

The Equitability of Small Business Energy Efficiency Programs

Irfaan Jamarussadiq, ICF

Brett Fidler, ICF

Greg Stiles, ICF

Karen Ehrhardt-Martinez, ICF

ABSTRACT

The growing national attention to energy equity and inclusion is driving utilities to take action to measure, understand, and improve the distribution of program participation and benefits across all segments of utility customers and particularly for customers with the greatest vulnerability. To date, most of these efforts have focused on enhancing energy equity in the residential sector. However, equity concerns also extend to energy efficiency programs in the small and medium business sectors. This presentation will share findings from a recent collaborative study designed to assess the equitability of program participation across all types of SMB customers operating in areas with higher and lower levels of social vulnerability. The study measures vulnerability using multiple indicators, including area median income, historically redlined districts, local energy burden scores, concentration of non-native English speakers and minority populations, and others. The findings are rooted in a multi-method study involving a combination of quantitative and qualitative research methods and data analysis and explores statistical relationships and geographical differences as well as the perspectives and experiences of individual SMB customers. Among the findings, the study revealed that the proportion of small business participating in the utility's energy audit program is slightly higher for businesses operating in areas with higher vulnerability scores and that businesses operating in these areas were also more likely to act on audit recommendations. The presentation will unpack these findings, discuss the strengths and weaknesses of the approach, and highlight the impact of these findings on the utility's SMB program.

Introduction

Public Service of Oklahoma (PSO) is an electric utility company serving over 514,000 residential and commercial customers in Oklahoma. Headquartered in Tulsa, PSO traces its origins back to 1889 when it was chartered to provide electric service in Indian Territory. Today, Oklahoma is home to 39 federally recognized Native American tribes.

PSO completed an initial residential energy equity analysis in 2021 and 2023 and wanted to apply a similar approach to small and medium business (SMB) customers. They wanted insights on participation and engagement with SMB customers in disadvantaged areas to evaluate current outreach and participation efforts, and to improve engagement with businesses in marginalized communities. This paper will present the methodology and findings from the SMB energy equity study for PSO which may benefit other utilities interested in SMB energy equity.

The PSO Small Business Energy Solutions Program

ICF implements the Public Service Company of Oklahoma Small Business Energy Solutions (SBES) Program utilizing a closed network of trained, dedicated service providers to deliver the program to qualified customers in all regions of the PSO service territory. The SBES program is delivered across the three regions of Oklahoma that make up the PSO service territory, in yellow below.

