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Electric vehicle and solar energy pilot: Opportunity to address suburban energy challenges

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ABSTRACT

Low- and moderate-income communities in suburban areas are dependent on transportation to meet basic needs. This case study describes an innovative approach by GRID Alternatives and Valley Clean Air Now (Valley CAN) to combine solar rooftop with electric vehicle incentives. Wider deployment of these technologies could decrease costs and increase access to renewable energy and EVs for potentially vulnerable families with high transportation and electricity costs.

1. Introduction

1.1. Case study introduction

The Smiths[1] moved to the suburbs of the San Joaquin Valley in Merced County, Calif. around 2008. During the Great Recession, the family was able to use their savings to purchase a two-bedroom home in the suburbs from a distressed asset investor. The 60-year-old house was in disrepair from abandonment by the previous owners and infested with rodents and other pests. The house is located 30 miles from Mr. Smith's job as a service man at the airport. His income of approximately $24,000 per year is about half of what is deemed to be a self-sufficient wage[2] for Merced County. His gas costs were approximately $30 per week, commuting in his old truck which had been driven for 200,000 miles before he retired it. This case study describes how GRID Alternatives and Valley Clean Air Now (Valley CAN) combine solar rooftop with electric vehicle (EV) incentives to help suburban households like the Smiths.

1.2. Suburban definition

No single definition of suburban exists. While many organizations have attempted to define suburban, a commonly used definition has not been found and no consensus among academics, city planners, and researchers on what constitutes a suburb has been established.[3] Some analysts have tried to use census data to define suburban, making "a rough approximation by taking the urban (metropolitan) area and subtracting census-defined central city municipalities. This approach works better in areas with many local governments than in places like Texas where annexations mean that many central cities take up much of the metropolitan area."[4]

It is important to note that "suburbs are actually extremely heterogeneous in their demographic composition, economy, and land use patterns."[5] Yet, several characteristics more frequently found in suburbs contribute to the following key challenges unique to low- and moderate-income (LMI) communities in suburban areas.

1.3. Suburban challenges

1.3.1. Rising housing costs during flat wage growth

Suburbs are usually thought of as affluent neighborhoods; however, a study by the Brookings Institution found that "the suburban poor outnumbered their city counterparts by almost one million people in 2005. During the first year of the recession that began in 2007, suburbs

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[1] The Smiths family name has been changed to protect their privacy.

[2] Self-Sufficiency Standard, available at: http://www.selfsufficiencystandard.org/self-sufficiency-standard-0.

[3] Ann Forsyth. 2012. Defining Suburbs. Journal of Planning Literature 27, no. 3: 270–281. https://dash.harvard.edu/bitstream/handle/1/16139611/Forsyth_Defining_Suburbs2012.pdf?sequence=1.

[4] Ann Forsyth. 2012. Defining Suburbs. Journal of Planning Literature 27, no. 3: 270–281. https://dash.harvard.edu/bitstream/handle/1/16139611/Forsyth_Defining_Suburbs2012.pdf?sequence=1.

[5] Alexandra Murphy and Scott W. Allard, The changing geography of poverty, Focus Vol. 32, No. 1, Spring/Summer 2015.

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added more than twice as many poor people as did their cities."[6] Some suburbs are still recovering from the financial downturn.[7] In the suburbs, low-income households "are much more likely to be homeowners than the urban poor, reflecting the fact that suburbs were originally designed for homeownership and zoning practices have reinforced those intentions."[8] As housing costs have continued to rise while wages have remained mostly flat, suburban poor homeowners struggle financially to remain in their homes and provide for maintenance and upkeep of their houses.

1.3.2. Insufficient public transportation options

Although some suburbs are dense and close to the city center, other suburbs are geographically spread out. Increasingly, as housing costs rise, people have been forced to move further and further from work. Between 2000 and 2017, jobs within a typical commuter's distance to suburbs fell by 7%.[9] Suburbs often do not have sufficient public transportation options. This forces LMI communities to rely on motor vehicles for commuting needs, resulting in an increased share of transportation costs of the household income.[10] In fact, lower-income families spend a much larger percentage of their income on transportation cost than upper income households. In 2014 8.2% of household income was spent on transportation costs by the upper third income bracket comapred to 15.7% by the lower third, almost double the amount of the upper third.[11]

1.3.3. Access to safety net and support

Adding to the need to commute far distances for work, support services for LMI families are often located in city centers. Overall, suburban areas are much more likely to lack organizations that provide shelter and food assistance, employment organizations, and education organizations, which are key to upward mobility.[12] Additionally, suburban anti-poverty organizations often cover geographically larger areas, making outreach financially and logistically challenging. LMI communities in the suburbs thus have less assistance available nearby and therefore need to spend more money and/or time on transportation to be able to access these services in a nearby urban environment.

