

2020 ACEEE SUMMER STUDY PAPER



**ON-BILL FINANCING: EXPANDING
ACCESS TO ENERGY EFFICIENCY,
CLEAN ENERGY ADOPTION, AND
ELECTRIFICATION FOR
EVERYONE**

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ABSTRACT

On-bill financing programs provide an opportunity for rural communities to finance whole-house energy efficiency retrofits and clean energy upgrades with no upfront payments. Rural Americans pay on average 40 percent more for energy than their urban counterparts. But the upfront costs of many energy efficiency projects put long-term, cost-effective savings out of reach of those with lower incomes in rural, disadvantaged communities. When designed appropriately, on-bill financing programs provide financing to everyone regardless of income, or credit. On-bill financing programs require no credit checks – as program eligibility is based on utility bill payment history – and tie the on-bill obligation to the utility meter; thus, allowing for the monthly charge to transfer to the next owner or renter.

Historically, on-bill financing programs have focused on energy efficiency measures, but now a new wave of programs is emerging that also finance solar rooftop panels, beneficial electrification projects, and battery storage devices. Orcas Power and Light Cooperative's (OPALCO) Switch It Up! and the Hawaii Green Energy Money Saver (GEM\$) programs are two innovative on-bill financing programs providing customers with financing options for clean energy upgrades for resilience.

On-bill programs increase energy affordability, expand access to capital for clean energy upgrades, and put underserved communities towards a path of greater energy equity in rural communities, helping create a decarbonized, clean energy future. This paper will provide an overview of existing programs, the RESP opportunity, as OPALCO secured RESP capital for its program and current impact data.

Introduction

Rural, islander, low-income, and under-resourced communities stand to bear the worst impacts of climate change and are the least prepared to withstand extreme weather events (e.g., flooding, droughts, and heatwaves)¹. Because buildings account for 40 percent of all national energy usage and about 36 percent of U.S. carbon emissions, achieving greenhouse gas reduction goals will require new strategies to advance energy efficiency, clean energy, and electrification of residential and commercial buildings². Equitable financing tools that provide low-cost funding to install clean energy upgrades in homes in vulnerable communities are needed to ensure a decarbonized world is achieved in a just way and available to all.

Despite the cost of clean energy technologies coming down in the last decade, not everyone can access efficiency and clean upgrades for their homes. Traditional financial products with strict credit requirements do not reach all; however, on-bill financing programs, when well-designed, can provide a solution for these households and communities.

On-bill financing implies repaying a home or business clean energy upgrade (e.g., solar energy panels or energy efficiency retrofits) over time through the monthly utility bill. Program

¹ According to the [2018 National Climate Assessment report](#), annual temperatures are expected to increase 2.5F over the next few decades regardless of future emissions, putting additional pressured on LMI and rural households, which are already experiencing high energy burdens, as discussed later in the paper.

² Energy Information Administration (EIA). www.eia.gov/energyexplained/energy-and-the-environment/where-greenhouse-gases-come-from.php

capital can come from different sources including the utility, a third-party lender (e.g., credit unions, and community development finance institutions), a “green” bank³, capital market investors, or from the federal government (e.g., the Rural Energy Savings Program)⁴. There are approximately 110 on-bill programs operating nationwide⁵. Most of these programs fund cost-effective energy efficiency retrofits (e.g., attic insulation and air sealing) that provide energy savings to the participant greater than the cost of the measures⁶.

Because of their member-centric nature, rural electric cooperatives (co-ops) have historically operated more on-bill financing programs than investor-owned utilities. Co-ops see on-bill financing programs as a way to improve member relationships and help vulnerable households and families afford clean and efficient energy upgrades. According to the National Rural Electric Cooperative Association (NRECA), co-ops serve 92 percent of all persistent poverty counties⁷. Due to real and perceived regulatory and legislative constraints, investor-owned utilities have been lagging their rural counterparts in terms of on-bill financing program development for their customers⁸.

New programs are emerging that fund cost-effective energy efficiency and clean energy upgrades (e.g., rooftop solar panels and community solar projects) for homes and businesses and beneficial electrification projects⁹. While not all on-bill financing programs are designed with equity in mind, the on-bill financing programs described in this paper go beyond the basics and actually take steps to advance equity with certain design features aimed at improving energy affordability, increasing accessibility to capital, and expanding clean energy adoption for low-income and communities of color. These on-bill financing programs advance equity through four primary program designs: 1) the on-bill obligation or tariff¹⁰ is assigned to the meter, rather than the individual, and is shown as a line item on the utility bill; 2) applicants are screened using on-time utility bill payment history, instead of credit scores; 3) requirements for positive cash-flow experiences while the costs of the upgrade are paid over time, with no upfront costs; and 4) include a loan-loss reserve to serve as a protection for participants by allowing utilities to write-

³ Green banks are financial institutions typically at the state level with a mission to provide investments for clean and efficiency energy projects

⁴ The U.S. Department of Agriculture Rural Energy Savings Program (RESP) provides zero-percent loans to rural utilities. www.rd.usda.gov/programs-services/rural-energy-savings-program

⁵ Environmental and Energy Study Institute. www.eesi.org/obf/map

⁶ Cost-effectiveness measures (e.g., solar PV, and whole-house envelop-type retrofits) coupled with quality assurance process in on-bill programs can lead to large energy savings for participants, like the Hawaii GEM\$ program, will be shown later in the paper.

