RESEARCH REPORT

2023 INCOME VERIFICATION ASSESSMENT EXERCISE

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Analysis of Self-Reported Solar for All Household Income Data

JUNE 2023

SOLAR FOR ALL
A PROGRAM OF DC'S DEPARTMENT OF ENERGY AND ENVIRONMENT

Groundswell

DEPARTMENT OF ENERGY & ENVIRONMENT
GOVERNMENT OF THE DISTRICT OF COLUMBIA

GOVERNMENT OF THE DISTRICT OF COLUMBIA
MURIEL BOWSER, MAYOR

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Analysis of Self-Reported Solar for All Household Income Data

ABSTRACT

In 2023, Groundswell and the DC Department of Energy and Environment (DOEE) partnered to begin an ongoing annual income validation exercise on Solar for All (SFA) subscriber households. This annual exercise in monitoring the subscriber household income distributions and the number of households that self-report income beyond the program limits will help determine if and when a formal re-verification process is needed. The 2023 sample examined 145 responses to Groundswell's one and two-year subscriber surveys from April 2022 to March 2023, focusing on responses to the question, "What is your household income?" To assess the current and potential future SFA subscriber income distributions, we calculated summary statistics from the survey responses and applied relative income mobility trends from outside economic research to the observed SFA population. The analysis shows very similar distributions for each survey's responses, with an estimated mean income between $19,000 and $31,000 for one-year respondents and between $16,000 and $29,000 for two-year respondents. **While a formal income re-verification process is not recommended at this time, our projections suggest it will be needed within the next 10 years to ensure the program continues to serve the target groups.** Our recommendation on *when* to conduct a re-verification process will be impacted by reported incomes in future survey years and available program capacity, especially as more households with incomes closer to the program income limits enroll.

BACKGROUND AND RESEARCH QUESTIONS

Households are eligible to participate in SFA if their household income is shown to be less than 80% of the area median income (AMI) for their household size. That is, their household income must meet the set threshold of being less than 80% of the median income for all DC households. The current threshold limits based on household size are shown in **Table 1** below. To enroll, a household can prove its income eligibility by participating in another low-income support program — such as the Low-Income Home Energy Assistance Program (LIHEAP) — or verify their income with pay stubs. Many government support programs require participants to reapply and verify their income every year. At the onset of the SFA community solar program, DOEE intended to re-verify the income of subscribers after three years in the program. However, such a process would be costly and time-consuming. Additionally, it would exclude qualified beneficiaries for simply not completing the re-verification process and could be intrusive to the subscriber households. For these reasons, DOEE established in 2022 that income re-verification would not be required for subscribers to remain in the program.

Table 1:

Income thresholds to qualify for SFA, effective April 2022

Persons in Household	1	2	3	4	5	6	7	8	9	10
Annual Income (thousands)	$79.7	$91.1	$102.5	$113.9	$123.3	$136.7	$148.1	$159.4	$170.8	$182.2

Source: Data from "Solar for All", Department of Energy and Environment

Each year, Groundswell, the subscription manager grantee for SFA, works with DOEE to complete a research project using SFA participant data. In 2023, as households began to reach their three-year anniversary, Groundswell conducted an initial income verification exercise using subscriber survey data. A similar income verification exercise will be conducted annually to monitor SFA participant household income demographics over time. This process will help inform if and when a formal income re-verification process is needed for the program to continue to reach the target communities. The major study questions for this purpose are: What percentage of SFA participant households have income levels within the SFA limits? Given the estimated projections and self-reported income data, is that percentage expected to remain stable over time? What is the average household income of participating SFA households? How much does household income vary year-to-year among enrolled households? We will also consult related research and share additional survey findings.

DATA COLLECTION AND METHODOLOGY

As a part of our ongoing customer engagement, Groundswell administers surveys to participant households for each year they participate in the program. The primary purpose of these surveys is to assess household satisfaction with the program and gather feedback about subscriber experiences. The surveys also ask for household demographic information, including income, age, race, and gender. While the demographic questions are optional, most households responding to the survey answer the demographic questions. The surveys are administered on a rolling basis according to the subscribers' program start date. Subscribers who have an email address with their SFA records are sent the online survey via automated email on the date of their program anniversary and a reminder email one week later. Subscribers without an email address on file receive the survey by mail during their anniversary month. Surveys have been sent for subscriber one and two-year anniversaries since 2022, and a three-year survey will begin to be administered to subscribers starting April 2023. To date, Groundswell has sent the one-year survey 629 times by email and 1,484 times by mail. The two-year survey has been sent 570 times by email and 2,130 times by mail. The online surveys are administered via SurveyMonkey, and data for surveys completed online and by mail are stored in SurveyMonkey. Live survey response dashboards are shared with DOEE and available to access through the SharePower business intelligence portal. The full response datasets for each annual survey were downloaded and combined for this assessment.

