Addressing Barriers to Low-Income Access to Residential Solar in Bennington County

Josh Kirschner
Energy Equity Intern
Bennington County Regional Commission
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Introduction:

A leader in national climate and energy policy, Vermont has committed to an ambitious set of goals to transform the state's energy and environmental footprint by 2050. In the "2022 Vermont Comprehensive Energy Plan", the state sets a goal of meeting 90% of energy needs across all end sectors through renewables sources by 2050.[1] In Bennington County, current energy goals reflect this statewide ambition. The "Bennington County Regional Energy Plan" calls for the county to phase out fossil fuels entirely and scale up renewable and electric alternatives by 50% before 2050.[2] Yet there is also an awareness that in order to reach its goals, the state must seek equitable avenues. Vermont has some of the highest energy costs in the country. These high expenditures, while manageable for wealthy residents, disproportionately affect those of low to moderate income (LMI) who spend a greater share of their income on energy. Meanwhile, programs intended to lower costs and aid in the energy transition support wealthy Vermonters while remaining inaccessible for LMI residents. Even programs that are targeted towards these communities are limited by unforeseen challenges. Thus, efforts to lower residential energy usage must also take care to reach LMI households and help alleviate the economic pressure.

This report will seek to analyze how current programs and regulatory structures support or prevent LMI access to solar energy. We will explore this topic for two reasons. The largest source of in-state renewable energy, solar energy is a central component of state and county energy plans. Meanwhile, photovoltaic (PV) systems carry significant environmental and financial benefits that LMI residents oftentimes miss out on. Understanding why uptake remains elusive for LMI households is crucial for ensuring that energy goals are achieved in an equitable fashion.

In this report, first, available data from the American Community Survey (ACS) will be used to diagnose disparities in energy access and costs among Bennington County households. Next, we will describe the landscape of offerings for residential solar, making note of costs and incentives, as well as income-based disparities in uptake. Afterwards, the report will outline potential barriers to access, before exploring models and recommendations that can be used to overcome these obstacles. In doing so, this report will offer tools for developing multi-stakeholder approaches to supporting low-income access to solar energy in Bennington County.

Vermont/Bennington Energy Profile

As previously mentioned, Vermont experiences relatively high fuel costs. Using data from the 2020 American Community Survey (ACS), statewide, the estimated average annual energy cost is approximately $2902.20.[3] In Bennington County, the estimated average annual

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[1] Vermont Department of Public Service, *2022 Comprehensive Energy Plan,* January 2022, https://publicservice.vermont.gov/sites/dps/files/documents/2022VermontComprehensiveEnergyPlan_0.pdf, 25.
[2] Bennington County Regional Commission, *Bennington County Regional Energy Plan*, March 2017, http://www.bcrcvt.org/uploads/1/1/1/8/111899771/bcrcenergyplan_march2017.pdf, 43.
[3] U.S. Census Bureau, 2020 American Community Survey 5-year Estimates Microdata, generated by Josh Kirschner; using data.census.gov <https://data.census.gov/cedsci/>

energy cost is slightly higher, at $2949.00.[4] Costs range dramatically from a couple hundred dollars to over ten thousand dollars a year.

To better under the effect of these costs, we can use the metric known as energy burden. This statistic calculates total energy cost as a percentage of total household income.[5] This demonstrates how great a strain energy costs are on household financial stability. Statewide, the energy burden is about 10.3%, while in Bennington County, it is an average of 12.1%.[6] This also ranges on a town-by-town basis, with Landgrove and Peru experiencing the lowest burden, and Bennington the highest.[7] According to the Vermont Low Income Trust for Electricity (VLITE), an energy burden greater than 10% is considered fuel poverty.[8] This means that statewide, and in Bennington County, many residents are living in fuel poverty.

Energy Inequity:

Energy burden is not shared equally among Vermont and Bennington County residents. While wealthy households can manage the high fuel costs, low to moderate income households are much more burdened by these expenditures. As a result, LMI households experience significantly higher energy burdens than their wealthy neighbors. An analysis of 2020 ACS data indicates that although county residents in the bottom 20% of income spend the least on energy, they have the highest energy burden.

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[4] U.S. Census Bureau, 2020 American Community Survey 5-year Estimates Microdata; Census microdata allows users to use individual observations to conduct cross-tabulations and other forms of data analysis. However, given the small population size of Vermont and Bennington County, microdata is only available at a Tri-County level rather than for a single county or town. Those three counties are Bennington, Rutland, and Addison. Statistics generated using this data will be referred to as "Tri-County" estimates. Given the relative similarities between the three countries, for the purpose of this report, I assume that county-level estimates are consistent with tri-county level estimates and can be generally equated.

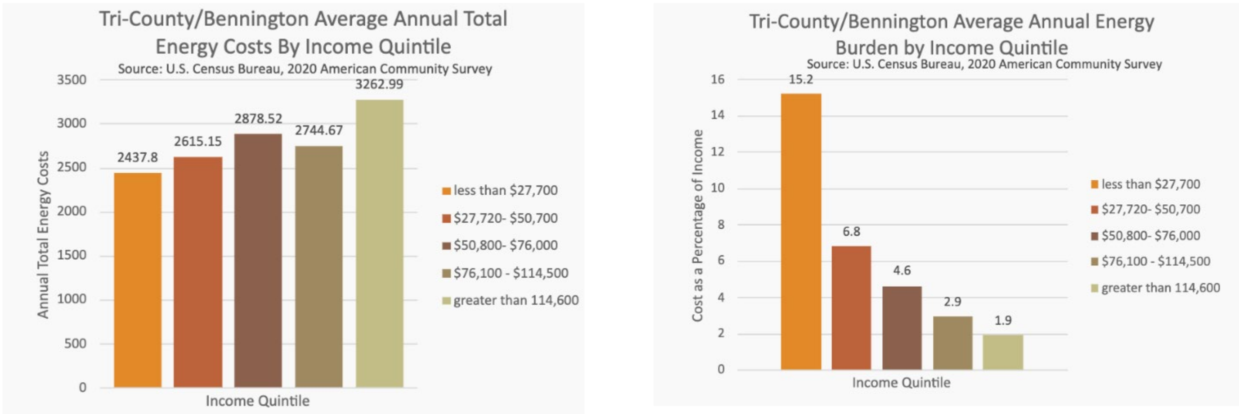
[5] Kelly Lucci and Justine Sears, *Vermont Energy Burden Report*, Efficiency Vermont, 2019, 5.

