Forks in the Road

Michael P. Vandenbergh

J. M. Gilligan

ESSAY:

FORKS IN THE ROAD

MICHAEL P. VANDENBERGH*

JONATHAN M. GILLIGAN**

This Essay outlines a simple heuristic that will enable public and private policymakers to focus on the most important climate change mitigation strategies. Policymakers face a dizzying array of information, pressure from advocacy groups, and policy options, and it is easy to lose sight of the forest for the trees. Many policy options are attractive on the surface but either fail to meaningfully address the problem or are unlikely to be adopted in the foreseeable future. If policymakers make the right decision when confronting three essential choices or forks in the road, though, the result will be 60% to 70% reductions in greenhouse gas emissions, an amount that will keep widely-adopted climate mitigation goals in reach. The three options are decarbonization of the electrical grid, electrification of the motor vehicle fleet, and electrification of buildings. International, national, and subnational officials, philanthropists, corporate executives, advocacy group leaders, and households all have the ability to prioritize these three options in their regulatory, purchasing, and other actions. If they choose these three

---

* Visiting Professor of Legal Studies and Business Ethics, The Wharton School, University of Pennsylvania; Professor and David Daniels Allen Distinguished Chair of Law, Director, Climate Change Research Network, and Co-Director, Energy, Environment and Land Use Program, Vanderbilt University Law School. We thank Linda Breggin, Cary Coglianese, J.B. Ruhl, Kevin Stack, and Ryan Trahan for insights about regulatory prioritization. For insights on the options for climate mitigation, we thank Michael Gerrard and John Dernbach and the legal scholars who co-authored LEGAL PATHWAYS TO DEEP DECARBONIZATION IN THE UNITED STATES (Michael B. Gerrard & John C. Dernbach, eds. 2019), as well as James H. Williams and the other energy economists and policy experts who participated in the Deep Decarbonization Pilot Project. Victoria Dorward, Aaron Megar, and Eliza Schmitt provided excellent research and administrative support.

** Associate Professor, Department of Earth and Environmental Sciences, and Associate Director for Research, Climate Change Research Network, Vanderbilt University.

decarbonatization options, many other mistakes can be made without jeopardizing the achievement of widely adopted emissions targets. If they make the wrong choice, however, few combinations of other viable options can achieve the necessary reductions. In the face of a growing consensus that immediate, major emissions reductions are required, the forks in the road heuristic can provide policymakers with the framework necessary to make smart decisions and ignore the noise surrounding climate law and policy.

INTRODUCTION

Climate change is widely acknowledged to be one of the principal threats facing society, but even motivated policymakers confront overwhelming complexity when sorting through the options for law and policy responses. A carbon tax and the Green New Deal appear to offer panaceas at the national level, but policymakers cannot adopt either option without major new federal legislation. It is unlikely that major climate legislation will be enacted soon, and, even if it is, the political compromises necessary to gain the necessary votes and the likely legal challenges will limit its scope and delay its implementation.[1] These legislative and judicial barriers threaten to prevent even aggressive national climate policymakers from achieving their goals. Yet public policymakers (e.g., international, federal, state, and local government officials) and private policymakers (e.g., managers of philanthropies, corporations, civic and cultural groups, colleges and universities, and advocacy groups) have other options. They face numerous decisions that they do control and that could have major implications for climate mitigation regardless of the status of federal legislation. In the face of a complex problem and intense lobbying pressure for and against climate mitigation, these public and private policymakers have difficulty selecting among the viable options even when they are motivated to do so. Policymakers are subject to constraints on information, bounded rationality,[2] identity-protective

1. Michael P. Vandenbergh & Jonathan M. Gilligan, *Beyond Gridlock*, 40 COLUM. J. ENVTL. L. 217, 217–30 (2015).

2. *See, e.g.*, Elke U. Weber & Paul C. Stern, *Public Understanding of Climate Change in the United States*, 66 *AM. PSYCH.* 315 (2011) (exploring bounded rationality limits on climate science acceptance and mitigation support); *see also* Erez Yoeli et al., *Behavioral Science Tools to Strengthen Energy & Environmental Programs*, 3 BEHAV. SCI. & POL'Y 69, 72–79 (2017) (providing recommendations for deploying bounded rationality and related insights for environmental behavior change).

cognition,[3] and solution aversion.[4] Many private sector and advocacy group managers also are motivated to support climate mitigation,[5] but they face similar problems: Among the viable steps that can be taken, which are the most important? Which don't really matter?

