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Decarbonizing Austin: Strategies to Increase Equity in Solar Adoption

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Decarbonizing Austin: Strategies to Increase Equity in Solar Adoption

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Dedication

For my dad. Thank you for your endless support and for teaching us to be lifelong learners.

Abstract

Decarbonizing Austin: Strategies to Increase Equity in Solar Adoption

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The clean energy transition is underway in most U.S. cities and solar energy plays a significant role in it. Rooftop solar is a viable way for many homeowners to not only participate in the transition away from fossil fuels, but also reap many other benefits that clean energy can offer, including lower utility bills, cleaner air and water, and the creation of green jobs. Although the price of solar energy systems has steadily fallen over the past decade, installing solar panels is still out of the question for many Americans. There are significant barriers to adoption, particularly for low-to-moderate-income (LMI) households, renters, and communities of color. Because of this, solar energy adoption has been highly inequitable and many segments of the population have been excluded from the clean energy transition. Fortunately, there are solutions grounded in energy justice that many cities, utility companies, and other organizations are implementing around the U.S. to lower these barriers and make access to solar energy more equitable, known as solar justice policies (SJ policies). Specifically, I examine four SJ policies put forth by utilities and local governments in California, Oregon, Wisconsin, and Colorado.

Austin, Texas presents an interesting case to analyze the extent of energy justice in solar deployment for many reasons. Firstly, like most cities in the U.S., Austin has a long history of segregation and inequality. The city has begun to reckon with this past with a new emphasis on equity in city departments and policies. Secondly, the city has recently put forth new strategies to

combat climate change and increase renewable energy deployment through its Climate Equity Plan and Austin Energy's Resource Generation Plan. It would be a fair assumption that these new, more aggressive renewable deployment policies that coincide with a city-wide focus on equity would produce successful SJ policies for the city's LMI residents and communities of color. However, the extent to which solar deployment policies pursue energy justice has yet to be analyzed. Through the comparison of four SJ policies around the U.S. with Austin's solar strategy, opportunities for improvement are illuminated.

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Chapter 1: Introduction

Local governments are working towards decarbonization as the clean energy transition takes hold in many U.S. cities, and solar is increasingly being recognized as a beneficial option for many homeowners. Solar offers the opportunity to participate in the transition away from fossil fuels while reaping many other benefits that clean energy can offer, such as lower monthly utility bills, cleaner air and water, increased resiliency, and the creation of green jobs. The price of solar photovoltaics (PV) has steadily declined over the past decade and is now regarded as the cheapest available source of new electricity generation (*Solar PV – Analysis,* n.d.). Falling costs have led to a sharp increase in adoption rates, and this growth is only expected to continue into the future (Sovacool et al., 2022). Despite these gains in affordability, installing solar panels is still out of reach for many Americans. There are many barriers to adoption, particularly for low to moderate-income (LMI) households, renters, and communities of color. Factors such as an inadequate roof, lack of home ownership, and low-income status have hindered these populations' ability to access solar. Solar energy adoption has thus been highly inequitable and has reinforced existing socioeconomic disparities (Sovacool et al., 2022). Fortunately, local governments and utility companies have put forth initiatives to reduce these barriers and make residential and community solar energy more accessible. These initiatives take many forms but are often part of cities' broader objective to mitigate greenhouse gas (GHG) emissions within their borders. Many cities have adopted climate action plans (CAPs) and renewable energy plans with strategies to address emissions, many of which include policies to promote solar energy deployment.

Austin, Texas is one such city that has taken several steps to decarbonize and promote solar energy through its CAP and energy plan, but it is still unclear to what extent equity is prioritized in solar policies and programs. Grounded in Heffron & McCauley's energy justice conceptual framework, this report aims to compare Austin's solar deployment approach with current successful solar justice policies (SJ policies). This comparison illuminates opportunities for policy improvement to ensure an inclusive clean energy transition for all Austinites, particularly those from historically marginalized communities. The study has four sections. First, I briefly examine the history of local efforts to decarbonize, followed by an examination of the current state of solar, including the benefits, trends, and barriers to adoption. Second, I describe energy justice as the conceptual framework and detail the SJ policies deployed by cities and utilities around the U.S. Third, I provide context for Austin's approach to solar deployment and current spatial trends of adoption. Fourth, I compare Austin's approach with the solar justice policies of other cities and utilities and provide recommendations for Austin.

Local Climate Mitigation

Before analyzing the solar policies being put forth by cities, it is helpful to look back at why cities began taking up the cause of climate change mitigation and how solar became a significant part of it. Cities, home to half of the world's population, consume a high proportion of the world's energy supply and are consequently responsible for an estimated 75% of global greenhouse gas emissions (*Cities*, 2019). As public awareness grew about the climate crisis and the role cities were playing in it, many local governments began to recognize their responsibilities in curbing emissions within their borders. There was a growing recognition that although cities are the cause of climate change, they can also be the solution. In the early 1990s, Local Governments for Sustainability (ICLEI) started their Cities for Climate Protection (CCP) Campaign that aided cities in developing climate mitigation strategies (Pitt, 2010). Around the same time, states were entering a new phase of renewable energy deployment as the uncertainty of electricity market restructuring began to settle. Motivated partially by environmental concerns, many states began to pursue a range of policies to stimulate renewable energy deployment (Martinot et al., n.d.). These policies, such as tax incentives, net metering laws, grants, and rebates, incentivized customer-sited renewable energy systems. Aside from these states wanting to deploy more renewables and reach their newly implemented renewable portfolio standards (RPS), they also recognized the resiliency benefits that distributed energy could offer the grid as a whole. This was particularly true for residential solar energy, as it can produce energy during peak hours and offset demand, which can aid utility supply and demand planning.

In 2015, the adoption of both the Sustainable Development Goals and the Paris Agreement further cemented the fact that cities have a significant role to play in emissions mitigation (Boehnke et al., 2019). This renewed sense of urgency coupled with federal and state inaction on climate change spurred cities and local governments to take more aggressive actions to meet this obligation and mitigate emissions (Schrock et al., 2015). One such action is in the form of climate action plans (CAPs), which are a framework for planning, measuring, and limiting greenhouse gas emissions and related climate change impacts. While these plans vary greatly depending on the city's particular circumstances, at minimum, they often include a current inventory of municipality-wide emissions and the most cost-effective ways to meet reduction targets. City-level mitigation has many advantages given that cities have the necessary infrastructure, connectivity, access to capital, and innovation required to put forth effective emissions reduction strategies (Deetjen et al., 2018).

CAPs are increasingly incorporating equity as a key component in their mitigation strategies, and there is growing recognition that social justice and climate action must be achieved in tandem (Fitzgerald, 2022; Schrock et al., 2015). By pulling the various levers of local government, cities can implement measures to transition to a zero-carbon energy sector and protect vulnerable residents in the process. City-level energy policies that pursue equity will be especially important as the solar industry continues to grow in the coming years. Although the procurement of renewable energy for residents is largely out of the scope of cities themselves, there are many actions they can take to increase deployment. This includes influencing local electric utilities, securing power purchase agreements (PPAs) with solar developers, incentivizing local renewable generation by providing subsidies, removing permitting barriers, and helping define the structures that allow for net metering (Deetjen et al., 2018). These actions, specifically the financial incentives, continue to play a large role in customer-sited solar deployment. In fact, cities with local financial incentives have installed 69% more solar than cities without them (Neij & Heiskanen, 2021). Prioritizing equitable funding mechanisms for solar deployment in city-level mitigation actions will ensure many more residents and enjoying the benefits solar can provide.

Benefits of Solar

The U.S. has seen exponential growth in solar adoption due to decreasing system costs and policy support from all levels of government (Rai et al., 2016). Researchers have suggested numerous motivations for the rapid increase in homeowners' participation. A main motivator for early adopters was the environmental benefits. An increase in clean energy technology reduces the greenhouse gas (GHG) emissions associated with fossil fuel-based electricity generation and helps achieve climate and sustainability goals. In addition to GHG emissions, fossil fuel power plants also emit hazardous pollutants that have direct and indirect health and environmental impacts, including nitrogen oxides (NOx), sulfur oxides (SOx), and particulate matter (PM)

(Krieger et al., 2016). Solar energy systems that actively displace the emissions coming from power plants can produce better air and water quality and associated health outcomes in these areas. Early adopters were primarily attracted to these environmental benefits despite the higher cost and perceived risks of adopting new technology.