[6] U.S. Census Bureau, 2020 American Community Survey 5-year Estimates Microdata.

[7] Lucci and Sears, 30-36.

[8] The Energy Security and Justice Program of University of Vermont Law School, *Energy Costs and Burden in Vermont: Burdensome for Whom?,* 2014, 3.

Figure 1 – Estimated Annual Energy Spending and Estimated Annual Energy Burden[9]



As shown above, while the bottom quintile spends about 25% less on energy annually than the top 20%, they spend eight times more of their income on energy costs. This has serious financial implications for these households. With over 15% of their income going to energy, that is money diverted away from other necessities such as food, housing, and healthcare, while also limiting wealth generation and upward mobility.[10] This means that state and local energy programming must be sure to specifically support LMI households and relieve energy burden.

Solar Energy

Introduction:

As Vermont moves away from fossil fuels in order to reach its 2050 climate goals, renewable solar energy will play a crucial role in this transition. As of 2021, the state has 450 MW of installed distributed solar capacity, making it the largest source of in-state renewable energy.[11] This figure is expected to rise rapidly to 600 MW by 2030.[12] For context, during its lifetime, the Vermont Yankee Nuclear Power Plant had a capacity of 620 MW, accounting for 71% of in-state energy generation. Thus, solar energy will take on a substantial share of the state-wide energy load. At a local level, Bennington County is also anticipating a significant increase in solar capacity. While the county only had 17 MW of solar energy in 2017, solar energy will make up most of the new renewable capacity by 2050.[13] In fact, the BCRC energy plan expects capacity to rise an additional 68 to 107 MW by 2050, accounting for 29% of local

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[9] U.S. Census Bureau, 2020 American Community Survey 5-year Estimates Microdata, generated by Josh Kirschner; using data.census.gov <https://data.census.gov/cedsci/>;
[10] Jennah Slayton, *Energy Inequity and Burden in Vermont*, August 2020, 5.
[11] Vermont Department of Public Service, 63,244.
[12] Vermont Department of Public Service 63.
[13] Bennington County Regional Commission, 57.

energy supply.[14]Today, there is between 20-30 MW of capacity in the region, although limited data makes it difficult to make an accurate estimate.[15]

Net Metering:

While the growth in solar capacity can be attributed to the need for renewables and the falling costs of these systems, distributed solar generation has been particularly supported by the Net-Metering (NM) system. As defined by the Vermont Public Utilities Commission (PUC), "Net-metering is the process of measuring the difference between the electricity supplied to a customer by their utility and the electricity fed back to the utility by a customer's electric generation system (such as solar panels) during the customer's billing period".[16] In other words, net-metering is a system in which panel owners are compensated for the energy they produce. Throughout the day, a solar array may produce more energy than a home needs. In this case, that surplus is sent into the larger electrical grid. At other points, the panels produce less than what is needed, and the owners draw from the grid. The net-metering system offers panel owners credit for the electricity they provide for the grid, essentially paying for that power. Those credits offset what is owed to the utility, lowering electricity costs for the owner.

The savings generated by the net-metering system have promoted the development of small distributed solar generation around the state. Roughly 300 MW of solar capacity in Vermont, 2/3 of the total, comes from net-metered systems.[17] Meanwhile, in Bennington County, 8.9 MW of solar capacity has been approved by the PUC for net-metering, while another 4.8 MW is waiting for approval.[18] Net-metering has proved to be a significant incentive.

Table-1: Current Net-Metering Rates as Set by the PUC Biennial Update[19]

Rate category	**Category I (< 15 KW)**	**Category II (15 kW -150 kW on a preferred site)**	**Category III (150 kW-500 kW on a preferred site)**	**Category IV (150 kW-500 kW on a non-preferred site)**
Residential blend (basic rate)	$0.17141/kWh	$0.17141/kWh	$0.17141/kWh	$0.17141/kWh
REC Adjustor	$0.00/kWh	$0.00/kWh	$0.00/kWh	$0.00/kWh

[14] Bennington County Regional Commission, 57.

[15] The Vermont Public Utilities Commission, All Net-Metering Cases, generated by Josh Kirschner; using epuc.vermont.gov < https://epuc.vermont.gov/?q=node/2>; "Energy Atlas," Community Energy Dashboard, accessed August 1, 2022, https://www.vtenergydashboard.org/atlas#solar.

[16] State of Vermont Public Utilities Commission, *Net Metering,* https://puc.vermont.gov/electric/net-metering.

[17] Vermont Department of Public Service,248.

[18] Vermont Public Utilities Commission, Net Metering Cases, generated by Josh Kirschner < https://epuc.vermont.gov/?q=node/95>.

[19] State of Vermont Public Utilities Commission, 2022 *Biennial Update on Net Metering Program,* June 2022, https://puc.vermont.gov/sites/psbnew/files/doc_library/22-0334-inv-biennial-update-order.pdf.

(sell)				
REC Adjustor (keep)	-$.04/kWh	-$.04/kWh	-$.04/kWh	-$.04/kWh
Siting Adjustor	-$.02/kWh	-$.02/kWh	-$.05/kWh	-$.06/kWh

As shown in the table above, the first-rate category is the Residential Blend. This value is the basic rate for electricity generated, constant across categories.[20] The second rate is the REC Adjustor. Renewable Energy Credits (RECs) are the credits associated with the consumption of renewable energy. In Vermont, utilities are required to meet a certain percentage of their energy mix through renewable energy. As a result, the REC Adjustor is used to encourage panel owners to sell their credits to utilities so they can reach their targets.[21] Finally, the Siting Adjustor is used to encourage deployment of small systems and to ensure that they are built on preferred sites, plots that maximize the environmental and energy benefits of the panels.[22] As a result, small residential scale projects on preferred sites are the most economical, while larger projects may face a lower pay off.