As this validation exercise pertains largely to income, we restrict the dataset to only include survey responses where the household income question was answered. For the 2022 assessment, 21 responses were removed from this analysis because those respondents did not answer the income question, leaving 124 out of the 145 responses. Of these 124 responses, 87 were to the one-year anniversary survey and 37 were to the two-year survey. The income question asks respondents to select their household annual income from the following multiple-choice options: $0-$15,000; $15,001-$25,000; $25,001-$35,000; $35,001-$45,000; $45,001-$55,000; $55,001-$65,000; $65,000+. Due to household income being reported as a range and not an exact value, we would like to show a range of possible income means. To do this, we will use the low-end values, midpoint, and high-end of each range to calculate a weighted average. Estimated averages will be calculated for combined responses on all surveys and each year's survey individually. In future years, the average incomes of cohort groups will be compared against time; for example, the 2024 report will compare the two-year responses to the 2023 one-year responses, as they gather data from the same enrollment cohort. The subscriber surveys are anonymous to protect respondents' privacy, so it is not possible to compare incomes from one specific household across years.

Second, we assess the number of respondents who reported their income as above $65,000+. Until April 2023, the income question was multiple-choice and did not allow respondents to write in their exact household income. Due to this limitation, we do not know for sure if some households would have exceeded the income limits. Assuming the survey responses are representative of the SFA population, we will report a range of possible percentages of households exceeding the income threshold and, conversely, the percentage continuing to fall below the threshold. Beginning April 2023, the surveys will ask respondents with incomes over $65,000 to report their exact income, and it will include an additional question about total household size. All surveys begin with an acknowledgment that their responses are anonymous and will not impact their enrollment or eligibility in any way, to

encourage people to share the most accurate and honest responses. Asking these tailored questions will allow for a more accurate assessment of the program eligibility status for households with higher incomes.

Third, we will use two methods of income forecasting to estimate what the household incomes of current SFA participants might be in three and ten years. The first method is to apply forecasted personal income growth rates published by the DC Office of the Chief Financial Officer in January 2023 to the survey income distribution ("District of Columbia Economic and Revenue Trends", 2023). These forecasted personal income growth rates are predicted averages in income growth over the next three years for all DC income earners, shown in **Table 2** below. As this forecast was recently published and is specific to DC, it might be the most accurate predictor of the *mean income of the current SFA population in three years*. However, we are not only interested in the mean income. We would also like to know the likelihood of current subscriber households to experience income growth beyond the program limits.

Table 2:

Moody's Personal Income Growth Projections, Washington DC (% change from the previous year)

2022	2023	2024	2025
0.2%	4.5%	4.6%	3.8%

Source: Data from "District of Columbia Economic and Revenue Trends" (2023)

In the next forecasting method, we apply historical observations of relative income mobility[1] to the survey response data. As described in a meta-analysis of income mobility by Jantti and Jenkins (2015), research on the topic of individual and household income mobility has been limited in comparison to the vast research on income inequality. This is partly because income mobility research requires data on the same individual or household at two points in time, which can be more difficult to collect than the population trend data used for income inequality research. Still, there have been many national-level studies of income mobility in recent decades, and while mobility studies have not captured trends in the past ten years, long-term studies have shown that income mobility remains relatively constant, with some decrease in mobility near the end of the 20th century and beginning the 21st century, in particular for the poorest households (Auten and Gee, 2009; Bradbury and Katz, 2002). To forecast the potential incomes of SFA households, we will take the 2022 survey results and apply the rates of mobility between income quintiles[2] as reported in three studies: "The U.S. Income Distribution: Trends and Issues" (2021) report from the Congressional Research Service which reports U.S. individual income mobility from 2009-2012; Bradbury and Katz (2002), a national-level study of household income mobility over 10-year periods; and a report from District, Measured that shows individual income mobility from 2002-2012 (Stein, 2015). Each of these studies looks at movement between income quintiles, and the movement matrices are displayed in **Tables 3-5** below.

[1] Relative income mobility refers to the movement up and down in income rankings compared to other individuals or households. It differs from absolute mobility, which purely assesses whether or not an individual or household has increased income from time A to time B. As the SFA income limits are based on 80% AMI which grows as the AMI grows, it makes most sense in this context to use relative mobility.

[2] Income quintiles refer to the income ranges that 20% of a population fall into. The first income quintile is the poorest and captures incomes between the 0 and 20th percentile. The second quintile captures incomes between the 20 and 40th percentile, etc., with the fifth quintile being the richest 20%.