The price to install a residential solar system has decreased by roughly 50% in the past ten years, with the average system price falling from $40,000 in 2010, to about $25,000 today (*Solar Industry Research Data | SEIA*, n.d.) Although an improvement, this is still cost prohibitive for many households. Yet, deployment continues to increase, which is largely due to the range of available financial incentives. There are significant financial benefits for those that participate in solar electricity, including federal tax incentives for installing solar panels, such as the investment tax credit (ITC), that homeowners can qualify for if they buy their system outright. There are also state-level incentives through renewable portfolio standards (RPS) and net energy metering laws (NEM) (Si & Stephens, 2021). In the case of NEM, some states allow solar adopters to participate in a buyback program in which excess kilowatts can be sold back to the utility company, often at the same rate that they sell it for. Individually, solar energy often results in lower, more stable monthly energy costs since households are requiring less energy from the grid. Having a solar system installed can also increase home values, but many solar adopters are less motivated by this benefit (NREL, 2020). Although it depends on the state and electricity costs, a rooftop solar system can have a quick pay-back period and save homeowners a significant amount on their overall energy expenditures.

While the environmental and economic benefits of solar are well understood, many social benefits of energy independence and reliability will become clearer as more communities feel the impacts of climate change. One such benefit that has become increasingly important is resilience against extreme weather. Solar combined with storage allows households to operate independently from the electricity grid, becoming more pertinent as climate change-related storms and power outages have increased. This independence from the grid can be lifesaving for individuals with medical devices or other health needs that require electricity. Medical equipment such as ventilators, home oxygen machines, and electric wheelchairs, could be charged in times of crisis with a solar array combined with a battery (Huff, 2021). It is easy to imagine how these health and resilience benefits could be multiplied for solar installed on multifamily dwellings. Not only does this help the resiliency of individual households, but it also increases social cohesion and community resilience in the face of climate change. This is particularly true of community solar, also referred to as shared solar, which is a solar deployment method that allows customers to subscribe to part of an off-site PV system. These systems have been associated with many community benefits such as participatory decision-making, community ownership and mobilization, and overall behavioral changes toward a more sustainable lifestyle (Brummer, 2018).

Adoption Trends

As of last year, solar PV reached 142.3 gigawatts of total installed capacity in the U.S., enough to power 25 million homes (*Solar Industry Research Data | SEIA*, n.d.). This hike in installation rates isn't going to slow down: The passage of the Inflation Reduction Act all but guarantees growth for solar. The industry is expected to grow five times larger over the next decade, to a total solar fleet of more than 700 gigawatts by 2033 (*Solar Industry Research Data | SEIA*, n.d.). While this appears to be great news for climate change mitigation, analyzing adoption trends unveils a stark disparity in who has benefitted from this technology. Up until this point, the homeowners participating in solar have been predominantly moderate-to-high-income families. Barbose et al. (2021) found that the typical solar adopter has a higher income, home value, credit score, and education level when compared to the broader population. Moderate-to-high-income families with good credit can pay out of pocket or qualify for a loan to cover the costs of a solar array, its installation, and maintenance. They are likely to qualify for federal tax credits and save money on their monthly utility bills. Households with these attributes have disproportionately adopted solar while LMI households have been largely excluded from this technology. The National Renewable Energy Labs (NREL) defines an LMI household as one that makes between 0 and 80% of the area median income, representing about 43% of the U.S. population (NREL, 2020). Of these LMI households in the U.S., 67% face a high energy burden (defined as paying more than 6% of income on energy bills) and spend three times more on energy bills than the average non-LMI household. A recent study also found that Black, Hispanic, Native American, older adult households, families living in low-income multifamily housing, and older buildings experience disproportionally high energy burdens (Drehobl et al., n.d.). Enduring an energy burden often has adverse effects on mental and physical health, education, job performance, and nutrition. Despite many LMI households facing energy insecurity, they are not the demographic that is receiving assistance from the federal government to lessen this burden. Higher-income communities are receiving the majority of U.S. clean energy tax credits, with the top income quintile receiving 60% of all credits (Gao & Zhou, 2022).

Recent studies have also revealed the racial disparities in solar adoption, finding that Black and Hispanic-majority census tracts installed significantly less rooftop PV between 2009 and 2013, even while controlling for differences in household income and homeownership (Sunter et al., 2019). This disparity was especially pronounced in terms of "seeding," which describes an initial deployment that influences further adoption in a specific neighborhood. Solar adoption is highly dependent on this seeding effect, so neighborhoods without early deployment will see much lower adoption rates. The authors found that Black-majority census tracts had disproportionately less seeding than other communities. Interestingly, Hispanic-majority tracts had more seeding but less solar adoption, which is likely due to the delayed initial adoption in these areas. Goa et al. found a similar trend in which non-white-majority census tracts installed fewer annual solar projects than white-majority census tracts in all income levels (2022). This inequity is compounded by the fact that non-adopters are cross-subsidizing solar adopters. Many utility companies are raising their rates due to revenue loss from solar producers no longer exporting energy from the grid and net metering programs (Gao & Zhou, 2022). This cross-subsidization has worsened the existing energy burden for certain socioeconomic groups. These current trends in solar adoption present a troubling equity issue that puts LMI and communities of color at a major disadvantage and may further entrench existing inequities.

Barriers to Adoption

LMI households and communities of color are being excluded from technology that would save them money on utility bills, increase resiliency, and provide a cleaner environment. Several overlapping barriers exclude these residents from solar energy deployment, many of which have been decades in the making. First, there are physical barriers that could be very costly or impossible to fix for LMI households including having an inadequate roof, too much shading, or other obstructions on or near the roof that would make a solar array cost ineffective. Many solar adopters first must repair their roof or get it completely remodeled to support a heavy PV system. Many must also cut down large trees or go out of their way to ensure their panels can be in the correct orientation to receive the most sunlight. All these steps to prepare for solar is costly in both money and time, resources that many lower-income households do not have. Another barrier is home ownership status. If a house is being rented or if the resident lives in a multifamily dwelling, they do not have the ability to make changes to their roof. This decision is up to the landlord or property owner, who usually has little to no incentive to install solar panels on their property if the tenants will receive the financial incentive through lowered energy bills. This phenomenon is known as the owner-tenant split incentive and extends to other energy-related improvements tenants would benefit from such as energy efficiency measures.

Even if an LMI customer owns a home and has an adequate roof, they may face many financing challenges, including the inability to afford the upfront payment. Despite the aforementioned gains in affordability, the cost of a solar system is still on the order of thousands of dollars ranging from $9,000 to $25,000 after the tax credit is applied (*How Much Will Solar Panels Cost to Install on Your Home in 2023?,* 2023). Other financing challenges include not qualifying for the federal tax credit, or being turned down for a loan if the homeowner has low to no established credit. The solar financing environment is not set up for LMI households, and many obstacles contribute to the lack of financing options including small project sizes, perceived issues with credit risk, and higher technical assistance needs (Hangen et al., 2021). Other barriers are regulatory and even further out of reach. For example, not all states allow community solar projects or Power Purchase Agreements, which are common strategies used for providing LMI solar.