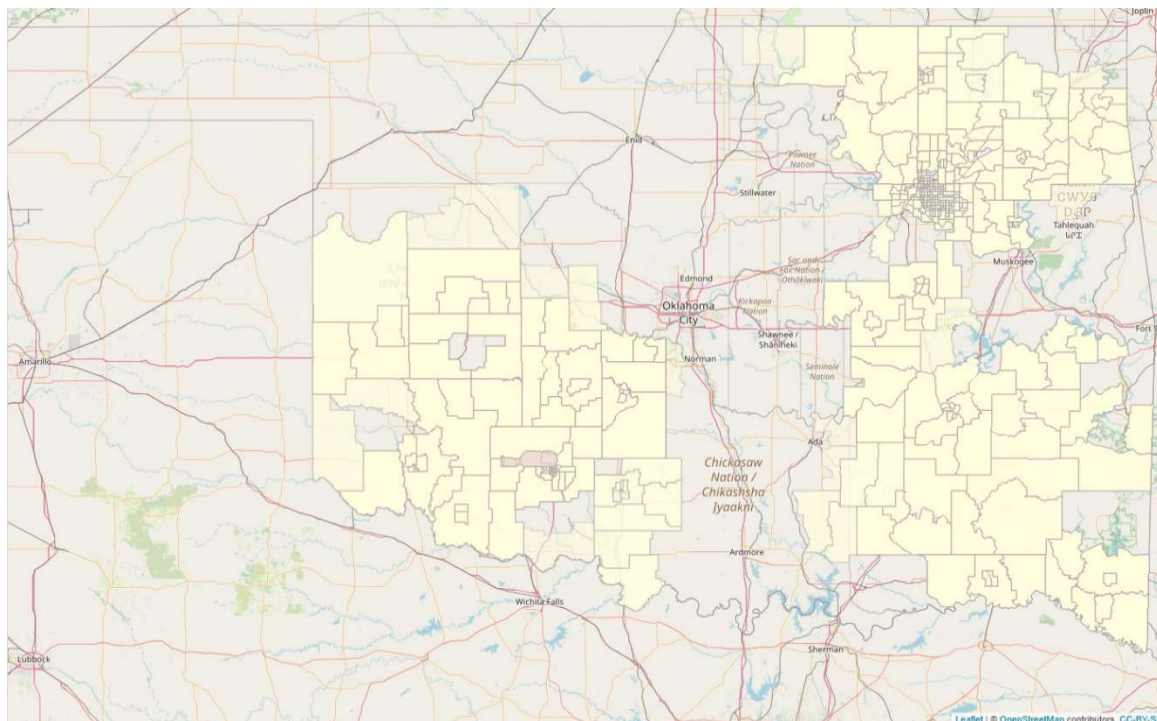


Figure 1. Map of PSO service territory. *Source:* ICF

PSO is a mid-sized utility operating in Oklahoma serving about 72,000 commercial and industrial customers, most of which qualify for the SBES program. The SBES program is available to commercial customers with annual usage of 320,000 kWh or less. For customers with more than one location, the aggregate total usage cannot exceed 2,000,000 kWh annually. SBES provides qualifying small businesses free on-site energy use analysis of customer facilities and provides rebates of up to 70% of the total project cost. Rebates are offered for lighting retrofits and replacements, and refrigeration controls/retrofit projects.

The PSO SBES program offers two measure types, Retrofit Lighting and Refrigeration Controls. Historically, energy savings from the program have been 95% Retrofit Lighting and 5% Refrigeration. Due to the included refrigeration measures and relatively low qualification threshold for SBES customers (resulting in typically smaller customers, by kWh usage), Refrigeration Controls projects are limited. PSO does not track facility type in the SBES program since annual kWh usage is the determining factor in qualification, so measure

distribution across facility type data is not available. Typical facility types involved in SBES include:

- Retail Shops
- Convenience Stores
- Small Offices
- Non-profits
- Medical Clinics
- House of Worship
- Small Schools

The SBES program uses a closed network of 5 subcontractors to deliver the program in dedicated geographic territories. Each subcontractor has their own territory with assigned annual rebate budgets and energy savings goals. Only SBES network subcontractors can offer the enhanced SBES rebates, and only within their assigned territories. Equipment and labor pricing are fixed in the program ensuring every customer pays the same amount for a particular measure. Acceptance of program pricing by SBES subcontractors is required for participation in the program. Subcontractor responsibilities include outreach to recruit customers into the program, performing the on-site energy assessments, managing all installation activities, and collecting the customer payment portion upon project completion.

The PSO SBES program began midyear 2016 and quickly became popular with customers and the participating subcontractors due to the straightforward program design, generous rebates and quick project turnaround time. The short turnaround time allows the program to ramp-up and down quickly to augment other commercial rebate programs in the portfolio and deliver more rebate funding customers if necessary. From 2016 through 2023, the SBES program achieved:

- \$20.47 million in rebates
- 2,609 customers served
- 64 GWh of energy saved
- 16.6 MW in reduced demand

The only major change to the design of PSO's SBES program since it was launched was the increase of the eligibility threshold from 220,000 kWh to 320,000 kWh in annual energy usage per account in 2022. This change was made to open a larger market for existing refrigeration measures and set the stage for the addition of other non-lighting measures. After the eligibility threshold change there was a nominal increase in refrigeration projects. However, no additional measures have been added to the SBES program. Efforts to market the SBES program have focused on those customers that received a SBES audit but did not follow through with a project, or to cross promote other PSO commercial programs to past SBES customers. As the program has matured, the average cost/kWh has decreased, likely due to the eligibility threshold increase and the SBES subcontractors becoming better at recognizing projects that are likely to have a faster ROI.