Table 3:

U.S. Individual Income Mobility from 2009-2012

	Quintile ended				
Quintile started	First (poorest)	Second	Third	Fourth	Fifth (richest)
First (poorest)	69%	21%	6%	3%	2%
Second	19%	49%	22%	7%	2%
Third	8%	20%	46%	21%	6%
Fourth	3%	7%	21%	50%	19%
Fifth (richest)	1%	3%	6%	19%	71%

Source: Data from Congressional Research Service (2021)

Table 4:

U.S. Household income mobility from 1988-1998

	Quintile ended				
Quintile started	First (poorest)	Second	Third	Fourth	Fifth (richest)
First (poorest)	53%	24%	12%	6%	4%
Second	26%	36%	23%	11%	4%
Third	11%	21%	28%	28%	13%
Fourth	7%	13%	24%	31%	26%
Fifth (richest)	3%	6%	15%	23%	53%

Source: Data from Bradbury and Katz (2002)

Table 5:

Washington, D.C. Individual Income Mobility from 2002-2012

	Quintile ended				
Quintile started	First (poorest)	Second	Third	Fourth	Fifth (richest)
First (poorest)	39%	28%	15%	11%	7%
Second	18%	35%	24%	13%	10%
Third	8%	17%	31%	28%	16%
Fourth	3%	7%	14%	39%	37%
Fifth (richest)	2%	2%	4%	12%	80%

Source: Data from Stein (2015)

The results from the studies differ somewhat based on the period observed, the observation of individual mobility vs. household mobility, the geographic area studied, and the datasets used. We use three different sets of results to show that there is a range of possibilities in income mobility for this group – it surely cannot be predicted exactly, but it may fall near these predicted ranges.

Lastly, we will investigate correlations between household income and other demographics or program satisfaction. Namely, we will compare answers to respondent age and household income, respondent race and household income, and the Net Promoter Score (NPS)[3] satisfaction rating to household income. This analysis will be done with response rate bubble charts as they provide a visual representation of the demographic layout. As most of these results are strongly skewed to one age range, race, or NPS, the bubble charts are only used for exploratory purposes.

[3] Net Promoter Score is a commonly used metric for customer experience surveys where respondents answer the question "How likely is it that you would recommend __ to a friend or colleague?" on a scale from 0 (not at all likely) to 10 (extremely likely). In this survey, we ask how likely it is that they would recommend the Solar for All program.

RESULTS

Household incomes were similar between the two surveys. As mentioned above, the household income question is multiple choice and asks respondents to select which income bracket they fall into ($0-$15,000; $15,001-$25,000; $25,001-$35,000; $35,001-$45,000; $45,001-$55,000; $55,001-$65,000; $65,000+). A low, medium, and high average scenario was created by using the lower limit, midpoint, and higher limit of each bracket as the hypothetical mean for households that responded as falling in that bracket. The means for each scenario were then calculated using a weighted average of the respondents in each bracket. The results are shown in **Table 6** below.

Table 6:

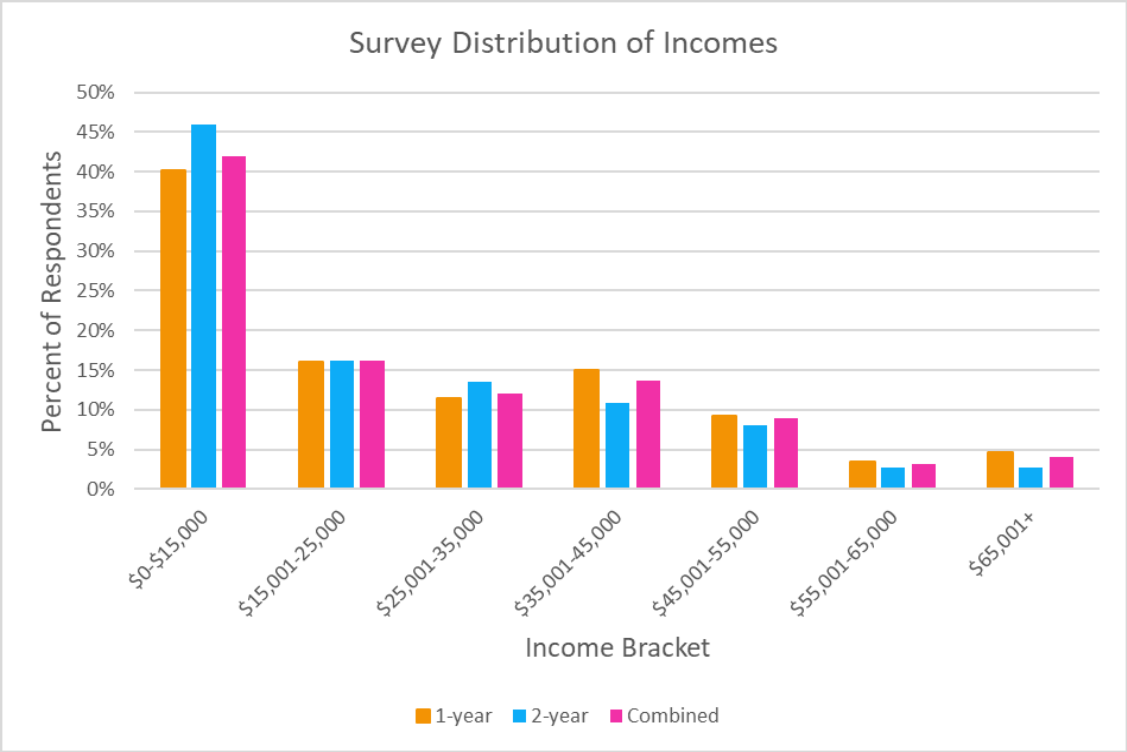
Estimated average incomes for low, medium, and high scenarios.