Other Incentives:

Unlike other energy efficiency measures that rely on more direct subsidies, the solar market relies on tax incentives. The first of which is the "Federal Solar Tax Credit". Under this mechanism, panel owners can deduct 26% of the cost of their array from their federal income tax in the year that it was built, specifically if tax liability is greater than the deduction amount.[23] At a state level, solar arrays are exempt from state sales tax and systems under 50 kW are not considered during property tax evaluation.[24]

Benefits of Solar:

Solar energy has several personal and social benefits that make it an attractive energy option. First, as a form of renewable energy, there are obvious environmental benefits. While the production and installation process may require fossil fuels, operating solar panels emit no greenhouse gas emissions while generating energy. Thus, PV systems offset the need for polluting fossil fuels and offer a clean alternative that can lower emissions. In fact, recent

[20] *2022 Biennial Update on Net Metering Program*, 46.
[21] *2022 Biennial Update on Net Metering Program*, 23.
[22] *2022 Biennial Update on Net Metering Program*, 42.
[23] U.S. Department of Energy, *Homeowner's Guide to the Federal Tax Credit for Solar Photovoltaics, https://www.energy.gov/eere/solar/homeowners-guide-federal-tax-credit-solar-photovoltaics#:~:text=In%20December%202020%2C%20Congress%20passed,a%2030%25%20tax%20credit.).*
[24] Vermont Department of Public Service, *A Vermonter's Guide to Residential Solar, September 2016,* *https://publicservice.vermont.gov/sites/dps/files/documents/Renewable_Energy/Vt%20Guide%20to%20Residential%20Solar%202016.pdf, 27.*

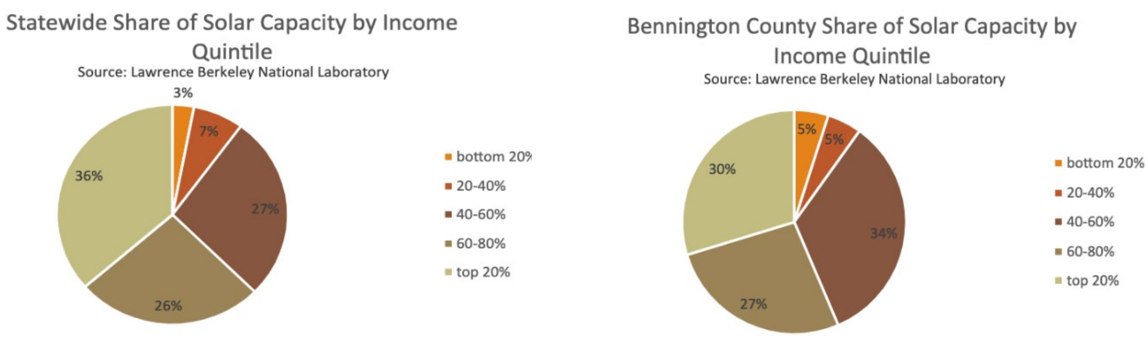
declines in state emissions stem from the deployment of clean energy sources.[25] In addition to its environmental benefits, solar energy has clear financial incentives. Although panels have a high upfront cost, they can generate immense savings over their lifetimes. According to Solar Sage, an online solar marketplace, over a 20-year period, a 5-kW array can save $30,277, roughly $1,513/year.[26] And by offsetting monthly utility bills, the solar panels can cut energy burden by over 50% across income quintiles.[27] Finally, there are downstream health benefits. Clean energy can help to lower air pollution, lowering the risk of respiratory diseases or cancers, and preventing illness, hospitalization, and premature death.[28] Thus, there are wide implications for such projects.

<u>Disparities in Solar Deployment and Barriers to Access:</u>

Income Disparities:

While solar development has been widespread, uptake and related benefits are unevenly distributed. State-wide, wealthier residents control much of the current solar capacity.

Figure 2- State-wide and County-wide share of solar capacity by Income Quintile



According to data from the PUC and the Lawrence Berkeley National Laboratory, in 2020, the 20% of households with the highest income owned 36% of solar capacity, while the

[25] Vermont Department of Environmental Conservation, Vermont *Greenhouse Gas Emissions Inventory and Forecast 1997-2017, https://dec.vermont.gov/sites/dec/files/aqc/climate-change/documents/_Vermont_Greenhouse_Gas_Emissions_Inventory_Update_1990-2017_Final.pdf.*

[26] Solar Sage, "Solar Panels in Bennington County, VT", https://www.energysage.com/local-data/solar-panel-cost/vt/bennington-county/#:~:text=Given%20a%20solar%20panel%20system,VT%20coming%20in%20at%20%2414%2C900.

[27] 2020 American Community Survey 5-Year Estimates Microdata.

[28] Vermont Department of Public Service, 2022 *Comprehensive Energy Plan Appendix D: Analysis of Greenhouse Gas Emission Reduction Pathways For Vermont, January 2022, https://publicservice.vermont.gov/sites/dps/files/documents/CEP_AppendixD_LEAPModelingReport.pdf,43.*

bottom 20% owned 3%.[29] Bennington County has only a marginally more equitable distribution. The top 20% owns 30% of capacity and the bottom 20% owns 10%.[30]

The following sections examine some of the barriers that prevent LMI households from installing PV systems. The reasons range from issues that stem from systemic poverty, a regressive regulatory system, and lack of cohesive information.

Costs:

The most visible barrier to LMI access is the high upfront costs that come with solar installation. Although costs have declined rapidly over the last 10 years, aided by a favorable regulatory system, solar panels remain an expensive investment. According to Solar Sage, in Bennington County, the average cost of a panel is roughly $2.98/watt ($2,980/kW).[31] For a traditional 5-kW system, the average market price is $14,900, with prices ranging from $12,665 to $17,135.[32] These high prices for solar installation are out of reach LMI households in Bennington County.

Not only is the upfront cost high, but the slow return on investment makes the expense even less attractive. Although a PV system can yield high savings over its lifetime, Solar Sage estimates that the payout period, the time before savings have offset the costs, is approximately 9.5 years in Bennington County.[33] This is a time scale that is not helpful for LMI households who need immediate cost assistance.

This barrier is likely to get worse as the economics continues to shift. According to the PUC, the fall in solar prices seen over the last 10 years has slowed and flattened out[34]. What's more, as inflation and supply issues grip the US, operational and material costs are likely to rise. This is all made worse by a shifting regulatory framework that will be explored later. Thus, cost is expected to be a major impediment to LMI solar development.