PSO has not been specifically focused on reaching vulnerable customers (defined as historically marginalized, low income) through the SBES program, as commercial income data that could be used in this determination is not robust. SBES is regionally structured to reach customers in every corner of the territory, and PSO has been successful with this approach. We believe this design has incentivized subcontractors to engage more economically diverse customers in their regions to recruit as many customers as possible. They find it more advantageous to outreach to all customers as they move systematically through their territories instead of cherry-picking customers based on economic status or other definer. They understand that vulnerable customers are more likely to struggle with utility costs and lack the capital to pay for energy efficient upgrades on their own. Even though the study shows that vulnerable customers are participating in the SBES program at or above parity, PSO is always working to make programs more accessible to all customers. As commercial data related to vulnerability improves, PSO may use it to identify customer segments or geographic areas that exhibit specific energy efficiency needs that can be met through their programs. Initiatives may include specific financing options, tiered rebate structures based on vulnerability metrics, special incentives or offerings, etc. SBES is flexible by design, and these changes can be easily incorporated as part of continuous improvement.

Methodology

The goal of this analysis was to determine the equitability of the SBES program by creating a set of utility equity metrics, identifying vulnerable communities, and assessing the level at which more vulnerable communities were participating and benefiting compared to less vulnerable communities relative to their representation across the service territory. Since individual business data was not available for the analysis, we decided to identify vulnerable communities that businesses served instead of disadvantaged status businesses. Using data from the US Census Bureau on race, ethnicity, and income, and data from Mapping Inequality on historically marginalized housing areas known as redlined districts, we created customer segments and defined vulnerable communities using their characteristics. We then calculated inclusion and benefit scores across customer segments using the measures of vulnerability to create customer segments. Finally, we compared inclusion scores of more vulnerable communities with less vulnerable communities through geospatial analyses, which geographically located vulnerable communities and provided insight into how more and less vulnerable communities differed geographically.

Challenges

While utilities can usually provide customer data in the residential sector, businesses in the commercial sector are often reluctant to provide firmographics and other individual business data. Commercial data would provide insight into whether businesses have a high energy burden or disadvantaged status. We decided to use residential data summarized at the Census tract level to identify businesses across the utility service territory serving disadvantaged communities.¹

¹ Census tracts can hold between 1,200 and 8,000 people (US Census Bureau 2022), so there may be several neighborhoods that small businesses serve in a single tract.

Defining Small Businesses. Although the Small Business Administration defines small businesses as those with fewer than 500 employees (Office of Advocacy 2023), we did not have access to counts of employees due to our firmographic data limitations. We chose to define a small business as the following criteria:

- Less than 320,000 kWh of energy consumption per year
- Not a national chain¹
- Not a city, government, or municipality
- Not an urban school
- Has at least 30 customers

Defining Disadvantaged Communities. Disadvantaged communities are defined as those living in Census tracts facing socioeconomic concerns. These concerns are summarized by the composite vulnerability score, which assigns a value from one to five for each Census tract in the utility service territory.

Measures of Vulnerability

Defining disadvantaged communities requires specifying what characteristics make a community disadvantaged. We decided to use public data on race and ethnicity, income, historically redlined areas, and more to create our own definition of vulnerability specific to this analysis. These measures of vulnerability were combined into a composite vulnerability score consisting of the following five indicators:

- Social Vulnerability Index greater than 0.8
- Racial and Ethnic Minority Status greater than 0.8
- Tract is classified as an Opportunity Zone
- Tract is classified as a Limited Income Area
- Tract is classified as a Redlined District

The composite vulnerability score is an indicator of which communities may be the most impacted by structural challenges that inhibit program participation.

CDC social vulnerability index. The Centers for Disease Control and Prevention (CDC) social vulnerability index (SVI) dataset provides social vulnerability rankings of Census tracts across the United States using 16 Census variables related to housing, income, race/ethnicity, and transportation (ATSDR 2022). The dataset features four indexes and an overall social vulnerability index, each of which expresses rankings as percentiles from 0 to 1 using the relevant Census variables. Our analysis focused on the overall social vulnerability index and the racial and ethnic minority status.