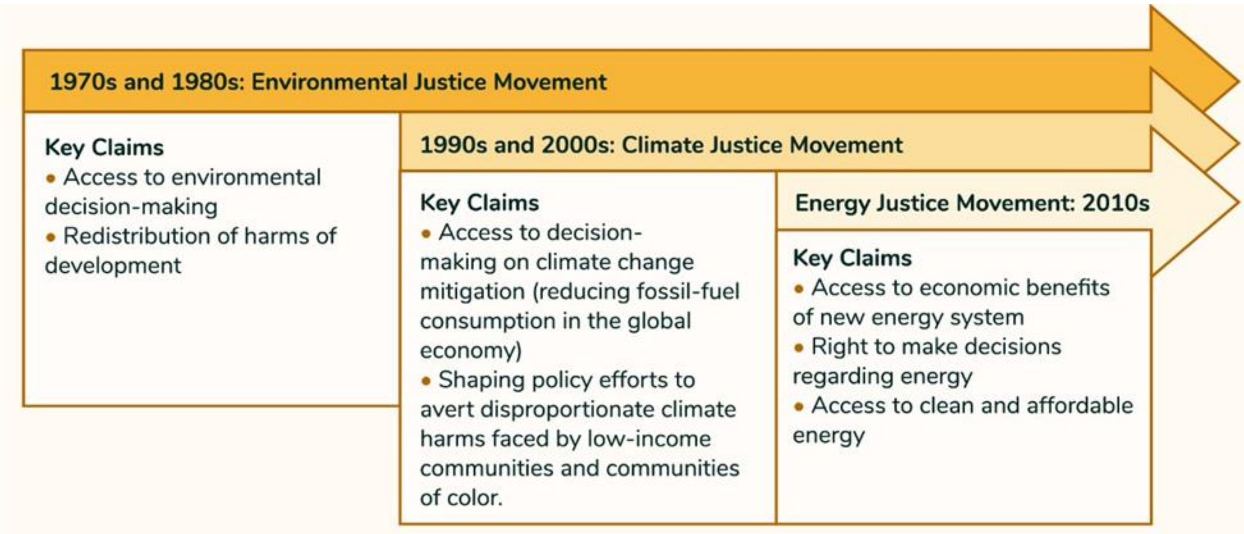
It is not accidental that U.S. solar adoption trends are starkly unequal; the seeds of many of these barriers were planted decades ago, particularly in terms of homeownership and LMI status. Beginning in the 20th century, aggressive policies from all levels of government inflicted residential racial segregation across the U.S. and created the partitioned landscape we see today (Rothstein, 2017). Many of these policies such as redlining and exclusionary zoning, made it extremely difficult for Black and Latinx families to buy and keep homes, which impeded their ability to build wealth over time. Redlining from The Homeowners' Loan Corporation (HOLC), a government-sponsored corporation created as part of the New Deal in the 1930s, continues to have dramatic "socioeconomic effects on household income, exposure to concentrated poverty, and even credit scores throughout the United States almost a century later" (Táíwò, 2022). This racialization of housing has put communities of color in a position where they are more likely to be low-income, renters, and left out of energy decision-making processes. As a result, these populations are also more likely to be energy insecure and would benefit significantly from energy system participation and ownership. Unless this unequal distribution of benefits is contended with, the clean energy transition will continue to exclude marginalized communities and further exacerbate inequities. Equitable solar deployment will not only help alleviate the energy burden but will also more equally distribute the benefits that solar has to offer. Solar energy deployment strategies that center energy justice can be a possible path forward to begin closing this solar equity gap.

Conceptual Framework

The rapid increase of solar adoption and its unequal distribution requires the pursuit of equity and inclusion to ensure solar benefits can be enjoyed by historically marginalized communities. Cities and utilities can harness this opportunity by pursuing plans, policies, and programs that ensure solar technology is accessible and affordable. The concept of energy justice can guide local governments and utilities in their efforts to achieve this. As Figure 1 depicts, the energy justice movement has roots in the environmental justice movement beginning in the late 1970s, in which activists and scholars provided evidence that communities of color were disproportionately impacted by environmental harms. Climate justice emerged from this movement in the 1990s and addresses the climate change issues facing communities of color and working-class communities. Although this movement is global in scope, climate injustice in the United States manifests as low-income communities and people of color suffering "the deepest impacts of climate change, given legacies of legalized segregation, redlining, and disinvestment that have left communities of color and the poor on land and in economic circumstances that make them the most vulnerable to climate change. Moreover, such communities lack the economic resources to easily "bounce back" from climate change-related events" ("Workbook," n.d.). Energy justice emerged from these movements in the early 2010s and has come to be used as a theoretical, policy, political, and management tool (McCauley et al, 2019).

Figure 1

Timeline and key claims of the Environmental Justice, Climate Justice, and Energy Justice Movements



Note. From *The Energy Justice Workbook*, Initiative for Energy Justice, n.d.

Several definitions of energy justice have arisen from the literature. The first, and still widely used, definition describes energy justice as having three core tenets; distributional, procedural, and recognitional justice (Jenkins et al., 2016). Distributional justice is concerned with how the benefits and burdens of the energy system are distributed. In fossil fuel infrastructure, the placement of polluting facilities near marginalized communities presents a distributional injustice. The same can be said for the inequitable distribution of clean energy technology and the benefits that come with it. Recognition justice acknowledges that "people with different social, cultural, ethical, racial, and gender backgrounds all have relevant and informative perspectives, opinions, and priorities that should be acknowledged and honored" (Spurlock et al., 2022). It also recognizes the inequitable distribution of past and present harm that the energy system has borne on marginalized communities. Lastly, procedural justice asserts that marginalized communities should participate in and have direct access to decision-making processes in the energy system. McCauley et al. (2019) broaden this concept by asserting that procedural justice and the right to fair process are not simply inclusion in decision-making, they also entail a demand for involvement in delivering a more equitable outcome. The second definition that arose in the literature was advanced by Sovacool & Dworkin (2015), who describe an energy justice decision-making framework that promotes eight core principles: availability, affordability, due process, transparency and accountability, sustainability, intra-generational equity, inter-generational equity, and responsibility (Figure 2).

Table 1

Eight core principles of energy justice

Principle	Explanation
Availability	People deserve sufficient energy resources of high quality
Affordability	All people, including the poor, should pay no more than 10 percent of their income for energy services
Due process	Countries should respect due process and human rights in their production and use of energy
Good governance	All people should have access to high quality information about energy and the environment and fair, transparent, and accountable forms of energy decision-making
Sustainability	Energy resources should not be depleted too quickly
Intragenerational equity	All people have a right to fairly access energy services
Intergenerational equity	Future generations have a right to enjoy a good life undisturbed by the damage our energy systems inflict on the world today
Responsibility	All nations have a responsibility to protect the natural environment and minimize energy-related environmental threats

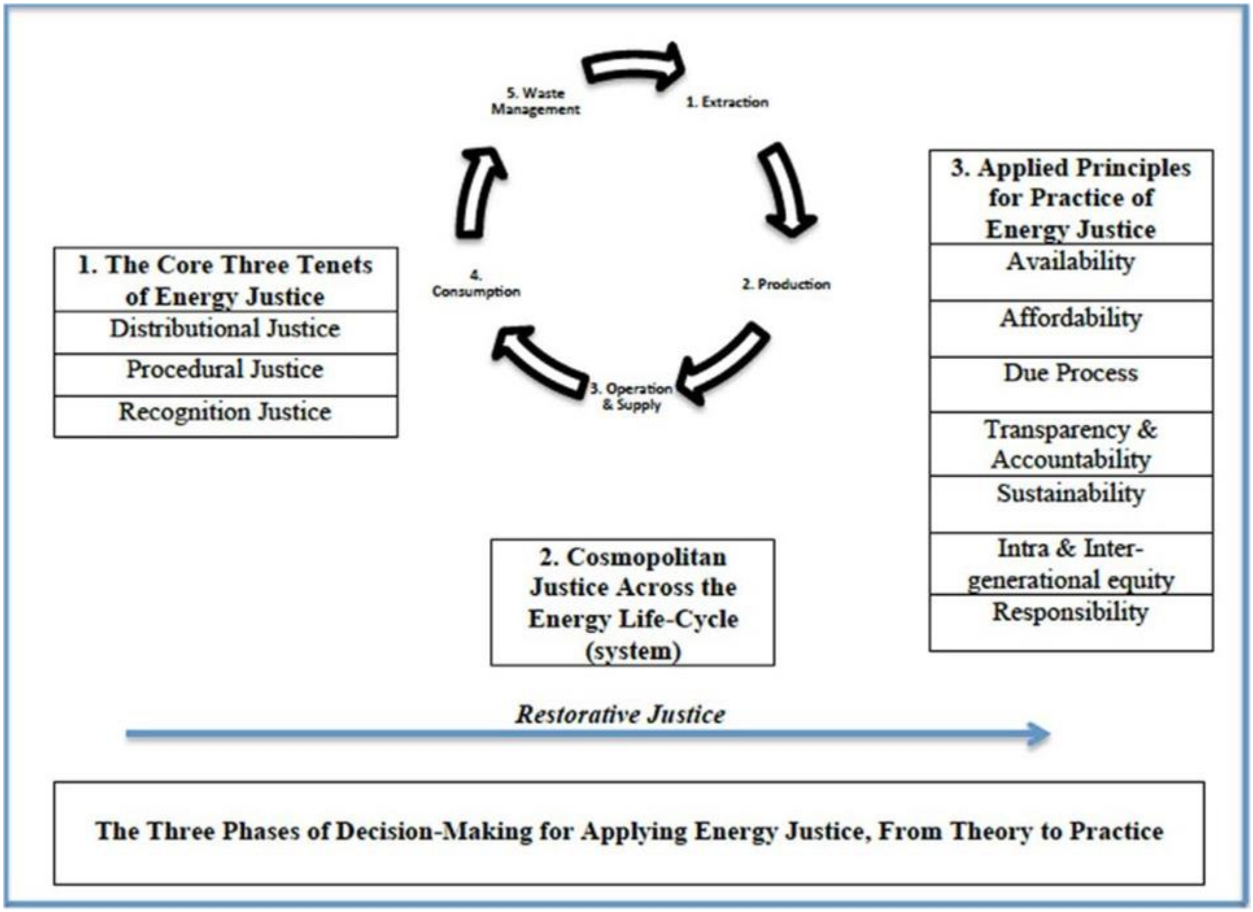
Note. From *Energy justice: Conceptual insights and practical applications*, Sovacool & Dworkin, 2015, p. 440. Copyright 2015 Elsevier Ltd.