⁷ NRECA. www.cooperative.com/content/public/maps/persistent-poverty/index.html

⁸ It should be noted that HECO is the utility pass-through for the Hawaii GEM\$ program, seen later in the paper.

⁹ **Beneficial electrification** (BE) entails replacing a fossil-powered end-use equipment (e.g., switching out a furnace with an air-source heat pump), in a way that benefits the utility, the end-user, and the environment.

¹⁰ On-bill financing program take different shapes. In **on-bill tariff programs**, the on-bill obligation is considered part of the customer’s utility service, and where the repayment is less than the estimated savings for the clean energy upgrades, creating net monthly savings for the participant. Programs described in this paper involve many features of on-bill tariff programs including debt-free clean energy investments, alternative underwriting (e.g., on-time bill payment history, instead of credit scores), and automatic transferability of the on-bill obligation by assigning it to the meter (and thereby including renters).

off bad investments. Equity means “just and fair inclusion into a society in which all can participate, prosper, and reach their full potential”¹¹.

This paper will focus on how on-bill financing programs for homes and businesses can improve energy affordability, unlock capital, broaden access to clean energy, and, in the case of rural co-ops, help lower rural poverty rates by alleviating high rural energy burdens on their members. First, the paper examines how on-bill financing program design features can break barriers for clean energy adoption, improve energy affordability, increase access to capital for clean energy, and address racial and income disparities in clean energy adoption. Next, the paper provides two brief case studies on leading-edge and innovative on-bill financing programs that fund clean energy and beneficial electrification projects for everyone regardless of income or credit. Each program funds different types of projects, including energy efficiency, renewable energy, and beneficial electrification technologies like electric vehicle (EV) charging. It should be noted that the author has been a major part of the Environmental and Energy Study Institute’s work with the two utilities discussed in the case studies.

Removing Barriers For Greater Clean Energy And Electrification Access

Well-designed on-bill financing programs incorporate design elements that focus on cost-effective measures. In well-design programs, cost-effective means that accredited contractors install clean energy upgrades on the participant’s home (or business), resulting in estimated net monthly energy savings. As shown later, with the Hawaii Green Energy Money Saver (GEMS) and Washington state Orcas Power and Light Cooperative’s (OPALCO’s) Switch It Up! programs, participants are experiencing real net energy savings. With these elements, on-bill financing programs can improve energy affordability, access to capital, and clean energy technologies for all households, and businesses, particularly those in rural areas.

Improving Energy Affordability for All

Nearly one-third of reported American households face challenges when paying their utility bills, with one in five cutting back on or forgoing necessities such as food, medicine, or health care. About half of all such households are black, and 40 percent of Latinos face energy insecurities. Over half of American Indian households and three quarters of Pacific Islanders also struggle with paying their electric bills¹². Due to inefficient housing stock, particularly in rural areas, households face high energy burdens, up to 40 percent higher than urban counterparts. On average, lower-income households, including those in urban areas, typically pay 10 percent of their total annual income on energy costs (Ross, 2018). In contrast, higher-income families pay

¹¹ NAACP. Getting Beyond Green. https://naacp.org/wp-content/uploads/2020/04/CESBS-Equity-Baseline-for-Building-Standards_July-2019.pdf

¹² EIA Residential Energy Consumption Survey (RECS) 2015. Accessed February 11th, 2020. www.eia.gov/consumption/residential/reports/2015/energybills/

one to three percent towards energy costs (Ross, 2018). These high energy burdens put pressure on other things they need, such as paying for electricity, heat, food, child care, or clothing.

Low-and moderate-income (LMI) families often cannot afford the upfront costs associated with clean energy upgrades, because they lack the capital to pay for what traditional utility rebates do not pay for. Because on-bill financing programs require no money down and spread the investment cost over time using a portion of the savings, they can be an option for LMI families in rural (and island) areas. These programs consolidate the repayment process by including the repayment charge on the utility bill, which saves time and allows participants to easily compare accrued energy savings, with costs. Utilities are generally confident in customer repayments because customers experience monthly net savings (i.e., where estimated bill savings are greater than cost-repayments), especially when a work plan is well-designed and executed¹³. A synthesis of various operating on-bill financing programs across the country, with these structures, showed default rates of less than one percent, giving utilities confidence that participants will repay (Leventis, 2014).