	1-Year	2-Year	Combined
Low ($0, $15k, $25k, $35k, $45k, $55k, $65k)	$19,500	$16,500	$18,600
Medium ($7.5k, $20k, $30k, $40k, $50k, $60k, $70k)	$25,500	$22,600	$24,700
High ($15k, $25k, $35k, $45k, $55k, $65k, $75k)	$31,500	$28,800	$30,700

Table 6 shows that the estimated average income for the combined population is between $18,600 annually and $30,700 annually, with the estimates being slightly higher for one-year survey respondents and slightly lower for the two-year respondents. The low average incomes are due to a strong concentration of incomes in bracket 1 (between $0-$15,000 annual income). This distribution is shown in Figure 1 below for the one-year, two-year, and combined response groups.

Figure 1:

Participants' Distribution of Incomes



Another major study question asks how many households self-reported income above the program income thresholds. From the 124 responses, five households reported their income as more than $65,000. However, respondents did not have the option to share their exact income, and they may have still been within the income limits. With this information, we can only state that between zero and five households, or 0%-2.3% of the respondents, exceeded the income limits. If we assume the survey responses are representative of program participants as a whole, then between 97.7% and 100% of participant households still meet the income requirements to participate. The surveys have been updated, effective March 2023, to allow households with incomes over $65,000 to enter their income in a comment box and request that respondents of all income levels share their household size. With these changes, the research question on graduation beyond the program's income limits can be answered more accurately in future years.

Next, we used two forecasting methods to estimate this SFA population's income distribution in the next three and ten years. Using the median combined income of $24,700, we can apply Moody's annual income growth projections until 2025 (See **Table 2** above). Using this forecasting method, we predict that the average household income in 2025 for the population that is currently enrolled in SFA would be roughly $28,000. As stated above, the change in average income does not inform us how many households no longer qualify based on the program's income limits, which is where the quintile mobility calculations are useful.

To estimate income mobility between quintiles in the next three and 10 years, we used results from three different studies on intra-generational mobility: *The U.S. Income Distribution* (2021), Bradbury and Katz (2002), and Stein (2015). First, we had to correlate the survey results with income quintiles. According to DC Health Matters, roughly 20.6% of DC residents had incomes below

$35,000 and roughly 39% had incomes below $75,000 ("2022 Demographics"). Applying these measurements to our survey data, we will say that respondents were in the first income quintile if they selected their income as $0-$15,000, $15,000-$25,000, or $25,000-$35,000. We will assume that all other respondents had incomes between $35,000-$75,000 and fell into the second quintile. From the combined survey results, 70% of the SFA population would fall into the first income quintile, and the remaining 30% would fall into the second income quintile. The forecasted income estimates based on each study are displayed in **Tables 7-9** below. Each cell in the table shows what percentage of the SFA population, according to the survey results and the applied forecasting estimates, would start and end in which quintile. For example, **Table 7** estimates that by 2025, 4% of SFA households would have started in the first quintile and ended in the third, and 6.6% would have started in the second and ended in the third, giving an estimated total of 10.6% of the population ending in the third quintile in 2032. While the SFA income thresholds do differ based on household size and some households in the third quartile may qualify, we will assume here that households in the third, fourth, and fifth quartiles would exceed the SFA income limits.

Table 7:

Forecasted 2025 Income Distribution based on results from The U.S. Income Distribution: Trends and Issues (2021)

	Quintile ended				
Quintile started	First (poorest)	Second	Third	Fourth	Fifth (richest)
First (poorest)	48.4%	14.4%	4.0%	1.9%	1.1%
Second	5.7%	14.8%	6.6%	2.2%	0.7%
TOTAL	54.1%	29.2%	10.6%	4.1%	1.8%

Table 8:

Forecasted 2032 Income Distribution based on results from Bradbury and Katz (2002)

	Quintile ended				
Quintile started	First (poorest)	Second	Third	Fourth	Fifth (richest)
First (poorest)	37.4%	16.6%	8.7%	4.5%	3.0%
Second	7.7%	10.8%	6.7%	3.3%	1.3%
TOTAL	45.1%	27.4%	15.4%	7.8%	4.3%

Table 9:

Forecasted 2032 Income Distribution based on results from Stein (2015)