Through the fog of information arising from policy and academic reports, a surprisingly simple heuristic can guide climate mitigation decision making. The core concept is that public and private policymakers face three major forks in the road when choosing among mitigation options: whether to decarbonize the electricity grid and electrify transportation and buildings.[6] Opting for the low-carbon

3. Daniel M. Kahan et al., *The Polarizing Impact of Science Literacy and Numeracy on Perceived Climate Change Risks*, 2 NATURE CLIMATE CHANGE 732 (2012). For a critique of the bounded rationality analysis, see Dan Kahan, *"Bounded Rationality": The Grigori Rasputin of Explanations for Public Perceptions of Climate Change Risk*, THE CULTURAL COGNITION PROJECT AT YALE LAW SCHOOL (July 15, 2014, 8:30 AM), http://www.culturalcognition.net/blog/2014/7/15/bounded-rationality-the-grigori-rasputin-of-explanations-for.html (concluding that "because positions on climate change have become such a readily identifiable indicator of ones' cultural commitments, adopting a stance toward climate change that deviates from the one that prevails among her closest associates could have devastating consequences, psychic and material").

4. *See* Troy H. Campbell & Aaron C. Kay, *Solution Aversion: On the Relation Between Ideology and Motivated Disbelief*, 107 J. PERSONALITY & SOC. PSYCH. 809, 810 (2014) (noting that conservatives will reduce their perception of climate change risks if they think a government regulatory response is necessary); *see also* MICHAEL P. VANDENBERGH & JONATHAN M. GILLIGAN, BEYOND POLITICS: THE PRIVATE GOVERNANCE RESPONSE TO CLIMATE CHANGE iv–vii (2017) (noting that private governance initiatives may bypass solution aversion for climate change).

5. Sarah E. Light, *The Law of the Corporation as Environmental Law*, 71 STAN. L. REV. 137, 161–63 (2019).

6. Legal scholars have noted the importance of prioritizing regulatory responses to environmental risks. *See, e.g.*, Wendy Wagner, *Regulating by the Stars*, *in* ACHIEVING REGULATORY EXCELLENCE (Cary Coglianese ed., 2016) (noting that "the best way to make progress is to focus on just a few core management objectives"). The concept of forks in the road regarding climate law and policy, however, has received surprisingly little attention. We first encountered the concept of climate forks in the road though interactions with the staff and work product generated by the Deep Decarbonization Pilot Project (DDPP). *See, e.g.*, JAMES H. WILLIAMS ET AL., PATHWAYS TO DEEP DECARBONIZATION IN THE UNITED STATES: 2050 REPORT 1 (2014), http://usddpp.org/downloads/2014-technical-report.pdf (using pathways as a metaphor for different types of climate action). Michael Gerrard and John Dernbach have managed a major effort among legal scholars to generate a legal and policy agenda designed to draw on the DDDP insights to achieve deep decarbonization. *See* LEGAL PATHWAYS TO DEEP DECARBONIZATION IN THE UNITED STATES (Michael B. Gerrard & John C. Dernbach eds., 2019). This project acknowledges the existence of forks in the road, *see* John C. Dernbach, *Legal Pathways to Deep Decarbonization: Postscript*, 48 ENVT. L. REP. NEWS & ANALYSIS 10875 (2018), but it has focused on identifying a large number of legal and policy options, including many that would implement the three main options we discuss here. *See also* Ryan Thomas Trahan, *Counting Carbon: Forward-Looking Analysis of Decarbonization* (2020) (forthcoming manuscript) (on file with the Hastings Environmental Law Journal) (describing decarbonization as a finite and discontinuous problem and recommending that policy-makers adopt a "counting

alternative at each of these forks in the road will not be sufficient, but it is a necessary step towards climate change mitigation. If policymakers make the right choice at each of these major forks in the road, they can make mistakes on more minor choices without compromising the ability to achieve the deep decarbonization necessary to increase the prospects for a 2C future.[7] If they make the wrong choices, even perfect decision-making regarding the other choices will not be sufficient.[8] These three forks in the road are especially important because they are linked and because they account for the lock-in effects of major capital and infrastructure investments.[9]

