Roadmap to Solar for Affordable Housing in Multnomah County

Institute for Sustainable Solutions
PORTLAND STATE UNIVERSITY

Multnomah County
Office of Sustainability

Roadmap to Solar for Affordable Housing in Multnomah County

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Many community members, organizations and staff were contributions in developing this report:

Report Author

Courtney Simms - Portland State University (PSU)

Key Advisors

Multnomah County - Office of Sustainability Tim Lynch, John Wasiutynski, Sam Baraso
Portland State University - Institute of Sustainable Solutions Beth Gilden, Amy Lubitow

External Advisors

Jeff Bissonnette - Oregon Solar Energy Industries Association (OSEIA)
Loulie Brown - Sabin Community Development Corporation
Shamir Chauhan - GRID Alternatives
Zac Christensen - Metro
Meghan Craig - SolarOregon
Faith Graham - NewHab
Jeni Hall - Energy Trust of Oregon
Carolina Iraheta - Verde
Nate Koffel - PVComplete
Connor McDonnell - US Department of Housing and Urban Development (HUD)
Sherrie Pelsma - Community Energy Project (CEP)
Travis Phillips - Portland Community Reinvestment Initiatives (PCRI)
Evan Ramsey - Bonneville Environmental Foundations (BEF)
Lizzie Rubado - Energy Trust of Oregon (ETO)
Yuichi Segawa - SolarCity
Ryan Sheehy - Viridian Management
Zachary Sippel - Energy Trust of Oregon (ETO)
Jaimes Valdez - Northwest Sustainable Energy for Economic Development/SparkNW
Nicolas Waissbluth - MapDwell
David Wolf - Renewable Northwest
Jason Zappe - Portland General Electric (PGE)

Report Design

Sara Harding Mihm - Multnomah County Office of Sustainability

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EXECUTIVE SUMMARY

Project Background

This report is the result of a collaboration between Multnomah County's Office of Sustainability and Portland State University's Institute of Sustainable Solutions. The report attempts to find a path for affordable housing projects and the families who live in them to benefit from solar PV. The 2015 Climate Action Plan (CAP) set a goal of 50 percent of all energy used in buildings to come from renewable sources by 2030, with 10 percent produced within Multnomah County. The 2015 CAP has a particular focus on equity because low-income households and communities of color have historically been disproportionately burdened by environmental harms and have not equitably benefited from environmental programs, such as solar energy. This report is focused on finding solutions to increase renewable electricity generation in the county by focusing on people living in affordable housing.

Approach

To create a roadmap to solarizing affordable housing the project followed these steps:

- Identify solar potential of existing affordable housing stock, establishing that a market exists
- Create a resource for affordable housing providers to understand the steps of solar
- Create a resource for solar installers to understand the intricacies of affordable housing
- Identify challenges and opportunities in solarizing affordable housing
- Provide an overview of current and unexplored funding and financing sources for solar projects
- Identify case studies and best practices for programming and projects
- Identify programs the County can use to encourage solarizing affordable housing projects

Findings

From MapDwell's initial analysis of existing affordable housing stock, the County has identified 150 multifamily buildings and 196 single-family homes with roof space sufficient to produce enough electricity to cover at least 25% of each household utility bill. For single family homes, the average production from all recognized buildings would produce a benefit of about $73 per month; for multifamily, it would cover about $41 per unit per month.

If systems were installed on all roofs with identified solar potential, it would reduce about 3,000 household utility bills by at least 25%, and have a payback of about 13 years. At the current cost of solar, the total cost for solarizing identified buildings would be about $24,200,000 and would generate about 14,000 megawatt hours per year.

While there is a huge potential benefit, there are considerable challenges deploying solar within affordable housing, including split incentives (where tenants benefit from a system the owner pays for), net metering for multiple tenants who each have their own individual account, and high upfront costs. This report includes an overview of each potential challenge, as well as potential solutions.

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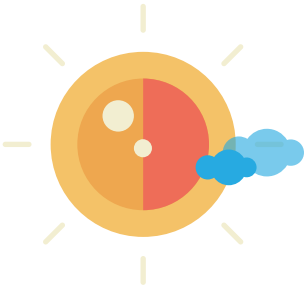
This report also identifies multiple solutions to encourage solar on affordable housing through programs and policy changes, including a Solarize campaign specifically for affordable housing and advocacy during the development of the community solar program, which was authorized by the Oregon State legislature. A solarize program would allow housing providers to take advantage of bulk pricing, reduced costs, and program management to make all the steps of going solar as easy as possible. A well designed community solar program will provide a new pathway for connecting low income communities to the benefits of solar PV.

PRODUCTION POTENTIAL



Total Affordable Housing Stock

Buildings with solar potential	**346**
Households	**3,010**
Total kW potential	**13,683**
Average monthly savings	**55%**

Multifamily Housing Stock

Buildings with solar potential	**150**
Households	**2,797**
Total kW potential	**11,914**
Average monthly savings	**47%**

Single Family Housing Stock (includes duplexes)

Buildings with solar potential	**196**
Households	**213**
Total kW potential	**1,768**
Average monthly savings	**58%**

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INTRODUCTION & PURPOSE

Multnomah County has recently committed to obtain all of the community's energy needs by 2050 from 100% renewable energy, and to decarbonize electricity supplies by 2035 -- starting with all renewable electricity in 2035. The County set an additional goal of obtaining 2% of all community energy need from 'community-based' energy sources that benefit 'front-line' communities. Climate change threatens to exacerbate the social and health inequities that already exist, with impacts falling first and worst on vulnerable communities that the County serves. A just transition to renewable energy must ensure that vulnerable communities are not only insulated from the costs of climate policies, but directly benefit from the investments and have a meaningful say in how these policies are developed.

The purpose of this plan is to provide an overview on where solar and affordable housing can overlap within Multnomah County and to identify policy options that can advance solarization of the affordable housing stock in Multnomah County. This will include defining the various typologies of affordable housing, and how potential solar projects might progress in each specific housing type. It will also include an overview of the distribution of these types of housing in Multnomah County, as well as how much solar potential exists in each typology.

Within the solar scope, this project will overview different ways to fund solar projects. It also reviews case studies to highlight successes and failures in solarization projects in multifamily and affordable housing in the past. Finally, it lists next steps for more solar in affordable housing within the County.

This guide hopes to (1) identify the production potential on the county's affordable housing stock, (2) identify challenges that are unique to affordable housing and their possible solutions, (3) explore incentives and financing possibilities for solar, and (4) discuss policy solutions to help push forward the solarization of this market.

2015 Climate Action Plan

Multnomah County and the City of Portland's 2015 Climate Action Plan lays the path for the County's efforts to address climate change using an equity lens. It sets an ambitious goal to supply 50 percent of all energy used in buildings from renewable sources, with 10 percent produced within Multnomah County from on-site renewable sources, such as solar. This will be achieved through actions that will both increase the supply of renewable energy and lower the demand for energy through energy efficiency, including mitigating cost burdens to low-income households to reduce energy usage and supporting solar access.

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Solar in Multnomah County

Incentive programs, including state tax credits and incentives delivered through the Energy Trust of Oregon (ETO), have long supported Solar in Oregon. However, these programs seem to have the most impact on wealthier households. According to the State of Oregon 2016 Tax Expenditure Report, the majority of tax incentives flow to the top quintile of earners. An analysis of installed solar projects in the City of Portland also shows that the number of residential solar projects in Portland increases with the median household income. (See Figure 1)