	Quintile ended				
Quintile started	First (poorest)	Second	Third	Fourth	Fifth (richest)
First (poorest)	27.3%	19.6%	10.5%	7.7%	4.9%
Second	5.4%	10.5%	7.2%	3.9%	3.0%
TOTAL	32.7%	30.1%	17.7%	11.6%	7.9%

Using the assumptions above, this method of forecasting predicts that in three years, up to 16% of the SFA population may have incomes above the program limits (**Table 7**), and in 10 years, up to between 27% and 38% may exceed the limits (**Tables 8 and 9**). For a one-person household, moving into the third quintile roughly correlates with surpassing the 80% AMI limit as the percentile distribution and limits change each year. Although we observe from survey data that most SFA households are single-resident households, some do have more household members and have a higher SFA income limit. A six-person household would need to roughly meet the 4th quintile to exceed SFA income limits. A lower limit on exceeding the program income guides could be found by assessing the percentage of households expected to get to the fourth and fifth quintiles. According to the method above, roughly 6% of SFA households may enter the fourth and fifth quintiles in the next three years, and between 12-19.5% in the next 10 years.

For households in any income quintile, the most common outcome is that they will remain in the same income quintile at the end of the observed period. However, as the time period grows, the likelihood that there will be movement between quintiles increases. It should be noted that upward and downward growth are both possible – in these tables, we see that households that start in the second quintile may end in the first quintile in a later year.

Lastly, we assessed the relationships between income and race, age, or program satisfaction ratings within the SFA population. Figures 2, 3, and 4 (below) visualize the distribution of responses by income with age, race, and NPS, with the bubble sizes representing the number of responses to answer intersections (for example, there were 16 respondents between ages 55-64 who have an income between $0-$15,000, and only one respondent who was between ages 35-44 with an income of $65,000+). At this time, SFA participants are heavily skewed towards those with incomes in the lowest bracket, individuals over 55, and Black/African American individuals. Additionally, most respondents reported high satisfaction with SFA and gave a Net Promoter Score of 10. With these skews and limited data, we do not find any significant correlations between income and the independent variables, but the figures nonetheless help visualize the SFA population attributes.

Figure 2:

Responses to Income Questions by Respondent Age

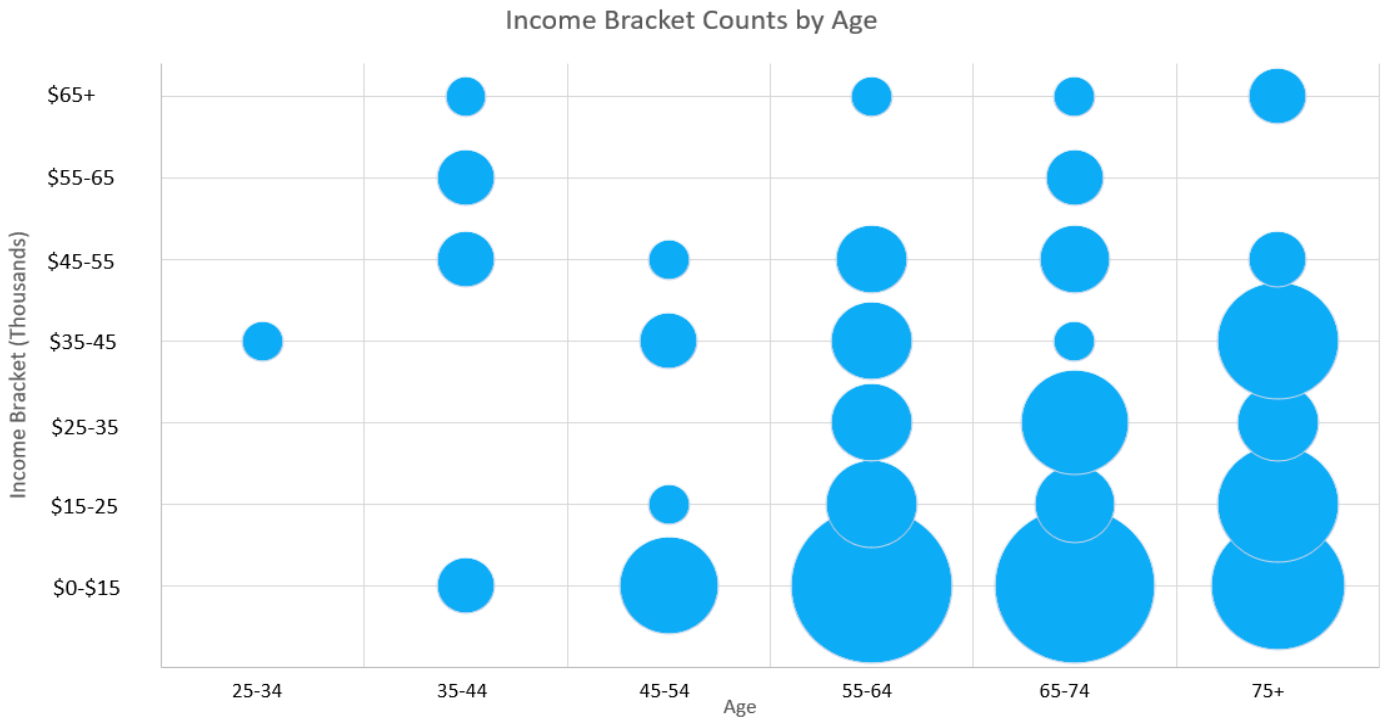


Figure 3:

