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AN INCLUSIVE ENERGY TRANSITION: EXPANDING LOW-INCOME ACCESS TO CLEAN ENERGY PROGRAMS

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An array of new state policies and declining costs for clean energy technologies have opened electricity markets to many new participants, including electric utilities' own customers. Most low-income customers, however, lack the resources to access these markets. Indeed, low-income customers already face disproportionately high energy and transportation burdens. Regulators and utilities have expressed concerns that these burdens will only increase due to the loss of cross-subsidies provided through traditional electricity rate structures. Rather than develop effective strategies to protect low-income ratepayers and facilitate their participation in clean energy markets, several states have either enacted reactionary policies that disincentive all customer classes from participating or pursue limited programs, such as community solar programs, that will provide few benefits to low-income households. This paper argues that states should develop and fund comprehensive programs to ensure that low-income households can participate in and benefit from the clean energy transition.

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I. INTRODUCTION

The United States energy system is in the midst of profound change. Renewable energy deployment has grown at an unprecedented rate, and innovations in metering, storage, and electric vehicle technology have spurred visions of a future energy system without fossil fuels.[1] Although the United States trails many other national governments in developing a forward-looking energy policy[2]—and will likely fall much further behind under the

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[1] *See, e.g.*, Mark Z. Jacobson et al., *100% Clean and Renewable Wind, Water, and Sunlight (WWS) All-Sector Energy Roadmaps for the 50 United States*, 8 ENERGY & ENVTL. SCI. 2093 (2015), http://web.stanford.edu/group/efmh/jacobson/Articles/I/USStatesWWS.pdf (describing how the United States could obtain all of its energy needs from wind, solar, and hydroelectric sources by 2050 using existing technologies).

[2] *Compare, e.g.*, THE DANISH GOVERNMENT, OUR FUTURE ENERGY 3 (2011), https://stateofgreen.com/files/download/387 (setting a goal for Denmark to obtain 100 percent of all energy supplies from renewable resources by 2015), *and* Chloe Farand, *Sweden Pledges to Cut All Greenhouse Gas Emissions by 2045*, THE INDEP. (Feb. 4, 2017, 1:50 PM), http://www.independent.co.uk/news/science/sweden-pledges-greenhouse-gas-emissions-zero-2045-paris-agreement-a7561111.html (setting a similar carbon-free energy coal), *with* THE UNITED STATES GOVERNMENT, NATIONALLY

Trump Administration[3]—an increasing number of states have undertaken or explored bold initiatives to rapidly expand their carbon-free energy systems.[4] In Massachusetts, for example, the 2017 legislative docket included a proposed bill to transition the state's electricity and heating systems away from fossil resources

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DETERMINED CONTRIBUTION (2016), http://www4.unfccc.int/ndcregistry/PublishedDocuments/United%20States%20of%20America%20First/U.S.A.%20First%20NDC%20Submission.pdf (establishing an economy-wide target of reducing its greenhouse gas emissions by twenty-six to twenty-eight percent below its 2005 level in 2025, but not setting an express national renewable energy goal).

[3] *See, e.g.*, *An America First Energy Plan*, THE WHITE HOUSE, https://www.whitehouse.gov/america-first-energy (last visited Apr. 17, 2017) (stating the Trump Administration will support shale oil, natural gas, and coal, and making no mention of renewable resources or climate change); Earl J. Ritchie, *How Bad Will Donald Trump Be for Renewable Energy?*, FORBES (Dec. 1, 2016), https://www.forbes.com/sites/uhenergy/2016/12/01/how-bad-will-donald-trump-be-for-renewable-energy/2/#74a0adb52b6e (projecting that the Trump Administration will enact policies favoring the oil industry and abandon the Clean Power Plan, thereby slowing the growth of renewables). *But see* Phuong Le, *Washington Governor: Trump 'Foolishness' Won't Affect Plans*, ASSOCIATED PRESS (Jan. 26, 2017), *reprinted in* Phuong Le, *Washington Governor: Trump 'Foolishness' Won't Affect Plans*, SFGATE (Jan. 26, 2017), http://www.washingtontimes.com/news/2017/jan/26/washington-governor-says-state-wont-be-deterred-on/ ("Washington Gov. Jay Inslee said Thursday the state will move forward with efforts to promote clean energy and tackle climate change despite 'foolishness' from President Donald Trump."); Ken Silverstein, *California Undercuts Trump's Inauguration With Aggressive Carbon Reduction Plan*, FORBES (Jan. 21, 2017), http://www.forbes.com/sites/kensilverstein/2017/01/21/california-undercuts-trumps-debut-with-aggressive-carbon-cutting-plan/#7fcf54ed422b ("By 2050, California hopes to have cut its greenhouse gas emissions by 80%.").

[4] For example, several states have increased their renewable portfolio standards to require at least fifty percent of their electricity to come from renewable resources. *See, e.g.*, Jocelyn Durkay, *State Renewable Portfolio Standards and Goals*, NAT'L COUNCIL OF STATE LEGISLATURES (Dec. 28, 2016), http://www.ncsl.org/research/energy/renewable-portfolio-standards.aspx; *see also* Robert Walton, *New Mexico Lawmakers Propose Expanding RPS to 80% by 2040*, UTIL. DIVE (Feb. 3, 2017), http://www.utilitydive.com/news/new-mexico-lawmakers-propose-expanding-rps-to-80-by-2040/435425/ (describing state renewable portfolio standard increases). In addition, New York has undertaken an effort to restructure its electricity system to accommodate substantial increases in distributed energy resources. N.Y. STATE DEP'T OF PUB. SERV., REFORMING THE ENERGY VISION, No. 14-M-0101, at 51–52 (2014).

and to halve the use of fossil fuels in the transportation system by 2050.[5] Hawaii has led the nation in committing itself to a fossil-free electricity system by 2045,[6] and several other states have enacted renewable portfolio standards that will increase their share of renewable power to at least fifty percent by the middle of the century, if not sooner.[7] For a country in which coal-fired power provided half of the nation's electricity only a decade ago,[8] the ascendancy of renewable resources has been astounding.