On-bill financing administrative structures can be designed to require immediate positive cash-flow experiences for participants, even while paying back for the energy upgrade, and can include rebates and tax credits to make monthly repayments more affordable. In tenant-occupied multi-unit dwellings, where renters pay their utility bills, renters can access the rebates as they can access the program and enjoy the benefits of clean energy upgrades. The GEM\$ on-bill program requires participants to show an estimated a minimum 10 percent net monthly energy savings on the utility bill after installing the solar panels while repaying for the upgrade cost. Loan loss reserves (LLR) are part of these administrative structures that both GEM\$ and OPALCO programs have included, and that provide support for participants in case of default. In these programs LLRs are triggered when the participant fails to make utility bill and repayment charges for three straight billing cycles (90 days). The utility can use the LLR to write-off the investment, while the participants keep the equipment and stops paying for the on-bill charges. Due to COVID-19, both programs are now offering six-month bill deference to participants in need (superseding the 90 days), and thereby increasing equity in the programs¹⁴.

Expanding Accessibility to Capital for Clean Energy Upgrades For All

LMI households have traditionally faced barriers accessing capital, including for clean and efficient energy upgrades, due to below-average credit scores and the frequent inability to meet other traditional financial requirements. Many of these families have outstanding debts that automatically disqualify them from accessing capital through traditional financing for clean energy upgrades.

"The financial system in this country is riddled with inequities¹⁵. This is one reason clean energy improvements like distributed solar have not been easily accessible for families in under resourced communities. On-bill financing is an important tool that can help break down the

¹³ Department of Energy (DOE). https://betterbuildingssolutioncenter.energy.gov/sites/default/files/IB%20L-1%20EE%20Financing%20through%20On-Bill%20Tariffs_Final_0.pdf

¹⁴ This is the situation as of final paper revision (7/19/20) and there is great uncertainty with COVID-19 and what will happen after these six-month deferment period expires.

¹⁵ This perspective is back up by the following report:

https://cepr.org/active/publications/discussion_papers/dp.php?dpno=13330

inequities, and can lead to the build out of a more equitable clean energy future." (M. Santiago-Mosier, managing director, access and equity, Vote Solar, pers. comm., March 27, 2020)

On-bill financing programs can alleviate these financial inequities by using alternative underwriting rather than traditional underwriting (e.g., credit scores). This means using on-time utility bill payment history, rather than credit scores, and by not asking for income or job verification to screen participants into these programs. Being in good standing on paying the utility bill, for the prior twelve months, has been deemed a fair enough predictor for future regular cost-repayments (Leventis, 2014).

Both Hawaii GEM\$ and OPALCO's Switch It Up! program in Washington state use key program administrative structures to increase access to capital and ensure equity: 1) use of twelve months of on-time bill payment history to screen participants, instead of credit scores, and no prior disconnections in the last three years; 2) the on-bill obligation (in both programs the repayment is through a tariff) is assigned to the meter, rather than the individual, and is shown as a line item on the utility bill; and 3) programs are designed to create positive cash-flow experiences for the participant, even while paying for the upgrade. With one year of program operation, respectively, both programs report no losses and no defaults. These results are evidence that these alternative screens processes are working.

Rural electric cooperatives and other utilities serving rural communities can tap into the Rural Energy Savings Program (RESP) to fund their on-bill financing programs. RESP is a no-interest loan program administered by the U.S. Department of Agriculture's (USDA's) Rural Utilities Service (RUS). RESP provides capital to rural utilities that ultimately helps rural households implement clean and efficient energy upgrades to their homes and businesses, including energy efficiency retrofits, on- and off-grid renewable energy systems, beneficial electrification projects, and electric charging stations. The availability of no-cost capital through RESP is driving interest in these new and innovative on-bill financing models that open up clean energy projects for everyone.

The no-interest RESP program can help utilities develop low-interest on-bill financing programs, in turn making monthly repayments more affordable and helping improve the cost-effectiveness of larger, more expensive clean energy projects. RESP reduces barriers for rural utilities to access capital and the need to be "a bank" for their customer's clean energy projects. To date, USDA has loaned more than \$80 million to 22 rural utilities in 14 states for programs that include on-bill financing programs. More recently, the Hawaii Green Bank has leveraged large amounts of capital for GEM\$, which sets a positive potential example for other on-bill financing programs looking to increase access to low-cost capital to help lower customer monthly payments. To provide further support for third-party financial lenders and leverage more capital for programs, utilities and states are operating loan loss funds (e.g., Arkansas) to shore up on-bill financing programs, in case of defaults, de-risking capital¹⁶. Both Hawaii GEM\$ and Washington state OPALCO Switch It Up! program set up loan loss funds that provide protections to participants, as bad investments can be write-off.