While the three core tenants and eight core principles definitions are helpful for conceptualizing energy justice, some scholars and practitioners have found them to be disjointed. In their article, ‘‘The Concept of Energy Justice Across the Disciplines,” Heffron & McCauley identified the framework’s ineffectiveness in being transferred into practice as a key limitation (2017). To remedy this, the authors combined elements of these two frameworks and expanded them to include restorative justice and cosmopolitan justice. Cosmopolitan justice, while out of the scope of this study, is concerned with justice across all stages of the energy system and is global in scale. On the other hand, the concept of restorative justice primarily emerged from criminal law and focuses on repairing harm done to the victim instead of solely punishing the offender. In this context, restorative justice calls for the repair of past and present harm done to marginalized communities and the environment by the energy system. The authors propose this framework could even prevent future energy injustices by ensuring “that decision-making was made in light of considering the potential harm of that decision and consequently the true cost of that decision” (p. 661). The authors view this form of justice as providing a uniting goal for decision-makers as they put energy justice into practice. Their resulting framework (Figure 2) displays how all of these definitions of energy justice are interconnected and applied in practice.

This framework displays three phases of decision-making, beginning with identifying the three core tenants of energy justice in the problem at hand. Next, the practitioner would identify where in the energy system this problem is occurring. They then decide which applied principle for the practice of energy justice would address this issue, if any. Notably, restorative justice is an ongoing thread of this framework and is intended to be applied at every step.

Figure 2

Energy Justice Conceptual Framework



Note. From *The concept of energy justice across the disciplines*, Heffron & McCauley, 2017, p. 660. Copyright 2017 Elsevier Ltd.

While different groups and disciplines have used the concept of energy justice differently, the above framework provides helpful insights on how to transfer energy justice theory into practice. It also adds a time dimension that is missing from other definitions, because restorative justice broadens the scope to address past harm. In light of the history of housing and wealth inequality in the U.S. that impacts solar adoption by communities of color, restorative justice is a particularly compelling piece of this framework. It not only ensures that past harms are being reconciled, but it also demands equitable future outcomes. However, this framework implies a national or global scale, so I will adapt it to apply to local solar strategies. This requires excluding cosmopolitan justice and due process as they are out of the scope of this study. To put this framework in the context of this report, the energy justice issue at hand is the inequitable distribution of solar energy (Step 1), which is concerned with the production and consumption phase of the energy system (Step 2). Strategies to remedy this inequity will ideally include several of the applied principles at once (Step 3). Restorative justice should be applied at each step of this process which requires an understanding of the historical context that produced and continues to produce harm to low-income and communities of color. This framework helps energy practitioners and policymakers think through energy justice concerns comprehensively, and for this reason, will guide this study.

Chapter 2: Solar Justice Policies

When the principles of energy justice are applied to solar deployment, the resulting strategies put forth by local government and utilities are termed solar justice policies (SJ policies). Gao & Zhou define SJ policies as policies "that aim to promote solar PV adoption by broader and more diverse segments of populations in the U.S" (2022). Not all SJ policies are the same, they differ depending on geographic location, the targeted demographic, the policy mechanism used, eligibility criteria, and the type of solar they are promoting. The SJ policies that have been employed have seen different levels of efficacy, and some have not been successful in targeting the demographic or achieving the adoption increase they hoped for. In their study, Gao and Zhou evaluated how effective local and utility-level SJ policies are at decreasing inequities in adoption. They found that SJ policies are positively related to solar deployment by low-income households. However, the positive impact is not statistically significant for Black-majority census tracts (2022). While this finding is somewhat hopeful in terms of success in low-income deployment, it illuminates a major shortcoming: Black households are not being effectively targeted and therefore are not receiving solar's corresponding benefits. Given the history of housing inequality, Black households should be explicitly focused on in these policies if restorative justice is to be pursued. Another study found that less than half of all community solar projects in the U.S. have participation from low-income households, with most subscribers being higher education institutions, government agencies, businesses, and high-income households (*Energy Equity*, n.d.). This is a troubling finding given that the community solar format has the ability to lower many barriers to solar adoption. These insights, taken together, indicate that SJ policies can have unintended distributional effects, and careful attention should be paid to their implementation and cascading impacts.

Despite some SJ policies' shortcomings, many are seeing success in targeting low-income households and households of color and are increasing deployment in these areas. Goa & Zhou analyzed the effectiveness of local and utility-scale SJ policies and included an exhaustive list of such policies in the U.S. (2022). In the following section, I employ a similar analysis by honing in on four policies employed by local governments and utilities in California, Oregon, Wisconsin, and Colorado that can be viewed as examples for cities and utilities across the U.S. that are attempting to put energy justice into practice through solar. In choosing solar policies to analyze, I used part of Goa & Zhou’s criteria by including only local and utility-level solar policies with a justice component, and the cases from California, Oregon, and Wisconsin were chosen in their work as well. However, the authors excluded community solar in their analysis as it wasn’t conducive to quantifying the effectiveness of SJ policies across incomes. For my last SJ policy, I stray from Goa & Zhou’s criteria and include a utility-scale community solar program in Colorado as there are many energy justice implications of this solar format. These four SJ policies were chosen because they are local and utility-scale, align with the energy justice framework, and are having tangible impacts on their target communities. Additionally, they demonstrate a diversity of geographies and solar formats such as multifamily, residential, and community solar. By analyzing a broad set of SJ policies according to the methods section below, key themes emerge that exemplify why these policies have been effective in increasing accessibility.

Methods

The analysis of the following SJ policies, summarized in Table 2, predominately included gathering and synthesizing grey literature about the respective programs. I first gathered public-facing information from each city or utility’s website about their solar program. I aimed to identify the basic program structure, the incentive type, eligibility criteria, and data about the program’s impact thus far. I then read 3-5 news articles and blog posts for each program that were linked to these websites. Reading these articles gleaned insights into the program’s community engagement strategies and how local residents view the program. Lastly, I read outreach plans, technical and policy documents, and program impact summary documents where applicable. Some programs are further along than others and have a more comprehensive analysis of the program’s effectiveness. For example, reports such as “Lessons Learned” and “Marketing, Education, and Outreach Plan” from Colorado and California respectively, proved helpful in understanding the challenges and opportunities for these programs. These reports offered a more fine-tuned assessment of the program structure and what changes are planned, if any. In analyzing this grey literature, I looked for the equity elements and how these programs adhere (or don’t adhere) to the energy justice conceptual framework.

Importantly, my methods and questions do not assess how *well* the principles of energy justice are being realized. The question of quality is important here, as planning scholarship has extensively demonstrated that planning initiatives often address equity in limited and superficial ways. In addition, my report does not address the question of scale. In other words, the number of people being served, and the new amount of energy being generated, may be significantly small relative to what is needed and possible. Instead, my methods and questions aim to link emergent practices with the principles of energy justice as a way of pointing out synergies and omissions in solar planning.

Table 2

Summary of Solar Justice Policies

	SOMAH	Madison, WI	Portland, OR	Colorado utilities
Distributive	✓	✓	✓	✓
Procedural			✓	
Recognition	✓			
Availability	✓	✓	✓	✓
Affordability	✓	✓	✓	✓
Transparency & Accountability	✓		✓	
Sustainability	✓	✓	✓	✓
Intragenerational Equity				
Intergenerational Equity				
Responsibility	✓	✓	✓	✓
Restorative	✓		✓	

SOMAH

The first such policy is California's Solar on Multifamily Affordable Housing Program (SOMAH), which is overseen by the California Public Utilities Commission and provides solar incentives to qualifying affordable housing within the service territories of Pacific Gas & Electric Company (PG&E), Southern California Edison Company (SCE), San Diego Gas & Electric (SDG&E), Liberties Utilities Company (Liberty), and PacifiCorp. The overarching goal of the program is to provide incentives for the installation and interconnection of at least 300 MW of solar in affordable multifamily housing by 2030. Funded by greenhouse gas auction revenues through California's Cap-and-Trade Program, SOMAH provides direct economic benefits to tenants, with specific eligibility for those in California's environmental justice or

Disadvantaged Communities (DACs), as defined by the California Environmental Protection Agency. DACs are census tracts that are disproportionately burdened by multiple sources of pollution and are primarily African American and Latino. SOMAH aims to "reduce barriers for these communities to access the benefits of solar for residents living in affordable multifamily housing, through energy bill credits and job training opportunities" (*SOMAH | Solar on Multifamily Affordable Housing*, n.d.). This program partners with community-based organizations (CBOs) to better serve and communicate with communities in need, many of which are environmental and social justice-focused organizations. To date, SOMAH has completed 335 projects serving 26,625 tenant units. Approximately 32%.of these projects currently serve residents in DACs, however, the program aims for 40% by 2026.