The transition to renewable resources is also creating novel economic opportunities for new participants in the energy market.[9] While the historic model of electricity production and regulation in the United States excluded all but a handful of designated monopoly providers from profiting in the electricity sector,[10] thousands of companies and individuals now sell renewable

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[5] Robert Walton, *Massachusetts Lawmakers Float Aggressive Bill Mandating 100% Renewables by 2035*, UTIL. DIVE (Jan. 24, 2017), http://www.utilitydive.com/news/massachusetts-lawmakers-float-aggressive-bill-mandating-100-renewables-by/434612/.

[6] *See* Press Release, Office of the Governor, Governor Ige Signs Bill Setting 100 Percent Renewable Energy Goal in Power Sector (June 8, 2015), http://governor.hawaii.gov/newsroom/press-release-governor-ige-signs-bill-setting-100-percent-renewable-energy-goal-in-power-sector; *see also* H.B. 623, 28th Leg. (Haw. 2015) (requiring an increase in renewable portfolio standards to twenty-five percent by December 31, 2020, and 100 percent by December 31, 2040 and "[r]equir[ing] the Public Utilities Commission to include the impact of renewable portfolio standards, if any, on the energy prices offered by renewable energy developers and the cost of fossil fuel volatility in its renewable portfolio standards study and report to the Legislature.").

[7] *See* Walton, *supra* note 5 (describing New Mexico's proposal of eighty percent renewable energy by 2040 fitting within Hawaii's target of 100 percent renewable energy by 2045 and California's target of fifty percent renewable energy by 2030).

[8] Bruce Lieberman, *Natural Gas and Wind are Supplanting Coal*, YALE CLIMATE CONNECTIONS (Jan. 1, 2017), http://www.yaleclimateconnections.org/2017/01/natural-gas-and-wind-are-supplanting-coal/.

[9] *See* WORLD ECON. FORUM, THE FUTURE OF ELECTRICITY: ATTRACTING INVESTMENT TO BUILD TOMORROW'S ELECTRICITY SECTOR 23 (2015).

[10] William Boyd, *Public Utility and the Low-Carbon Future*, 61 UCLA L. REV. 1614, 1629–31 (2014).

electricity and other electricity services.[11] Utilities' own customers have begun to play a larger role as providers of electricity services.[12] State net metering laws and federal and state tax incentives have played critical roles in incentivizing these new participants to join the electricity market.[13] Advanced metering and communication technologies have also enabled utility customers to earn revenue through demand response programs, which pay customers for reducing their energy usage.[14] Electric vehicle technology could create even more economic opportunities for utility customers, who could receive payments for allowing their car batteries to provide ancillary services to the grid.[15] As laws and technologies have advanced, an increasing number of utility customers have begun to view the electricity system as a source of revenue, rather than a mere source of essential services.[16]

Many low-income electricity customers, however, have few viable opportunities to participate in these new electricity markets or to otherwise benefit financially from the clean energy transition.[17] To get access to the emerging "prosumer" energy markets, utility customers must have the resources to invest in the metering, storage, renewable generation, or demand response

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[11] *See* Elizabeth Graffy & Steven Kihm, *Does Disruptive Competition Mean a Death Spiral for Electric Utilities?*, 35 ENERGY L.J. 1, 4 (2014) (noting that growth in solar development was enabled by private leasing models, rather than utility deployment).

[12] Boyd, *supra* note 10, at 1677–78.

[13] Melissa Powers, *Small is (Still) Beautiful: Designing U.S. Energy Policies to Increase Localized Renewable Energy Generation*, 30 WIS. INT'L L.J. 595 (2012); Inara Scott, *Incentive Regulation, New Business Models, and the Transformation of the Electric Power Industry*, 5 MICH. J. ENVTL. & ADMIN. L. 319, 354–55 (2016).

[14] Sharon B. Jacobs, *Bypassing Federalism and the Administrative Law of Negawatts*, 100 IOWA L. REV. 885, 896–900 (2015) [hereinafter Jacobs, *Bypassing Federalism*].

[15] *See* Brian Lamble, *Of Nesting Dolls and Trojan Horses: A Survey of Legal and Policy Issues Attendant to Vehicle-to-Grid Battery Electric Vehicles*, 86 CHI.-KENT L. REV. 193 (2011).

[16] *See* Boyd, *supra* note 10, at 1677–80 (discussing customers' interests in realizing the benefits of disruptive technologies).

[17] *See* Adrienne L. Thompson, *Protecting Low-Income Ratepayers as the Electricity System Evolves*, 37 ENERGY L.J. 265, 267–68, 281 (2016).

technologies that enable utility customers to serve as producers.[18] Many low-income customers lack access to the necessary capital or to the resources to procure, install, and deploy innovative energy technology.[19] Indeed, many low-income households already face disproportionate energy and transportation burdens, and it is highly unlikely that they will have access to the resources necessary to enable them to build rooftop solar, buy electric vehicles, or install smart meters.[20] Without access to capital and services that could enable streamlined installation of clean and smart energy facilities, low-income customers will continue to be excluded from the transitioning energy market.[21]

Utilities have argued that emerging energy markets tend to provide disproportionate direct benefits to middle- and upper-income consumers.[22] Some states have responded with thoughtful programs to ensure access that is more inclusive.[23] Other jurisdictions, however, have either embraced limited solutions, such as community solar,[24] which will likely not broadly expand low-income participation in the clean energy economy,[25] or

[18] INTERSTATE RENEWABLE ENERGY COUNCIL, SHARED RENEWABLE ENERGY FOR LOW- TO MODERATE-INCOME CONSUMERS: POLICY GUIDELINES AND MODEL PROVISIONS 11–12 (2016).

[19] Thompson, *supra* note 17, at 292.

[20] *Id.* at 267–68, 281.

[21] INTERSTATE RENEWABLE ENERGY COUNCIL, *supra* note 18 at 11–16.

[22] Troy A. Rule, *Solar Energy, Utilities, and Fairness*, 6 SAN DIEGO J. CLIMATE & ENERGY L. 115, 135–38 (2014-2015).