Responses to Income Question by Respondent Race/Ethnicity

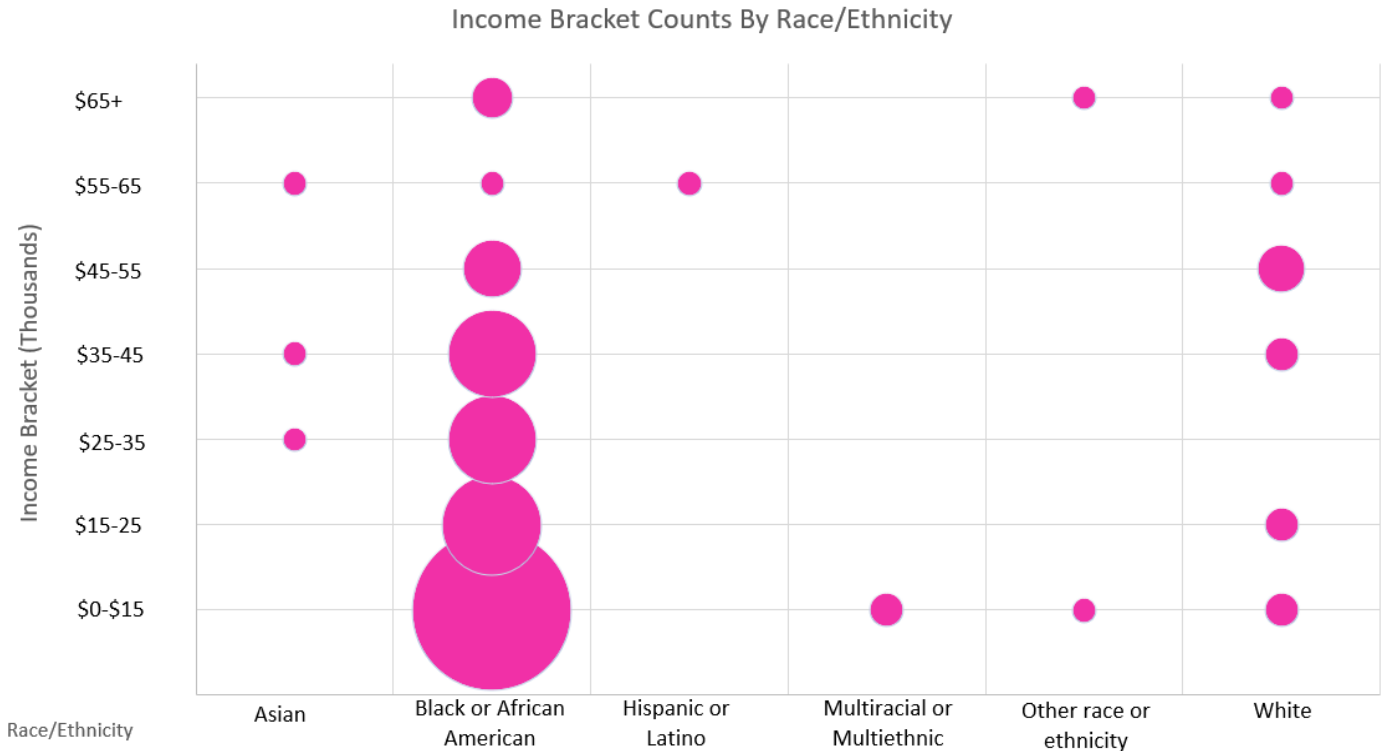
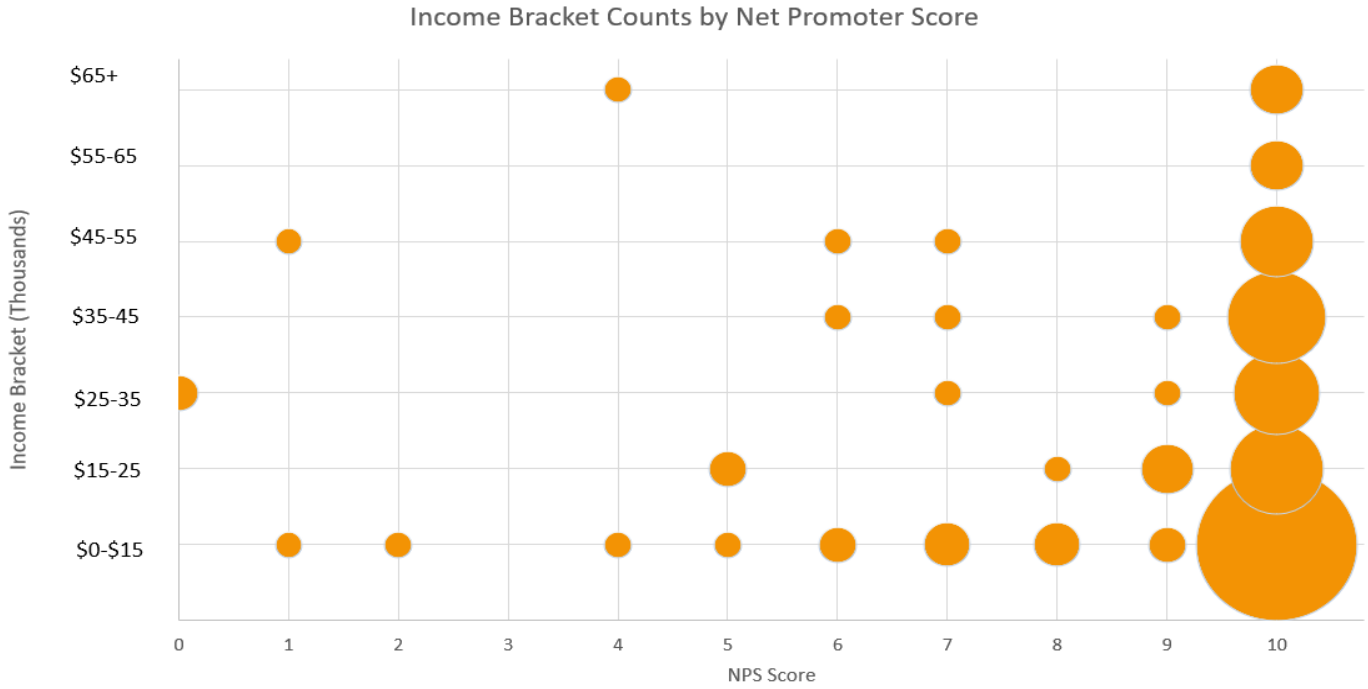