Madison & Portland Grants

The City of Madison and Portland General Electric and Pacific Power are both pursuing similar SJ policies in the form of grants. The City of Madison's Backyard Solar Grants help make solar energy more accessible for Madison-based community organizations and affordable housing providers that serve the City of Madison residents. This program is funded by the city and provides grants to non-profit organizations and affordable housing providers. Grants will fund up to 20% of the total project cost, and aim to serve "diverse, low-income residents and neighborhoods" ("Backyard Solar Grant," n.d.). These grants are part of MadiSUN, the City of Madison's broader initiative to expand solar for homes, businesses, and nonprofit organizations throughout 2023. This program has three main facets: a solar group purchase program aimed at reducing the cost of solar installations for households, a pool of grants provided to businesses installing solar energy sources, and a grant to increase solar energy access for residents and local organizations (*Madison Launches New Solar Power Initiative*, n.d.). The city partnered with the local nonprofit RENEW Wisconsin, an organization aimed to increase access to renewable energy in the state.

Similarly, Portland General Electric and Pacific Power's Solar Innovation Grants provided $81,600 in grants to nine community-based organizations to develop programs that benefit LMI residents through solar technology. These grants were the culmination of a three-year community outreach effort to understand the barriers facing low-income communities in obtaining solar energy (*Increasing Access to Solar for Oregonians with Low and Moderate Incomes*, 2018). In 2017, Energy Trust began hosting four listening sessions in communities in or near the Portland area, focusing on how solar can reduce home energy costs and empower low-income residents to participate in renewable energy generation. Over 120 participants shared solar challenges unique to their respective communities and connected with other groups interested in collaborating on solar projects. Later that year, Energy Trust hosted an LMI solar working group that met monthly to discuss the issues related to solar access including housing, financing, community engagement, and workforce development. The working group included 20 stakeholder organizations from around the Portland metro area and had representation from renewable energy, environmental justice, and low-income community advocacy groups. The consensus from this extended outreach effort was that a grant format is important for advancing innovative ways to increase access to solar among LMI households and other communities that have faced barriers to participation, such as rural residents and communities of color (*Increasing Access to Solar Energy in Low- and Moderate-Income Communities*, 2019).

Grant Awardees include organizations such as African American Alliance for Homeownership, Solar for All, and Oregon Clean Power Co-op, among several others. Some of the goals of the awardees include "figuring out a shared benefit model to pass on solar financial benefits to tenants in affordable multi-family buildings, creating a co-housing development with solar access, and bringing solar solutions to qualifying Habitat for Humanity Homes" (*Low-Income Solar Innovation Grants*, n.d.). A goal of the Solar Innovation Grants is to learn from the solutions that the awardees employ, so they can become scalable and replicable models elsewhere in the service area.

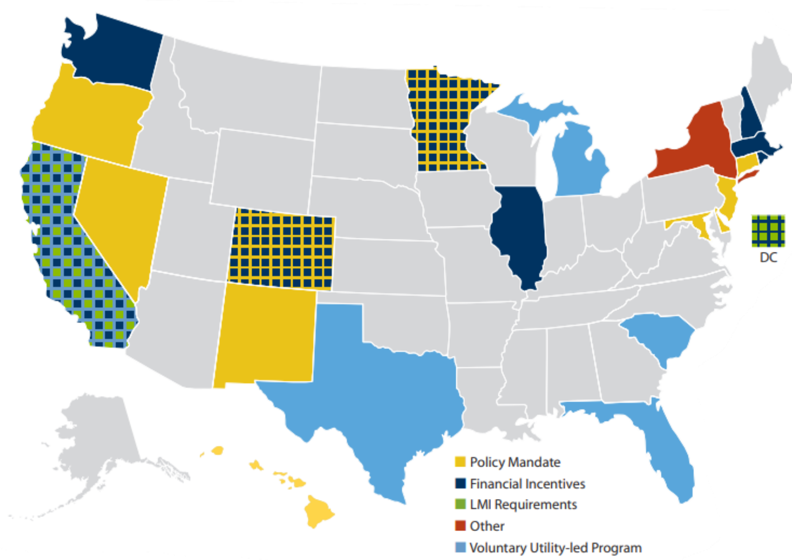
Community Solar Demonstration Project

A particularly effective type of SJ policy aims to make community solar more accessible. Community solar, also referred to as shared solar, is a solar deployment method that allows customers to lease or subscribe to a large, off-site PV system (*Community Solar*, n.d.). This model provides an alternative to rooftop solar for renters, multifamily housing residents, and homeowners with inadequate roofing. As of December 2021, community solar has been established in 39 states in the U.S., and 21 of those states developed community solar-related programs intended to benefit LMI customers (NREL, 2021). Several general approaches have been identified to increase equity in community solar deployment: policy mandate, LMI requirements, financial incentives, and voluntary utility-led programs (Heeter et al, 2021) (Figure 3). One notable example of a low-income community solar program is the Colorado Energy

Office Low Income Community Solar Demonstration Project. This project aimed to demonstrate the feasibility of building 100% low-income community solar models and reducing the energy burden of LMI Colorado residents. Partnering with seven utility companies in the state, the program built six community solar projects, all of which offered solar credits to the 380 total low-income subscribers to ensure affordable solar energy (Dobos & Artale, 2020). While the participating utilities had slightly different results, each project reported benefits for their tenants, with each subscriber saving 15 to 50 percent on their electricity bills. Since it was a demonstration project, an important aspect of this project was synthesizing lessons learned to ensure smooth transitions in the future

Figure 3

States with a community solar program with an equitable component



Note. From *Equitable Access to Community Solar: Program Design and Subscription Considerations* Heeter et al., 2021, p. 2.

Although the above SJ policies vary widely in their content, what they all have in common is that they lower key barriers that stand in the way of solar being more accessible and inclusive for renters, LMI households, and communities of color. More specifically, all of the policies are working towards distributional justice by lowering barriers and distributing this technology more equitably. While these SJ policies do not cover all aspects of the Heffron & McCauley Energy Justice Framework, as depicted in Table 2, they all have unique features that align with other areas of the energy justice framework that make them great models. One of the most notable characteristics of SOMAH, for example, is its focus on projects that serve DACs; it acknowledges that residents in these areas are primarily communities of color that have been exposed to disproportionate amounts of pollutants, likely in part by the fossil fuel-based energy system. Because of this focus, barriers are also lowered for communities of color, particularly Latino and Black communities, to adopt solar. This program is making strides in terms of how the restorative justice component of energy justice can be put into practice. It recognizes that harm has been done to particular communities and aims to restore justice to them by increasing the availability and affordability of clean energy. These underserved communities are tangibly benefiting from this program through financial benefits, consumer protections, a cleaner environment, and access to job training and energy efficiency programs. Although they have not met their fast-approaching deadline of 40% of projects in DACs by 2026, SOMAH acknowledges this may require program changes to meet this goal. Because it lowers many barriers at once and explicitly focuses on DACs, it is clear that SOMAH is committed to rectifying past harms through the long-term benefits of solar for underserved communities.

The solar grants from Portland and Madison are a particularly effective SJ policy mechanism because they lower significant financial barriers and are conducive to community autonomy. While rebates and tax incentives lower overall project costs, they are often unrealistic for low-income households because the project will require upfront payments. Grants awarded to community organizations reduce the need for an upfront payment by the target community. These two programs are deeply pursuing the procedural and recognition justice components of energy justice by using this SJ policy structure. Firstly, awarding grants to community organizations instead of imposing technical expertise, is an acknowledgment that no one knows these communities better than those who live there, and they have valuable knowledge about what will benefit them. Awardees of both the Madison and Portland grants, and the communities they serve, are at the forefront of energy decision-making. They decide what to do with their funds and what kind of solar energy model will work best for them. This community control has been exemplified by the different approaches the recipients have taken to suit their community needs. Similarly, in the case of the Colorado Energy Office Low-Income Community Solar Demonstration Project, the community solar format has restorative effects beyond the solar project itself. Community energy is associated with stronger community cohesiveness, increased political participation, inclusiveness, and empowerment (Brummer, 2018). Community solar policies with a low-income component, such as this Colorado program, are an especially effective SJ policy for the long-term co-benefits it provides marginalized communities.