[23] Deborah Behles, *From Dirty to Green: Increasing Energy Efficiency and Renewable Energy in Environmental Justice Communities*, 58 VILL. L. REV. 25, 31–33 (2013) (describing several programs in California, in particular, while noting that limited funding undermines several state programs). *See also* INTERSTATE RENEWABLE ENERGY COUNCIL, *supra* note 18 at 8–9, 13, 18, 20, 22–24 (discussing programs in Colorado, California, and New York).

[24] Community solar refers to a project through which multiple community members receive electricity or financial benefits. DAVID FELDMAN ET AL., NAT'L RENEWABLE ENERGY LAB., SHARED SOLAR: CURRENT LANDSCAPE, MARKET POTENTIAL, AND THE IMPACT OF FEDERAL SECURITIES REGULATION 3 (2015), www.nrel.gov/docs/fy15**o**sti/63892.pdf. In most cases, beneficiaries of community solar buy "shares" of the solar project in exchange for receiving the benefits. *Id.* at 8, 18, and 27 (discussing models of financing and participation).

[25] *See infra* notes 106–110 and accompanying text. Although community solar can provide opportunities for low-income households to participate in and

adopted reactionary policies that tend to stifle all consumer participation. For example, regulators have suspended net metering programs, partly out of fear that net metering may unfairly impact low-income ratepayers, although the economic impacts of net metering are contested.[26] While net metering could shift costs towards low-income ratepayers, or at least interfere with the cross-subsidies provided in most utility rate structures, if net metering programs were more expansive[27] evidence suggests that net metering could provide many benefits—in the form of pollution

receive benefits from solar power, many low-income ratepayers lack the resources to buy shares of a community solar array. While states may require community solar developers to obtain a minimum amount of participation from low-income households, both the economic and the logistical hurdles associated with recruiting participants and developing the solar arrays have impeded low-income households' participation in community solar projects. *See* LOTUS ENGINEERING & SUSTAINABILITY, LLC, ANALYSIS OF THE FULFILLMENT OF THE LOW-INCOME CARVE-OUT FOR COMMUNITY SOLAR SUBSCRIBER ORGANIZATIONS 16–21 (2015), https://www.colorado.gov/pacific/sites/default/files/atoms/files/Low-Income%20Community%20Solar%20Report-CEO.pdf (evaluating Colorado's low-income solar program and identifying several programmatic hurdles).

[26] *See, e.g.*, Lincoln L. Davies & Sanya Carley, *Emerging Shadows in National Solar Policy? Nevada's Net Metering Transition in Context*, 30 ELECTRICITY J. 33 (2017), https://ssrn.com/abstract=2875878; Ari Peskoe, *Unjust, Unreasonable, and Unduly Discriminatory: Utility Rates and the Campaign Against Rooftop Solar*, 11 TEX. J. OIL GAS & ENERGY L. 211, 289–96 (2016) (describing the cost-shifting argument as a distraction and criticizing regulatory responses); Benjamin Storrow, *Is Nev. Poised to Change Course on Net Metering?*, CLIMATEWIRE (Nov. 1, 2016), http://www.eenews.net/climatewire/stories/1060045090/ (discussing Nevada, the "poster child" for the debate on net metering); Rule, *supra* note 22 (explaining how utility companies claim that net metering is "unfair" and it has a potential for "income-regressive" effects, but ultimately contests these claims).

[27] *See* Thompson, *supra* note 17, at 282–85 (describing how rate design traditional created cross-subsidization between ratepayer classes); Jon Wellinghoff & James Tong, *Wellinghoff and Tong: A Common Confusion Over Net Metering is Undermining Utilities and the Grid: 'Cost-Shifting' and 'Not Paying Your Fair Share' are Not the Same Thing*, UTIL. DIVE (Jan. 22, 2015), http://www.utilitydive.com/news/wellinghoff-and-tong-a-common-confusion-over-net-metering-is-undermining-u/355388/ (explaining how net metering may interfere with the cross-subsidies). *But see* Peskoe, *supra* note 26 (stating the cost-shifting claims are overblown).

reduction, deferred investment in new infrastructure, and ancillary services[28]—to all ratepayers, including low-income ones.[29] Nonetheless, several regulators have imposed restrictions on net metering that seem counter-productive.[30] Most jurisdictions have failed to develop a strategy for ensuring that low-income consumers can participate in and benefit from the changing energy markets.

To address these shortcomings, this paper recommends a more deliberative approach to providing low-income communities better access to the emerging clean energy economy. First, this paper recommends that states develop strategies that would apply statewide, citywide, or at the utility level to ensure that low-income communities are integrated into the energy transition underway. Second, once a plan is in place, states should assign specific organizations responsibility for providing low-income communities resources, services, and access to the clean energy economy. Third, to facilitate this access, states should provide financial resources for the low-income energy service providers to purchase equipment in bulk and install resources in a strategic manner that will lower soft costs. Finally, states should also ensure sustained funding for programs that will enable low-income households to be continuous participants in, and beneficiaries of, the ongoing energy transition.

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[28] "Ancillary services maintain electric reliability and support the transmission of electricity." FEDERAL ENERGY REGULATORY COMMISSION, ENERGY PRIMER: A HANDBOOK OF ENERGY MARKET BASICS, at 55 (2015), https://www.ferc.gov/market-oversight/guide/energy-primer.pdf.

[29] Rule, *supra* note 22, at 137–38 (arguing that net metering and other utility policies that promote renewable energy development may mitigate disproportionate impacts that low-income communities face due to their proximity to polluting energy sources); Davies & Carley, *supra* note 26, at 5–7 (explaining how Nevada regulators disregarded a study showing that net metering would bring grid-wide benefits and lower costs); Peskoe, *supra* note 26, at 277 (discussing multiple benefits).

[30] Rule, *supra* note 22, at 138 (stating that reforming net metering on account of wealth distribution impacts is generally inefficient and undesirable); Peskoe, *supra* note 26 at 277–98 (arguing that the focus on cross-subsidization is misdirected and that policy reforms that stifle distributed solar development, such as net metering limitations, undermine competition and necessary reforms in the electricity system).

