Advancing Equity in Access to Distributed Energy Resources in California

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Executive Summary: The widespread adoption of distributed energy resources (DERs) such as household solar panels and electric vehicles is a key component of California's plan to dramatically reduce greenhouse gas emissions. Unfortunately, DER uptake and thus the benefits it provides are disproportionately concentrated among wealthy, white households and communities in the state. Here, we propose that the California State Legislature address this inequity through two distinct mechanisms: 1) requiring the California Public Utilities Commission (CPUC) to prioritize DER programs that maximize non-energy benefits (e.g., reduced emissions, comfort, and safety, as proposed in 2021's Senate Bill 345) and 2) directing the CPUC to prioritize infrastructure updates in disadvantaged communities. These changes would help transform sustainable technologies from a force that exacerbates existing inequality gaps into a mechanism for promoting public health and economic well-being in poor communities and communities of color.

I. Distributed Energy Resource (DER) Policy in California

California currently leads the nation in the rollout of distributed energy resources (DERs), which include residential solar photovoltaic systems (systems that use energy from the Sun to produce electricity), energy efficiency upgrades, and electric vehicle charging stations (John 2019). Distributed energy resources offer numerous advantages: households with solar photovoltaic systems gain tax benefits, higher property values, and tens of thousands of dollars in energy savings over a 25-year period (Borenstein 2017). Electric vehicle adoption can provide cost savings and reductions in sound and air pollution; for instance, urban electric vehicle adoption would lead to a 90% reduction in urban emissions of nitrogen oxides and sulfur oxides, harmful gasses emitted by burning fossil fuels (Noel et al. 2018; Requia et al. 2018; Huo et al. 2015). On a larger scale, widespread adoption of DERs improves air quality (Yang et al. 2018) and reduces greenhouse gas emissions, thereby helping to mitigate the catastrophic effects of climate change (Akorede, Hizam, and Pouresmaeil 2010).

Various barriers such as lower rates of home ownership, insufficient access to capital, and older buildings in disadvantaged communities have resulted in the inequitable adoption of DERs in California (Brockway, Conde, and Callaway 2021; Scavo et al. 2016). These obstacles are exacerbated by existing energy policy. For example, in allocating support for DERs in low-income communities, the California Public Utilities Commission's (CPUC) uses a narrow definition of cost-effectiveness which focuses on direct energy benefits (e.g., energy savings) and does not consistently account for broader 'non-energy benefits' such as community health, safety, and comfort (Scavo et al. 2016). This omission reduces the extent to which low-income and disadvantaged communities benefit from the CPUC's resources (Scavo et al. 2016). Furthermore, current electrical infrastructure has disproportionately less circuit hosting capacity in Black-identifying and disadvantaged communities, limiting their ability to install solar photovoltaic systems and other DERs (Brockway, Conde, and Callaway 2021).

The state adopted the Single-family and Multifamily Affordable Solar Homes Programs designed to promote DER adoption in low income communities. However, these programs installed only 72 MW of solar capacity in low-income households and communities since 2007, relative to the total 9,000 MW of rooftop solar capacity in the state (California Public Utilities Commission n.d.a; California Public Utilities Commission n.d.b; Chhabra and de Lamare 2021). Moreover, these efforts are focused on household and community levels and do not address systemic obstacles to equitable DER adoption.

II. Evidence of Inequalities in DER distribution in California

The current distribution of DERs in the United States disproportionately benefits wealthy, white households and thus perpetuates racial, ethnic, and socioeconomic inequalities in the state (Reames 2020; Sunter, Castellanos, and Kammen 2019; Galen et al. 2020). In terms of racial and ethnic disparities, one national study found that, even when differences in household income and home ownership are accounted for, Black- and Hispanic-majority census tracts have 69% and 30% lower rates of solar photovoltaic adoption, respectively, than no majority tracts (Sunter, Castellanos, and Kammen 2019). Communities with the lowest rates of DER adoption are often those that could benefit the most from greater access and uptake. Low-income households of color face disproportionately high energy burdens (Drehobl, Ross, and Ayala 2020), have poorer indoor and outdoor air quality (Ferguson et al. 2020; Mohai, Pellow, and Roberts 2009), and live in homes that have less efficient insulation and appliances (Drehobl and Ross 2016; Penney and Kloer 2015).

