). The National Resources Defense Counsel has endorsed this definition. Vignesh Gowrishankar, *Beneficial Electrification: Plug in for the Greener Grid!*, NAT. RESOURCES DEF. COUNCIL (Sept. 27, 2018), <https://www.nrdc.org/experts/vignesh->

beneficial electrification is defined as the use of electric technologies to secure societal environmental outcomes, expanding the benefits of electrification beyond the individual and to the collective population. Societal impact of electrification is directly tied to the source generation of the electricity powering the end-use application. Therefore, the emissions impact of electrification will compound the environmental benefits of the investments of utilities in cleaner generation technologies. “As the power sector reduces its environmental footprint, the emissions efficiency [or emissions per unit of energy output] of electric end-uses will improve correspondingly.”<sup>147</sup> By leveraging the emissions efficiencies of utility-scale investments in grid generation, electrification can achieve significant societal reductions today and ensure that savings compound as utilities continue pursuing their own emissions goals.

### CONCLUSION

Each wave of electrification has created a new understanding of the public interest and need for large-scale investments to be made on behalf of society. Past waves of electrification required investments in generation, transmission, and distribution—the basic bones of our electric grid. Climate change and the actions necessary to respond are complex and require collaboration across sectors. Climate change is increasingly discussed and understood in terms of the public interest. The public vocabulary emerging around climate change is borrowing from the traditions that shaped U.S. public utility regulation. Moving towards a lower-carbon future will require investments in lower-carbon source generation and cross-sector conversion to electric end-use technologies. Opportunities for electrification to be deployed to reduce emissions exist today, but meaningful responsive action against climate change will require scale. Beneficial electrification will be an important addition to that public vocabulary to increase education, stoke consumer demand, and position electrification and continued investment in source generation as investments pursued on behalf of the public interest. To realize the full benefits of electrification as effective climate action, customers, companies, and regulators will need to revisit policies and invest in new technologies. Utilizing the public interest tradition may provide a framework for collaborating at scale, progressive policies, and changes in regulation, all of which will be required for any meaningful

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gowrishankar/beneficial-electrification-plug-greener-grid; Rebecca Cole, *Accelerating the Electrification of Buildings at e-Lab Accelerator 2019*, ROCKY MOUNTAIN INST. (May 1, 2019), <https://rmi.org/accelerating-the-electrification-of-buildings-at-elab-accelerator-2019> (defining beneficial electrification as “[use of] renewable energy and efficient electric technologies to heat and cool homes and businesses”).

<sup>147</sup> THE REG. ASSISTANCE PROJECT, *supra* note 119, at 11.

steps towards a lower-carbon future. It is only with intentional innovation and new regulatory policies that we can ensure the transition to a lower-carbon future is in the public's interest.