¹ The Sightline Analytics team at ICF provided a list of national chains excluded from the small business definition.

Opportunity zones. The Internal Revenue Services (IRS) provides a list of Census tracts that qualify as opportunity zones, which are low-income areas that taxpayers can invest in (IRS 2023).

Limited income areas. The U.S. Department of Housing and Urban Development (HUD) provides income limits by Census tract that determine eligibility for public housing programs (HUD 2023). We defined “limited income areas” as Census tracts where 50% or more of the population is at 80% of the Area Median Income (AMI).

HOLC redlined districts. The Home Owners’ Loan Corporation (HOLC) in the 1930s evaluated the risk of providing mortgage loans to neighborhoods across the United States. Neighborhoods received a grade between A (“best”) and D (“hazardous”). The grades were heavily influenced by racial prejudice, with lower grades typically assigned to immigrant neighborhoods and communities of color (Mapping Inequality 2023). Our analysis considered Census tracts that received grades C (“definitely declining”) and D (“hazardous”) as redlined districts because immigrant and working-class families often lived in areas that received a C grade.

Measures of Inclusion and Benefits

Composite vulnerability scores identify communities impacted by several socioeconomic factors, but do not report on how these factors impact program participation. Inclusion and benefit scores describe the level at which a particular segment is participating and benefiting relative to the overall population. This research summarized inclusion and benefit scores across composite vulnerability scores and quintiles of household characteristics.

Household data. The U.S. Census Bureau publishes the American Community Survey (ACS) every year and provides population and housing information by Census tract across the United States (US Census Bureau 2023). For our analysis, we used the ACS to collect data on household area median income (AMI) and minority percent of households.

Program participation data. PSO provided data on which businesses in the SBES program completed audits required to be eligible for the program and upgrades required to complete the program. We then filtered this list down to those that met our definition of a small business. To determine whether a business was a national chain, we filtered out businesses matching a set of national chain patterns compiled previously by the Sightline Analytics team at ICF. City and municipality governments were excluded if they had “city” or “municipality” in their business name.

Measuring Equity with Inclusion Scores

Equation 1. Inclusion score for customer segments participating in energy efficiency programs.

$$\text{Inclusion Score} = \frac{\text{Segment Program \%}}{\text{Segment Universe \%}}$$

- Inclusion Score – Ratio that describes the relationship between a segment’s representation in a program compared to their representation in the customer universe.
- Segment Program % – Percent of the customer segment that participated in a program.
- Segment Universe % – Percent of the customer universe that is the customer segment.

Inclusion scores measure program participation of a segment relative to the segment’s representation in the overall customer universe. For example, in Table 1, seniors make up 30 percent of program participants but only 15 percent of total customers. The inclusion score is therefore $30\% / 15\% = 2$, meaning that seniors are highly represented in the program.

Table 1. Example of calculating inclusion score for senior program participants.

Senior program participants	Program participants	Percent senior program participants	Total seniors	Total customers	Percent total seniors	Inclusion score
3	10	30%	15	100	15%	2

Source: ICF

To interpret the inclusion score, we compared the score to parity (i.e., value of 1). If the score is above parity, then the program represents program participants more than in the total customer pool, and below parity implies less representation. Figure 2 shows how different customer segments can be visualized in relation to parity.

If a program is geared toward serving a specific customer segment, then parity would not be the best baseline for gauging equity performance. In this case we would expect the inclusion score to be above parity, but there is no established methodology for determining what the baseline should be and it heavily depends on program expectations. Parity serves as a preliminary measure of equitability for this analysis, but utilities should consider what level of inclusion they want to target for their programs.



Figure 2. Example of inclusion scores for three groups. The dotted line represents parity. Groups A and B are above parity, while group C is below parity. Source: ICF Analysis.