Figure 4:

Responses to Income Question by Respondent Net Promoter Score



SUPPORTING FINDINGS

In the spring of 2023, Richmond (2023) conducted research using income trends to project income distributions for SFA participants in future years. The income projections found it would be unlikely for current SFA households to graduate out of the program income thresholds in the next 10 years. Using the available income data from SFA, LIHEAP, and UDP at the point of program enrollment, Richmond observed that the average SFA participant income was on the lower end of what our survey results showed, around $17,000. After applying growth projection models using Moody's annual estimated growth rates and truncated randomized normal distributions, it was predicted that the SFA income distribution will remain roughly the same until 2025. Looking further, incomes for this group are projected to increase slightly by 2032, with a projected mean of around $26,000 and the 75th percentile of around $45,000. This was similar to our findings using the same Moody's growth method applied to the annual survey results, with our predicted mean being $28,000. Although it aligns with the predicted growth in average income, it does not account for households who may experience larger increases in their income and move between quintiles, as shown in the above quintile mobility projections and "The U.S. Income Distribution" (2021), Bradbury and Katz (2002), and Stein (2015). As shown in **Tables 8 and 9**, we predict that up to between 27% and 38% of the current SFA subscribers may fall into the third, fourth, or fifth-income quintiles by 2032. This would place the 75th income percentile of SFA subscribers somewhere above $75,000, as opposed to the $45,000 predicted by Richmond (2023).

While we utilized national and District-level mobility studies to forecast SFA mobility, it should be noted that many factors contribute to income mobility. Race is a major factor, with upward mobility being more common for White households than Black or Hispanic households ("The U.S. Income Distribution", 2021). The survey results show that a majority of SFA subscribers are Black/African American. This is not shown in the survey

results, but as the subscriber organization serving SFA households, Groundswell is aware that many enrollees are seniors on fixed incomes, which essentially gives them no chance of upward relative income mobility. Additionally, we know from enrollment data that a majority of SFA households live in Wards 7 and 8, which have significantly lower median incomes than the other Wards ("2022 Demographics"). Finally, because income eligibility requirements for SFA are updated annually to align with the recommendations of the U.S. Department of Housing and Urban Development, it is possible subscribers who experience income increases may still fall within the updated qualification guidelines. This is all to say that given other known factors about the current SFA participant population, the actual income growth beyond the program limits in 10 years may be lower than the forecasts predicted by the results of other studies.