Financing:

While paying out of pocket may not be an option for most households, financing may make it easier to cover the upfront costs. For example, Vermont State Employees Credit Union (VSECU)'s "Vgreen Suite" includes a set of flexible, low interest loans for energy efficiency and clean energy projects. The extended terms and discounted rates are intended to help customers overcome the up-front costs and encourage energy efficiency measures.[35]

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[29] Lawrence Berkeley National Laboratory," Solar Demographics Tool", https://emp.lbl.gov/solar-demographics-tool.

[30] Lawrence Berkeley National Laboratory. Although not explored in this report, it is also important to recognize the disparities across racial lines as well. According to studies out of the University of Vermont people of color in Vermont are 7x less likely to own solar panels than white Vermonters, a fact that should be questioned and explored.

[31] Solar Sage.

[32] Solar Sage.

[33] Solar Sage.

[34] *2022 Biennial Update to the Net Metering Program, 16.*

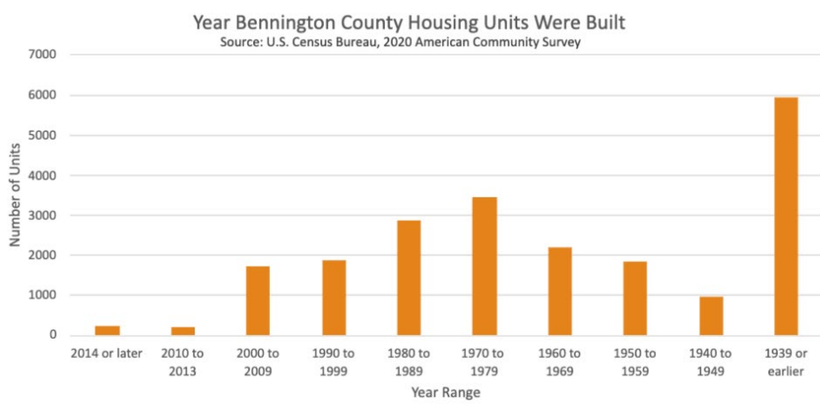
[35] Laurie Fielder, Director of Vgreen Program Director, in conversation with author, 11 July 2022.

Despite the availability of credit, many LMI households may struggle to access financing. Low-income customers, for example, are more likely to have poor credit, making them ineligible: "The people that are less than positioned to utilize the credit are people with credit challenges...they've defaulted in the past or they've defaulted with us in the past."[36] Without a strong credit history, even generous lenders may be hesitant to take on risk. Even when financing is an option, LMI households may be wary of taking on added risk over fears of overleveraging themselves -- they may be concerned that taking on credit will put them further into debt or give them fewer options if unforeseen costs arise. LMI households thus don't have the financial flexibility to access or justify financing.

Land Characteristics:

Like the rest of the state, Bennington County has an aging housing stock. In the region, 41% of homes were built before 1960, with 30% before 1940. Meanwhile, only 10% of homes were built after 2000.

Figure 3 - Number of homes in Bennington County Built Over Specific Ranges of Time[37]



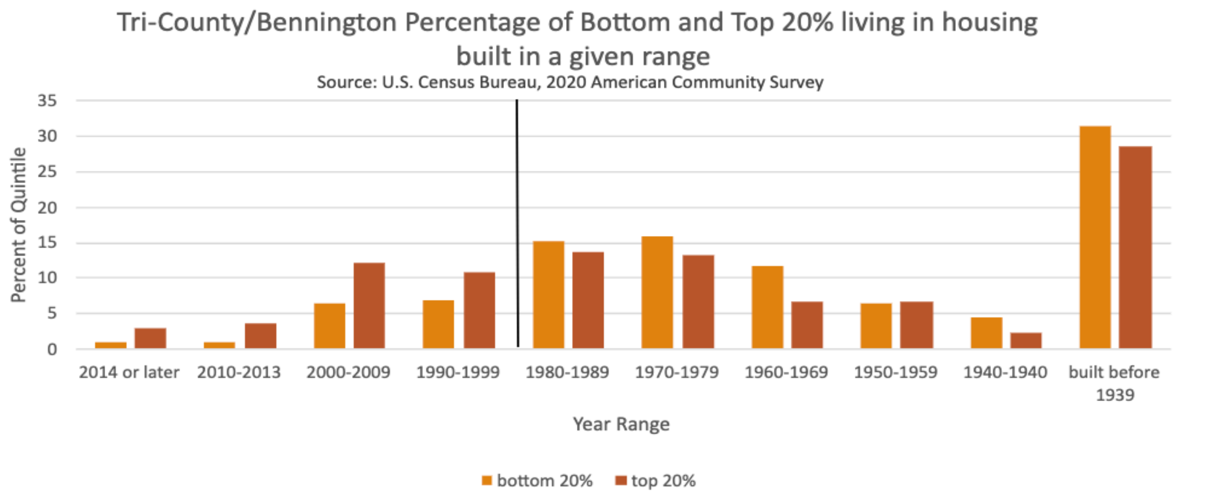
This phenomenon poses a unique challenge for solar deployment as aging homes likely require additional renovation to ensure the structure can support an array, thus increasing the time and cost of a project. This is also an issue that disproportionately affects LMI households in the region.

Figure 4 – Percentage of Bottom and Top 20% that Live in Housing from Each Year Range[38]

[36] Laurie Fielder.

[37] U.S. Census Bureau, 2020 American Community Survey 5-Year Estimate, Table S2504; generated by Josh Kirschner using data.census.gov < https://data.census.gov/cedsci/>

[38] 2022 American Community Survey 5-Year Estimates Microdata.



In figure 4, there are more low-income residents than wealthy residents living in houses built before 1990, while more high-income earners live in newer homes. This makes it evident that LMI residents often live in older, poorly maintained homes. This may be because the houses are less expensive, or they may be the result of redlining and zoning as well.[39] Because of this, LMI households are less likely to invest in a solar system as the project would more likely require additional, expensive work.