Part II of this paper provides a short overview of the current state and federal policies and the technological innovations that have enabled energy consumers to become electricity service providers. Part II also explores ways in which electricity markets may continue to evolve and create increasing opportunities for electricity prosumers. Part III describes some of the risks that the evolving electricity system presents to low-income consumers who already face an undue energy and transportation burden. As this part describes, some policymakers have recognized these risks and pursued progressive policies to provide low-income households access to clean energy resources. Other regulators, however, have responded to low-income needs by pursuing regressive policies that will stifle continued development of a clean energy system. Part IV argues for a more comprehensive set of measures that will enable low-income households to be part of a more inclusive energy transition through planning, designated low-income energy providers, and access to affordable clean energy systems. Finally, Part V concludes that a more inclusive energy transition is feasible, but will require planning and strategy to succeed.

II. RENEWABLE ENERGY REGULATION, INNOVATION, AND THE RISE OF "PROSUMERS"

For the past several years, the energy system has been in the midst of disruption as renewable energy technologies and state and federal policies have made a transition away from fossil fuels increasingly viable.[31] These technologies and policies have also altered customers' relationships with the energy system.[32] Although utilities continue to supply the vast majority of energy services in the United States, a growing number of energy consumers today produce energy as well. Multiple factors have led to the rise of energy prosumers, including state and federal policies that encourage utility customers to generate their own power and reduce consumption on demand and technological innovations that

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[31] *See* Boyd, *supra* note 10 (discussing customers' interests in realizing the benefits of disruptive technologies).

[32] *Id*. (discussing customers' interests in realizing the benefits of disruptive technologies).

have enabled much broader participation in energy markets at much lower costs.[33] As technologies for energy storage and electric vehicles continue to improve and costs come down, it seems likely that even more prosumers will seek participation in a dynamic energy system.[34] This section will highlight the key laws and technological innovations that have enabled and will likely accelerate changes in energy markets.

A. Generation

Electricity generation was once considered the near-exclusive domain of large utility providers.[35] The central power station model embraced by U.S. electricity regulators and utilities allowed a small number of utilities to own and operate each component of the electricity system—from generation to distribution—through vertically integrated monopolies.[36] For nearly one hundred years, electricity service was a one-way transaction from utilities to consumers.[37]

The passage of the Public Utility Regulatory Policies Act ("PURPA")[38] in 1978, followed by the enactment of the nation's first net metering programs in the early 1980s,[39] began to change the electricity system. PURPA opened electricity generation to

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[33] Graffy & Kihm, *supra* note 11, at 5–6 (discussing declining costs of solar and wind power technologies and the proliferation of the state renewable portfolio standards); Sharon Jacobs, *The Energy Prosumer*, 43 ECOLOGY L.Q. 519, 527, 531–32, 534 (2016) [hereinafter Jacobs, *Energy Prosumer*] (discussing declining costs of solar and storage and policies that support demand response and net metering).

[34] Boyd, *supra* note 10, at 1699–1701.

[35] *Id*. at 1628–29.

[36] *Id*. at 1629–30.

[37] *Id*. at 1628–30; *see* Amy Stein, *Distributed Reliability*, 87 U. COLO. L. REV. 887, 907–09 (2016).

[38] Pub. L. No. 95–617, 92 Stat. 3117 (1978) (codified as amended at 16 U.S.C. §§ 2601–2645 (2012)).

[39] *See* Harvey L. Reiter & William Greene, *The Case for Reforming Net Metering Compensation: Why Regulators and Courts Should Reject the Public Policy and Antitrust Arguments for Preserving the Status Quo*, 37 Energy L.J. 373, 376 (2016) (tracing net metering tariffs to 1980 and stating that the first net metering law was passed in 1983).

new providers.[40] It also allowed cogeneration facilities that were customers of the utilities to sell their excess power production to the utilities,[41] creating the first class of utility "prosumers." Net metering laws expanded the opportunities for prosumers by allowing utility customers to pay only for their net energy usage, measured by discounting the amount of energy customers delivered to the utility from the amount they received.[42] Customers that were able to produce their own electricity through wind, solar, and other designated sources could thereby avoid paying for each unit of electricity delivered by the utility to the customers.[43] Although this incentive did not immediately spur significant interest in renewable energy development by utility customers, it paved the way for the future prosumer movement.

In the 2000s, net metering—in combination with federal tax credits, state renewable portfolio standards, and state subsidies—finally spurred a notable uptick in renewable energy production by utilities' customers.[44] Since then, rapid technological advances and mass production of solar panels have allowed hardware costs for solar arrays to drop substantially.[45] The combination of lower costs and subsidies has also opened solar development to third-party solar providers, who rely on net metering to make solar more affordable for customers, shared by both the third parties and utilities.[46] Net metering thus became a critical tool in promoting rooftop and distributed solar development.[47] Indeed, net metering became such an important incentive that the utilities' trade association, the Edison Electric Institute, warned it could lead to a utility death spiral if increasing numbers of utility customers

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[40] Joe Tomain, *The Past and Future of Electricity Regulation*, 32 ENVTL. L. 435, 451 (2002).

[41] *Id*.

[42] Rule, *supra* note 22, at 118.

[43] *See id.*

[44] Sanya Carley, *The Era of State Energy Policy Innovation: A Review of Policy Instruments*, 28 REV. OF POL'Y RES. 265, 273–75 (2011).

[45] Jacobs, *Energy Prosumer*, *supra* note 33, at 527.

[46] Boyd, *supra* note 10, at 1677; JASON COUGHLIN ET AL., U.S. DEPT. OF ENERGY, A GUIDE TO COMMUNITY SOLAR: UTILITY, PRIVATE, AND NON-PROFIT PROJECT DEVELOPMENT 3 (2010), http://www.nrel.gov/docs/fy11osti/49930.pdf.