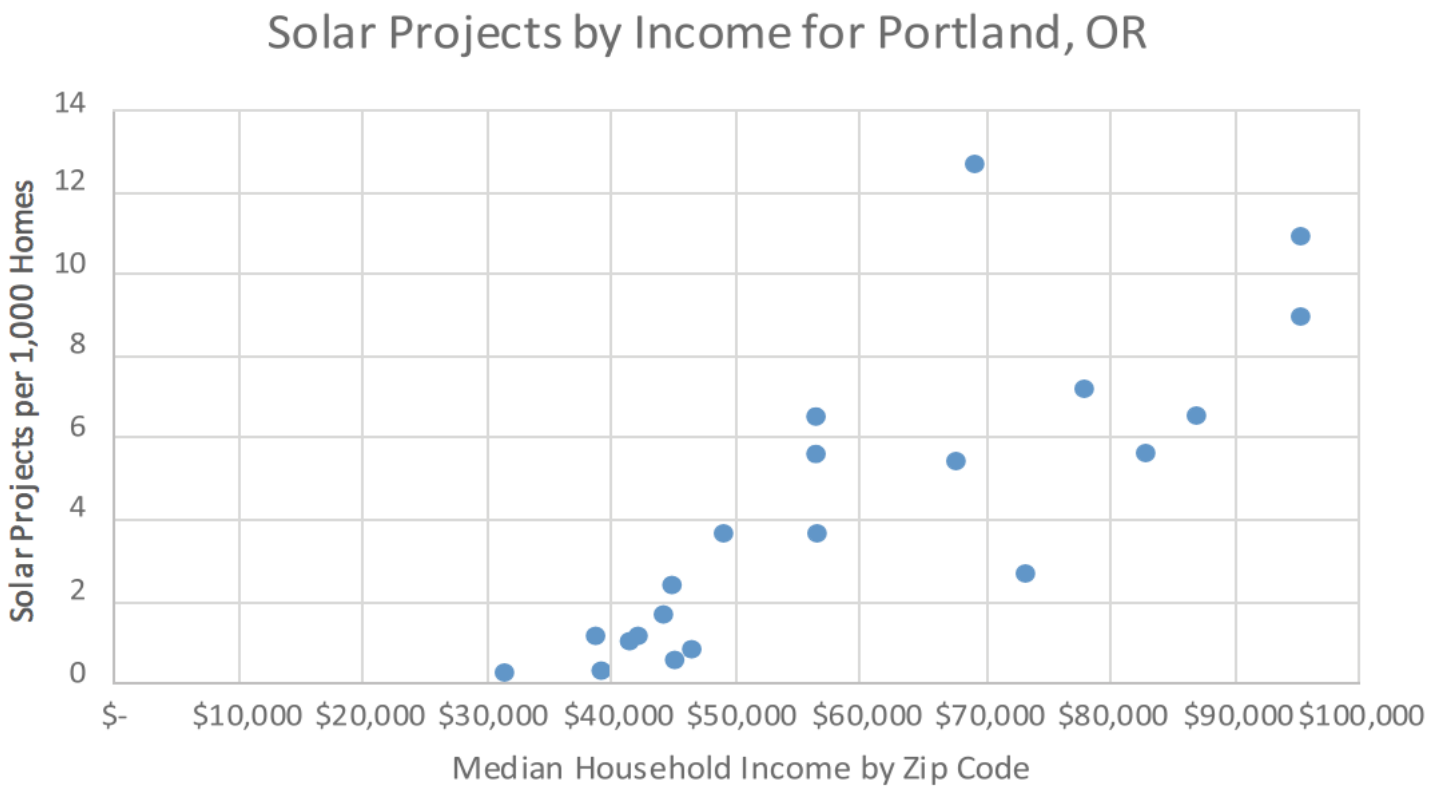

Figure 1: Zip code density of solar installations by median household income

EQUITY & SOLAR

Solar for Low Income Households

Affordable housing is largely left out of the renewable energy economy. The majority of affordable housing is multifamily housing (which has many barriers to going solar), and most incentives for solar have historically benefitted those who can use tax credit based solar incentives, mainly those with higher incomes. This, combined with the up-front cost of solar, has prevented expansion of solar and its benefits into the low-income market, despite the benefit of lower monthly energy bills. If the goal is to increase solar for low-income households, incentive programs will need to be tailored to help this market grow, including funding and personnel support.

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Energy Poverty in Multnomah County

Almost one in five households of Multnomah County are considered at or below the federal poverty level in 2015. Utility costs for these families make up a larger share of household income than they do for families that are more affluent. The Center for American Progress found that, **"Low income households in the [U.S.] spend a higher percentage of household income on energy costs than their higher-income peers. Their energy spending is more than twice the average for low-income households."** In just the first three months of 2017, the most requests to 211info were for housing and utility assistance. Renewable energy can help to ensure an ongoing resource for bill stabilization for these households. By solarizing affordable housing, we can bridge the gap between renewable energy and low-income households.

BENEFITS OF SOLAR

Financial Benefits

While Oregon has historically had low energy costs, both residential and commercial energy rates have increased over the past decade, while costs for rooftop solar have dropped at a dramatic rate. With incentives lowering the overall cost for a system and increased efficiency dropping the number of panels needed for a system, the time needed for a system to payback has decreased and total lifetime benefits have increased. Most panels have a 25 year warranty, and have a lifespan of over 30 years.

Environmental Benefits

In addition to steady energy production throughout the day, solar PV has the substantial benefit of reducing the reliance on fossil-fuels in the energy sector. As the County works towards its Climate Action Plan goals, increased renewable energy production is a key step towards in reducing the county's carbon footprint.

One solar-related job supports two jobs elsewhere in the U.S. economy, and every $1 spent on solar generates an additional $1.47 in spending economy-wide.

Job Creation

Rooftop PV sales, design, installation, and support requires a full team to complete successfully. Many of these jobs must be near the installation, unlike traditional "plant" based forms of energy production, which can take place far away from where the energy consumed. With a majority of the installations taking place within Multnomah County, increased solar installations will provide well-paying jobs. One out of every 50 new jobs added in the United States in 2016 was created by the solar industry, representing 2% percent of all new jobs (The Solar Foundation). In a new solar economic impact analysis, the U.S. solar industry added $154 billion in economic

Job Creation per million $ of spending

Energy Source	Total Jobs
Oil and natural gas	5.2
Coal	6.9
Building retrofits	16.7
Wind	13.3
Solar	13.7
Biomass	17.4

Source: WorldBank

output in 2016. Multnomah County is ranked 2nd in Oregon for solar jobs, which pay a median wage of $26/hour in Oregon. An average solar panel installer makes $33,200 with a high school diploma. Only 27.3% percent of workers hired in 2014 had an associate's degree or higher. (NRDC)

AFFORDABLE HOUSING GLOSSARY

Affordable Housing

Housing that is affordable to households with incomes equal to or lower than 80 percent of the median family income for the county in which the housing is built. Defined as three or more units. (SB 1533)

Subsidized Housing: Housing that is owned by private owners who receive subsidies in exchange for renting to low- and moderate-income people. Owners may be individual landlords, for-profit, or non-profit corporations. Subsidized housing can be obtained through subsidies, such as Section 8 or other state programs.

Section 8: A program which encourages the private sector to construct affordable homes and subsidizes public housing. This assistance can be "project-based" (subsidized properties) or "tenant-based" (vouchers for tenants to use on private sector housing).

Affordable Housing Groups

Public Housing Authority (PHA): Any state, county, municipality, or other governmental entity or public body, or agency or instrumentality of these entities that is authorized to engage or assist in the development or operation of low-income housing (Home Forward in Multnomah County). "Public Housing" is PHA-owned housing provided for tenants who earn below a certain income level (decided by each PHA).

Developer: A non-profit or for-profit builder and provider of affordable housing. They can either use the Low Income Housing Tax Credits or sell them to a syndicator.

Syndicator or fund manager: creates funds to pool investor capital, then uses these funds to purchase the tax credits (either from solar investments or low income housing tax credits) from the developer in exchange for an equity stake in the housing development. With capital from investors, developers can limit the amount of money they borrow to fund construction, which reduces the developer's debt and keeps rent affordable (Enterprise, 2015).

Other Affordable Housing Terms

Utility Allowance: The amount that a PHA subsidizes a resident's utility costs in order to account for all housing costs. Allowances may be provided for any utilities that the resident pays. These are subtracted from the overall rent prior to billing, not direct payments.

Master Metered vs Tenant Metered Utilities: Where utilities are tenant metered, each household has

a separate account, and meter, with the utility company and pays the bill for their household. Where utilities are master- metered, the housing provider pays the local utility company for utilities used and the tenant does not have their own utility account. In such instances, the utility costs are included in the basic rent levels established by the PHA, and no separate allowance is provided. Master metering for electricity has been mostly phased out, and is uncommon in most modern apartments.

Affordable Housing Distribution

As the most populous county in Oregon, Multnomah County has a high concentration of affordable housing projects. With over 800 projects and 28,000 units under some sort of housing assistance, there is a largely untapped market within affordable housing with the potential to go solar.