Tenure Status:

Homeownership can also prove to be a significant barrier. In Bennington County, 26.6% or roughly 3,886 households, are renters.[40] These renters are heavily restricted from installing a system or reaping its benefits. First, they are discouraged by the "split incentive" phenomenon. Since renters don't own the building, they must defer to their landlord to make any renovations such as solar installation. As such, the landlord is expected to pay the upfront cost, while the savings would be distributed to the ratepayers—the tenants. Because the costs and benefits are separated, the landlord is disincentivized from carrying out the installation.[41]

Even if a panel is installed for a multi-family building, there is no guarantee that tenants will see the savings. For example, for many renters (27.7%), their electricity costs are collected as part of their monthly utilities. As such, they may not know how much they spend in the first place, and the landlord is able to charge the same rate. Separately, many buildings use a

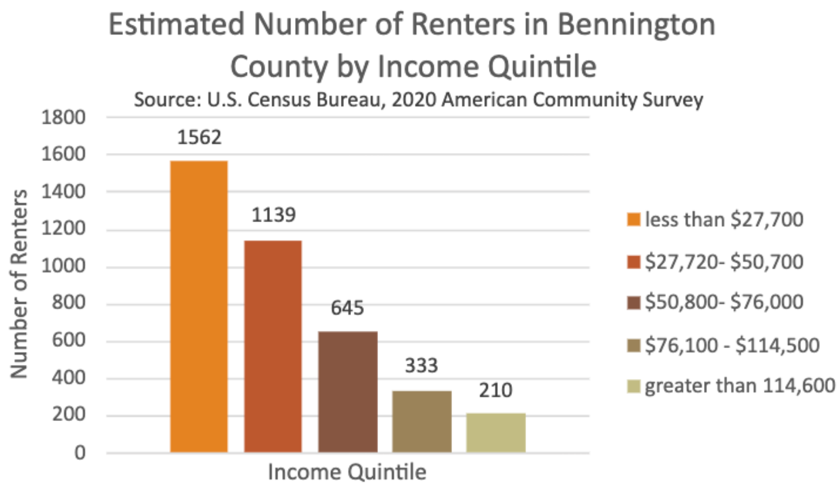
[39] "Unlocking Participation" https://www.lowincomesolar.org/why-act/unlocking-participation/.
[40] U.S. Census Bureau, 2020 American Community Survey 5-Year Estimates Table DPO4; generated by Josh Kirschner using data.census.gov < https://data.census.gov/cedsci/>

[41] Stephen Bird and Diana Hernandez, "Policy options for the split incentive: Increasing energy efficiency for low-income renters", *Energy Policy* 48 no.12 (2012): 506-514.

"master-meter" system—a single electrical meter for the whole building. As a result, it is impossible to calculate individual electrical use and distribute net metering credits fairly.

This is an issue that once again disproportionately affects low-income residents. As shown below in Figure-5, LMI households make up a disproportionate share of renters in the area, likely since these units are less expensive and require less management. As a result, low-income access is also an issue of rental access.

Figure 5 – Estimated number of renters by Income Quintile[42]



Regressive Incentive Structure:

While the current solar incentives have been crucial in driving rapid deployment, it should be noted that their regressive nature favors wealthy residents. The Federal Income Tax Credit is a major example of a regressive incentive. While the credit has been beneficial in subsidizing the cost of installation, it is only accessible for the upper income quintiles: "Congress has decided to give that subsidy only to people that have a taxable income. That creates a lot of inequities."[43] As a nonrefundable credit, the incentive is only helpful if an individual has significant tax liability. In other words, if a person wants to deduct $1,000, they must owe at least $1,000 in taxes. LMI households may not have an adequate tax liability. In fact, according to the National Renewable Energy Laboratory, the credit is 62% more effective for people with an income above $75,000, meaning LMI residents are missing out on the cost-saving benefits.[44] For context, the county median income in 2020 was 58,200, indicating that the credit is ineffective for most residents.[45] The tax credit is also detrimental because non-profits, including those who support LMI households or are trying to expand access cannot

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[42] U.S. Census Bureau, 2020 American Community Survey 5-Year Estimates Microdata.
[43] Kevin Jones, Director, The Institute for Energy and the Environment at the University of Vermont Law School, in conversation with the author, July 12, 2022.
[44] Jeffrey J. Cook, et al, *Affordable and Accessible Solar for All: Barriers, Solutions, and On-Site Adoption Potential*, (The National Renewable Energy Laboratory, 2021), 3.
[45] U.S. Census Bureau, 2020 American Community Survey 5-year Table S1901, generated by Josh Kirschner; using data.census.gov <https://data.census.gov/cedsci/>;

claim the credit. All together, "it's immediately 26% more expensive for low-income communities and nonprofits to do solar."[46]

Net Metering has also proven regressive. As the program has evolved, "reductions in net-metering rates without any direct intervention to support LMI participation only makes participation less feasible."[47] As the rates have changed and the adjustors have been added, the credits have become less valuable. This has lowered the associated savings and extended the payout period, pricing Vermonters out of the program. In addition, there is no additional program or rate to further support low-income solar deployment. As such, the system is increasingly favoring wealthy residents who can afford the lower savings.

Time and Bureaucratic Complexity:

When considering the reasons why solar uptake among LMI households is low, we must also consider how the psychological strain of poverty may limit these residents. In her report for the Vermont Energy Action Network on low-income weatherization in Vermont's Northeast Kingdon, Tara Santi writes "For low and moderate-income households, attention may be on a number of other pressing concerns, such as job security or medical care...Given limits of time, mental energy, or income, people may settle for heating sources that satisfy their needs, even if an upgrade may save them money."[48] As she suggests, low-income residents must juggle their more immediate needs. They may be working long hours or several jobs to ensure that they can purchase food, pay rent, have insurance, etc. As such, they may have limited time or mental bandwidth that prevents them from considering a large-scale home renovation such as solar installation. This is especially the case given the technical and bureaucratic complexity of these projects. Solar installation may require a person to coordinate with a contractor, an installer, Green Mountain Power (GMP), and the PUC. F

Future Uncertainty:

Beyond the issues that are specific to solar energy, there are several barriers that are related to the insecurity that comes with poverty that makes investment in a PV system impractical. First, LMI households are more likely to face greater job and income insecurity. Because of this financial uncertainty, residents may be less likely to take on a large expenditure such as a home renovation, especially if they won't see savings for years. Second, LMI households face greater housing insecurity. According to a report written by the University of Vermont Law School, low-income households are twice as likely to have moved in the last year than high income residents.[49] And while the local data doesn't support this in a significant way, if the principle stands, homeowners are less likely to conduct a major home renovation with a long payout period if they may not be there once savings are generated. Finally, there is

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[46] Jeannie Oliver, Staff Attorney, The Institute for Energy and the Environment at the University of Vermont Law School, in conversation with the author, July 12, 2022.
[47] Norwich Solar Technologies, letter to the Vermont Public Utilities Commission, April 25, 2022,4.
[48] Tara Santi, *Increasing Energy Efficiency and Beneficial Electrification in Low-Income Households in the Northeast Kingdom, (*Energy Action Network, 2020),9.
[49] University of Vermont Law School Institute for Energy and the Environment, *Low-Income Solar Ownership in Vermont: Overcoming Barriers to Equitable Access(*The University of Vermont Law School, 2018) 18.

uncertainty around unforeseen costs. Residents may be concerned that a large expenditure will leave them financially strained or overleveraged if an unforeseen cost, such as health care or car expense, arises. Overall, the risk aversion and uncertainty associated with poverty may make it difficult for LMI households to justify the cost of a solar system.