The inequitable distribution of DERs in California is demonstrated by the California Communities Environmental Health Screening Tool (CalEnviroScreen). CalEnviroScreen measures pollution burden by using environmental, health, and socioeconomic data to give a score to every neighborhood in the state (OEHHA 2021). Households in the top 5% of CalEnviroScreen (i.e., the most disadvantaged communities) are 8.2 times less likely to have photovoltaic systems than households in the bottom 5% of CalEnviroScreen (i.e., the most advantaged communities) (Lukanov and Krieger 2019). Communities with high pollution burdens and low rates of DER uptake are most concentrated in Los Angeles County, western San Bernardino County, and the San Joaquin Valley (OEHHA 2021, Lukanov n.d.b.). These communities are characterized by high concentrations of ozone (the main component of smog) and airborne particulate matter, numerous facilities that release toxic chemicals, and high rates of poverty, among other risk factors (OEHHA 2021). DER deployment would benefit these communities by providing cost savings and reducing some sources of pollution (Borenstein 2017; Huo et al. 2015; Noel et al. 2018; Requia et al. 2018; Yang et al. 2018).

III. Policy Options

i. Option 1: No change from the current system

Currently, the regulatory environment leads to DER uptake in communities that already have a greater grid capacity and more demand for further DER adoption. The CPUC also prioritizes DER programs that provide the greatest energy benefits. Therefore, the status quo allows for continued uptake of DERs without further state spending or changes to regulation.

Advantages:

The status quo has allowed California to lead the nation in solar photovoltaic deployment, with 1.3 million residential solar systems installed (Associated Press, 2021). Adoption of DER by these households and those incentivized by the current system will help California achieve its ambitious climate goals. Moreover, state programs are already in place to encourage DER adoption in low-income communities (California Public Utilities Commission n.d.a; California Public Utilities Commission n.d.b).

Disadvantages:

If steps are not taken to address the systemic inequities and barriers to the adoption of DERs, their adoption will be a growing source of inequality instead of merely a symptom. Disadvantaged communities will continue to pay more for energy and bear the brunt of environmental pollution if their needs are not prioritized by California's energy regulators. DER benefits supported by the utility bills of all customers will continue to disproportionately benefit more affluent consumers. Moreover, inaction towards addressing DER inequity will serve as a roadblock to lowering greenhouse gas emissions across the state.

ii. Option 2: Require the CPUC to prioritize DER programs that provide the greatest non- energy benefits to communities.

The CPUC oversees nearly $1 billion in public purpose charges—money that comes from consumer utility bills and funds programs such as support for low-income customers (Becker 2021). These funds, in part, promote a variety of DERs and are allocated via cost-benefit analysis (Becker 2021). However, when allocating these resources, the CPUC uses a narrow definition of cost-effectiveness such as calculating the 'avoided costs' of energy distribution and generation resulting from energy efficiency programs (CPUC, n.d.c). By not consistently accounting for 'non-energy benefits' such as health, safety, comfort, and tenant retention in these regulatory decisions, the CPUC reduces the extent to which low-income and disadvantaged communities benefit from these investments (Scavo et al. 2016).

In 2016, the California Energy Commission recommended that the state address this inequity by establishing common definitions of non-energy benefits and standardizing how they are measured and valued by the CPUC (Scavo et al. 2016). Two bills have been introduced in the California legislature based on this recommendation (AB 961 in 2019 and SB 345 in 2021), but both bills stalled in the Appropriations Committees of their respective chambers (California Legislative Information, 2021). These changes could be implemented by the passage of a similar bill that directs the CPUC to a) define non-energy benefits for DER, b) prioritize DER funding that yields the greatest non-energy benefits, and c) publicly track demonstrated DER non-energy benefits.

Advantages:
Non-energy benefits can match or exceed the direct energy benefits of a program (Riggert et al. 2000), so standard accounting practices do not give a full view of the benefits of DERs. When the non-energy benefits of energy efficiency programs are included, the benefit-cost ratio can increase to up to 1.5 and 3.5 times the initial investment for single-family and multifamily households, respectively (Drehobl and Ross, 2016). Factoring in non-energy benefits of DERs would benefit disadvantaged communities and allow stakeholders to gain a more holistic view of the societal benefits of DER investments using public funds (McCormick 2015). Furthermore, incorporating non-energy benefits into the CPUC's decision making process will help California achieve its climate and energy goals by encouraging more widespread adoption of DERs (e.g. Masson et al. 2014).

Disadvantages:
Discussion of non-energy benefits has historically sparked debate over net energy metering, which refers to the calculation of electricity bills based on the difference between energy produced by 'behind-the-meter' DERs and energy provided by utility companies and consumed from the grid. 'Behind-the-meter' DERs are those that supply electricity to buildings directly without passing through a power meter, for example rooftop solar panels. Households with residential solar consume less energy from the grid, so they pay less towards the fixed costs incurred by utilities companies (Ybarra, Broughton, and Nyer 2021). The growing use of distributed solar, coupled with net energy metering, could shift this cost burden from households with rooftop solar, who are generally wealthier (Ybarra, Broughton, and Nyer 2021), to more disadvantaged households without it (California Legislative Information, 2021). Opponents of AB 961 and SB 345 stated that considering non-energy benefits would inflate the value of behind-the-meter DERs and exacerbate the cost-burden shift, although proponents argued that SB 345 targeted low-income communities and thus would not have exacerbated cost-burden issues.