The forks in the road heuristic will allow policymakers to cut through the cloud of information, external pressure, and policy options and make the choices necessary to achieve deep decarbonization. Achieving the Paris Agreement's goal of limiting global warming to 2C with a high degree of confidence will require reducing emissions in industrialized nations by 35% by 2030 and by more than 80% by 2050.[10] Failing to meet these targets will make it increasingly difficult and expensive to achieve the goal of limiting climate change.[11] The forks in the road approach can simplify decision-making and enable policymakers to focus on options that will achieve major emissions reductions despite the persistent gridlock at the federal level.[12] We examine each fork in the road—decarbonization of the electricity grid, electrification of transportation, and electrification of buildings.

---

approach" for decarbonization analysis). Our goal is to encourage policymakers to focus on the small subset of the most important legal and policy choices.

7. *See* LEGAL PATHWAYS, *supra* note 6, at 10 (defining "2C future" as a future where global warming above pre-industrial levels is kept below 2° Celsius).

8. *See* Dernbach, *supra* note 6, at 10879 (describing the probability of 2C and 1.5C futures and the impacts that different policies can have on these goals).

9. For an analysis of the term "lock-in effects," see *infra* notes 14–16 and accompanying text.

10. D. Van Vuuren et al., *Stabilizing Greenhouse Gas Concentrations at Low Levels: An Assessment of Reduction Strategies and Costs,* 81 CLIMATIC CHANGE 119, 121 (2007).

11. Richard Millar et al., *The Cumulative Carbon Budget and Its Implications*, 32 OXFORD REV. ECON. POL'Y 323, 324–342 (2016); Joeri Rogelj et al., *2020 Emissions Levels Required to Limit Warming to Below 2 °C*, 3 NATURE CLIMATE CHANGE 405, 405–412 (2013); Joeri Rogelj et al., *Probabilistic Cost Estimates for Climate Change Mitigation*, 493 NATURE 79, 80–83 (2013); Thomas F. Stocker, *The Closing Door of Climate Targets*, 339 SCIENCE 280, 280–82 (2013).

12. For instance, the three forks in the road concept would be a valuable heuristic to steer the funding decisions of the Bezos Earth Fund, which was recently established with a $10 billion commitment by Amazon founder Jeff Bezos. *See* Kimberly Kindy, *Jeff Bezos Commits $10 Billion to Fight Climate Change*, WASH. POST (Feb. 17, 2020), https://www.washingtonpost.com/national/jeff-bezos-commits-10-billion-to-fight-climate-change/2020/02/17/e103ae7c-51b7-11ea-b119-4faabac6674f_story.html.

DECARBONIZATION OF THE ELECTRICITY GRID

The decision to decarbonize the electricity grid is the most important of the three forks in the road because of the sector's large carbon emissions and because the decarbonization of motor vehicles and buildings largely depends on a decarbonized electric grid. The electricity grid contributed roughly 30% to total U.S. greenhouse gas emissions in 2017.[13] In addition, the lock-in effects are substantial: Electrical power plants have lifespans of thirty years or more, so the choices made in 2020 will dictate the carbon footprint of the grid in 2050, absent expensive abandonment of functioning assets.[14] Similarly, the building of transmission and charging infrastructure will take time and will be in place for an extended period.

Decarbonization of the grid is a feasible option. Renewable power is becoming cost-competitive with coal and natural gas in many areas of the United States, and a range of options are available to deal with the intermittency of power generated from the wind and sun. We favor renewable power, but the grid decarbonization fork in the road is indifferent as to the source of the non-carbon power that substitutes for fossil fuel-based power. Most engineering analyses find that it will be much easier and more cost-effective to decarbonize the grid if there is a significant contribution from nuclear or other technology that does not suffer from intermittency.[15] Regardless of specific technological choices, the required decision at the fork in the road is to adopt and implement strategies that lead to the prompt decarbonization of the grid.