For our analysis, customer segments were defined using the composite vulnerability score, quintiles of area median income, and quintiles of minority percent of households. We calculated two sets of inclusion scores for businesses, one for completed audits and the other for

completed upgrades. The inclusion score provides insight into whether small businesses are serving the different customer segments within their communities equitably.

Conversion Rates

Equation 2. Conversion rate describing the percentage of businesses that qualified for the SMB program ended up completing the tasks required to improve energy efficiency.

$$\text{Conversion Rate} = \frac{\text{Completed Upgrades}}{\text{Completed Audits}} \times 100\%$$

- Conversion Rate – Percentage of businesses who qualified for the program that completed all energy efficiency tasks required by the program.
- Completed Upgrades – Count of businesses that completed energy efficiency tasks required by the program.
- Completed Audits – Count of businesses that entered and qualified for the SMB program.

Conversion rates explain how completed audits translate into completed upgrades. The utility was interested in conversion rates across their service territory and disadvantaged communities, so we compiled an Excel spreadsheet that showed conversion rates by Census tract, service region, and disadvantaged communities. This allows the utility to find businesses with low conversion rates and understand what challenges they face completing the SMB program.

Geospatial Mapping

We also created a set of geospatial analyses to compare levels of vulnerability across the utility service territory and illustrate which low vulnerability areas had low inclusion scores. Figure 3 shows a map of PSO's service territory by composite vulnerability score. Areas are shaded on a scale from one to five based on their level of vulnerability, with scores of five indicating areas that meet all five socioeconomic indicators of vulnerability. Since population density varies by Census tract and tracts are created to have roughly similar population counts, larger tracts tend to be more rural and smaller tracts tend to be more urban. The map shows higher concentrations of vulnerability in more urban tracts, particularly in the Tulsa metro area, top right of figure 3.