Community Solar: An Inclusive Alternative

Introduction:

If traditional, residential net-metering systems are unavailable to many in the county, then a prime alternative is what is known as "group net-metering", or "community solar" projects. While highly case specific, community solar can generally be defined as when "a group of accounts in the same service territory are benefiting from one array".[50] Simply put, it is when a group of ratepayers receive renewable energy and net metering credits from a single, large-scale array. This section examines two different types of community solar projects as models for LMI inclusion.

Co-Op/Community Owned Solar:

Structure:

In a Co-Op/Community Owned Model, a large solar array is owned by a group of shareholders, which can include households, businesses, municipalities, non-profits, etc. These shareholders buy into the project by purchasing "shares", which corresponds to a certain capacity of the total array. The revenue from the shares is then used to construct the array. Once the system is complete the energy and credits are then distributed proportionally to a ratepayer's number of shares.

Benefits:

Unlike a traditional residential solar system, the community owned model helps to lower barriers and empower households. First, the cost of participation is lower than a traditional system. In a residential array, the owner is responsible for all costs. In a community-owned array, however, both material and installation fees are divided among the many shareholders. As such, by pooling resources and sharing the financial burden, the cost to each shareholder on a $/watt basis is lower; moreover, because of economies of scale, a larger system is already less expensive per watt, further driving down the cost and making projects more accessible.

In addition, community solar projects are accessible to those who were otherwise restricted from a residential system. While a traditional system requires installation on the owner's property, community owned solar projects do not require shareholders to be near the

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[50] Martha Staskus, Chief Development Officer, Norwich Solar Technologies, in conversation with the author, June 29,2022.

array (as long as they are in the same utility territory).[51] This “off-site” generation allows renters and those with land restrictions to participate in a solar project.

Finally, community owned projects can encourage LMI participation and support residents. Some projects offer discounted share prices for income qualifying households. Others divert some of the net metering credits to LMI communities or non-profits, even if they aren’t shareholders.

Challenges:

It's important to also recognize some of the drawbacks associated with community owned solar. First, although share costs are generally lower than a traditional system, there still is a significant upfront cost and long payout period associated with these projects. Thus, while more households, particularly among the middle-income quintiles, may qualify, these projects may continue to be out of reach for low-income residents (unless the project takes steps to offer income-based assistance).

A second issue is the administrative and bureaucratic complexity. When constructing a small, residential system, the permitting process is straightforward. However, according to Ms. Staskus, for larger systems, “there is so much to do before the project even nears permitting or construction”[52]-- the number of bureaucratic hurdles increases. In addition, coordinating among stakeholders (including shareholders, installers, contractors, and utilities) can be difficult and time consuming. And since these projects are community organized, they may not have the capacity to handle each administrative issue. All this together often slows the construction process, places a burden on organizers and brings about high operational costs. In fact, it is because of this that many are discouraged from getting involved in the first place. Jim Hand of Hand and Sun Installers, a small company in Manchester, has expressed hesitation about pursuing community solar projects because his company doesn’t have the capacity to handle the burden, a sentiment he said was held by installers around the state.[53] Staskus said that Norwich was one of the few in Vermont that was large and diversified enough to conduct community solar projects.[54] Thus, community owned solar projects can struggle to make it off the ground and keep costs down.

Finally, there is a level of risk associated with community owned projects that may discourage participation. Given the complexity of these systems, there is potential for project failure, in which case shareholders would lose their investment. As such, residents, particularly risk averse and low-income residents, may be hesitant to get involved.

Co-Op Model Case Study: ACORN

ACORN Energy Co-Op is a community owned and operated organization in Addison County that helps to provide affordable, renewable options for its members. In recent years, the co-op has developed and implemented three separate community solar projects for its

[51] As all of Bennington County is serviced by Green Mountain Power (GMP), this shouldn’t be an issue.
[52] Martha Staskus.
[53] Jim Hand, Hand and Sun, in conversation with the author, July 14, 2022.
[54] Martha Staskus.

members. In each case, ACORN identifies a site and creates a legal entity (LLC) to represent the project and its shareholders. Once established, ACORN finances the project through two means. First, they find a “Series A Investor”, a large investor such as a business that can contribute much of the funding and has the tax appetite to effectively realize the credit. ACORN then opens the project up to “Series B Investors”, ACORN members and town residents who wish to buy into the project. Once all the legal, financial, and bureaucratic elements are covered, ACORN then constructs the array and distributes the credits to its various investors.[55]

ACORN’s model has several important benefits. First, due to the scale of the project and resource pooling, the share price is significantly lower. In the latest ACORN project, in Bristol, the buy-in cost was approximately $1.7/watt, $1.28/watt less than for a stand-alone system.[56] Meanwhile, there are significant lifetime savings associated with the project. In Bristol, although the payout term is extensive (12-13 years) over the 25-year period, ACORN estimates that savings will more than double the value of the original investment.[57] Second, the project provides “off-site” solar generation, allowing renters and other land restricted residents to participate. In addition, since the project is developed, implemented and managed by ACORN, little administrative burden is placed on the shareholders, making participation simple. Finally, as partial owners of the co-op and the project, shareholders are part of the governance involved with the panels, helping make it more democratic and avoid issues of environmental justice

At the same time, there are a few issues that make the structure hard to scale and inaccessible. First, although discounted, there are still significant upfront costs to the shareholder, as well as a payout period that may be impractical for low-income residents. Second, the co-op and its community solar projects are run by a small group of volunteer workers. Without great administrative capacity, a project could become bogged down navigating bureaucratic hurdles, costing time and money. This is especially the case given the larger number of stakeholders involved. In fact, ACORN’s second project in Shoreham VT took six years to complete due to a series of administrative holdups. As such, ACORN is burdened by high costs and limited administrative bandwidth, making this form of community owned project challenging.