1.4. Economic background

The case study pilot was implemented in the city of Winton in Merced County, Calif., situated in the San Joaquin Valley. In 2010, the population in Winton was 10,613.[13] The median household income in the Winton zip code is $42,705, which is lower than U.S. ($55,322) and California ($63,783) income.[14] In Winton, 21.9% of people live in poverty (compared to 15.1% in the U.S.), which is generally consistent with California's inland valleys, and 8.4% live in deep-poverty (compared to 6.7% in the U.S.), earning less than half of the federal poverty level.[15] Employment in the San Joaquin Valley is largely concentrated in the agricultural sector, with over 19% of the population employed in this season-dependent industry.[16] The unemployment rate is fairly high in Merced County - 10.6%, more than double the national average of 4.1% as of February 2018.[17] The unemployment rate reflects the large role agriculture plays in the region with strong seasonal swings, displaying high winter peaks and lower numbers in the summer and fall.[18]

1.5. Housing stock and energy burden

Housing in Merced County, Calif, is almost evenly split between owner-occupied and renter-occupied units; in 2010, 54.5% of housing units were owner-occupied and 45.5% renter-occupied.[19] The majority of the housing stock in the county, over 75%, is detached single-family units, reflecting the suburban environment. Mobile homes represent the second largest amount of housing units at 6.2%.[20] The average family spends approximately $2,148/year (owners) or $1,708/ year (renters) on home energy costs. This translates to an energy burden of almost 16% for homeowners and approximately 13% for renters that make 0–30% of Area Median Income (AMI) (see Fig. 1[21,22]). The calculations for energy burden do not include transportation costs, only electricity and heating fuel.[23]

1.6. Transportation costs

Transportation costs for Winton are higher across different fuel sources compared to the national average. Gasoline costs $2.84/gallon (compared to the U.S. national average of $2.38/gallon) and diesel costs $2.89/gallon (compared to $2.55/gallon).[24] However, the fuel costs are slightly lower than the average fuel costs in California, where gasoline is $3.08/gallon and diesel $3.07/gallon in 2017.[25] In addition, the suburban region is highly car-dependent – more so than the U.S. national average. Some 80% of work commuters in the relevant zip

[6] Steven Raphael and Michael Stoll, Job Sprawl and the Suburbanization of Poverty, Metropolitan Policy Program at Brookings, March 30, 2010, https://www.brookings.edu/research/job-sprawl-and-the-suburbanization-of-poverty/ .

[7] Alana Semuels, The Places that May Never Recover from the Recession, The Atlantic, Dec. 29, 2017, https://www.theatlantic.com/business/archive/2017/12/suburban-poverty-and-recession/549350/.

[8] Alexandra Murphy and Scott W. Allard, The changing geography of poverty, Institute for Research on Poverty, Focus Vol. 32, No. 1, Spring/Summer 2015.

[9] Elizabeth Kneebone and Natalie Holmes, The growing distance between people and jobs in metropolitan America, Metroplitan Policy Program at Brookings, March 2015, https://www.brookings.edu/wp-content/uploads/2016/07/Srvy_JobsProximity.pdf.

[10] According to the Bureau of Labor Statistics, transportation costs are the second largest share of household expenditures, after housing. Depending on the make-up of the family, transportation costs make up between 15.9% and 18.6% of the household expenditures. (BLS, https://www.bls.gov/news.release/cesan.nr0.htm).

[11] Pew Charitable Trusts, Household Expenditures and Income, March 30, 2016, http://www.pewtrusts.org/en/research-and-analysis/issue-briefs/2016/03/household-expenditures-and-income.

[12] Alexandra Murphy and Scott W. Allard, The changing geography of poverty, Institute for Research on Poverty, Focus Vol. 32, No. 1, Spring/Summer 2015.

[13] 2010 Census Interactive Population Search, https://www.census.gov/2010census/popmap/ipmtext.php?fl=06:0686076. (Accessed 30 March 2018).

[14] TownCharts, http://www.towncharts.com/California/Economy/95388-Zipcode-CA-Economy-data.html. (Accessed 30 March 2018).

[15] Headwater Economics, Populations at Risk, https://headwaterseconomics.org/tools/populations-at-risk/. (Accessed on 9 February 2018).

[16] TownCharts, http://www.towncharts.com/California/Economy/95388-Zipcode-CA-Economy-data.html. (Accessed 30 March 2018).

[17] Bureau of Labor Statistics, Local Area Unemployment Statistics. (Accessed 9 May 2018).

[18] Bureau of Labor Statistics, Local Area Unemployment Statistics. (Accessed 9 May 2018).

[19] Census, General Housing Characteristics, Merced County, 2010.

[20] American Community Survey, Census, General Housing Characteristics, Merced County, 2016.

[21] DOE's Low Income Energy Affordability Data (LEAD) tool, https://openei.org/doe-opendata/dataset/celica-data. (Accessed on 9 February 2018).

[22] The graph contains income levels that follow HUD guidelines: 0–30% Area Median Income (AMI) – extremely low income, 30–50% AMI – very low income, 50-80% AMI low income, Over 80% AMI is no longer considered low income, and 100%+ AMI is above median income.

[23] For more information on the methodology, please see https://openei.org/doe-opendata/dataset/celica-data.

[24] DOE's EERE State and Local Energy Data tool, https://apps1.eere.energy.gov/sled/. (Accessed 9 February 2018).

[25] EIA, Weekly Retail Gasoline and Diesel Prices, https://www.eia.gov/dnav/pet/pet_pri_gnd_dcus_sca_a.htm. (Accessed 17 May 2018).