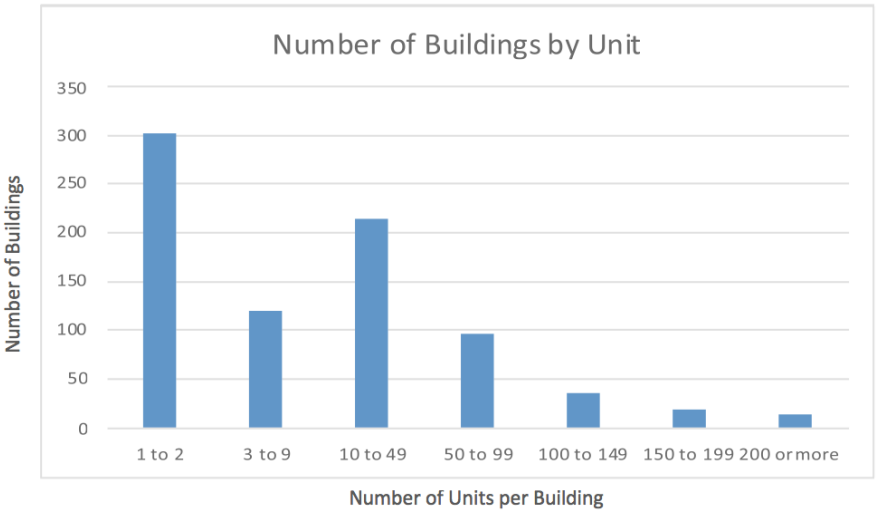

Figure 2: Affordable Housing Buildings by Number of Units per Building

The types of affordable housing in Multnomah is incredibly varied, with almost half of projects receiving subsidies for affordable housing being single family homes or duplexes, and only a few major complexes with over 200 units. (See Figure 2)

Housing Type by Income

The characteristics of housing for lower income families matches much of the distribution for affordable housing in Multnomah County. Unlike households that make over $40,000 a year, low-income households are more likely to be in multifamily housing. (See Figure 3)

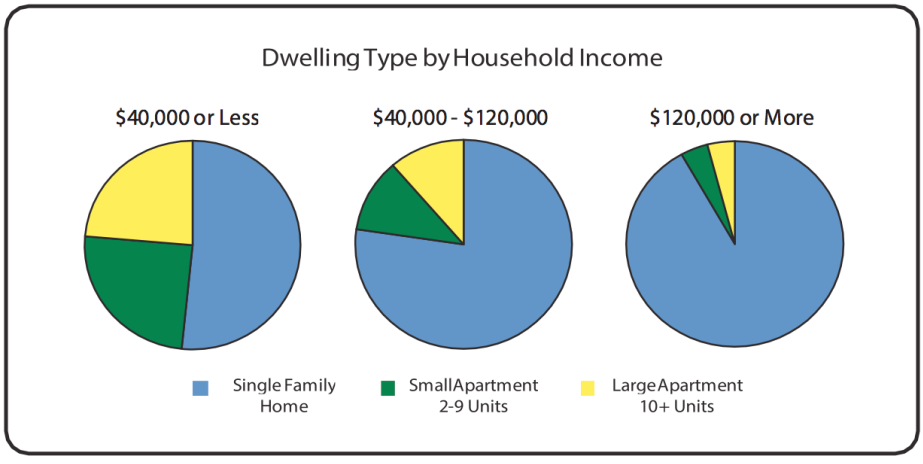

Figure 3: Dwelling Type by Household Income

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OVERVIEW OF SOLAR PV & SOLAR GLOSSARY

Kilowatt (kW) vs. Kilowatt Hour (kWh)

1 kilowatt (kW) is 1000 watts (W), and as most systems are over 1000 watts, they are usually measured in kilowatts. Kilowatts measure the maximum amount of power a system can generate at a time. Kilowatt hours (kWh) are a measurement of energy over time, and is how the utility measures a home's energy use. Think of kilowatts as the speed you're running and kilowatt hours as how far you've actually run.

Panel Ratings

Standard Test Conditions (STC)/"Nameplate Rating": This is the simplest way to understand a system, because you just take the wattage of each panel and multiply it times the number of panels. For example, system with 10 panels of 200 watts each is 200 W x 10 = 2000 W, or 2.0 kW.

Performance Test Conditions (PTC): PTC is a different way to measure a system, this number will be a little less than STC. PTC uses outside test conditions and measures how much energy is likely to be actually produced. A 200-watt panel may actually produce only 180 watts. PTC ratings take into account real world conditions, including loss from wires, inefficiencies, etc.

DC vs. AC

Solar energy systems creates power in direct current (DC), but your house and the grid work with alternative current (AC). To convert your power from DC to AC, your system uses an inverter. When DC electricity is converted to AC, some energy is lost, which is shown by the efficiency of the inverter. You determine AC watts by multiplying the panels' PTC DC wattage by the inverter efficiency. This will be the lowest number of the three.

Net Metering

A net meter keeps track of the power you acquire from the utility, and what you supply to the grid. Each month, the power you used from your utility is offset by the power you send to the utility from onsite energy generation, e.g. solar. In this policy scenario, the ratepayer is only charged for the difference (net) of energy consumed less energy produced. If a ratepayer generates more power than is used in a given month, the electric bill will have no kilowatt-hour charges, and will only include the basic utility service charges. Surplus energy becomes energy credits that will be applied to your future electric bills. Under Oregon net metering rules, all credits must be used within the calendar year that they are generated.

Community Solar

Community solar, also called "shared solar" or "virtual net-metering", is program that allows multiple "subscribers" to purchase a portion of the energy generated by an on- or off-site solar system. The

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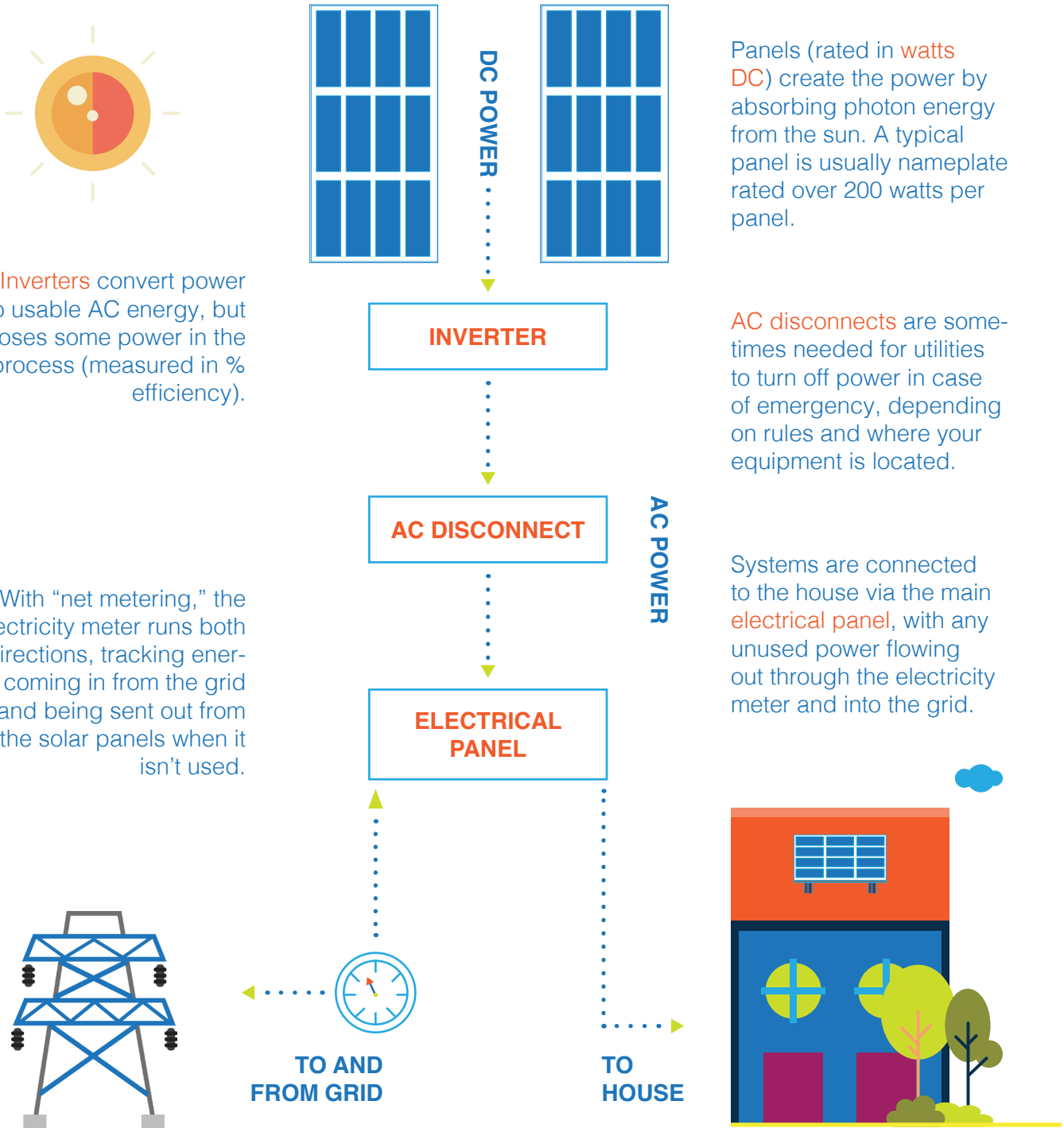
costs of the system and the energy benefits are shared across a number of participants. The electricity produced does not need to flow directly to all subscribers meter as with net metering. Instead, the electricity flows to the grid and the participating utility then allocates credits for the electricity produced by the PV system to the subscribers based their share of ownership.