Restorative justice was notably lacking in many of these SJ policies, which would require the explicit acknowledgment of past harm and the resulting inequitable outcomes as well as effective and ongoing repair for these harms. In this context, restorative justice would include the city or utility acknowledging the inequities endured by LMI and communities of color and their resulting exclusion from clean energy access and decision-making. The SJ policy would also specifically benefit these communities and have meaningful impacts such as bill savings, energy security, or the potential for intergenerational wealth building. Only two of the four SJ policies met these criteria, SOMAH and the Portland Solar Innovation Grants. Changes to the remaining policies that ensure restorative action is being taken for impacted communities would improve them greatly. Another aspect of these policies to take into consideration is the differing geography and political climate of the areas they are enacted. Not every city will be able to accomplish the same types of policies and will often depend on political will and the culture of the area. However, what these policies demonstrate is that it is possible to accomplish SJ policies in a diverse array of cities with varying political climates using different models and funding mechanisms. They each lower several barriers to solar adoption and provide unique combinations of restorative, distributional, and procedural justice through the applied principles while being tailored to fit each area's needs. These policies can be looked at as examples for cities aiming to increase solar deployment in an equitable manner, particularly Austin, Texas described in depth below.

Chapter 3: Austin, Texas's Solar Deployment

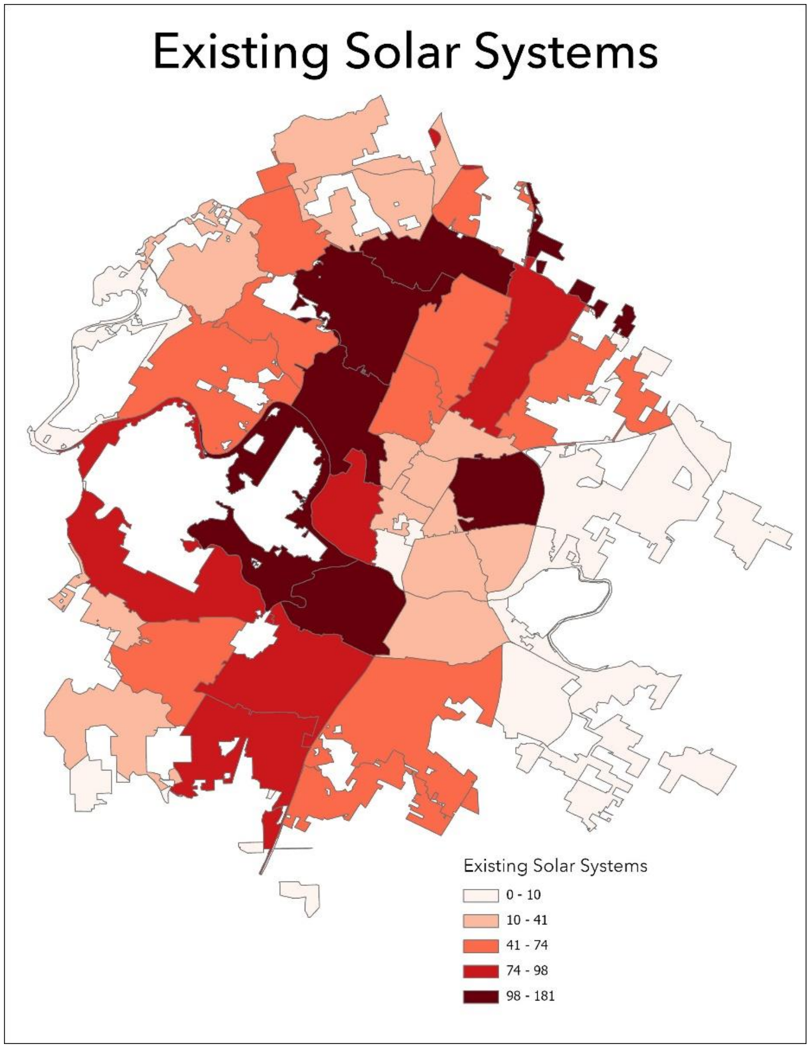
Austin, Texas is an interesting case to analyze the extent of energy justice in solar deployment for many reasons. Firstly, like most cities in the U.S., Austin has a long history of segregation and inequality. It is likely these existing inequalities will deepen as the population continues to grow dramatically, and large tech companies continue to relocate to the area (*Inheriting Inequality,* n.d.). The city has begun to reckon with this past with a new emphasis on equity in city departments and policies. Secondly, the city has recently put forth new strategies to combat climate change and increase renewable energy deployment. It would be a fair assumption that these new, more aggressive renewable deployment policies that coincide with a focus on equity would produce effective SJ policies for the city's LMI residents and communities of color. However, the extent to which solar deployment policies pursue energy justice has yet to be analyzed. The below sections briefly describe the city's segregationist history, followed by the city's spatial solar deployment patterns and recent SJ policies.

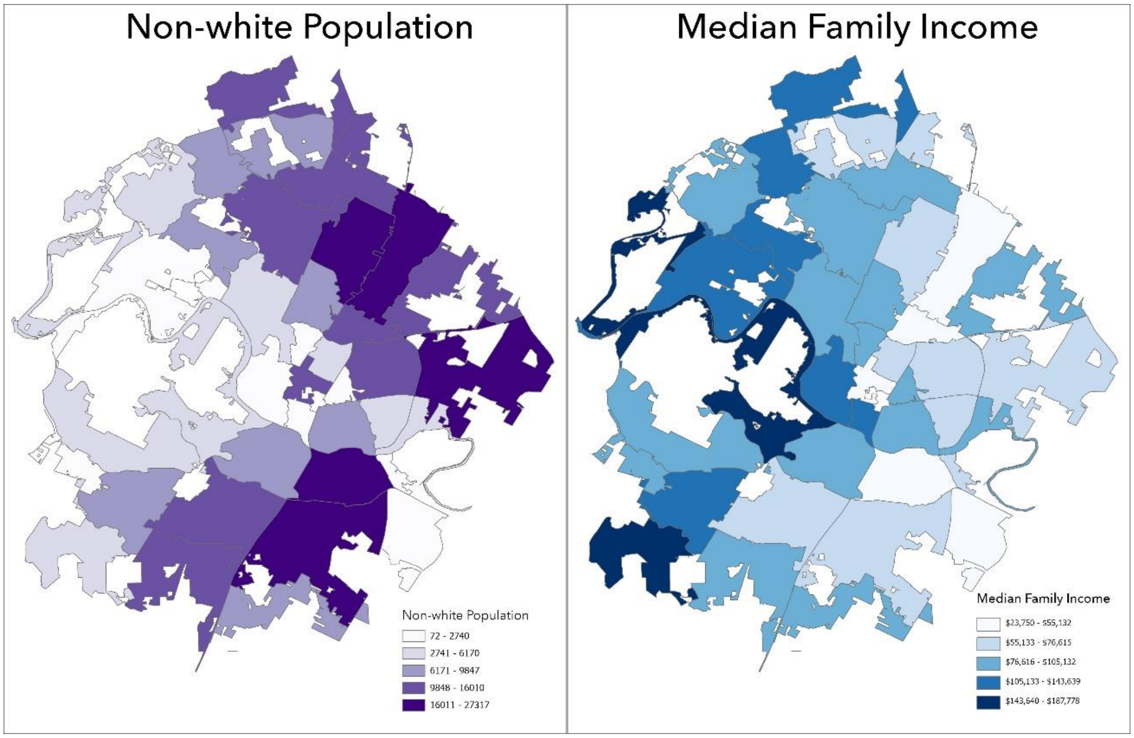
Austin, generally considered a progressive Texas city, is far from a just place for all its residents. Current injustices have roots in mandated racial segregation and historic zoning patterns from the early 20th century. The City of Austin's comprehensive city plan, which was adopted in 1928, designated East Austin as the area where industries and minority groups, specifically Black and Mexican American communities, would relocate (EJOLT, n.d.). Because it was unconstitutional to use zoning laws to promote racial segregation, "the city used tactics such as eliminating utility services to Black families and prohibiting them from accessing public services in areas west of East Avenue to enact their plan" (Shepherd, 2021). This new plan resulted in polluting industrial facilities being moved to what is now Austin City Council District 1, near the predominately Black and Latinx communities that were forced there. Over 90 years after the publishing of this comprehensive plan, Austin remains a highly segregated city with unequal distribution of environmental harms and benefits which often manifests in an East-West divide. However, it is important to note that many impacted residents have been displaced over the years by gentrification and other factors, so current disparities don't illustrate the full picture. Energy injustice, specifically in solar deployment, is one area where these disparities are still seen today (Figure 4).