ELECTRIFICATION OF THE MOTOR VEHICLE FLEET

The decision to electrify the motor vehicle fleet is the next most important fork in the road. Transportation accounted for roughly 30% of U.S. greenhouse gas emissions in 2017, and this percentage is rising

13. U.S. ENVIRONMENTAL PROTECTION AGENCY, INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS 1990-2017 ES-24, tbl.ES-6 (2019).

14. For a discussion of lock-in effects, see Christopher Serkin & Michael P. Vandenbergh, *Prospective Grandfathering: Anticipating the Energy Transition Problem*, 102 MINN. L. REV. 1019 (2018); Dan Tong et al., *Committed Emissions from Existing Energy Infrastructure Jeopardize 1.5 °C Climate Target*, 572 NATURE 373, 375–77 (2019); Steven J. Davis et al., *Future CO2 Emissions and Climate Change from Existing Energy Infrastructure*, 329 SCIENCE 1330, 1330–1333 (2010).

15. Steven J. Davis et al., *Net-zero Emissions Energy Systems*, SCIENCE 6 (June 29, 2018), https://science.sciencemag.org/content/sci/360/6396/eaas9793.full.pdf; Alexander E. MacDonald et al., *Future Cost-competitive Electricity Systems and Their Impact on US CO_2 Emissions*, 6 NATURE CLIMATE CHANGE 526 (2016).

as the electricity sector decarbonizes.[16] Electric vehicles are very efficient and have a lower carbon footprint than fossil fuel-powered vehicles, even in the remaining fossil fuel-heavy electric grids in the United States.[17] The advantage of electric vehicles becomes even greater if the electric grid uses clean generation technology. Aircraft and ships are difficult to electrify, but most cars, trucks, and construction equipment can be electrified.[18] Lock-in effects are also important: Automobiles remain on the road for more than a decade, so the choices made in 2020 will have a large effect on the carbon footprint of the motor vehicle fleet from 2030 to 2035.[19]

Further, widespread electrification of transportation is feasible. Regulatory pressure for electric vehicle adoption is growing from state and local governments in the United States and from many foreign governments.[20] Announcements by major automakers suggests that many anticipate a global transition to electric vehicles.[21] In addition, many corporate fleets are converting to electric vehicles. Amazon recently announced that it will buy 100,000 electric delivery vehicles, and the United Parcel Service (UPS) announced that it will buy 10,000

16. EPA, *supra* note 13, at ES-24.

17. *See, e.g.*, Graff Zivin et al., *Spatial and Temporal Heterogeneity of Marginal Emissions: Implications for Electric Cars and Other Electricity-Shifting Policies*, 107 J. ECON. BEHAVIOR & ORG. 248, 263–67 (2012) (concluding that CO_2 emissions from driving electric vehicles are less than those from driving a hybrid car in most areas of the United States, but the emissions are affected by the carbon-intensity of the electric grid and the timing of vehicle charging). The carbon intensity of the electric grid in many areas of the United States has decreased substantially since the Zivin et al. study. *See, e.g.*, Jacques A. de Chalendar et al., *Tracking Emissions in the US Electric System*, 116 PNAS 25497, 25497 (2019) (concluding that "[r]ecent direct emissions estimates show that the carbon intensity of the U.S. grid as a whole decreased by 30% from 2001 to 2017 as gas and renewables displaced coal").

18. For a discussion of the difficulties of reducing aircraft emissions, see Michael P. Vandenbergh & Daniel Metzger, *Private Environmental Governance Responses to Climate Change: The Case of Global Civil Aviation,* 30 FORDHAM ENVTL. L. REV. 62, 63-70 (2018) (reviewing technical and governance challenges to aviation-focused climate mitigation and suggesting private governance response).

19. Consumer Reports, *Make Your Car Last 200,000 Miles,* CONSUMER REP. (Nov. 6, 2018), https://www.consumerreports.org/car-repair-maintenance/make-your-car-last-200-000-miles (noting "[t]he average age of all cars on the road is more than 11 years").