PARTS OF A SOLAR SYSTEM



Panels (rated in watts DC) create the power by absorbing photon energy from the sun. A typical panel is usually nameplate rated over 200 watts per panel.

Inverters convert power to usable AC energy, but loses some power in the process (measured in % efficiency).

AC disconnects are sometimes needed for utilities to turn off power in case of emergency, depending on rules and where your equipment is located.

With "net metering," the electricity meter runs both directions, tracking energy coming in from the grid and being sent out from the solar panels when it isn't used.

Systems are connected to the house via the main electrical panel, with any unused power flowing out through the electricity meter and into the grid.

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GOING SOLAR

Contract

Contact different installers to see what system size is recommended. Most installers will estimate your system size by looking at your utility bill and what can physically fit on the roof. This evaluation usually happens remotely using satellite views. Building owners can also do their own analysis using online programs including MapDwell and Google Project Sunroof. Once a size and cost is estimated, the installer creates a contract. In Oregon, it is best to use an ETO Trade Ally installers to maximize available incentives. ETO also provides a guide for choosing the contractor that is right for you.

Site Visit

Before any contract is signed, an auditor will come to evaluate the building to consider system size, roof type and angle, shading, etc. The auditor will evaluate the roof condition and electrical panel. For multi- family homes, this is a good time to check for any obstructions on the roof.

Applications

Installing solar panels involves a lot of paperwork. This includes applying for solar incentives and building permits with the city or county. The installer will understand any requirements. These applications need approval prior to installation of the system.

Installation

The big day is finally here! Your installer will be on your roof installing the panels as well as around the house near the main electrical panel. They will also install an inverter between the connection of the electrical panels and the solar panels. It is often placed inside a garage or in the shade, because inverters run more efficiently when cool. Depending on the system size, more than one inverter may be necessary. For multifamily buildings, the inverter may be in the same room as the electric panel, if there is space. The timeline for the installation will range from one to three days, depending on the size of the system being installed.

Interconnection and Approval

Before connecting your solar panels to the grid, a building inspector will look at the system. They will verify the safety of the work, checking the wiring and mounting, and that the overall installation is up to code.

Source: EnergySage

NOTE: Each project may have additional steps, depending on the quality and type of the roof, purchasing option, and incentives. Make sure to discuss the project with your installer, as timelines can vary.

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OWNERSHIP MODELS

There are currently three (soon to be four) ownership models, each with their own opportunities and challenges. Depending on your situation, you can outright own a system (either with a cash purchase or solar loan), lease a system, or participate in a power purchase agreement (PPA).

In the future, community solar will also be available, and may be a preferred option for multi-family homes or homes with tenants (very common in affordable housing). Here's an overview of options (Source: EnergySage):

Purchasing a solar panel system with cash, or financing a purchase with a solar loan, is best when you:

- Want to maximize the financial benefits of installing a solar panel system, rather than solely benefitting from the system's environmental benefits;
- Are eligible to reduce your federal and state tax liability through the federal investment tax credit;
- Are a business, and can realize tax benefits by treating the solar panel system as a depreciable asset; and/or
- Want to increase the market value of your home by installing a solar panel system.

A solar lease/PPA is best when you:

- Are primarily interested in using electricity generated from renewable resources, rather than maximizing the financial benefits of installing a solar panel system;
- Want to avoid the responsibility of maintenance or repairs for a solar panel system;
- Are ineligible for federal or state investment tax credits resulting from your investment in a solar panel system;
- Have a complex tax structures that would make use of solar tax credits difficult; and/or
- Do not want to carry the upfront costs of the system until tax credits can be taken advantage of.

PPA vs Lease

In both the PPA and lease model, an installer/developer builds a solar energy system on a customer's property at no or low cost. In PPA, the system offsets the customer's electric utility bill, and the developer sells the power generated to the customer at a fixed rate, typically lower than the local utility. In a lease, the PV system still offsets the customer's electric utility bill, but the customer has a fixed lease payment for the system to the developer, rather than based on the system production. In both systems, the solar renewable energy credits (SRECs), rebates, and tax incentives usually go to the developer/owner to help offset the cost of the system, rather than the customer. However, the customer usually has a lower payment than would exist if there were no incentives.

PPAs and leases typically range from 10 to 25 years and the developer remains responsible for the operation and maintenance of the system for the duration of the agreement. At the end of the PPA contract term, a customer may be able to extend the PPA, have the developer remove the system or choose to buy the solar energy system from the developer at a significantly reduced cost (depending on the terms of the contract).

OWNERSHIP CONSIDERATIONS

	Solar loan/cash purchase	*Solar lease/PPA*
Installation cost	Cash rebates can reduce the total cost by up to 50 percent. Most solar installers will manage the paperwork and adjust the purchase price to reflect the net amount.	Solar energy system require little or no upfront cash investment. Ratepayer does not qualify for tax credits, rebates, or incentives – those belong to the third party owner of the
Maintenance	You own the system and are responsible for maintaining it. Note that solar equipment is durable and carries warranties, so there won't be much maintenance to worry about. Your purchase may not include an app to track your system's performance.	The solar company owns and maintains the solar power system. Most leases include free apps that track the performance of your system.
Terms	Loans are generally available for 10 to 20 year terms.	Solar leases and PPAs are generally for 20 to 25 years, at which point you can renew your agreement or purchase the system outright.
Savings and return on investment	You can save between 40 percent and 70 percent on electricity costs over the lifetime of your solar panel system, depending on your property and the incentives in your state. You receive free electricity for the life of the solar energy system (usually 25 to 30 years).	You can save between 10 percent and 30 percent off the prices you pay your utility for electricity, depending on your property and the incentives in your state.

COMMUNITY SOLAR IN OREGON

As part of SB 1547 (2016), the Oregon Legislature established a community solar program for PGE and PacifiCorp customers. Under community solar programs, the output and benefits of a single solar project can be shared by a group of customers. Community solar is also called "shared solar." For Oregon, 10 percent of total program capacity must be made available to low-income customers, with a minimum requirement per project of 5 percent.

Community solar has been successful in other states that have implemented it and, given enough support, can be a major factor in providing affordable clean energy for low and moderate income house-

holds in Multnomah County. In other states, community solar has become a popular solution for multifamily housing and renters, because they can participate without having to provide the space for the solar PV system. Under community solar, renters--so long kept out of the solar market--will be able to receive solar power benefits without relying on a landlord's generosity.

Rules to implement the program are still being developed by the Oregon Public Utility Commission and are slated for completion in 2019.

See the Moving Forward section for recommendations the County might make in a shared solar program.