Moreover, disadvantaged communities face many barriers when adopting DERs, including limited disposable income and a lower proportion of home ownership (Scavo et al. 2016). Given these barriers, only changing the way that non-energy benefits are valued may have limited impact.

Lastly, non-energy benefits include hard-to-measure factors such as 'comfort' and 'health' which do not have a straightforward financial value (e.g., Skumatz and Gardner 2005). Incorporating non-energy benefits into decision making may increase bureaucracy and slow DER deployment.

iii. Option 3: Direct the CPUC to prioritize grid infrastructure updates in disadvantaged communities.
Solar photovoltaic systems and other DERs require the electric grid to have the hosting capacity, or electric infrastructure, to accommodate them (Cohen and Callaway 2016). A recent study in California found that over half of residential households lack the hosting capacity to install solar panels to meet an average household's energy needs (Brockway, Conde, and Callaway 2021). This issue is particularly pronounced in Black-identifying communities and disadvantaged communities, as measured by CalEnviroScreen's sensitive population and linguistic isolation (i.e. proportion of limited English-speaking households) metrics (Brockway, Conde, and Callaway 2021). As a result, the electric grid is more likely to prevent households in Black-identifying and disadvantaged communities from benefiting from DERs. This inequality will worsen as regulators impose restrictions to prevent the installation of more DERs in an area than the electric grid has the capacity to support (Brockway, Conde, and Callaway 2021; CPUC 2017).

Behind-the-meter solar generation and electrical vehicle demand in California is expected to increase by 260% and 370% respectively in the next ten years (CPUC 2020). These increases will require massive grid infrastructure investments financed by utility ratepayers and overseen by the CPUC (Niller 2021). Neither the CPUC's DER Action Plan 2.0 nor its rulemaking on preparing the electric grid for DER adoption discuss policies to address inferior hosting capacities in disadvantaged communities (CPUC 2021a; CPUC 2021b). These historical inequalities should be addressed by new legislation from the California State Legislature to prioritize grid infrastructure improvements in disadvantaged communities. This legislation should include specific timelines for when these disparities will be eliminated and allocate funding to meet those timelines.

Advantages:
The prioritization of these grid infrastructure updates is necessary to prevent DER adoption from exacerbating existing inequalities in California. Since current DER demand is higher in disproportionately white and affluent communities (Brockway, Conde, and Callaway 2021), grid infrastructure updates will likely focus on whiter, wealthier neighborhoods without explicit guidance to prioritize grid equity. In addition to expanding DER access, grid infrastructure investments help communities by enhancing grid reliability and increasing resilience to extreme weather events (Wheeler 2020). Grid infrastructure updates are financed by all ratepayers, and the harms of climate change are disproportionately focused on disadvantaged communities (Islam and Winkel, 2017). Thus, the state should prevent grid infrastructure updates from being yet another mechanism by which the wealth of affluent communities is entrenched.

Disadvantages:
Prioritizing grid infrastructure updates in disadvantaged communities may result in a discrepancy between areas with demand for DERs and areas with the electric grid hosting capacity to support DER installation. If a rapid, state-wide reduction in greenhouse gas emissions is the top priority for energy regulation, it is most efficient to prioritize grid infrastructure updates with demonstrated DER demand, even if these communities are disproportionately white and affluent. Electric grid hosting capacity is not currently the primary obstacle to DER uptake in low-income communities and communities of color; other barriers such as insufficient access to capital are more immediate (Scavo et al. 2016). Therefore, addressing hosting capacity inequality is unlikely to have a significant effect on the discrepancies in DER adoption across income, racial, and ethnic divides in the short-term.

V. Policy Recommendation

We recommend that the California State Legislature immediately implement Option 2, which is likely to have the greatest short-term impact on addressing disparities in the adoption of DERs. While it does not address all barriers to DER adoption faced by disadvantaged communities, a new bill would implement prior recommendations by the California Energy Commission and would allow resources to be better targeted. Legislation on non-energy benefits of DERs will face resistance related to the cost burden shift associated with net-energy metering (similar to previous bills). Targeting the bill to support low-income communities, together with education and raising stakeholder buy-in, may be sufficient to overcome this opposition.

Meanwhile, we recommend pursuing Option 3 to ensure that, over the long-term, grid infrastructure is sufficient for disadvantaged communities to adopt and benefit from DERs. While this recommendation may result in some short-term discrepancies between hosting capacity and DER demand, the social, economic, and ethical benefits of DER access in disadvantaged communities must be prioritized. Together, these recommendations will help prevent inequitable DER adoption from perpetuating the state's existing racial, ethnic, and socioeconomic disparities.

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