As noted later in the paper with the Hawaii GEM\$ on-bill program example, on-bill financing programs can be combined with a traditional power purchasing agreement (PPA). This allows the participant to create additional revenue streams by selling power generated by the

¹⁶ The Arkansas Department of Environmental Quality, for example, offers a residential energy efficiency loan reserve program for four rural electric cooperatives that provide on-bill financing programs for their members.

solar panels, back to the grid, using the PPA, which results in larger savings while repaying for the solar panels. These savings can be reinvested in the communities they serve, particularly important in underserved communities.

Addressing Racial and Income Disparities In Clean Energy Adoption

The adoption of distributed energy resources, particularly solar PV, is uneven across racial and income lines, due to factors including higher rental rate among communities of color, and lack of access to traditional financing because of low-or-no credit scores. A University of Berkeley report compares similar census tracts and shows how while holding for medium household income, majority Black and Hispanic census tracts have, on average, 69 percent and 30 percent, respectively, fewer solar panels installations relative to no majority census tracts. In contrast, majority-white census tracts showed 21 percent greater solar adoption when comparing to a no majority census tract (Sunter, 2019).

On-bill financing programs can help communities of color finance and access grid-tied solar panels, and invert these current processes, by allowing for wealth building through lower energy bills. These programs can be accompanied by well-designed quality assurance and control mechanisms that protect consumers, particularly low-income consumers. These quality assurance protections, imbedded in innovative on-bill financing programs, can broaden clean energy access to renters, multifamily buildings, and to families that do not have the capital for upfront payments or credit scores. Renters are often excluded from participating in energy efficiency programs and installing energy improvements that will benefit them. This is due to the split incentive issue, where landlords are unmotivated to invest in clean energy upgrades for renters, who pay for their energy through the utility bill, as energy savings are accrued to occupants.

Tying the on-bill obligation to the utility meter, not the individual customer, allows the charge to transfer to the next owner or renter. Because solar panels have a 30-year life span, this provides large monthly utility bill savings, while the participant enjoys the benefits of the upgrade. While most people do not stay in their homes for that long period, having the on-bill obligation assigned to the meter allows for the repayment to transfer to the next owner, and continues to be repaid until is all paid-off. Monthly repayments become more affordable since the payments are spread throughout the clean energy upgrade's warranty period (e.g., 20 years for solar panels). These innovative design elements make it easier for LMI homeowners and renters to enjoy the benefits of solar energy and a more efficient home while saving energy, money, and reducing carbon emissions.

Assigning the investment to the utility meter helps solve the split incentive issue, allowing tenants to access clean energy projects in multi-dwelling buildings. On-bill financing programs, like the Hawaii GEM\$ program, finance multi-family building envelope retrofits, which coupled with solar panels, greatly reduces their energy bills. With 44 million households renting (36 percent), and with Blacks, Hispanics, and Asians making up half of those (2017 data), on-bill financing programs can help address these racial disparities among renters to access clean energy upgrades¹⁷. In on-bill financing programs, the first renter, with approval from the landlord, installs a clean energy upgrade on the unit, resulting in energy savings, a lower energy

¹⁷ American Housing Survey. www.census.gov/programs-surveys/ahs.html

bill (even while paying for the upgrade) and more comfortable home. To participate in the program, the renter signs an on-bill obligation agreement (provided by the landlord) acknowledging the existence of a charge on the utility bill to repay the installed energy upgrade. Successive and future renters for the upgraded unit receive the agreement as a disclosure of the line item's existence on the utility bill, ensuring transparency. The subsequent unit occupants enjoy all the benefits of the improvements, including lower energy bills and reduced carbon emissions. In the case of Hawaii GEM\$, landlords can temporarily stop payments, with prior approval from the utility, when there is a lag between unit occupants. Once the unit is reoccupied, payments begin again. The on-bill obligation agreement program documents also come into play when the home or business with the charge on the bill is sold, as the charge would automatically transfer to the next owner.

On-bill financing programs can include equipment warranties in the repayment charge, so program participants, including tenants, are covered in case of equipment shortfalls. In the Hawaii GEM\$ program, the charge includes a 10-year workmanship guaranty and a 20-year manufacturer's warranty on solar panels and inverters. These on-bill financing program features and others (e.g., utility bill payment history) can help LMI households install energy upgrades which helps with the transition to a distributed and locally-produced clean energy grid.