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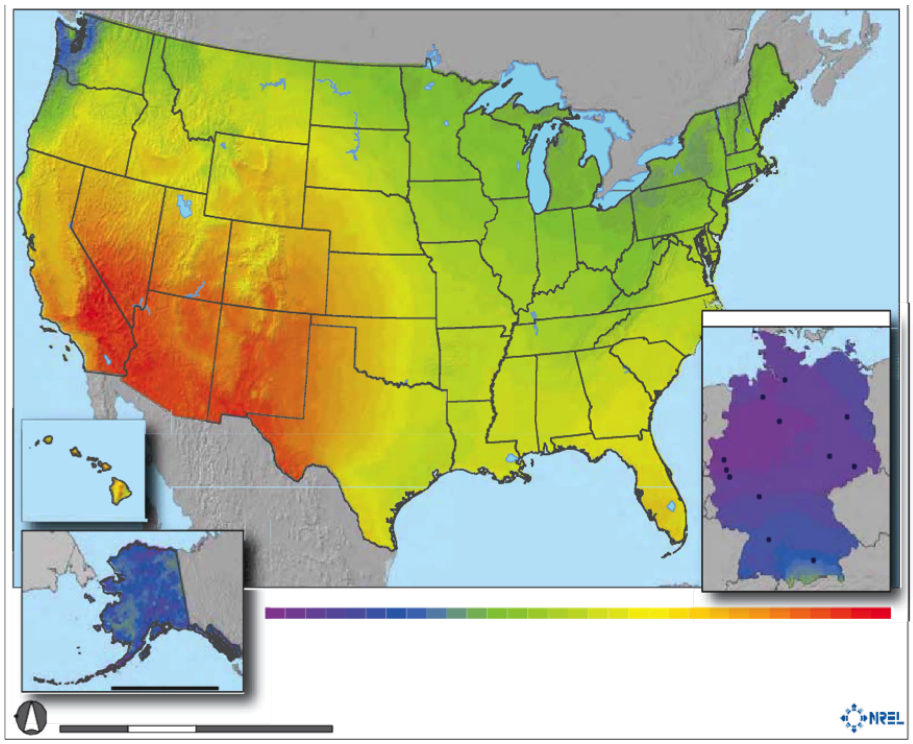
AFFORDABLE HOUSING TYPOLOGIES & PRODUCTION POTENTIAL

Western Oregon Solar Potential

The state of Oregon has significant solar resources despite the states reputation as a rainy, moss-covered place. Even western Oregon, the rainiest section of the state, is a good place for solar development. In western Oregon, cool days keep panels running more efficiently than in hotter climates and the area receives more sun exposure than Germany, a world leader in solar power.



Photovoltaic Solar Resource: United States and Germany

Methodology for Affordable Solar

To understand the solar potential of affordable housing in Multnomah County, 805 properties were analyzed, representing over 23,000 households. The County used MapDwell, an MIT solar potential analysis software, which uses lidar data and satellite images of buildings to estimate the amount of sunlight on roof tops. For the purposes of this study, only properties where at least a 25 percent of the electric utility bill could be offset through solar were considered to have solar potential. (Source: Energy Trust of Oregon LMI Solar Program). Because usage data is not publicly available the study assumes the needed number of solar panels per a unit. For multifamily, this is a solar system size of 2kW per unit. For single family and duplexes, it is 3kW per unit. Affordable housing properties are defined for this project as properties receiving some sort of subsidy to maintain their affordability, and were identified using Metro's 2015 Regional Inventory of Regulated Affordable Housing (with additional buildings added from HUD's database of subsidized properties.

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SNAPSHOT
SOLAR POTENTIAL
SINGLE FAMILY & DUPLEX

Total Number of Buildings
302

Total Households
332

Buildings Solarized
196

Households Solarized
213

Total System Size
1,768kW

Total Cost After Incentives
$2,642,468

Total Revenue Per Year
$228,025

Average Cost Per Property
$13,482

Average Revenue Per Year
$1,163

Average Payback Period
12.6 years

Total Solar Output
1,785,284 kWh/year

Average Household Savings
$73/month

TYPOLOGIES AND CHALLENGES

Single Family - Owner Occupied

Owner-occupied affordable single family homes are those homes where the home was considered affordable when it was purchased. Owner-occupied homes were not part of the analysis, as housing locations are not publicly available.

Opportunities:
Single-family homes tend to be far easier to develop solar projects on for several reasons. Sizing the system is straightforward and based on one family's usage and available roof area. There is no split incentive, meaning owner pays for and benefits from the system. Because there is a single meter, occupants can take advantage of existing programs like ETO incentives and net metering rules. Finally, financing is also potentially easier if the project can be shown to be cash flow positive and customers can potentially be identified and provided further subsidy through existing programs like Low Income Home Energy Assistance Program or Weatherization Assistance Program participation.

Challenges:
Upfront capital costs can be particularly challenging for a low-income family, so additional subsidy would be needed. In addition, tax liability may be low, making tax incentives less valuable. In addition, loan products typically used to finance a solar project may not be well suited for income-constrained household that may be wary of debt for a solar project. Finally, low income homeowners are not publically known, making targeted outreach difficult.

Single Family - Tenant Occupied

As of 2015, 267 tenant-occupied single-family homes were listed as affordable housing within Multnomah County, with countless more de- facto affordable housing. As per owner-occupied housing, de-facto tenant- occupied housing is hard to identify using public information, so solar potential is using only tenant-occupied subsidized housing.

Opportunities:
Tenant occupied single-family homes, like owner occupied homes, tend to be far more straightforward when contemplating solar projects. Sizing the system is straightforward and based on one family's usage and available roof area. In addition, the cost to build a complete system for each building is low compared to a multi-unit building.

Challenges:
Net metering benefits will go to the tenant, but the system is usually purchased or leased by the owner (split incentives). There may be a covenant on the home to not raise rent if the house has undergone previous low income weatherization assistance.

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TYPOLOGIES AND CHALLENGES

Multifamily Housing

The majority of affordable housing units (about 23,000) within Multnomah County are located in multifamily housing.

Opportunities:
Low customer acquisition cost: Unlike normal residential housing, affordable housing complexes, especially multifamily, allows for multiple households to be contacted at once. For affordable housing, multiple buildings are under the same owner, and thus a portfolio of buildings may all be worked on at the same time.

Benefits to owner: Unlike buildings where the entirety of the electricity is paid for by the tenant, multifamily buildings often have community space (such as hallways, stairwells, elevators, and community rooms) where the energy is paid for by the building owner.

Challenges:
Split incentive: If the home is not owner-occupied, there is a split incentive, because the net metering benefits will go to the tenant, but the system is usually purchased or leased by the owner.

Utility allowances:
Rent is typically reduced in many of these buildings to account for utility payments, also called “utility allowances”. Under a community solar program, it has not yet been determined how utility allowances would be impacted for participating tenants. Meaning the tenant may pay all, some, or none of the costs of the share of the solar project allocated to their unit.

Sizing:
Depending on the number of tenants and the size of the building, systems may not be able to cover both tenant and community space usage. Possible solutions include looking to expand system size by building mounted solar over parking lots or other empty space around the property. Under current net-metering rules solar projects that only cover common-space electricity usage will be most cost effective. Adding individually metered tenant usage will be difficult with until community solar rules are in place and virtual net metering allowed.

SNAPSHOT
SOLAR POTENTIAL
MULTIFAMILY

Total Number of Buildings
465

Total Households
22,951

Buildings Solarized
150

Households Solarized
2,797

Total System Size
11,914kW

Total Cost After Incentives
$21,620,005

Total Revenue Per Year
$1,573,079

Average Cost Per Property
$144,133

Average Revenue Per Year
$10,487

Average Payback Period
14.7 years

Total Solar Output
12,322,276 kWh/year

Average Household Savings
$40/month

Roadmap to Solar for Affordable Housing
in Multnomah County

SNAPSHOT
SOLAR POTENTIAL
PUBLIC HOUSING

Buildings Solarized
19

Households Solarized
236

Total System Size
872 kW

Cost to Owner
$1,558,571

Total Revenue Per Year
$115,589

Average Payback Period
14.5 years

Household Savings
$37/month

SNAPSHOT
SOLAR POTENTIAL
PRIVATE HOUSING

Buildings Solarized
327

Households Solarized
2,774

Total System Size
12,810 kW

Average Cost to Owner
$69,431

Average Revenue Per Year
$5,154

Payback Period
13.42 years

Household Savings
$60/month

TYPOLOGIES AND CHALLENGES

Transitional Housing

Transitional housing provides temporary housing for people moving out of houselessness, shelters, incarceration, or in patient addiction treatment. Usually, the short-term nature of tenancy requires the building owner to be the utility account holder.

Opportunities:
Master metering, in addition to the number of assistance programs and multiple tenants, makes solar PV a great opportunity for reducing operating costs.