[47] Rule, *supra* note 22, at 118.

became energy producers.[48] While reports of utilities' deaths may be exaggerated, there is little dispute that net metering has stirred concerns about the viability of the traditional utility business model.[49]

B. Demand Response

As with customer generation of electricity, demand response programs date back to at least the 1970s, but have recently become more popular for utility customers as new technologies and payment structures have developed.[50] Demand response programs are simple in concept; they either charge electricity customers higher rates during peak periods to incentivize load reduction or they pay electricity consumers directly to reduce their load upon request.[51] Demand response programs have grown in size and scope, and demand response providers (that is, utilities' customers) may now receive incentive payments in both retail and wholesale markets.[52] What's more, through programs developed by the Federal Energy Regulatory Commission ("FERC") and regional transmission operators, particularly the Pennsylvania, Jersey, Maryland Power Pool ("PJM") Interconnection, demand response providers may now bid demand response into separate energy, capacity, and ancillary service markets.[53] With the Supreme Court's blessing of wholesale demand response programs,[54] and increased interest by many utility customers seeking to benefit from participating in demand response programs, demand response is on the cusp of becoming another major energy service provided by utilities' own customers.[55]

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[48] Peter Kind, EDISON ELEC. INST., DISRUPTIVE CHALLENGES: FINANCIAL IMPLICATIONS AND STRATEGIC RESPONSES TO A CHANGING RETAIL ELECTRIC BUSINESS 3–5 (2013), http:// www.eei.org/ourissues/finance/Documents/disruptivechallenges.pdf.

[49] Boyd, *supra* note 10, at 1677.

[50] Jacobs, *Bypassing Federalism, supra* note 14, at 895–900.

[51] *Id.* at 897.

[52] *Id.* at 897–98.

[53] *Id.* at 927.

[54] FERC v. Elec. Power Supply Ass'n, 136 S. Ct. 760 (2016).

[55] Stein, *supra* note 37, at 926–30.

Technological innovations have opened demand response programs to many more participants who can decrease their load through small changes in electricity use.[56] Historically, only large customers had the capacity to implement demand response. However, smart energy meters and digital communication systems now allow utilities to communicate with an array of electrical devices, including residential hot water heaters and air conditioners.[57] This communication allows utilities to make subtle adjustments in the appliances' operations and related power consumption.[58] In exchange for allowing utilities such access, utilities' customers may receive payments for participating in demand response.[59] On a much larger scale, third-party demand response aggregators may now bid into competitive wholesale markets to attempt to lower system-wide energy use and market clearing prices during peak consumption periods.[60] If the aggregated demand response bid clears the market, retail sales of power will drop for utilities that would otherwise serve that load. While these innovations will help maintain overall grid reliability and lower prices, they reduce utilities' overall sales and could, like net metering, have disruptive impacts on the utilities' business model.

C. *Storage and Electric Vehicles*

Although electricity storage and the integration of electric vehicles into a dynamic electricity grid are in early stages, improved technologies and lower costs make it likely that many utility customers will soon be able to sell new grid management services to electric utilities. As the costs of storage technologies decline, residential ratepayers will be able to provide more ancillary services for themselves and the grid.[61] Electric vehicles

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[56] Joel B. Eisen, *Distributed Energy Resources, "Virtual Power Plants," and the Smart Grid*, 7 ENVTL. & ENERGY L. & POL'Y J 191, 205–208 (2012).

[57] *Id.*

[58] *Id.*

[59] Stein, *supra* note 37, at 930 (discussing demand response programs for swimming pool pumps).

[60] Jacobs, *Bypassing Federalism, supra* note 14, at 900; FERC v. Elec. Power Supply Ass'n, 136 S. Ct. 760, 770 (2016).

[61] Stein, *supra* note 37, at 916–26.

could help ensure that wind power produced at night can be put to good use or stored for use during daylight and peak periods, when energy prices are higher.[62] When combined with smart communication devices, electric vehicle charging programs could enable vehicle owners to charge their batteries when prices are low or to even be paid when they take power from the grid during "oversupply" periods when generation exceeds load.[63] As storage and electric vehicle technologies improve, it is only a matter of time before enterprising third parties or energy regulators create new payment structures that will incentivize utility customers to become storage and grid management service providers.

D. The Multiple Economic Benefits to Clean Energy Market Participants

Utility customers who participate in net metering, demand response, or emerging storage and ancillary service programs receive several economic benefits. First, and most obviously, they receive payments from the utilities (and thus other utility customers) whenever they provide the desired electricity service. Although direct payments for some services can be relatively low, they can amount to meaningful economic benefits when combined with subsidies and other compensatory systems. Net metering, for example, effectively allows participants to receive some retail electricity service for free or at deep discounts.[64] Although net metering participants must make initial investments in solar arrays or batteries, federal and state tax credits offset some of the upfront price and provide a shorter payback period for net metering customers.[65] Demand response operates under a similar design, in that participants who enroll in demand response programs may have to make initial investments in smart meters, but they then

[62] Lamble, *supra* note 15, at 198–204. *But see* Stein, *supra* note 37, at 934 (noting that vehicle owners may not always be willing to provide grid management services if personal vehicle needs outweigh the benefits provided by a utility).

[63] Lamble, *supra* note 15, at 198–204.

[64] Scott, *supra* note 13, at 355.

[65] Powers, *supra* note 13, at 638–39. Kayci G. Hines, *Solar Shift: An Analysis of the Federal Income Tax Issues Associated with the Residential Value of Solar Tariff*, 5 ARIZ. J. ENVTL. L & POL'Y 388, 390 (2015).

benefit both by paying less for retail power consumption and by receiving payments for their negawatts.[66] Storage and electric vehicle integration programs will presumably operate similarly. Thus, new energy markets create economic incentives for those who have the capital to invest in the technology necessary to participate in these markets.

Beyond those direct incentives, participation in clean energy programs usually creates attendant benefits, including higher property values, local jobs, and improved air quality.[67] According to the Lawrence Berkeley Laboratory, rooftop solar increases property values.[68] Electric vehicle advocates argue that vehicle charging stations have a similar economic benefit, at least for commercial properties.[69] Both solar arrays and electric vehicle charging systems are signs of affluence, and they could thereby increase values of the specific properties on which they are located, as well as neighborhood property values.[70] Installation of distributed resources could also bring jobs to low-income neighborhoods.[71] Finally, electric vehicles also provide direct air quality benefits by eliminating emissions from vehicles run on fossil fuels.[72] While the direct air pollution benefits of distributed solar depend on whether solar arrays are offsetting localized emissions, distributed solar could also improve air quality.[73] Since participation in clean energy programs requires an initial outlay of capital, however, many low-income communities receive none of the direct and attendant benefits clean energy programs offer. The next section explores this dynamic.