On-Bill Financing Programs Highlights

The on-bill financing programs presented below provide expanded energy access solutions to under-resourced and frontline communities in primarily-rural areas, and help them fund distributed clean energy projects, saving them money and benefiting the environment. The author is part of the Environmental Energy Study Institute team that has worked to help develop and launch these and other on-bill financing programs over the last five years.

Program	Hawaii GEM\$ ¹⁸	OPALCO Switch It Up! ¹⁹
Launch date	April 2019	April 2019
Impact	\$6.6 million ²⁰	\$1.2 million ²¹
Projects	149	125
Measures financed	Solar PV & Energy Efficiency	BE
Capital Source	Green Bank	RESP
Meter tied	Yes	Yes
Market	Residential & Commercial	Residential & Commercial
Credit enhancement	Loan loss reserve	Loan loss reserve
Transferable	Yes	Yes

¹⁸ Hawaii GEM\$ On-Bill Program. gems.hawaii.gov/

¹⁹ OPALCO's Switch It Up Program. energysavings.opalco.com/switch-it-up/

²⁰ gems.hawaii.gov/wp-content/uploads/2020/01/HGIA-Quarterly-Report_12-31-19_PUC-Filed-1-27-20.pdf

²¹ opalco.com/wp-content/uploads/2020/02/February-2020-Board-Materials.pdf. Accessed February 20, 2020.

Underwriting	12 months of utility bill payment history	12 months of utility bill payment history
Rate	5.5%	2%
Max term	20 years	15 years
Max amt.	\$50,000	\$21,000

Table 1. Summary of On-Bill Financing Programs

Orcas Power and Light Cooperative (OPALCO) On-Bill Program

Orcas Power and Light Cooperative (OPALCO), a co-op serving about 11,200 members in the San Juan Islands in northwest Washington, offers the Switch It Up! On-Bill program to its members. Launched in April 2019, the beneficial electrification focused program finances the replacement of propane-fueled residential and commercial equipment with efficient electric equipment. The program also finances EV charging stations for residential, small businesses, and schools. Capitalized by a \$20.8 million RESP loan, the program's goal is to finance at least 100 beneficial electrification projects per year for the next 10 years, thereby providing access to capital to 1,200 homes and businesses (or 10 percent of OPALCO members).

While 86 percent of OPALCO’s power is hydroelectric generated, approximately one-third of buildings are heated by burning fossil fuels²² (e.g., propane, and fuel oil)²³. Because no bridges provide connections between the islands and the mainland, delivered fuels need to be ferried in at great costs, which increases heating costs for those with fossil fuel-powered devices and increases energy burdens, particularly in the winter. Reducing and/or eliminating residential fossil fuel usage is a step towards equity for OPALCO and its members.

OPALCO is not your average rural electric cooperative. “On-bill financing and low-income solar has been the vision of our Board of Directors to help meet the needs of our membership by reducing barriers to entry for energy efficiency and solar projects and provide more funding for [low-income assistance programs](#), as demand is higher. Members are hungry for things they can do themselves to help mitigate climate change and keep their energy costs down. Many of our members just can’t afford to make the improvements needed for efficiency and carbon reduction – the on-bill financing program removes the biggest barrier”, (T. Neal, head accountant, OPALCO, pers. comm., January 23, 2020)

The on-bill program encourages members to decarbonize by helping them switch to electricity from fossil fuels and make their homes and businesses as efficient as possible while maintaining affordability. The program is part of OPALCO’s utility-wide initiative -- called “This Electric Life” -- to electrify buildings and transportation (including island ferries), powered by the cooperative. Switch It Up! allows OPALCO to increase revenue by moving additional energy uses onto its power grid, but in a way that provides member value, through more efficient equipment, and environmental benefits.

²² Delivered fuels like propane are not regulated by a state commission.

²³ www.opalco.com/wp-content/uploads/2017/08/RESP-Appendix.pdf

Switch It Up! eliminates the barriers of the upfront costs of energy efficiency retrofits and electrification projects, and the challenge of securing credit. OPALCO members can fund up to \$21,000 in space-and-water heating electrification projects at no upfront cost. One Switch It Up! participant replaced his inefficient propane-powered furnace for a more efficient ductless air-source heat pump (DHP), using the program to finance a \$5,300 DHP system (including rebates) over 10 years. The program participant's total year-to-year energy costs went from \$2,352.63 (propane: \$922.16 + electricity: \$1,430.47) to \$2,324 (all electric), which includes a \$50 per month (or \$600 annually) repayment charge. The participant is now experiencing \$630 annual energy savings, or about \$28.63 net annual bill energy savings (1.2%) when factoring in the DHP repayment plan. Because of the Switch It Up! program, this household eliminated propane usage, saving money and reducing carbon emissions. Eliminating high-cost delivered fuels like propane OPALCO's households enables them to reach their full potential, because it lowers energy burdens for LMI households, reduces indoor air-concerns (and health-related issues), and decreases carbon emissions.