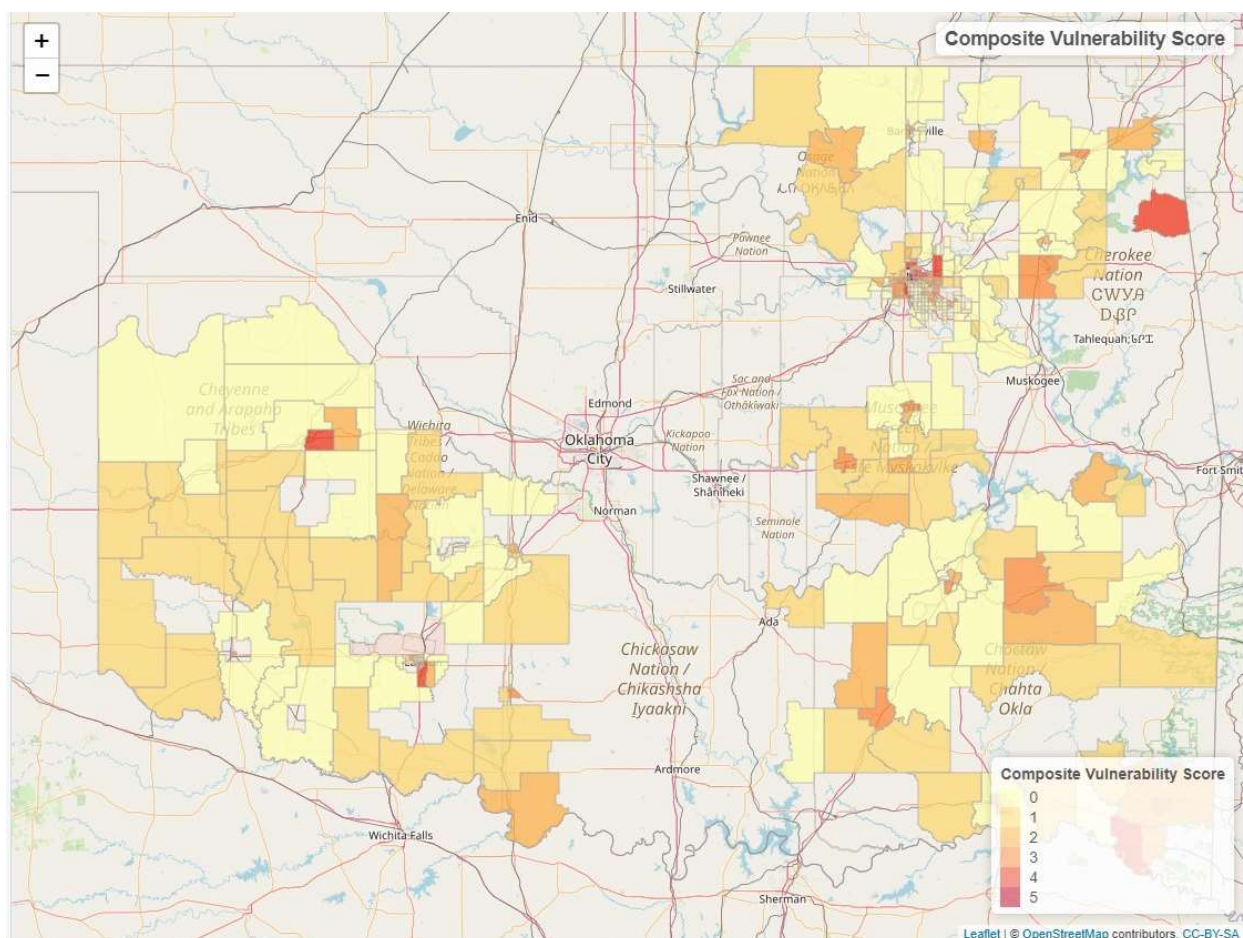


Figure 3. Map of PSO utility service territory by composite vulnerability score. *Source:* ICF

Findings

This research set out to explore the equitability of PSO’s Small Business Energy Efficiency program based on the recognition that disadvantaged communities are frequently and historically overburdened by a lack of access to energy-efficient technologies among other equity-related concerns. Our analysis looked across PSO’s service territory to identify which communities were more highly and less highly vulnerable based on a variety of indicators and then considered whether the program inclusion rate (a measure of participation) was higher or lower than parity for small business customers operating in more vulnerable areas. Overall, our findings indicate that PSO’s Small Business Energy Solutions program has been successful in reaching a somewhat disproportionately high share of customers operating in more vulnerable communities for both the business audit program and upgrade program. We also found that the conversion rate from audits to upgrades was higher in more vulnerable communities.

Equity and Program Inclusion. As shown in the two tables below, PSO’s SBES program is successfully reaching and recruiting businesses in more highly vulnerable Census tracts at a higher rate than businesses operating in less vulnerable areas. More specifically, eligible businesses operating in more highly vulnerable areas are participating in both the energy-

efficiency audit and energy-efficiency upgrade programs at higher rates than businesses operating in less vulnerable areas as shown in the bottom two rows of each table. Areas with composite vulnerability scores of 3 or more (on a 5-point scale) had average SBES energy audit inclusion rates of 1.11 compared to an average inclusion score of 0.97 for areas with vulnerability scores less than 3. Average inclusion scores for SBES energy upgrades showed a similar pattern with an average inclusion score of 1.16 for highly vulnerable areas and 0.95 for areas with vulnerability scores under 3. The results shown here are based on the use of the composite vulnerability score described above, but these results also held true for 5 of the 6 other vulnerability metrics we explored, except red line districts. There were only 55 redlined districts in this analysis, all of them being in the Tulsa metro area. The limited number of redlined districts and their geographic concentration resulted in a small and non-representative sample of Census tracts with limited variation.

Table 2. Summary of vulnerability scores by Census tract for completed energy audits.