Case Study: Hartford

In 2019, the town of Hartford, VT sought to utilize town resources and capacity to support a community owned solar project and aid low-income residents. The town identified the roof of the municipal police and fire building as a site for a large solar array, working with Norwich Solar Technologies to build an 87-kW installation. Once constructed, the town diverted some of the energy and its credits to Twin Pines Housing and Steward Property Management,

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[55] Maddison Shropshire, Adison County Regional Commission, in conversation with the author, June 24, 2022.
[56] ”ACORN Energy Solar 3: An Investment Opportunity in Local Community-Owned Solar Generation” (ACORN, 2021)2.
[57] ”ACORN Energy Solar 3: An Investment Opportunity in Local Community-Owned Solar Generation”,3.

two affordable housing entities in Norwich that were shareholders of the project. The credits then helped to lower costs for LMI residents living in these affordable housing communities.[58]

This example acts as an interesting model for how local, community owned projects can be used to directly support LMI residents. While lowering its own energy costs, Hartford was able to collaborate with LMI entities and develop a way for affordable housing residents to participate, circumnavigating some of the cost barriers.

Meanwhile the project also acts as an example of how towns can wield their social positions to support community solar projects. By leveraging town land, there was no cost or added complexity to the project for land development or obtaining property. In addition, the town had more capacity to shoulder the administrative and bureaucratic burden of the project.

Some concerns to note, however, include the fact that the project relied on an outside impact investor to finance a portion of the project, a necessity that may be hard to acquire. In addition, the project succeeded because Hartford was willing to shoulder much of the burden and had the capacity to do so. The same may not be true for many towns, especially those in Bennington County with small populations and few resources.

Subscription/Third Party Leasing Model:

Given some of the challenges of the Co-Op model, the other available option is what is known as the "Subscription" or "Third Party Leasing" (TPL) Model. Under this model, the solar array is owned by an independent entity, such as solar developer, business, or investor. These actors finance, build, and manage the project. Once it is complete, the system owner then leases parts of their array to interested subscribers. These subscribers then utilize the net metering credits associated with the array and pay a fee to the owner at a discounted rate. The panel owner gets a return on their investment through the subscription fee, and the subscribers save on the difference between the net metering credits and the leasing costs.

Like the community owned model, TPL is more accessible for otherwise restricted households. First, since the panel is owned by the lessor, there are no upfront costs associated with TPL. The only cost to the subscriber is the subscription fee, which is typically (although not necessarily) less than monthly utility costs. And without a high upfront expenditure, the savings are immediate. Thus, the cost and payout barriers are effectively removed. In addition, like the community owned model, off-site generation allows low-income households, renters, and those with poor land conditions to take part in a solar project and see energy savings. There is also significantly less risk associated with the project for shareholders as they have little financial stake if the project fails. Finally, since the array is built and managed by the owner, there is no administrative burden placed on the subscriber, making it a much easier process.

Despite these benefits, TPL suffers from several flaws. Subscribers save less than if they owned the panels themselves: "As soon as you move away from direct ownership, though you're leaking money away from the low-income residents who you're trying to bring these

[58] "Hartford, VT Public Safety" Norwich Solar Technologies, https://norwichsolar.com/projects/hartford-public-safety/.

benefits to."[59] When residents own panels, they can offset their entire utility bill through the net metering credits they receive. When leasing, while subscribers get the net metering credits, they must pay an extra fee to the lessor. Thus, subscribers save solely on the difference between net metering credits and the fee. Norwich Solar Technologies, for example, claims that subscribers to their TPL projects save an average of 5-10% on their utility bills rather than on the whole thing. And while the savings are more immediate, over the lifetime of a project, subscribers save less than owners. What this means is that low-income households who can only afford to subscribe save less than those who can afford to own.

A second issue that arises with TPL is over energy governance and consumer protection. Since subscribers are not owners, they have little say over project siting or RECs. And in fact, TPL agreements often involve selling the RECs to the utilities.[60] This poses serious environmental justice concerns. If the RECs are sold, the subscribers are unable to reap the environmental benefits of the panels and are instead producing solar for others. Meanwhile without say over sitting, there is concern that community needs will not be respected, or discriminatory practices will determine the project's placement.

Finally, there are concerns about the sustainability of TPL projects. These arrays require the interest of an outside "angel investor", an independent actor that is willing to front the costs and take on the investment risk. Thus, these projects are only viable if they have a willing investor – an unstable funding source.

TPL Case Study: StarLake Lane Community Solar

To better understand the TPL model, and how it can be used to support LMI communities, we can look at the StarLake Lane Community Solar Project. For this project, Norwich Solar Technologies, in collaboration with one of its Impact Investors built three 15 kW arrays on the land of StarLake Lane, a low-income housing community in Norwich, Vermont. The panels were then leased out to the 14 households living in the development, each of them paying a discounted subscription fee. Unique to this project as well, the investor has agreed to turn ownership of the array over to the community once the initial investment has been paid off (about five years).[61]

This project has clear implications for LMI access to solar. Here, the low-income residents of StarLake Lane can access solar energy and net metering, all without paying upfront costs. Thus, savings are immediate and average $251/year.[62] In addition, as the administrative details are handled by Norwich, the technical burden is not passed onto the community, making it easier to participate. Finally, through the ownership agreement, the community will become a part of the governance structure, an arrangement that is not typical of TPL projects.

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[59] Jeannie Oliver.
[60] Jeannie Oliver.
[61] "Starlake Community Solar", Norwich Solar Technologies, https://norwichsolar.com/projects/starlake-community-solar/.
[62] "Starlake Community Solar".

Still, some issues persist. As mentioned earlier, this project still relied on the involvement of an “angel investor” -- an individual willing to front the cost and accept the heightened risk of working with a low-income community. Thus, while it worked here, the funding source is not necessarily stable or guaranteed on a wide scale. Meanwhile, the community experiences savings lower than if they owned the project.