Repayments are made over time—up to 10 years—depending on the measure installed. Longer repayment periods allow for more affordable monthly repayments as project costs are aligned with savings generated by the upgrade, and to qualify only on-time bill payment history is required, rather than credit scores. Project repayments are tied to the meter (not the person) allowing for the charges to transfer to the next owner or renter, and there are no loans involved, just an energy conservation agreement. The zero-interest RESP loan allows OPALCO to charge a low-interest rate (2%) to Switch It Up! participants, included in the repayment, to pay for program administration costs. While the program has had zero defaults to date, interest charges also fund a \$115,000 loan loss reserve (LLR), which serves as a backup in case of defaults and non-payments. The LLR is triggered when the participant fails to make utility and repayment charges for three straight billing cycles (90 days). OPALCO, which reserves the right for disconnection due to non-payment, can then use the LLR to write-off the investment. Then, the participant keeps the equipment and stops paying the on-bill charges. For performance shortfalls, the equipment warranty applies. These design elements promote affordability and accessibility because it decreases risk and increases confidence in repayments.

Switch It Up! participants can access rebates for eligible program measures (e.g., ductless air-source heat pumps) to reduce the principal and reduce monthly payments. LMI on-bill program participants are eligible for OPALCO's Energy Assist Program, ranging from \$30-\$60 a month depending on the number of household members and based on income. This monthly bill credit, which is for families that already qualify for federal energy programs, such as the Low-Income Home Energy Assistance Program, can effectively offset the Switch It Up! monthly repayment charge (\$30-\$50 for LMI families). These on-bill program features can help hard-to-reach members decarbonize their buildings, save energy and money, increasing member value and program participation.

For its first project, the Switch It Up! program financed a partial conversion of a local hotel's propane-powered radiant heating system. For an investment of \$105,000, the old system was replaced with electric ductless air-source heat pumps for about half of the hotel's forty rooms. This switch out gives hotel guests more control over their room temperature, and the option for air conditioning in the summer. The hotel reduced its total energy costs, even while

repaying OPALCO on its electric bill. With the generated savings, the hotel reinvested on additional air-source heat pumps, energy efficiency retrofits, and added solar panels to their roof.

Combined, these well-designed elements broaden access to this program to all community members, by increasing access to low-cost capital regardless of credit scores. “The Switch It Up! program represents a step forward in achieving rural equity in energy, something that historically has not been feasible for all OPALCO’s members. As an archipelago, the San Juan Islands are an extremely rural place since we are cut off from the mainland by an hour-long ferry ride” (T. Neal, head accountant, OPALCO, pers. comm., January 23, 2020)

Hawaii Green Energy Money Savers (GEM\$) On-Bill Program

Hawaii Governor David Ige and the Hawaii Green Infrastructure Authority (HGIA) officially launched its Green Energy Money Savers (GEM\$) On-Bill Program in April 2019. GEM\$ is an on-bill repayment program aiming to help renters, households, nonprofits, and small businesses save on their electric utility bills by financing eligible clean energy improvements. GEM\$ is funded through the Green Energy Market Securitization (GEMS) program -- Hawaii’s green bank. (HGIA manages both the GEM\$ On-Bill Program and GEMS). HGIA is housed within Hawaii’s Economic Development Department and is authorized by the Hawaii Public Utilities Commission. Participating Hawaiian Electric Companies (HECO) customers can conveniently pay back the cost of installing solar PV, a solar water heater, or other eligible clean energy improvements through their monthly utility bill, with no upfront costs. The program is available to LMI customers of HECO, a utility that serves 95 percent of Hawaii’s population.

GEM\$ supports Hawaii’s goal of carbon neutrality economy-wide by 2045 by helping households and renters fund solar panels that take advantage of the state’s mild climate and abundant solar resources²⁴. Since petroleum accounts for 61 percent of Hawaii’s electricity production (as of 2018), solar panels financed through the GEM\$ on-bill program directly reduce Hawaii’s fossil energy dependency and decrease carbon emissions.²⁵

The GEM\$ program unlocks capital, and helps break down the barriers of traditional underwriting and upfront installation costs while increasing access to solar for renters and reducing net energy costs²⁶. “The GEM\$ program is designed to democratize clean energy and reduce energy poverty by expanding access and affordability of renewable energy and energy efficiency to renters, low and moderate-income homeowners, small businesses, and nonprofit organizations. With 43 percent of Hawaii’s households renting and almost half of Hawaii’s households classified as ALICE (Asset Limited Income Constrained, Employed) or below, including 11 percent that live below the Federal poverty level, GEM\$ provides financing options to many have been traditionally locked out of participating in clean energy” (G. S. Yamamoto Lau, executive director, HGIA, pers. comm., January 24, 2020)

²⁴ To participate in GEM\$, customers must demonstrate a minimum 10 percent net monthly energy savings on the utility bill after installing the solar panels, while repaying for the upgrade cost.