The top map depicts existing solar installations in the City of Austin and contains 2,761 total arrays (*Project Sunroof*, n.d.). This dataset was last updated in 2019, so the total number of installations is likely much higher given the rapid growth of residential solar. However, this map is useful in displaying general adoption patterns throughout the city. There is higher solar deployment to the west of Interstate 35, as shown by the red and burgundy zip codes which correspond to between 98 and 181 solar installations in these areas. These areas have historically been white and wealthy areas as shown in the Median Family Income map (bottom right), which displays the MFI for all Austin zip codes in 2021 Inflation-Adjusted dollars (American Community Survey, 2017-2021). There are an average of 101 installations in the three wealthiest zip codes in Austin. While there are several solar installations in the zip codes to the east, they are far less concentrated than in the western zip codes. However, there is one notable exception, the 78723 zip code in East Austin has a high concentration of solar installations. This anomaly is likely explained by the fact that this zip code encompasses the Mueller neighborhood; a redevelopment of the former Robert Mueller Municipal Airport that is touted as a "transit-oriented and pedestrian-friendly model of new urbanism and sustainability" (*Visit Mueller Today*, n.d.). Sustainability was integral to the planning of this neighborhood and this zip code is largely unrepresentative of East Austin as a result. Overall, however, these spatial patterns demonstrate the legacy of the 1928 plan and the ongoing disparities for East Austinites. The Non-white population map (bottom left) is the population per zip code after excluding the White Alone, Not Hispanic or Latino category. Taken together, these maps demonstrate that solar adoption in Austin presents a spatial, racial, and economic disparity. These inequalities don't appear to be slowing down, especially as the population grows, and tech industries bring high-paying jobs to the city center. As Austin reckons with its unjust past, the city is beginning to take action to explicitly pursue equity. This is demonstrated by the city's creation of an Equity Office, an equity assessment tool, and an increase in staff training on racial equity (*Equity Office | AustinTexas.Gov*, n.d.). This equity focus is also seen in its climate and energy planning.

Figure 4.

Existing solar arrays (top) Median Family Income (bottom right), and Total Non-white Population (bottom left) for all zip codes in Austin, Texas





Note. Data adapted from Google Project Sunroof, 2019 and American Community Survey (ACS) 2017--2021 (5-year estimates).

The Austin Climate Equity Plan and Austin Energy Resource, Generation, and Climate Protection Plan to 2030 (2030 Plan) demonstrates the city's commitment to cut emissions over the next decade, and both plans include policies surrounding solar deployment (Summarized in Table 3). The recently adopted Austin Climate Equity Plan is arguably the most comprehensive mitigation measure Austin has taken to fight climate change. Austin's climate action plans have gone through several iterations in the past, the first being adopted in 2007. The Community Climate Plan was adopted by the city council in 2015, which set the ambitious goal of net-zero emissions by 2050. Five years later, the city set out to revise the plan and adjust its goals and priorities. In September 2021 after more than a year of planning and collaborating with the community, the Austin Climate Equity plan was adopted and was markedly different from its predecessor. Most notably, the new plan is centered on racial equity. In the plan's executive summary, the steering committee acknowledges that the impacts of climate change are distributed unequally and that the climate crisis cannot be solved "without addressing equity, and we cannot talk about climate change solutions without talking about racial and environmental justice and centering communities of color in our response" (p. 5). The other major change in the new climate action plan is that it accelerates the pace at which the city aims to reach net-zero emissions by 2040, a decade earlier than the previous plan. To achieve this, the plan works in tandem with community plans from other departments to reach climate and equity goals, including the Austin Energy Resource, Generation, and Climate Protection Plan to 2030, Project Connect, Austin Resource Recovery Zero Waste Plan, Austin Strategic Mobility Plan, and Water Forward.

Table 3

Summary of Austin's solar deployment approach

	Solar Rebate + VoS credits	Community Solar (CAP customers)	Multifamily Solar
Distributive		✓	✓
Procedural			
Recognition			
Availability	✓	✓	
Affordability		✓	✓
Transparency & Accountability			
Sustainability	✓	✓	✓
Intragenerational Equity			
Intergenerational Equity			
Responsibility	✓	✓	✓
Restorative			

In terms of solar, the plan has several actions to equitably increase solar deployment. One of which is through green jobs training and career pathways for skills related to the installation and maintenance of new and existing green technologies and solutions, specifically focusing on low-income communities and communities of color (p.43). Another strategy the plan describes is exploring a bulk purchasing program to secure discounts on low-carbon technologies such as heat pumps, heat pump water heaters, solar photovoltaic and solar thermal systems, and battery storage systems (p. 51). These technologies are intended for affordable housing and city-owned buildings, with the goal of passing down these discounts to area residents. Although not every detail is expected in a plan of this size, there is little in the way of how these solar strategies will be implemented. Aside from these strategies, the majority of the solar goals in the Climate Equity Plan are reliant on the successful implementation of Austin Energy's 2030 Plan; a ten-year plan that outlines energy efficiency and climate change protection goals for the community-owned utility. Adopted unanimously by the city council in early 2020, this plan updated and replaced the previous Generation and Climate Protection Plan to 2027 and added more aggressive clean energy targets. The goal at the heart of the plan is for all of the utility's electricity generation to be carbon-free by 2035, with incremental percentage increases of carbon-free electricity generation in the years in between. One action to achieve this is increasing local solar energy from both utility-scale and residential installations. By 2030, the utility aims to install 375 MW of solar capacity, 200 of which will be customer-sited. The plan also aims to continue to build out its multifamily solar pilot program, which is a metering and billing solution that decreases installation costs for solar on multifamily properties and creates solar bill credits for tenants. This alleviates the challenge of a lack of sub-metering on multifamily buildings and still allows tenants to benefit financially from the system. However, at the time of writing, this program still has no participants. The 2030 Plan alludes to the billing system being a challenge to expanding this program.

The last solar goal in the plan is to "provide moderate and limited-income customers preferential access to community solar programs" (p. 4). Austin Energy currently owns three community solar farms; the Palmer Array, La Loma solar farm, and an array on a parking garage at Austin Bergstrom International Airport. Austin Energy customers can subscribe to have their energy use covered by community solar. The average subscriber's utility bill is increased by $14 unless they are eligible for the Customer Assistance Program (CAP). Residential customers on low or fixed incomes who participate in certain federal, state, or local assistance programs can benefit from the City of Austin CAP utility discounts. The average CAP customer sees an average reduction in their utility bills of $650 a year. CAP customers can receive a reduced rate for community solar and energy efficiency improvements at no cost (*Customer Assistance Programs (CAP)*, n.d.). In 2022, the community solar program had 273 market rate participants and 154 CAP participants. An Austin Energy employee working on this program said their goal is to "balance market-rate and CAP customers 50/50 at all times, but technology, staffing, customer communications, and other challenges remain obstacles in keeping the proportion steady."

Although not listed in the 2030 Plan, Austin Energy offers financial incentives for single-family solar installations through rebates and a Value of Solar (VoS) credit. Homeowners are eligible for a $2500 rebate by completing a solar education course and installing a qualifying solar system on their homes. Additionally, solar homeowners will have a VoS credit applied to their monthly utility bill for every kilowatt-hour of electricity their solar PV system generates which is currently valued at 9.7 cents per kWh. This is a billing mechanism that the utility uses instead of net-metering, and it is aimed to credit the solar adopter for money the solar system is saving the utility in terms of energy and reduced wear-and-tear of the distribution infrastructure. Although the rebate and VoS credits don't apply to renters and many LMI households, the utility's decision to forgo net metering in place of VoS credits could potentially have equity benefits given that many LMI customers experience cost-shifting from utilities that participate in net-metering. Although many of the solar policies have equity considerations built into them, it is possible they aren't as effective as they could be. As shown in Table 2, many aspects of energy justice are lacking in Austin's solar policies as they currently stand. Comparison with the SJ policies above reveals many areas for potential improvement.

Chapter 4: Comparison

While there are clear opportunities for improvement when comparing Austin's solar approach with the SJ policies, it is important to highlight key challenges that could hinder the City of Austin and Austin Energy from adopting these policies. The first is that solar projects, particularly community and multifamily solar have very high capital costs. Even after federal, state, and local financial incentives are applied to the project, it may not be cost-effective and even if it is, there may be challenges in passing down the maximum benefit to the customers while balancing utility costs. In addition to capital costs, there are also "soft costs" accrued throughout the project timeline that include all non-hardware costs; design, siting, permitting, installation, interconnection, and financing. They also include sales, general, and administrative expenses solar companies incur for customer acquisition, workforce training, and certification (*Soft Costs,* n.d.). While these soft costs can present issues, the costs and time associated with permitting, inspection, and installation (PII) are increasingly challenging for solar projects, particularly in the wake of Covid-19 (Cruce et al., 2022). PII is administered by the local Authority Having Jurisdiction (AHJ) and the utility, whose processes and timelines vary tremendously from place to place. Streamlining these processes and lowering soft costs would have significant impacts on the cost-effectiveness of a solar program.