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[66] Jacobs, *Bypassing Federalism, supra* note 14, at 887.

[67] Behles, *supra* note 23, at 44–45.

[68] Alan Chen, *Berkeley Lab Illuminates Price Premiums for U.S. Solar Home Sales*, BERKELEY LAB (Jan. 13, 2015), http://newscenter.lbl.gov/2015/01/13/berkeley-lab-illuminates-price-premiums-u-s-solar-home-sales/.

[69] Behles, *supra* note 23, at 44–45.

[70] *Id*.

[71] *Id*.

[72] *Id*.

[73] Uma Outka, *Environmental Justice Issues in Sustainable Development: Environmental Justice Issues in the Renewable Energy Transition*, 19 J. ENVTL. & SUSTAINABILITY L. 60, 117–19 (2012).

III. THE RISK OF AN UNJUST ENERGY TRANSITION

Many low-income electricity customers have few viable opportunities to participate in clean electricity markets or to otherwise benefit financially from the clean energy transition.[74] To access the emerging clean energy markets, utility customers must have the resources to invest in the metering, storage, renewable generation, or demand response technologies that enable utility customers to serve as producers.[75] Many low-income customers, however, lack access to necessary capital or the resources to procure, install, and deploy innovative energy technology.[76] Indeed, many low-income households already face disproportionate energy and transportation burdens,[77] and it is highly unlikely that they will have access to the resources necessary to enable them to build rooftop solar, buy electric vehicles, or install smart meters. Without access to capital and services that could enable streamlined installation of clean and smart energy facilities, low-income customers will continue to be left out of the transitioning energy market.

Recognizing these risks, some regulators have responded to the potential disproportionate impacts of the prosumer movement by embracing community solar as a tool to increase low-income access to renewable resources.[78] Other regulators have responded to concerns about disproportionate effects by eliminating net metering programs or imposing extremely high net metering participation charges.[79] Neither approach is adequate. While community solar programs allow increased access to clean energy

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[74] Thompson, *supra* note 17, at 268.
[75] *Id*. at 267–68.
[76] *Id*. at 292.
[77] *Id*. at 268–70.
[78] *Id*. at 290–91; *see also* Electricity: Green Tariff Shared Renewables Program, S.B. 43, 2013 Gen. Assemb., Reg. Sess., § 2833(d)(1)(A)(ii) (Cal. 2013) (requiring 100 MW of the program's capacity to be located in "disadvantaged communities," including areas with "socioeconomic vulnerability."). In Colorado, solar developers must allocate at least five percent of subscriber shares to low-income participants. Community Solar Gardens Act, H.R. 10-1342, 67th Gen. Assemb. (Colo. 2010); 4 COLO. CODE REGS. § 723-3.3665(d)(IV) (2017).
[79] *See* Thompson, *supra* note 17.

systems, they are unlikely to provide benefits to large numbers of low-income communities. Eliminating clean energy programs in the name of low-income communities is a cynical strategy that only deprives low-income households of access to clean energy benefits. Smarter strategies are necessary to enable low-income households to benefit from the current energy transition. Otherwise, households and communities with high energy and transportation burdens may remain trapped in an electricity system that has failed to protect them from energy insecurity or to help lift them out of poverty.

A. Low-Income Energy and Transportation Burdens

Low-income communities and households in the United States face a higher energy and transportation burden than their middle- and upper-income counterparts.[80] The terms "energy burden" and "transportation burden" refer to the percentages of a household's income spent on energy and transportation.[81] As the wealth gap in the United States has grown, so has the disproportionate energy and transportation burden borne by low-income households.[82]

In comparison to middle- and upper-income ratepayers, who spend 1-5% of their annual income on household heat and energy, low-income ratepayers spend 6-30%.[83] According to a 2016 survey by the American Council for an Energy Efficient Economy ("ACEEE"), in metropolitan areas alone, the median low-income household's energy burden was 7.4%, but some cities had low-income residents with energy burdens as high as 25%.[84] In

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[80] *Id.* at 269.

[81] *Id.*

[82] *See* THE PEW CHARITABLE TRUSTS, HOUSEHOLD EXPENDITURES AND INCOME: BALANCING FAMILY FINANCES IN TODAY'S ECONOMY (2016), http://www.pewtrusts.org/~/media/assets/2016/03/household_expenditures_and_income.pdf.

[83] Thompson, *supra* note 17, at 269.

[84] ARIEL DREHOBL & LAUREN ROSS, AM. COUNCIL FOR ENERGY-EFFICIENT ECON., LIFTING THE HIGH ENERGY BURDEN IN AMERICA'S LARGEST CITIES: HOW ENERGY EFFICIENCY CAN IMPROVE LOW INCOME AND UNDERSERVED COMMUNITIES 3 (2016), http://energyefficiencyforall.org/sites/default/files/Lifting%20the%20High%20Energy%20Burden_0.pdf.

comparison, the median energy burden for higher income households was about 2.3%.[85]

Low-income households also face disproportionate transportation costs.[86] In comparison to middle- and upper-income households, who spent 11.2% and 8.2%, respectively, on transportation in 2014, low-income households spent 15.7%.[87] This percentage represented a significant increase over prior years, when low-income transportation expenditures accounted for 9.5-10.5% of household income.[88] Higher gasoline expenditures are the primary cause of the increased transportation burden.[89] If gasoline prices spike, low-income communities will be particularly hard hit.