Challenges:
Since the income for transitional housing is constantly in flux, raising capital for the project may be difficult. Financing options that provide up-front capital, like a PAA, may help to overcome this challenge.

Public Housing

Public Housing in Multnomah County is owned and managed by HomeForward, the local Public Housing Authority. There are 46 public housing developments in Multnomah County, housing over 2,000 households.

Opportunities:
Single source of funding (HUD), large portfolio of buildings under one owner.

Challenges:
Almost all housing is multifamily, which will go through the same challenges already listed (see Multifamily).

Private Development

A number of different funds are available for affordable housing through private-public partnerships, which can be used by non-profit community development corporations and for-profit developers. The main form of these funds are LIHTC and Section 8 Vouchers. In addition to HUD and state subsidies, a number of financial entities provide loans or grants for low income housing at low or fixed rates. While each form of funding is different, developers usually have control of how funding is spent, so long as it goes into the development.

Opportunities:
Developers are already comfortable with multiple sources of funding, syndication of tax credits, and have a portfolio of buildings.

Challenges:
Since all funding sources might have different covenants, developers should check that the ownership type they choose will not affect their funding (such as liens from financing a lease).

CHALLENGES & OPPORTUNITIES IN SOLARIZING AFFORDABLE HOUSING

Metering Arrangements

Depending on the housing type and utility structure, systems can either benefit all the tenants or just cover common space.

- **Master-metered**: If the building owner pays for all the electric utilities, solar can be a great option to cut down the costs of everyone's energy usage! Because the system can offset the usage for the entire building, a larger system size can be installed. Master metered buildings usually do not have utility allowance discounts to rent; the net savings from the system can be passed on to tenants.
- **Individually metered/tenant metered**: When each unit in a multi-family building has a meter and the tenant pays their own electric bill, there is the added challenge of a split incentive. Typically, the building owner would pay for the solar PV system and under current Oregon rules virtual net metering is not available. In this instance, a solar PV system can be used to offset common area energy costs. Until community solar is available, it is difficult to imagine how a solar PV system can benefit tenants in individually metered multifamily housing.

Building and Roof Age

Roof age and structural integrity are common barriers to solar projects. Solar industry best practice is to ensure that the roof has at least 15 years of life left before considering it suitable for PV installation. Planning a solar PV installation with a roof replacement project is ideal. It will allow the design of the solar PV system and needed electrical conduit and other factors to be built into the roof replacement project.

Another concern is the age of the electrical panel. It is possible that a main electrical panel cannot handle a solar system tying in; the installer will look at the electrical panel during the audit to ensure an upgrade is not necessary, or that any necessary upgrades are completed as part of the solar PV project.

Historic District Restrictions

In certain areas, there may be design restrictions to ensure the historic aesthetic is not impaired by changes to buildings. During the permitting process, your installer will work with your jurisdiction (either city or county) to see any building restrictions that might affect panel placement.

Obstructions and Shading

Multnomah County is fortunate to have beautiful year-round greenery. But, depending on the surrounding landscape, trees might shade ideal spots for rooftop solar. In addition, multifamily buildings often have numerous vents and equipment on the roof, which may obstruct the placement of panels. An installer will ensure that there is a place for panels and enough solar potential during the design process. For this study, MapDwell takes into account the location of obstructions when calculating solar potential.

High Up Front Costs

The upfront price tag for a solar PV system can be high. Initial cost can be bought down with Federal and state tax credits, and payed over time with savings on utility bills. However, there is still an upfront cost. There are numerous financings options to handle up-front costs. Many banks and other financial entities will provide upfront capital to groups looking to go solar in exchange for the tax benefits that solar provides. These are often at competitive rates. Look to the funding section for a list of potential financing options. In addition, a lease or PPA ownership plan gives you the option of having a system at little to no upfront cost.

Debt Limits

Some borrows have limitations in their ability to take on more debt on a property, especially if they are a public or non-profit entity. While this might be a barrier to financing the addition of a solar system on the property, housing providers should consider financing solar projects when the property is refinancing its debt and/or financing major renovations.

Nonprofit Tax Status

Federal solar incentives are in the form of tax credits, meaning that for an entity or individual to take advantage of the incentive they need to have tax liability that can be reduced with the tax credit. Since non-profits typically do not pay taxes, taking advantage of tax credits can be a challenge. Lack of tax liability does not mean, however, an organization cannot benefit from tax credits and deductions available to help pay for solar. Many tax credits can be passed through to funders with tax liability through syndication, which can provide them with the up-front capital necessary to purchase or lease a solar system.

Uncertain Incentives

Some incentives, such as the Oregon Residential Energy Tax Credit (RETC) and the Federal Investment Tax Credit (ITC), which offset much of the cost of a system, have or will expire. Without these incentives solar projects in Oregon will have difficulty penciling out. On the other hand, panel costs have decreased dramatically over the past decade. The cost of solar has decreased even as incentives to go solar have gone down. Working with an established solar company that has experience with incentives and the specific market type will provide the best opportunity to find creative ways to pay for a solar PV system.

Credit Scores

Most loan products have a credit score threshold requirements for borrowers to qualify. This is true of solar leases and loans too. If the borrower has a low credit score there are a few options available, although no current options exist in the solar PV lending space. Craft 3 offers an energy efficiency on bill loan program that extends lending to people with lower credit scores. A similar program, or some kind of public sector credit enhancement could help serve the part of the market that has a harder time accessing lending. Alternatively, consistency of prior utility bill payments could be used as the basis for credit worthiness for solar PV loans.

Utility Allowances

Rent reductions to account for tenant utility costs and called “utility allowances”, and are determined by the affordable housing provider using predefined methodologies. These allowances may limit the housing provider’s desire to share energy savings with tenants, as the housing provider is typically absorbing the cost of the rent reductions associated with the allowances. Currently, it is believed that a tenant’s participation in future community solar will not affect their utility allowance. Therefore, tenant’s using utility allowances may be able to benefit from community solar subscriptions.

Split Incentives

While owners are (almost always) the party paying for a solar system in Oregon, tenants are usually the beneficiaries, as they pay the utility bill and receive the net metering benefits. There are multiple ways to remedy this difficulty:

- Master metering: If rent increases enough to cover the cost of the system, there will be cost stability for the tenant and tax incentives for the building owner.
- On-bill financing: The tenant pays for the system through their utility account.

Tenant Education

Affordable housing is incredibly complicated, from funding sources to occupant qualifications. Solar, as well, can be confusing for those who’ve never worked with it before. Tenants and owners alike will have to be educated on how solar works, what it can do, and how to make it work best for them. Solar installers will also need to be educated on the numerous hoops of the affordable housing world, in order for this market to be opened up for business. Hopefully, this report will be the first step towards solving this challenge!

Occupancy Duration

If a tenant does not know how long they will spend in housing, they may not be interested in solar if there is the chance they will not live within the home the entirety of the solar lifespan. To remedy this, solar purchasers should look into transferable financing products. Utility financing can provide on-bill financing, which can transfer as accounts transition.

Equity Considerations

Depending on the tenants, some might have higher need for assistance from solar than others. Also, depending on the production of the system and number of tenants, there might only be a negligible benefit on each unit. Developers may want to consider concentrating benefits from the solar production to specific units/tenants, or consider other means of sharing benefits with tenants, including: reserving savings in an emergency tenant fund; providing additional funding support for individual development accounts (IDA); supporting access to transit or car sharing programs; or providing additional programming and service to the building.

POTENTIAL & UNTAPPED FINANCING AND FUNDING OPPORTUNITIES

Potential Funding Sources - Tax Credits

Federal Investment Tax Credit (ITC)
Nonprofits, For-Profits, Homeowners, Tenants
Tax Credit

Overview: The federal government provides a tax credit equal to 30% of the total installed cost of a solar system. If the system owner cannot take the entire credit in the first year, the remaining credit can be rolled over to subsequent returns. This incentive will continue to December 31, 2019, after which it will step down incrementally to settle at 10% in 2022.

Considerations: Generally, a non-profit housing developer's tax exempt status would make the entity ineligible for the federal tax credit. However, properties undergoing Low Income Housing Tax Credit (LIHTC) syndication may be able to engage equity investors to capture the ITC.