CONCLUSION AND RECOMMENDATION

The findings support the decision to renew all current SFA participants without a formal income re-verification. Survey responses to Groundswell's one and two-year surveys showed household incomes were concentrated on the lower end — below $25,000 per year. **The supporting evidence from DOEE shows that households may be more concentrated on the lower end of the income spectrum than the survey results show.** While the observed surveys did not collect exact self-reported incomes, only 2.3% of the respondents reported an income of more than $65,000. Given the currently enrolled SFA population, an income re-verification is not necessary at this time.

However, we do anticipate that an income re-verification process will be needed in future years. The 2025 forecasted income distribution (**Table 7**) predicts that up to 16% of SFA households may exceed the income limits in the next three years. This accounts for increasing limits to the income threshold every year to meet 80% of the current AMI. However, the known population demographics of race, neighborhood, age, and household size all decrease the likelihood of large income increases. Assessing the percentage of households that may enter the fourth and fifth quintiles in three years can serve as a lower bound to this estimate. According to **Table 7**, roughly 6% of households may be in the fourth and fifth quintiles in three years, while up to 16% may be in the third quintile or higher. We will continue to monitor survey results for an indication of this change. However, households that do exceed the income limits may be inclined to hide that information for fear of being removed from the program, even on an anonymous survey. With survey bias and low response rates, the only way to surely know whether households continue to qualify is to conduct a formal income re-verification.

The demographics of newly enrolling subscriber households will likely have a large impact on when a formal re-verification is needed. Unlike other district energy assistance programs, SFA is open to low *and- moderate-income* households. Although moderate-income households are eligible, there have not yet been a significant number of enrollments from this group. This gap between eligible households and actual participants is likely due to the enrollment focus on LIHEAP participants, residents of affordable housing units, and Wards with the lowest incomes. The forecasted incomes calculated this year are based on the estimate that 70% of SFA households fall into the first income quintile while only 30% fall into the second quintile. As more households in the second quintile enroll, the estimated number of subscribers who will have

income growth beyond the program limits will only increase. In future years, this validation project will continue to monitor subscriber household income, especially with the growing number of subscribers from moderate-income households.

Lastly, an income re-verification would be most beneficial to the program at a point in time when there is a waitlist for enrollment. As of the date of this report, there has been enough project capacity to enroll all subscribers without delays or a waitlist. However, we anticipate that the program will reach full capacity in the future. Much like we predict that households in lower quintiles could move beyond program limits, other households will move into lower quartiles and need utility bill discounts from SFA and other programs. The amount of available capacity will likely impact when a re-verification process is needed, as the case to conduct a large-scale re-verification process and remove subscribers from the program is not as strong if there is remaining capacity available and a wide majority of subscribers are still believed to have household incomes within the income requirements. All of these factors will be taken into consideration as this validation exercise is repeated in the years to come.

ABOUT THE AUTHOR

Emily Peck is the Manager of Subscriber Services at Groundswell. In addition to managing community solar participant data, Emily leads research efforts related to community solar programs and subscribers, especially as it relates to the DC Solar for All program. Her research with Groundswell to date has involved subscriber survey responses, solar credit history analysis, and income mobility forecasting. Emily completed undergraduate studies at the University of Michigan in Economics and German with a minor in Environmental Studies. At Groundswell, she combines her analytical mindset with her passion for clean energy and sustainability. Emily believes that understanding the stories that data tells is the key to leading effective programs like DC Solar for All.

REFERENCES

Auten, G. and G. Gee. 2009. *Income mobility in the United States: new evidence from tax data.* National Tax Journal, 62 (2) (2009), pp. 301-328.

Bradbury, K. and Katz, J. 2002. *Are lifetime incomes growing more unequal? Looking at new evidence on family income mobility.* Federal Reserve Bank of Boston, Reg. Rev. Q4 (2002), pp. 3-5.

"2022 Demographics," DC Health Matters, accessed April 10, 2023, https://www.dchealthmatters.org/demographicdata?id=131494&sectionId=936

"District of Columbia Economic and Revenue Trends: January 2023," Office of the Chief Financial Officer Office of Revenue Analysis, accessed April 2, 2023, https://cfo.dc.gov/sites/default/files/dc/sites/ocfo/publication/attachments/DC%20Economic%20and%20Revenue%20Trend%20Report_January%202023.pdf.

Richmond, Jen. 2023. *Validation of relaxed income reverification procedures for SFA subscribers.* DC Department of Energy and Environment.

"Solar for All," DC Department of Energy and Environment, accessed March 15, 2023, https://doee.dc.gov/solarforall.

Stein, Perry. "Here are your chances of moving up the income ladder in D.C." *The Washington Post.* July 30, 2015. https://www.washingtonpost.com/news/local/wp/2015/07/30/here-are-your-chances-of-moving-up-the-income-ladder-in-d-c/

The U.S. Income Distribution: Trends and Issues, Congressional Research Service, updated January 13, 2021, https://sgp.fas.org/crs/misc/R44705.pdf.