20. *See, e.g.*, Lia Cattaneo, *Plug-In Electric Vehicle Policy: Evaluating the Effectiveness of State Policies for Increasing Deployment*, CTR FOR AM. PROGRESS (June 7, 2018), https://www.americanprogress.org/issues/green/reports/2018/06/07/451722/plug-electric-vehicle-policy (analyzing how state-implemented policies have affected the market shares of electric vehicles in those states).

21. *See, e.g.*, DELOITTE LLP, NEW MARKET, NEW ENTRANTS, NEW CHALLENGES: BATTERY ELECTRIC VEHICLES 1 (2018) (noting a "sea change in the market for electric vehicles").

electric delivery vehicles.[22] Similarly, Lyft has announced that its drivers' vehicles will all be electric by 2030.[23]

The Amazon and UPS announcements also demonstrate how decarbonization of the electric grid and vehicle electrification can address other problems: Internet-based shipping creates major carbon emissions, but an electrified delivery fleet can make a dent in those emissions and even reduce them well below the emissions from personal vehicles used by retail shoppers.[24] Battery prices are falling rapidly, and electric vehicles are very close to achieving lower total cost of ownership than gasoline vehicles.[25] Other energy sources for vehicles, such as hydrogen cells, are under development and may be valuable in the future.[26] Given the lock-in effects of current decisions regarding motor vehicles, however, the potential future availability of these options should not prevent electrification of the motor vehicle fleet.

In addition to the direct benefit of reducing greenhouse gas emissions from vehicle operation, electrification of the vehicle fleet could have important synergies with the decarbonization of the electrical grid. Personal vehicles spend the vast majority of their time

---

22. Andrew J. Hawkins, *Amazon Will Order 100,000 Electric Delivery Vans from EV Startup Rivian, Jeff Bezos Says*, THE VERGE (Sept. 19, 2019), https://www.theverge.com/2019/9/19/20873947/amazon-electric-delivery-van-rivian-jeff-bezos-order; United Parcel Service, *UPS Invests In Arrival, Accelerates Fleet Electrification With Order Of 10,000 Electric Delivery Vehicles*, UPS PRESS ROOM, (Jan. 29, 2020), https://www.pressroom.ups.com/pressroom/ContentDetailsViewer.page?ConceptType=PressReleases&id=1580304360144-453.

23. *See* Tina Bellon, *Lyft Promises Switch to 100% Electric Vehicles by 2030*, REUTERS (June 17, 2020), https://www.reuters.com/article/us-lyft-electricvehicles/lyft-promises-switch-to-100-electric-vehicles-by-2030-idUSKBN23O37R (explaining that rideshare services emit 50% more carbon than typical private car use); *see also* Alan Jenn, *Emissions Benefits of Electric Vehicles in Uber and Lyft Ride-hailing Service*, 5 NATURE ENERGY 520, 522–23 (2020) (demonstrating substantial GHG emissions reductions arising from electrifying ride-hailing services such as Uber and Lyft).

24. Joshuah K. Stolaroff et al., *Energy Use and Life Cycle Greenhouse Gas Emissions of Drones for Commercial Package Delivery*, 9 NATURE COMM. 1, 11 (2018) (finding that the life-cycle greenhouse gas emissions per package from internet shopping with delivery by electric trucks or autonomous electric helicopter drones is about 80% smaller than for retail shopping using a personal electric car and about 90% smaller than retail shopping using a conventional personal car).

25. Claire Curry, *Lithium-Ion Battery Costs and Market*, BLOOMBERG NEW ENERGY FIN. (July 5, 2017), https://data.bloomberglp.com/bnef/sites/14/2017/07/BNEF-Lithium-ion-battery-costs-and-market.pdf.