Residential Energy Tax Credits (RETC)
Homeowners, Tenants
Tax credit

Overview: Homeowners or renters can apply for a tax credit on their personal Oregon income taxes for purchasing energy saving products and solar PV systems. Currently, the credit is $1.30 per watt of installed capacity of direct current, up to $6,000 ($1,500 per year over four years). The tax credit is transferrable if the owner of the system does not have tax liability. (Source: ODOE)

Considerations: The RETC program is scheduled to sunset on December 31, 2017. RETC devices must be purchased by December 31, 2017, operational by April 1, 2018, and applications must be received by ODOE no later than June 1, 2018. This credit cannot be combined with Rural Renewable Energy Development Grants.

Federal Low Income Housing Tax Credits (LIHTC)
Nonprofits (through syndication), For-Profits
Tax Credit

Overview: Low income housing tax credits fund the development and rehabilitation of affordable housing. Housing developers apply for tax credits that accrue over a 10-year period, and raise development capital by syndicating them to investors. Investors generally form a limited partnership with the housing provider, and may retain the tax credits so long as the units are maintained as affordable housing throughout a 15-year compliance period.

Considerations: Ideally, a solar installation would be wrapped into a LIHTC project at the time of syndication, as a component of either new construction or existing building rehabilitation. When stacked with the federal solar tax credit and accelerated depreciation, this strategy can enable the solar portion of

the LIHTC project to pay itself back in short order. Installing a solar array after LIHTC syndication (and during the 15-year compliance period) may be more difficult, as investors may be reluctant to make additional improvements that change project cash flow or the equity basis for calculating tax credits.

Accelerated Depreciation/Modified Accelerated Cost Recovery System (MACRS)
Nonprofits (through syndication), for-profit housing providers
Tax Deduction

Overview: Businesses can deduct their taxable federal income through accelerated depreciation on investments, including solar PV systems. Most renewable energy property – including solar PV – has a six year depreciation schedule. The depreciation schedule used is: 20%, 32%, 19.2%, 11.52%, 11.52%, 5.76% in years 1 - 6 respectively.

Considerations: As with the federal ITC, a nonprofit housing developer's tax exempt status may preclude the organization from utilizing accelerated depreciation benefits. However, properties that are undergoing LIHTC syndication and owned by a taxable entity may be able to capture these benefits. Equipment placed in service before January 1, 2018 can qualify for 50% bonus depreciation. Equipment placed in service during 2018 can qualify for 40% bonus depreciation. And equipment placed in service during 2019 can qualify for 30% bonus depreciation.

NOTE: The Federal 2017 The Tax Cuts and Jobs Act may impact this section if adopted.

Property Tax Exemption for Alternative Energy Systems
Nonprofits, For-Profits, Landlords
Property Tax Exemption

Overview: Oregon has provided a property tax exemption for any changes in the real market value of a property due to installing a qualifying renewable energy system.

Considerations: The property tax exemption is scheduled to expire in July 2018. Projects must be net-metered or provide an offset to on-site electricity use.

Potential Funding Sources - Grants

Public Housing Agencies Capital Fund
Public Housing
Grant

Overview: The Public and Indian Housing Office of Capital Improvements administers the Capital Fund. The Capital Fund provides funds, annually, to Public Housing Agencies (PHAs) for the development, financing, and modernization of public housing developments and for management improvements. The funds may not be used for luxury improvements, direct social services, cost funded by other HUD programs, and ineligible activities as determined by HUD on a case-by-case basis.
Considerations: This might put solar installations in competition for other critical repairs.

PGE Renewable Development Fund
Nonprofits (multifamily and low-income tenants preferred)
Grant

Overview: Starting in 2016, PGE launched a new offering to further leverage customer green power funds. The Renewable Development Fund offers competitive funding awards to applicants deploying their own clean energy projects. This fund prioritizes community driven projects.

Considerations: PGE will make funds available through an open and competitive application process. Applications will be reviewed and evaluated by third-party vendors in accordance with eligibility guidelines, preferred project standards, and established evaluation criteria. Award funding is limited and will differ from project to project based on applicant request and available funding.

Pacific Power Blue Sky Community Project Funds Nonprofits, For-Profits
Grant

Overview: Since 2006, Blue Sky customers have funded nearly 100 new community-based renewable energy projects in more than 35 communities in Oregon, Washington and California. Blue Sky funding awards cover up to 100 percent of the capital costs to install qualifying, new renewable energy systems for non-residential sites in Pacific Power's service area. This fund prioritizes community driven projects.

Considerations: Projects are selected annually through a competitive evaluation process. Applications are accepted during a defined application period. Funding is limited and varies year-to-year. Individual award amount is influenced by a number of factors, including the number and type of applications received and the outcome of the evaluation process.

Energy Trust of Oregon Commercial Solar Incentives
Nonprofits, For-profits, local government entities, possibly housing authorities
Grant

Overview: These Energy Trust cash incentive are generally paid directly to the solar contractor. They act as a coupon on the total solar system cost, decreasing the amount you pay the contractor. The application for Energy Trust Incentives must be made prior to construction.

Considerations: To be eligible to for Energy Trust incentives, the solar installation must meet the following four requirements:

- Have a Total Solar Resource Fraction (TSRF, the amount of sunlight a measured area will receive over the year) of 75% or higher
- 10 years of roof life
- Be installed by a certified Trade Ally of Energy Trust of Oregon
- Be a grid-tied system in Pacific Power or Portland General Electric territory

	Pacific Power territory:	Portland General Electric (PGE) territory:
Systems between 0 and 15 kW	$1.00/watt	$1.10/watt
Systems between 16-300 kW	$1.00-$0.40/watt	$1.10-$0.60/watt
Maximum amount	$120,000	150,000

Oregon Renewable Energy Development Grants (REDs)
Nonprofits, For-Profits, Landlords
Grant

Overview: RED grants are awarded competitively, and the application process is announced in the last quarter of each year. Individuals, businesses, nonprofits, tribes, or other organizations that plan to install renewable energy systems at a business or a residential rental property in Oregon are eligible to apply. ODOE awards grants up to $250,000 per project, not to exceed 35 percent of the project's eligible costs.

Considerations: No more than 75 percent of the total system costs may be applied from government incentives or grants, including the proposed RED grant. Other government incentives or grants include, for example, federal Rural Energy for America Program grants and tax credits. The RED Grant cannot be combined with a RETC incentive. The application process is announced in the last quarter of each year, and the current offering is unknown.

Potential Financing Opportunities

Clean Renewable Energy Bonds (CREBs)
Public Sector
Financing

Overview: Clean renewable energy bonds (CREBs) may be used by certain entities -- primarily in the public sector -- to finance renewable energy projects. The list of qualifying technologies is generally the same as that used for the federal renewable energy production tax credit (PTC). CREBs may be issued by electric cooperatives, government entities (states, cities, counties, territories, Indian tribal governments or any political subdivision thereof), and by certain lenders.

Energy-Efficient Mortgages
Nonprofits, for-profit housing providers, homeowners
Financing

Overview: Homeowners can take advantage of energy efficient mortgages (EEM) to finance energy efficiency improvements to existing homes, including renewable energy technologies. The U.S. federal government insures them through Federal Housing Authority (FHA) or Veterans Affairs (VA) programs. This allows borrowers who might otherwise be denied loans to pursue energy efficiency, and it secures lenders against loan default.
Considerations: Single family residences only. The FHA allows lenders to add up to 100% of energy ef-

ficiency improvements to an existing mortgage loan with certain restrictions. FHA mortgage limits vary by county, state and the number of units in a dwelling. See website for more details. These mortgages were previously limited to $8,000. The maximum amount of the portion of an energy efficient mortgage allowed for energy improvements is now the lesser of 5% of: The value of the property, 115% of the median area price of a single-family dwelling, or 150% of the Freddie Mac conforming loan limit. Works for energy efficiency and renewable energy.

Energy Performance Contracting
Public housing authorities
Financing Method

Overview: EPC is a financing technique that uses cost savings from reduced energy consumption to repay the cost of installing energy conservation measures. Normally offered by Energy Service Companies, this innovative financing technique allows building users to achieve energy savings without up front capital expenses. The costs of the energy improvements are borne by the performance contractor and paid back out of the energy savings. Other advantages include the ability to use a single contractor to do necessary energy audits and retrofit and to guarantee the energy savings from a selected series of conservation measures.

Considerations: Financing is obtained separately. This usually works best for large energy users, such as larger multifamily apartment complexes. This is currently available for public housing authorities. Works for energy efficiency and renewable energy.