²⁵ energy.hawaii.gov/resources/dashboard-statistics

²⁶ The Hawaii GEM\$ program finances solar rooftop PV, solar water heaters, and heat pumps for homeowners and renters. For businesses and multi-family buildings, the GEM\$ program finances energy efficiency improvements including building envelope-type retrofits, and LED lights. Other commercial energy efficiency technologies are eligible subject to HGIA approval. <https://gems.hawaii.gov/approved-energy-improvements-ei-list/>

To participate in GEM\$, residential participants must fulfill three requirements: participants have to be in good standing with HECO on their utility bill for the prior twelve months, with no disconnection notices in the past three years; must demonstrate an estimated minimum 10 percent net monthly energy savings on the utility bill after installing the solar panels, while repaying for the upgrade cost; and must be an LMI household²⁷. These design elements further equity by ensuring an immediate cash-flow positive experience for the participant by providing savings on the utility bill, which expands access for these clean energy upgrades for all regardless of credit scores or income.

To reach these net monthly energy savings, GEM\$ provides a complete quality assurance and control process for programs participants, where there is a separation between contractors and the entity providing the funds. Accredited energy auditors (previously vetted by HGIA) evaluate the approved participant's building structure and model the solar panels production. Then, the information is sent to HGIA where future energy savings is modeled using participant's past energy bills to determine if the participant can meet the minimum 10 percent net energy savings requirement (while repaying for the upgrade), once the clean energy upgrades are installed. If not, the customer is ineligible to participate in the GEM\$ program.

When the customer is approved, and once the solar panels are installed, city and county inspectors as well as the utility inspectors (HECO) check that the system is installed properly. With the building permit approved, the utility issues the final interconnection approval, and places the system in service connecting to the grid. At that point, the contractor and the participant sign a certificate of completion, which certifies to HGIA that the system has been installed. Then prior to funding the investment, HGIA accesses the system monitoring, to perform a final check-in, to ensure that the solar PV system is operating and that energy is being generated close to estimations. Contractors also train participants on how to use the solar system monitoring web portal. While HGIA does not guarantee energy savings after installation, HGIA does work with participants in the event that, due to equipment and hardware failure, the system is not generating energy adequately and the utility bills became higher than normal. In those cases, approved contractors fix the solar system at no additional cost to the participant, as the program charges include a 10-year workmanship and 20-year panel warranty.

GEM\$ increases access and ownership to solar energy for single-family, and multifamily buildings by tying the on-bill obligation to the utility meter, rather than the individual. Through these design elements, GEM\$ solves the split incentive issue by allowing tenants to participate in the program, with no upfront costs. Because GEM\$ has no maximum financing limits — and long repayment periods (up to 20 years) — on investments to commercial buildings, installing solar panels on tenant-occupied multi-unit dwellings is a viable and affordable option for renters to enjoy on-site generated solar energy. GEM\$ has funded solar panels atop these buildings and adjacent solar carports, generating solar energy for individual units and common areas. The GEM\$ team is designing a model that would allow direct pipe-in customized solar energy amounts to individual units in multifamily buildings aligned with each unit's specific energy

²⁷ GEM\$ uses the U.S. Department of Housing and Urban Development (HUD) definition of LMI household as those with an income lower than 140 percent of the area median income (AMI). GEM\$ uses HUD data at the county level, not at the state level. HUD's definition corresponds with United Way's ALICE definition that working families due to high child care costs, transportation costs, and high housing costs, are living paycheck to paycheck.

usage. This innovative model would allow multifamily tenants to enjoy solar energy, produced by panels installed on their premises.

The GEM\$ program, with a \$6.7 million investment portfolio (with one year of data), reports zero defaults and zero non-payments, which is due in part to program administrative structures. These structures include that participants need to demonstrate an estimated minimum 10 percent monthly net energy savings (while repaying for the eligible improvement). The participant experiences an immediate positive cash-flow, and decreases the risk of disconnection. Lower energy bills resulting from the improvements, even while repaying for the costs, provides a positive cash-flow for the participant. This extra money, coupled with the 25 percent refundable solar tax refunds, provides a large cushion that helps reduce the risk of non-payment and disconnection for participants (GEM\$ and HECO, as the utility, reserve the threat of disconnection in case of non-payment). By not requiring credit scores or income verification for program participation, and instead only asking for on-time utility bill payment history, GEM\$ is broadening access to LMI households that would otherwise would not access capital for clean energy due to being credit-challenged. Of the 604 applications received by GEM\$ to date, 157 were actively declined due to prior disconnections²⁸, with 206 lapsed because the customer missed the two-month application window. In one year, GEM\$ has funded 149 applications. Additionally, GEM\$ has set aside 0.25 percent of the total on-bill portfolio for allowances for loan losses, to be triggered in case of non-payments and defaults.