26. Iain Staffell et al., *The Role of Hydrogen and Fuel Cells in the Global Energy System*, 12 ENERGY AND ENV'T. SCI. 463, 464–68 (2018).

parked.[27] If they were connected to the grid during these times, they could be programmed to help stabilize the grid by charging their batteries at optimal times.[28] They also could be programmed to supply stored energy to the grid from their batteries when demand surges or supply drops (due, for instance, to overcast skies or calm winds).[29]

ELECTRIFICATION OF BUILDINGS

The decision to electrify buildings is the third fork in the road. Although decarbonizing the electric grid and electrifying the motor vehicle fleet can achieve a roughly 60% reduction in greenhouse gas emissions,[30] combining these two steps with building electrification can achieve an additional 10% reduction.[31] Electrification of buildings involves changing to electric heating and cooling systems and electric appliances such as water heaters, stoves, and ovens.[32] The building sector accounted for roughly 12% of U.S. greenhouse gas emissions in 2017, so the potential emissions reductions achievable by using non-carbon energy in buildings are substantial.[33] Although it is impractical to require all existing buildings to electrify, electrification of new construction and buildings undergoing significant renovation could reduce emissions from buildings by up to 80% and national emissions

27. *See, e.g.*, David Z. Morris, *Today's Cars Are Parked 95% of the Time*, FORTUNE (Mar. 13, 2016), https://fortune.com/2016/03/13/cars-parked-95-percent-of-time (citing a report by transportation analyst Paul Barter).

28. *See, e.g.*, Davis et al., *supra* note 15 (discussing the possibility of utilizing electric vehicle batteries to contribute to the grid and the amount of contribution that an electric fleet could make).

29. Jasna Tomi & Willett Kempton, *Using Fleets of Electric-drive Vehicles for Grid Support*, 168 J. POWER SOURCES 459, 460–468 (2007).

30. *See, e.g.*, DANIEL STEINBERG ET AL., ELECTRIFICATION & DECARBONIZATION: EXPLORING U.S. ENERGY USE AND GREENHOUSE GAS EMISSIONS IN SCENARIOS WITH WIDESPREAD ELECTRIFICATION AND POWER SECTOR DECARBONIZATION, NAT'L RENEWABLE ENERGY RES. LAB. TECHNICAL REP. iv (2017) (finding that "electrification alone . . . can result in 41% reductions (below 2005 level) in economy-wide fossil fuel combustion emissions" and that electrification of the vehicle fleet and other aspects of the economy along with "power sector decarbonization can achieve reductions of nearly 74% below the 2005 level of economy-wide fossil fuel combustion emissions").

31. *See id.* at iv (describing the framework of the study).

32. *See* JEFF DEASON ET AL., ELECTRIFICATION OF BUILDINGS AND INDUSTRY IN THE U.S.: DRIVERS, BARRIERS, PROSPECTS, AND POLICY APPROACHES, LAWRENCE BERKELEY NAT'L LAB. v (2018) (defining building electrification to include "grid-connected electrification of energy end uses in U.S. buildings" and noting that "electrification involves substituting electric technologies for combustion-fueled technologies for end uses where other fuels are being used — most notably, space heating and water heating," whereas electrification of industry involves "powering a wide range of industrial processes by electricity rather than combustion fuels").

33. STEINBERG ET AL., *supra* note 30, at 54.

by about 10% by 2050, if the electrical grid is also converted to clean generation technologies.[34] If the grid is electrified, electric cooling and heating systems have a near-zero carbon footprint.[35]

As with the other two forks in the road, electrification of buildings is achievable even if the political gridlock over federal climate legislation continues. Electric options for heating and cooling systems and appliances are already available and are becoming increasingly attractive options with technological advances. Many local governments and private sector organizations have already recognized the advantages of electrification and have taken initial steps toward building electrification.[36] For instance, a growing number of cities have required all new city buildings to use electric, not natural gas, appliances.[37] Announcements by corporations, civic and cultural groups, and colleges and universities demonstrate that the movement toward building electrification is occurring in the private sector as well as the public sector.[38]

34. JESSICA LEUNG, CTR. FOR CLIMATE & ENERGY SOLUTIONS, DECARBONIZING U.S. BUILDINGS 4 (2018).

35. *See, e.g.*, DEASON ET AL., *supra* note 32, at 9 (concluding that building electrification has been growing since 1950 in the United States, but substantial opportunities remain for "space heating, water heating, clothes drying, and cooking").