Soft costs can also present logistical challenges for utilities that can impede a solar justice policy from being implemented or reaching the intended customers. LMI customer acquisition and verification of LMI status on a rolling basis accrue costs for the utility. Collaboration with other government-run assistance programs, such as CAP, can ease customer acquisition challenges, but often require more consideration for customer protection and ensuring these customers don't lose the benefits of other programs (*Summary: Low-Income Community Solar Subscription Tool Request for Information*. (2022). Another challenge facing utilities is billing software. A consolidated and transparent billing mechanism is key to ensuring target customers opt into solar programs and are receiving credits on their monthly utility bills. However, researching new software that can handle these capabilities and training staff to operate them comes with considerable time costs (Dobos & Artale, 2020). Despite these challenges, there are many insights that can be gleaned from SJ policies and opportunities to improve Austin's solar approach.

Several of the policies to promote solar deployment in Austin have the potential for beneficial equity implications for residents. Firstly, the multifamily solar program solves a key challenge that prevents multifamily tenants from receiving the benefits of solar energy: Sub-metering. If the individual units are not sub-metered, it would be nearly impossible to know the usage of each unit and how much savings they would incur from a solar system. However, the shared solar pilot program would use virtual metering and provide credits to tenants regardless of submeters. There are many reasons this pilot program hasn't received much traction among property owners. One is the owners-tenant split incentive, mentioned above. Property owners have little incentive to install solar when their tenants realize the financial benefits via solar credits on their utility bills. This challenge could likely be overcome if the benefits to property owners are emphasized and actively promoted. The reduced maintenance and increased resiliency of the property are increasingly attractive benefits as Austin experiences more frequent and intense climate-related disasters. The SOMAH program does a good job of advertising the fact that both property owners and tenants will benefit from solar. It would be worth exploring the strategies that SOMAH has done to spread the word about the program, such as outreach programs for property owners. If Austin could communicate these benefits on their website and through targeted outreach to property owners, it would potentially increase participation. It is also important to note that the program is still under a year old and is likely sorting through logistical and administrative issues.

The next solar policy of note is the 2030 plan goal to have 200 out of 375 MW of newly installed solar be customer-sited. This includes both residential and community solar installations. It is unclear what the exact breakdown of the 200 MW will be, but siting more residential solar would have negative distributional implications given the many barriers to residential solar. The rebate and VoS credit are largely out of reach for LMI communities and households of color in Austin. However, if more community solar was installed this would have positive impacts on LMI customers, given that CAP customers will be given preferential access to this program as per the 2030 plan. It is unclear how Austin Energy will do this given that there were considerably more market-rate customers than CAP customers in 2022. Additionally, CAP customers currently only receive a very small discount for community solar. Technology, staffing, and customer communication have been cited as obstacles to increasing the number of low-income participants in the program because significant resources are dedicated to customer acquisition, billing, and verifying low-income status. Using the CAP program as the eligibility criteria for a discount on community solar was an effective decision because the utility saves resources identifying households in need of assistance. CAP customers can opt-in to the community solar program at the time of applying for CAP. However, some customers may not know the details of the program and may avoid it for fear of increased fees and utility bills. A more comprehensive explanation and outreach to LMI households may increase participation. This may include communication alternatives to emails and calls since some low-income households have technology barriers. The utility could also explore alternative financing options to ensure CAP customers see a meaningful reduction in their monthly utility bills.

In the case of the Colorado Energy Office Low Income Community Solar Demonstration Project, they were able to identify several lessons learned from their six projects. Several of the lessons are things Austin Energy already does, namely: Integrate solar with complementary programming and simplify customer acquisition. Working with existing CAP customers streamlines these processes since the City of Austin already identifies residents who may be energy burdened. However, there appears to be a disconnect between the benefits of community solar and how some CAP customers are perceiving the program. Many of Colorado's lessons learned focused on customer experience such as setting clear cost-saving expectations, clearly outlining consumer protections, directing marketing materials at low-income, simplifying billing, and having transparency in bills (Dobos & Artale, 2020). Potential CAP customers should feel that this program is transparent and beneficial for them. Many of the Colorado community solar projects worked directly with the community to develop the solar garden by deciding on on-site placement and hiring local contractors. An interesting way the Colorado demonstration project helped spread the message about their program was through a community "kick-off" event, to celebrate the project's success, build momentum, increase visibility, and boost community involvement (p. 40). These seemingly simple strategies can go a long way in terms of building community trust, involvement, and ownership. Austin Energy could take some of these steps to make the community feel more connected to the community solar in the city, which would likely increase participation.

Some of the SJ policies from other states also highlight strategies that Austin isn't currently pursuing that would be beneficial in many ways. Firstly, the DACs that are prioritized in SOMAH are an effective strategy to focus programs in areas that are predominantly communities of color. Although race is not a factor in determining DACs for the state, there is a significant amount of overlap between DAC areas and communities of color, given communities of color are disproportionately burdened by the accumulation of environmental hazards (Monserrat, 2015). A similar approach could be taken in Austin using geographic and environmental hazard criteria. Although the CAP program is a good place to start in terms of identifying burdened communities, identifying geographic areas could have significant restorative effects for the city. Using similar criteria as the DACs, many of these areas would be located in East Austin, where the most environmental hazards are located. The legacy of the 1928 Comprehensive Plan is still seen today with the placement of hazards to the east where the majority of communities of color in Austin live. The city has made it clear that it wants to explicitly pursue racial equity, but no climate and energy policies have race as a component. Austin Energy and the city should lean into solar policies that address the spatial and racial adoption disparities if it is to pursue restorative justice for marginalized communities.

Another way Austin could increase its recognition and procedural justice in terms of solar is by implementing a grant program, similar to those in Portland and Madison. As the energy sector lead at Energy Trust of Oregon, Betsey Kauffman, stated, "People who live in and know their community is best able to understand the barriers to solar energy…Through these grants, we're sowing seeds to see what creative solutions will blossom." This is an important consideration for any LMI solar program; often outside experts impose solutions on a community without stopping to ask about their priorities and hesitancies in an energy project. However, these communities have ownership and control of their energy future and can create models that meet their specific needs. These grants could go to neighborhoods or the many community-based organizations to use towards solar equipment, job training, installation, storage, or whatever they deem beneficial to their communities. This program could potentially be financed with the revenue from market-rate community solar customers or from the city as part of the Climate Equity Plan implementation. This type of program would help build community cohesiveness and resiliency, which is especially important in the face of climate change. It is important that marginalized communities make their own energy-related decisions, whether that be multifamily solar, community solar, solar on a community building, etc., instead of the city imposing solutions that may not be a good fit. The resulting solutions could be replicated in other neighborhoods and result in cost savings for more LMI households.

Chapter 5: Conclusion

As solar adoption increases across the U.S., it is important that marginalized communities have equitable access to solar electricity and all the benefits that come with it. If representation from renters, LMI households, and communities of color, is aggressively increased, these benefits will be more equally distributed and energy burdens will be greatly reduced. Multifamily solar programs such as SOMAH, community solar programs that prioritize LMI households, grants, and creative financing have proven to be promising ways forward. They all increase distributional justice and increase deployment for marginalized communities, and have unique features that apply other areas of energy justice into practice. Austin has several solar policies in its Climate Equity Plan and Austin Energy's 2030 Plan, many of which have an equity component. Additionally, the city has begun reckoning with the inequities and legacy of its racist past and has had a new focus on equity in city policies. In comparing these SJ policies to Austin's approach to solar, a few similarities and areas for improvement are illuminated. Austin Energy is streamlining customer acquisition by integrating its community solar program with the City of Austin's customer assistance program. This reduces the resources needed to identify and verify eligible households. However, this approach doesn't take the spatial and racial disparities of solar adoption into consideration. Austin Energy should specifically address racial disparities in solar adoption through increased seeding in communities of color and ensuring marketing and application materials are accessible. It would also be beneficial to expand the CAP and multifamily solar pilot programs to ensure these underserved groups have ongoing support in solar adoption. These actions will ensure marginalized communities are not excluded from the clean energy transition and that the benefits of solar can be reaped by the whole community as the city continues to lower its emissions.

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