Vulnerability Flags	Tracts (#)	Tracts (%)	Tracts w/ Audits (#)	Tracts w/ Audits (%)	Eligible SBESs (#)	Audit Participation (#)	Audit Participation (%)	Inclusion Score
0	165	45.1%	127	77.0%	27,229	635	2.3%	0.90
1	81	22.1%	64	79.0%	13,434	342	3.0%	0.98
2	46	12.6%	38	82.6%	9,429	274	2.7%	1.12
3	51	13.9%	45	88.2%	10,884	340	4.5%	1.21
4	18	4.9%	17	94.4%	3,540	92	2.6%	1.01
5	5	1.4%	5	100.0%	1,275	18	1.4%	0.55
Total	366	100.0%	296	80.9%	65,791	1,701	2.6%	
0-2	292	79.8%	229	78.4%	50,092	1,251	2.5%	0.97
3-5	74	20.2%	67	90.5%	15,699	450	2.9%	1.11

Tracts refers to the Census tracts used by the US Census Bureau. *Source:* ICF

Table 3. Summary of vulnerability scores by Census tract for energy upgrades.

Vulnerability Flags	Tracts (#)	Tracts (%)	Tracts w/ Upgrades (#)	Tracts w/ Upgrades (%)	Eligible SBESs (#)	Upgrade Participants (#)	Percent Participation (%)	Inclusion Score
0	165	45.1%	90	55.2%	27,229	240	0.9%	0.77
1	81	22.1%	52	64.2%	13,434	175	1.3%	1.14
2	46	12.6%	29	63.0%	9,429	129	1.4%	1.20
3	51	13.9%	36	70.6%	10,884	157	1.4%	1.26
4	18	4.9%	11	61.1%	3,540	41	1.2%	1.01
5	5	1.4%	5	100.0%	1,275	10	0.8%	0.69
Total	366	100.0%	223	60.9%	65,791	752	1.1%	
0-2	292	79.8%	171	58.6%	50,092	544	1.1%	0.95
3-5	74	20.2%	52	70.3%	15,699	208	1.3%	1.16

Tracts refers to the Census tracts used by the US Census Bureau. *Source:* ICF

Equity and Audit to Upgrade Conversion Rates. Evidence also suggests that the conversion rate for those customers moving from energy audits to energy upgrades is higher for small business customers operating in more vulnerable areas than those operating in less vulnerable areas. These findings hold true across 5 of the 6 measures of vulnerability with conversion rates ranging from a low of 34% to a high of 50%. Redlined districts did have slightly higher conversion rates than non-redlined districts (48% vs 44%), but the difference in conversion rates was not statistically significant. It is not clear why conversion rates are not higher, but it is possible that these areas are impacted by strong and intentional historical discrimination. For the other vulnerability measures, the differences in conversion rates were most pronounced when vulnerability was measured as either a low area median income or a high social vulnerability index score. These results suggest that PSO customers in more vulnerable areas are more likely to act on some or all the recommendations provided in an energy audit perhaps due, in part, due to special incentives offered to eligible customers.

Erosion. While the findings for inclusion and conversion rates indicate that businesses in more vulnerable areas are participating in PSO's small business programs at a higher rate than customers in less vulnerable areas, the results did show a small amount of erosion in inclusion scores when comparing the scores for the energy audit program as compared to the energy upgrade program. In other words, while relatively high levels of inclusion for businesses in vulnerable areas are found for both the audit and upgrades program, the differences between more highly vulnerable areas and less highly vulnerable areas are smaller for the upgrades program than for the audit program. This is most likely because the upgrades program requires a more sizeable investment that the audits and businesses operating in highly vulnerable areas will find it more difficult to cover that investment.

Determining What is Equitable. Although the inclusion metrics show that the Small Business Energy Solutions Program is successfully reaching customers in more vulnerable areas at a rate above parity with inclusion scores of 1.11 and 1.15 for the audit and upgrade programs respectively – these results don't tell us whether the program is reaching businesses in vulnerable areas in an equitable fashion. An inclusion score of 1.0 would indicate that participation in more highly vulnerable areas and less vulnerable areas is proportionally equal, but equality and equitability are different. It is also important to consider how we might define equitability for this program. Is it an average inclusion score of 1.50 for vulnerable areas or some other value? These are questions that each utility must grapple with and address as part of the development of a set of equity goals and strategies during the Equity Goals and Strategies workshops we hold with the utilities. It is important to note that utilities are constrained by utility commissions and are often required to ensure that their programs are open to all customers equally. In the future, we could explore using differences in area median income (AMI) by Census tract to set targets. For example, the AMI for a Census tract is 50%, we could take the inverse ($1/0.5 = 2$) and use that as the target inclusion score. In the meantime, we can use parity as a preliminary threshold to measure against.