High energy and transportation burdens account for only some of the problems facing low-income households. According to The Pew Charitable Trusts, low-income households had much less financial slack in their budgets in 2014 in comparison to 2004.[90] Indeed, the median low-income household in 2014 had an income shortfall of approximately $2,400, indicating that low-income households were going into debt to meet basic living expenses.[91]

Quite obviously, low-income households have little-to-no capacity to make the upfront investments in solar arrays, smart meters, or electric vehicles to participate in the growing clean energy markets.[92] So long as access to capital is a condition of participation in these markets, low-income communities will be left behind. To address these concerns, regulators have pursued various strategies that include curtailing clean energy incentive programs for middle- and upper-income ratepayers and expanding access to clean energy resources through community solar programs.[93] As the next two sections indicate, neither approach has worked very well. However, more holistic solutions pursued by

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85 *Id.* at 3–4.
86 THE PEW CHARITABLE TRUSTS, *supra* note 82, at 8.
87 *Id*.
88 *Id.*
89 *Id.* at 9.
90 *Id.* at 11.
91 *Id.*
92 Thompson, *supra* note 17, at 292.
93 *Id.* at 281.

some states, as described in Part IV, could provide much better results.

B. Death Spirals and Regulatory Overreactions

Interest in low-income access to clean energy programs has increased substantially as participation in net metering has grown. Electric utilities and some regulators fear that net metering could substantially reduce the revenues utilities collect from higher-income customers who have the ability to invest in solar arrays and other clean energy technology.[94] Under traditional electricity rate design, wealthier customers typically pay higher rates that are designed to subsidize low-income energy assistance programs.[95] Net metering threatens to undo some of this cross-subsidization, however, because it incentivizes ratepayers with high rates to install solar arrays and offset some amount of their retail electricity consumption.[96] In places where customers also pay time-of-use rates, net metering creates an even greater incentive for them to defect from the utility by producing solar power during peak periods.[97] If enough customers who have the ability to pay for solar arrays participate in net metering, utilities fear that costs for non-participants will have to rise.[98] Higher rates will increase the incentives for another wave of customer participation in net metering and lead to more price hikes for non-participants.[99] If the cycle continues, a death spiral could result, in which only low-income customers are left without an ability to pay for utility services.

Although claims that net metering may erode cross-subsidization and lead to a death spiral are likely overblown, and although net metering caps and price adjustments have already minimized the risk of a death spiral caused by net metering,[100] regulators in some states have used concerns about the

[94] Peskoe, *supra* note 26.
[95] Wellinghoff & Tong, *supra* note 27.
[96] *Id.*
[97] Kind, *supra* note 48, at 4.
[98] *Id*. at 5, 13.
[99] *Id.*
[100] Peskoe, *supra* note 26.

disproportionate impacts of net metering on low-income ratepayers to justify the evisceration of net metering programs. In Nevada, for example, the state public utility commission ("PUC") effectively eliminated net metering by (1) requiring all net metering participants to pay a monthly fixed cost that will be approximately three times the fixed costs for non-participants and (2) reducing the payments net metering customers receive for the electricity they sell to utilities by about 80 percent.[101] To justify its decision, the Nevada PUC relied on utility cost estimates that indicated that net metering was creating an unfair subsidy for net metering customers at the expense of other ratepayers.[102] The PUC also rejected independent analyses that showed that net metering was providing grid-wide benefits for all customers.[103] From the PUC's perspective, only a few privileged customers were benefitting from net metering at the expense of less-privileged ones.[104] To avoid this seemingly unfair result, the Nevada PUC effectively eliminated net metering in the state.

While the PUC's decision may have been motivated by a desire to protect low-income ratepayers from price spikes, the PUC never considered ways in which a different regulatory or pricing structure could provide new benefits to low-income participants. In the traditional utility rate design model, low-income customers may benefit from reduced rates, but they rarely benefit from programs that are designed to provide new opportunities and access to new markets. The PUC's decision reflects this approach. Indeed, by eliminating net metering in the state, the decision weakened Nevada's clean energy market and the benefits it could provide to ratepayers of all economic levels.[105]

C. *Community Solar to the Rescue?*

On the other end of the spectrum, low-income and renewable energy advocates have sought to expand access to renewable

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[101] Davies & Carley, *supra* note 26, at 7–10.
[102] *Id.* at 8–9.
[103] *Id.* at 5–7.
[104] *Id.* at 9–10.
[105] *Id.* at 10–13.

energy benefits through community solar programs.[106] Community solar has multiple meanings, but it frequently refers to a program in which participants can buy or receive "shares" of an offsite solar array in exchange for receiving electricity from that array.[107] Participants then use the solar power to offset their retail electricity consumption through a virtual net metering transaction. Since funding for the community solar array comes from multiple participants—and is frequently provided or supplemented by subsidies, grants, and donations—community solar potentially provides opportunities for low-income households to participate in and benefit from clean energy development and markets.[108]

Community solar may provide several benefits to low-income communities, but broad access to the evolving energy markets is unlikely to be one of them. Community solar projects may help raise neighborhood property values and potentially attract other clean energy projects into the neighborhood.[109] If these projects reduce the use of fossil fuels in the neighborhood, the community at large will benefit from improved air quality. However, to the extent community solar is seen as a way to provide direct economic benefits to low-income households, most community solar programs fall short. The majority are not focused on providing low-income access to lucrative energy markets, and programs with low-income carve-outs face many impediments.[110] Even if programs successfully attract substantial participation from low-income households, this will not necessarily yield direct financial benefits for these participants; depending on the size of the solar array and the number of participants, the division of the net metering rights into distinct shares may substantially diminish the value of net metering for each individual participant. Thus, while community solar may enable some low-income households to participate in a limited clean energy program, community solar

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[106] Thompson, *supra* note 17, at 290–91; Behles, *supra* note 23, at 45–47.
[107] FELDMAN ET AL., *supra* note 24.
[108] Thompson, *supra* note 17, at 290–91; Behles, *supra* note 23, at 45–47.
[109] Behles, *supra* note 23.
[110] *See* LOTUS ENGINEERING & SUSTAINABILITY, LLC, *supra* note 25 (evaluating Colorado's low-income solar program and identifying several programmatic hurdles).

is not on its own an effective strategy for expanding new energy markets to low-income communities.

And yet, as tepid a program as community solar may be, it represents one of the only common strategies aimed at actually expanding clean energy markets and benefits to low-income communities. Very few programs consider strategies to increase low-income access to energy storage, electric vehicles, or demand response programs. This is in part because these technologies and the markets to support them are just developing. In addition, the financial resources necessary to provide low-income access to these clean energy systems are significant. Without a plan to expand access, however, low-income households will remain vulnerable to increasing energy and transportation burdens, even as wealthier ratepayers learn how to profit from the clean energy transition.