GEM\$ participants are experiencing demonstrated net energy savings on their utility bills because of well-placed administrative structures and by integrating contractors. One project in Maui involved a \$38,282 solar PV system installation on a LMI residential household (that included multiple families) with a pre-solar energy bill of \$614 per month. The projected net monthly energy savings are \$62 (10.1 percent), with a post-retrofit utility bill of \$552 (which includes a post-retrofit energy bill of \$281 plus a program charge of \$271). The program charge includes a 10-year workmanship guarantees, and a 20-year manufacturer's warranty on solar panels and inverters. The GEM\$ participant is expected to save \$28,784 on the utility bill (over the energy upgrade's lifetime), plus \$23,350 in tax credits (Hawaii offers a 25 percent refundable solar tax credits for those installing solar PV that works like a refund for LMI families). Total estimated benefits over the panel's lifetime are \$52,134. With these \$744 in annual net monthly energy savings, GEM\$ participants, like this Maui household, can avoid non-payment situations. This real example from a GEM\$ participant proves that on-bill financing programs broaden access to clean and efficient energy upgrades for communities of color and LMI households.

Businesses and nonprofits installing rooftop solar panels – which are larger in capacity than those used on single-family homes – can combine the GEM\$ on-bill program with a traditional PPA. These organizations can install a large system on their property that generates more than will be consumed on-site and enter into a PPA with HECO to sell the surplus energy back to the grid, thereby creating an extra revenue stream. Businesses can use the GEM\$ program to fund the system, and then repay it over time on the utility bill, using the energy bill savings. Generated savings translate into new investment and activity in the communities.

On-bill financing investments help under-resourced households' access and own solar panels, which directly reduce oil burning for power production (in Hawaii's case). Fewer carbon

²⁸ With the understanding that it be a difficult situation for low-income households, they can re-apply for GEM\$ if they are able to pay their utility bill on-time for 12 months, and not have a disconnection in three years prior.

emissions mean a healthier environment for all, and particularly for those communities located near shipping terminals and oil-fired power plants, which tend to be under-served communities. Financing clean energy upgrades through GEM\$ reduces Hawaii's dependence on fossil fuels and increases its resiliency in case of extreme weather events, such as hurricanes and floods.

Conclusion

Because innovative on-bill financing programs (including Hawaii GEM\$ and Switch It Up!) expand accessibility, increase access to capital for clean energy upgrades, and address racial and income disparities in clean energy adoption, they offer special advantages as financing mechanisms. These programs break the barriers for LMI households by not requiring upfront payments, and by spreading the payments over time using a portion of the savings. This broadens access for all. On-bill programs, like the ones highlighted in this paper, increase access to capital by not asking for credit scores or job verification, and instead screen participants using on-time utility bill payment history. On-bill financing programs promote equity by including renters through assigning the investment to the utility meter, rather than to the individual, and by allowing the repayment to transfer to next occupant.

The Hawaii GEM\$ and OPALCO Switch It Up! on-bill programs demonstrate how these programs can finance clean energy upgrades and beneficial electrification projects and provide net energy monthly savings for participants. On-bill financing programs have progressed beyond funding energy efficiency by allowing LMI households to own solar energy, promoting equity. But more needs to be done to improve affordability, increase accessibility, and advance equity. The scope and the challenge to help LMI families avoid the worst impacts of climate change and address the racial disparities in clean energy adoption are greater than current on-bill financing program availability. Utilities should offer more on-bill financing programs that help LMI households and communities of color afford and access clean energy upgrades.

On-bill financing programs need to continue to improve so that these programs reach more people through more program availability and provide financing for more clean energy and resilient upgrades. A major way to do this is to continue to build on the excellent program designs demonstrated by both the GEM\$ and Switch It Up! programs, and to continue to include more program designs that promote equity in future on-bill programs. On-bill financing administrative structures can be designed to provide increase support for the participant in case that the estimated energy savings do not materialize after the energy upgrade installation. This could be a supplemental warranty added to the maintenance and manufacturer's warranty that is included on the repayment charge, as GEM\$ does. Programs should also actively verify post-installation projects demonstrate post-project savings. On-bill financing programs can build healthy loan loss reserves that are triggered in case of non-payment situations, and provide six-month bill deference for participants that have been prompted by the economic recession.

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