Is It Enough to Understand Equity at the Community Level? Unlike residential sector equity studies that can compare inclusion across different types of *household* based on household or occupant characteristics, the inclusion metrics presented here make comparisons across more or

less vulnerable *communities* (measured at the Census tract level) and the characteristics of the community. The use of communities as the unit of analysis is not ideal, and the study would benefit from the ability to use businesses as the unit of analysis. Doing so would require a range of information about the characteristics of the business that are currently either unavailable or difficult/expensive to find. As such, this analysis cannot account for whether the businesses participating in each area are themselves disadvantaged in any way. A more rigorous assessment would assess inclusion and conversion rates at the business level alongside firmographic data that could include business type, whether businesses are minority owned, estimated revenue, and/or estimate the business' energy burden.

Creating an Equity Roadmap and Next Steps

Once the SEBS equity study was completed and the data were presented to PSO, the teams worked together to develop the path forward. The key question raised was “*Which customers do we prioritize?*” Options identified included those with historically lower inclusion scores, customers deemed most vulnerable by PSO, or groups that are higher priority for regulators and stakeholders.

In addition to prioritizing customers, PSO must consider the equity implications for:

- Customers deemed less vulnerable
- Large commercial & industrial customers that were not part of the study
- Shareholders
- Trade allies
- Future customers

The process to identify priority customers and develop an equity roadmap began with a series of team workshops, which were broken into three parts. First, the team would identify high priority customers and their specific needs in terms of involvement in energy efficiency programs. Second, establish a project vision and mission and develop a set of key equity goals based on the identified high priority customers. Third, develop the strategies that will be used to meet these customers' needs and achieve study goals. From the workshops emerged three key equity goals and strategic steps were identified to reach these goals.

Equity Goal 1

Identify Customers and Communities That Need Better Access to the SBES Program

Strategic Goals:

1. Collaborate with community groups that know and work with vulnerable customer groups.
2. Gather better data on business customers and/or search data sources for appropriate business firmographics.
3. Understand how well programs are reaching vulnerable businesses instead of focusing on regionality.

Equity Goal 2

Engage and Listen to Customers to Better Understand Their Needs

Strategic Goals:

1. Identify past participants that are vulnerable and create a referral program.
2. Showcase equity goals and roadmap on the program website and in print material.

Equity Goal 3

Increase Inclusion and Benefit Scores of Vulnerable Communities

Strategic Goals:

1. Develop targeted strategies to reach and recruit members of vulnerable communities.
2. Target outreach to promote and build awareness of specific offerings among vulnerable groups.

There were several initial delivery strategies outlined after the team workshops. These included adding smart thermostats to the SBES program and coupling it with the PSO Power Hours commercial demand response program, changing the current SBES rebate structure, tiering rebates based on customer size, and accepting projects from larger customers potentially at a lower incentive rate. These tactics could be focused and offered only in vulnerable areas or to vulnerable customers to increase participation. These strategies and others are under consideration.

Discussion and Conclusions

The PSO SBES energy equity study provided valuable insights in how the program is currently engaging SMB customers in areas with higher levels of social vulnerability. The study found the SBES program has been successful in reaching a somewhat disproportionately high share of customers operating in more vulnerable communities for the audit and upgrade portions of the program. Conversion rates from audit to upgrades were found to be higher in more vulnerable communities. Knowing how the SBES program is engaging SMB customers in areas with higher levels of social vulnerability provided PSO with a foundation to develop equity strategies and tactics for engaging high priority customers.

The analysis used a community's social vulnerability as a proxy to identify disadvantaged businesses. The analysis did not determine if the businesses participating in the SBES program are disadvantaged. Use of a community's social vulnerability as a proxy was effective and sufficient for PSO to develop equity strategies and tactics for the SBES program.

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