IV. RECOMMENDATIONS FOR A MORE INCLUSIVE ENERGY TRANSITION

Expanding low-income access to a clean energy system will require the development of a strategy, designation of low-income clean energy providers, bulk purchase and deployment projects, and sustained funding for low-income programs. Rather than view low-income households as perpetual recipients of lifeline rates, state planners and renewable energy advocates should begin to envision a future energy system in which low-income households are no longer reliant on expensive fuels and cross-subsidization through rate design. With the right plan and implementation strategy, low-income households can become equal and productive participants in a clean energy transition. This section briefly sketches out the key steps to developing a more inclusive energy transition.

First, states must develop plans based on the idea that clean and advanced energy technologies will displace fossil fuel resources in all communities. Until regulators and planners embrace a transition to 100% clean energy, they will not have the capacity to envision equitable access to clean energy resources. Once they do envision an inclusive transition, state regulators must then develop a strategy for prioritizing low-income acquisition of clean energy technologies and systems. Much as a state might design its long-term transportation or land use strategies, an inclusive energy transition strategy would establish end goals, identify the strategies and tactics to achieve those goals, identify potential obstacles and tactics to overcome them, and establish clear, enforceable steps to implement the strategy.

Second, states should establish or designate specific providers who will provide low-income households and communities clean energy services.[111] States may assign this role to existing utilities, state agencies, non-profit organizations, or other entities that have the skill and capacity to provide specialized services to low-income communities. Third-party organizations may be best suited to this task, as some existing models demonstrate. In California, for example, the non-profit organization GRID Alternatives has a contract with the state to provide rooftop solar development to low-income communities.[112] Not only has this model successfully increased low-income solar access, it has also lowered participants' monthly electricity bills by approximately 80 percent.[113] In Washington, D.C., city leaders created a separate utility, the D.C. Sustainable Energy Utility, to administer an Affordable Solar Program and install rooftop solar on homes owned by low-income residents.[114] In 2012, the program helped install nearly ninety rooftop arrays.[115] In 2015, the Sustainable Energy Utility installed 137 solar arrays on low-income houses, accounting for thirty percent of all solar deployment in

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[111] *See* Jan Ahlen, *The Consumer-Centric Utility*, 154 No. 7 PUB. UTIL. FORT. 24, 26–27 (2016) (discussing various models of designated providers).

[112] *About SASH*, GRID ALTERNATIVES, http://gridalternatives.org/what-we-do/solar-programs/single-family-solar/sash?_ga=1.135369969.1575050414.1490702572 (last visited Mar. 26, 2017).

[113] George L. Nichols & Stanley L. Greschner, *D.C. Sustainable Energy Utility, Successful Solar Incentive Programs Grow Solar Penetration Within Low-Income Communities #203*, 2 *in* 42ND ASES NATIONAL SOLAR CONFERENCE (2013), http://toc.proceedings.com/21494webtoc.pdf.

[114] *Id*. at 6.

[115] *Id.*

Washington, D.C.[116] The successes of these third-party organizations indicate that low-income households may benefit from this third-party model. Alternatively, if states assign existing utilities the role of providing clean energy services to low-income communities, states should create clear regulatory requirements and oversight protocols to ensure that utilities are meeting expectations. As the data on energy burdens illustrate,[117] the utility system has not always served low-income communities effectively, and utilities should receive authorization to provide low-income clean energy services only if the utilities can deliver. Whichever model the state employs, it should make sure that low-income providers have adequate training and capacity to deliver clean energy services to low-income markets.

Third, states should finance bulk purchasing and deployment projects to reduce equipment and soft costs.[118] Replacing traditional energy sources, gasoline-powered vehicles, and outdated appliances with the equipment necessary to enable an inclusive energy transition will be an expensive endeavor. It will also take significant development resources. States can minimize these costs through bulk purchasing programs and strategic development programs that take advantage of economies of scale.[119] States should enact laws that require any new homes and buildings that receive low-income financial assistance to be built with solar arrays, smart meters, and electric vehicle charges already in place.[120] This will rapidly accelerate low-income access to this hardware and reduce installation and permitting expenses associated with retrofits.

[116] D.C. SUSTAINABLE ENERGY UTILITY, ON THE MAP: HELPING DC LEAD IN SUSTAINABILITY, 2015 ANNUAL REPORT 12 (2015), https://www.dcseu.com/docs/about-us/DCSEU-FY2015-Annual-Report.pdf.

[117] *See infra* notes 80–93.

[118] *See* NICK LAWTON, GREEN ENERGY INST., SHRINKING SOLAR SOFT COSTS: POLICY SOLUTIONS TO MAKE SOLAR POWER ECONOMICALLY COMPETITIVE 33 (Apr. 2014), https://law.lclark.edu/live/files/17499-shrinking-solar-soft-costs.

[119] NICK LAWTON, GREEN ENERGY INST., SOLAR BUILDING STANDARDS: HOW AMERICAN CITIES CAN LAY FOUNDATIONS FOR A NEW GENERATION OF SOLAR DEVELOPMENT 8 (Jan. 2015), https://law.lclark.edu/live/files/18782-solar-building-standards-how-american-cities-can.

[120] *See id.* at 31 (discussing the benefits of equipment mandates).

Finally, states should create and support a dedicated low-income program to provide consistent resources to support an inclusive energy transition. Many low-income energy assistance programs provide intermittent and inadequate resources.[121] Without adequate and sustained funding, staffing, and other resources, low-income households will not have the capacity to participate in the energy transition. State planners should therefore develop programs that ensure steady access to capital and other necessary resources.

V. CONCLUSION

The transition to a clean energy system threatens to leave low-income communities, who already face disproportionate energy and transportation burdens, further behind. To avoid this outcome, regulators should begin planning for a comprehensive and inclusive energy transition. Not only will a strategic approach help ensure that low-income communities have priority access to clean energy technologies, it will also accelerate the country's transition to carbon-free energy sources.

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[121] Thompson, *supra* note 17, at 271–73.