Recommendations:

Having explored the benefits and drawbacks associated with community solar projects, this final section will offer recommendations on how to better support and scale up these projects. These points are intended to help stakeholders and interested parties work together to overcome some of the existing challenges and develop new ways of including low-income residents into community solar projects. Recommendations were developed using case study analysis, available literature, and conversations with experts.

1) Increase Coordination Among Stakeholders to Share Financial and Administrative Burden:

In the examples we have seen thus far, projects struggled to develop a financing structure that was effective, equitable, and scalable, often depending on which types of actors were involved. Some projects were easily financed but inaccessible for LMI households (as in the case of ACORN). Others relied on a generous outside investor (StarLake), a source that is unstable and potentially inequitable. Similarly, some projects were more equipped to handle the bureaucratic complexity of community solar. While ACORN has struggled to navigate the regulatory hurdles of an array given their limited capacity, projects that relied on town resources or the technical expertise of an installer such as Norwich Technology saw greater success.

From these examples, it is evident that different entities are better equipped to handle different aspects of a project. Thus, in order to handle the financial and administrative burden of these projects, **we must encourage relevant stakeholders, including towns, businesses, installers, non-profits, and regional planning commissions (RPCs) to collaborate, leveraging unique social positions and expertise.** If we want to make community solar easier and more accessible, we must ensure that each actor is doing what they can to contribute to and streamline the process. Below are some potential (non-exhaustive) examples:

a) Towns:
    i. Identify specific preferred sites in order to maximize regulatory outcomes
    ii. Connect with installers about using municipal lands to host an array
b) RPCs
    i. Help towns identify specific preferred sites in order to maximize regulatory outcomes
    ii. Submit joint letters of support w/ towns to maximize regulatory outcomes
    iii. Facilitate interactions between relevant actors through forums and incubators
    iv. Offer administrative and planning support for town projects

c) Installers
   i. Offer administrative and technical support
   ii. Connect interested hosts with interested buyers

It is also important to ensure **that LMI interests are represented throughout the process.** Oftentimes programs intended to support low-income residents miss the actual needs and goals of these households. Thus, encouraging participation can maximize equity. This can be accomplished by **collaborating with other intersectional organizations that work with and support LMI communities such as non-profits, housing authorities, or community groups to develop new mechanisms of participation.** This can also include offering **more targeted outreach and education to directly engage low-income residents.**

2) Develop Shared Resources to Simplify and Streamline the Process

Towns, organizations, or communities that may be interested in starting a project, may not have the capacity to get their project off the ground or know where to start. Another way to overcome the administrative hurdles is to work with stakeholders to **develop resources that interested parties can use in order to ease burdens and speed up the process.** Having consolidated resources and tools can make it easier to get the ball rolling. The Vermont Energy and Climate Action Network (VECAN), has a community solar toolbox to help stakeholders begin to navigate the process. Other possible tools can include **a sample request for proposals (RFP)** that the town can quickly adapt and send out to installers or **informational materials/videos** to outline the regulatory and implementation process. By promoting these resources, we can make the process simpler and encourage action.

Another element to consider is **ensuring that there is reliable, up-to-date data that is readily available.** Currently, information about regional solar capacity, costs and savings, or preferred siting is piecemeal and hard to accurately assemble. This may make it difficult for interested groups to understand the current landscape or develop a project plan. By consolidating information into an accessible format, we can speed up the research and development process, while better informing people about the benefits of solar.

3) Increase Outreach to Low-to-Moderate Income Households

In our efforts to support LMI solar uptake, we must be sure to utilize effective outreach methods. As such, stakeholders and project developers should **work with towns and organizations to develop and distribute materials targeted towards LMI communities that highlight the energy and financing options available.** While information currently exists, much if it isn't targeted or calibrated to the needs of low-income residents. Making more inclusive educational materials can better inform low-income residents and encourage participation. This includes offering comprehensive information on how the projects work, associated costs and savings, and financing options. We must also work to **promote other forms of cost-saving energy efficiency such as weatherization if participation in solar is not the best option for a household, as well as other opportunities such as Green Savings Smart.**

In addition, stakeholders should make efforts to better utilize **community-based, grassroots outreach methods**. Outreach that comes down from government bodies or companies may fail to adequately engage community members or make them feel included. This is especially the case given cynicism about new programs and a disdain for government elitism that has slowed other low-income programs in the region. Thus, outreach can be more effective by collaborating with community organizations and utilizing existing grassroots networks. **Tabling or presenting at community events, working with community leaders, or promoting neighborhood demonstrations are all ways in which outreach campaigns can be more localized and engaging**. Meanwhile, **encouraging members of the community to take part in local outreach** can help expand the scope of the campaign and reach more people.

4) Regulatory Reform

As we have seen, some of the issues related to community solar community are caused by the current regulatory sphere. And while these reforms require larger structural action, it is still important to articulate some of the needs. The major change involves the incentive structure. On a federal or state level, **offering a more direct incentive or subsidy for solar installation can support uptake for those who don't have enough of a taxable income to utilize the income credit.** Meanwhile, reforming the net metering system can help further expand access. Although changes in recent years have been made to check supply and regulate the market, the changes have priced out low-income residents. **Thus, resetting the program to a higher rate or offering an income-based rate that is higher for LMI households can help make the system more progressive rather than regressive.** Meanwhile, **changing the siting adjustor** can help community solar projects make more economic sense.

On the bureaucratic side, the PUC and state government should make efforts to **streamline the review and permitting process.** By speeding up the process, regulators can lower costs and administrative burden, making community solar easier and more accessible.

<u>Conclusion:</u>

Over the last decade, Vermont policymakers have been specifically focused on the rapid expansion of solar energy as a central component of the energy transition, yielding energy markets and the regulatory sphere to create highly success incentives. Yet these same programs that have been critical in solar expansion have also systematically excluded LMI households from accessing panels themselves, creating an increasingly inequitable system. It is thus important that we begin to switch gears. If Vermont wishes to pursue an equitable energy transition, it is essential that we use social engineering tools that meet the specific needs of low-income residents and ensure that our models are progressive in nature. This way, we can expand the benefits of solar energy to those most vulnerable to environmental and financial burdens of fossil fuels and not just those at the top.

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