36. *See, e.g.*, Amanda Myers, *As Cities Begin Banning Natural Gas, States Must Embrace Building Electrification Via Smart Policy*, FORBES (July 22, 2019), https://www.forbes.com/sites/energyinnovation/2019/07/22/as-cities-begin-banning-natural-gas-states-must-embrace-building-electrification-with-smart-policy/#755e1f2d6ce6 (noting the growth in municipal adoption of electrification policies); *see also* DEASON ET AL., *supra* note 32, at vi (concluding that "[m]any policies, programs, and regulations affect the prospects for electrification"). These include government-sponsored research, development, and demonstration of electric technologies; electricity rate design; demand response program and electricity market design; financial incentives for adoption of these technologies; energy savings targets; building energy codes and appliance and equipment standards; educational and outreach efforts; energy planning processes; and air quality regulations. Emerging approaches that hold particular promise include charging lower prices for off-peak electricity usage (time-varying rates) and rewarding the grid services that newly-electrified end uses would offer (electricity market designs that reward flexibility).

37. *See* Myers, *supra* note 36 (stating that because most existing buildings will remain up until 2050, "policymakers must ensure new builds are all-electric and retrofit existing buildings . . ."). Ironically, barriers to decarbonization of the grid and electrification of vehicles and buildings can be expected to include not only opposition from fossil fuel interests but also the delays caused by existing environmental laws. *See* J.B. Ruhl & James Salzman, *What Happens When the Green New Deal Meets the Old Green Laws* (2020) (forthcoming manuscript) (on file with the Vermont Law Review) (noting the challenges posed by existing environmental laws for decarbonization of the grid combined with electrification of vehicles and buildings).

38. Myers, *supra* note 36.

RESPONDING TO THE FORKS IN THE ROAD

When faced with a blizzard of policy options and pressure from advocacy groups, policymakers can easily engage in muddled decision-making or convince themselves that options with low impact or little chance of adoption are appropriate. The focus on these three forks in the road can bring clarity to decision-making and help policymakers prioritize the most promising actions and resist pressure to take a less productive course. Understanding the significance of these three forks in the road can also help the public hold public and private policymakers accountable.[39] Advocacy groups and the general public can evaluate the decisions of governments, corporations, and other organizations against a reasonably simple standard: Will the decision lead the organization to take the necessary forks in the road?

Prioritizing these three forks in the road will require public and private policymakers to fend off numerous critiques. Economic, social, and political interest groups will lobby heavily against the decarbonization option at each fork in the road. Additionally, critics will claim that this heuristic requires acting on incomplete information, fails to anticipate the development of unforeseen new technological advances, and does not account for other social goals. Although these are legitimate concerns, many of them can be accounted for in the specific laws, policies, and programs pursued after making the right choice at each fork.

Time is of the essence when dealing with climate change mitigation: Climate change requires prompt emissions reductions, and infrastructure lock-in effects mean that decisions made today will determine the U.S. carbon footprint over the next several decades. Failing to make the right decision at each of these forks, despite inadequate information and other concerns, will make it difficult if not impossible to achieve deep decarbonization. Making the right decision at each fork will not be enough to achieve deep decarbonization, but it will ensure that the inevitable failures with adoption and

39. *Id.*; *see also Building Electrification Commitment at the University of California to Reduce Carbon Emissions*, GUIDEHOUSE INSIGHTS (Oct. 16, 2018), https://www.navigantresearch.com/news-and-views/building-electrification-commitment-at-the-university-of-california-to-reduce-carbon-emissions (noting that "due to the University of California's 100% clean energy procurement commitment, the electrified space and water heating technology will support the reduction of greenhouse gas emissions as part of its sustainability commitment").

implementation of climate polices will not prevent the U.S. from achieving this critical goal.[40]

40. *See* STEINBERG ET AL., *supra* note 30, at v ("pathways to achieving deep reductions in GHG emissions will necessarily involve additional strategies for reduction, but electrification and electricity decarbonization will play a large and important role in achieving a low-carbon future").