Unexplored Funding Sources

These programs have not been explored for solar projects or have not been used within Multnomah County.

Oregon Affordable Housing Tax Credit (OAHTC)
Nonprofits, for-profit housing providers, public housing authorities
Tax Credit

Overview: Under the OAHTC Program, the Department has the authority to certify tax credits for projects. Through the use of tax credits, lending institutions are able to lower the cost of financing by as much as four percent for housing projects or community rehabilitation programs serving low-income households.

Considerations: All of the savings generated by the reduced interest rate must be passed directly to the tenant in the form of reduced rents.

Rural Renewable Energy Development Zone
Rural Nonprofits, for-profit housing providers
Tax exemption
Overview: A Rural Renewable Energy Development Zone (RRED Zone) can be used to encourage

renewable energy investments within any city, county or contiguous counties in Oregon. Projects can receive a three to five year exemption on property taxes. The total amount of property that can qualify for an exemption is subject to a cap set for each Zone designation.

Considerations: The zone can only cover territory outside of the urban growth boundary of any large city or metropolitan area. Businesses must meet certain employment and/or investment requirements to be eligible. Interested businesses must apply for authorization before construction or installation begins. Also, the RRED Zone must have a designation that cannot exceed $250 million in initial market value. Currently, Multnomah County does not have a RRED Zone, but Clackamas County does have one outside of the Metro area, and one can be created.

HOME Investment Partnerships Program
Dependent on strategy the County decides
Grants through jurisdictions

Overview: The HOME Investment Partnerships Program (HOME) provides formula grants to jurisdictions to fund programming around homeownership and affordable rental housing. Local governments can use HOME funds for grants, direct loans, loan guarantees or other forms of credit enhancements, or rental assistance or security deposits.

Considerations: HOME's flexibility allows groups to create a program that is tailored to their needs. In this instance, it would be working with rehabilitation to assist in solar implementation. Jurisdictions must match 25 cents of every dollar in program funds. There currently has been no implementation of HOME funding for solar programming nationally, but there is no reason Multnomah County cannot implement the first application.

Low Income Weatherization Program (LIWP)
Nonprofits, for-profit businesses, homeowners, local government entities including cities, counties, and housing authorities
Grant

Overview: LIW funds can be used to increase the energy efficiency in multifamily housing through energy- reducing projects like insulation, windows, appliances, and lighting. LIW applications can be submitted during OHCS's Notice of Funding Availability application process.

Considerations: A construction or rehabilitation activity must demonstrate measurable cost-effective energy conservation to be considered eligible for the LIWP funding. As a whole, projects must show first year savings equal to or greater than one kilowatt-hour saved for each program dollar spent. The project receiving a LIWP grant must remain affordable for at least 10 years. At least one-half of the units in the project must be rented to households whose income is at or below 60 percent of the HUD-defined area median income.

Weatherization Assistance Program (WAP)
Nonprofits, for-profit businesses, tenants, homeowners
Grant

Overview: This program through the US DOE provides funds for energy efficiency in low-income households. WAP currently contributes to making residential structures "solar-ready" by reducing the home's energy load and thus maximizing the total energy burden that can be offset by renewable energy generation. WAP funds can also pay up to $3,545 per residence for renewable energy per federal guidelines.

Considerations: Currently, the Oregon State Plan governing WAP funding does not specifically allow renewable energy installations, though pilots of this approach are underway. Reducing the energy use through efficiency measures will allow for a smaller, less expensive solar PV system to be needed, and energy efficiency upgrades should be completed in combination with any solar PV installation.

Low Income Home Energy Assistance Program (LIHEAP)
Nonprofits, private individuals, local government entities including cities, counties, and housing authorities
Grant

Overview: LIHEAP, a federal program to assist low-income families with costs associated with home energy bills, energy crises, and weatherization, could offer a mechanism for increasing solar access to low-income communities.

Considerations: While there are only a few examples of utilizing LIHEAP funding and low-income solar distribution to date, the topic is gaining attention. Coordinating LIHEAP funding with solar projects has been explored in Minnesota and California. In Minnesota, LIHEAP funds have been used to determine eligibility for families to participate in low-income renewable energy and efficiency programs. In California, LIHEAP funds have been used to directly fund solar programs in the Solar for All Program, with 1,482 low- income households (both single-family and multifamily) receiving fully installed solar systems funded through $14.7 million in LIHEAP funding. (Source: US Dept. of Health and Human Services)

Energy Trust of Oregon Multifamily Custom Cash Incentives
Multifamily: Nonprofits, for-profit housing providers, public housing authorities
Cash-based incentive

Overview: Energy Trust provides a site evaluation and energy-savings action plan to recommend upgrades, estimated energy savings, costs, qualifying cash incentives, and return on investment.

Considerations: Incentives are subject to funding availability and may change. An engineering study or other technical assessment may be required to determine the potential savings involved in a custom project. All equipment purchases must receive pre-approval from Energy Trust to qualify for custom incentives. Incentive may be available for community solar, but has not been specified.

Commercial Property-Assessed Clean Energy (CPACE)
Multifamily: Nonprofits, for-profit housing providers
Financing

Overview: CPACE helps businesses and nonprofits finance the upfront cost of qualified energy improvements by offering completive lending rates and favorable terms with no up-front costs. The cost of the project is secured through a benefit assessment lien on the property and is repaid to the lender over time with a guarantee to the lender of payment in case of default. PACE spreads the cost of energy of improvements over the lifetime of the project. Multifamily properties are considered eligible for financing under Multnomah County's CPACE program called PropertyFit.

Considerations: The financing is secured with a lien on the property, so in the event of a foreclosure, the financing must be repaid before other claims against the property. Lender consent is required by any existing lenders on the property, this may be an issue for an affordable housing project where the existing financing structure is complicated. The repayment obligation also remains with the property, so any new owners would take responsibility for the remaining payments.

HUD Residual Receipts
Multifamily: Nonprofits, for-profit housing providers
Financing

Overview: Some HUD supported mature low income housing developments have accumulated "replacement reserves" and "residual receipts" over time. These funds are moneys that exceed amounts needed to operate a property on a monthly basis, maintain a reserve for replacement funds and make allowable payments to the property's owner. Residual receipts are generally placed in an interest-bearing account that may be used for project-related purposes. Under some circumstances, housing providers may be able to access these accounts to finance energy efficiency of renewable energy projects on the site, provided they have returns that would allow the provider to recapitalize the reserve accounts.

Considerations: Additional federal and state guidance is needed to determine if these funds can in fact be used for solar PV projects.

BEST PRACTICES & CASE STUDIES

Case Studies for Housing Providers

El Paso Housing Authority (TX, 2012) | Case Study
Master metered buildings, Public Housing
System Coverage: Common area and 73 tenant units (165kW)

Project Financing:
- ARRA
- Local Government Loan
- HUD Grants
- PHA Capital Fund

Cost Savings: $43,245 (@$0.13/kwh) - $544 per unit

El Paso Housing Authority (EPHA) combined solar PV with two wind turbines to create a 73 unit zero net energy building for affordable housing for seniors. This new construction was originally going to use solar thermal panels to provide hot water, but solar PV panels were shown to be more effective. EPHA also had to work with the utility provider, as net metering was not currently available.

EAH Housing Crescent Park (CA, 2009) | Case Study
Low Income Housing Tax Credit, Master Metered
System Coverage: Common area and 378 tenant units (900kW)

Project Financing:
- City Bonds
- 4% LIHTC Leveraged Sources:
- CA MASH Rebates
- HUD Residual Receipts
- Energy savings

Cost Savings: $154,000/year, 60-80% of electric demands

EAH's experience at Crescent Park incorporated the tax credit with its LIHTC transactions and was able to use the projected savings from the solar system to secure financing, thus ensuring that solar on the affordable housing was possible without added subsidies. At the time, this was the largest solar installation on affordable housing in the country.

Santa Barbara County Housing Authority (CA, 2011) | Case Study
Energy Performance Contracting, Virtual Net Metering
System Coverage: Common areas and 863 tenant units (1.7 MW)
Project Financing: Power Purchase Agreement (PPA): $0.08/kWh - 20 year term w/ Buyout Option

Leveraged Sources:
- CA MASH Rebates
- Federal ITC (1603)
- ARRA
- HUD Energy Grant
- Energy Performance Contract

Cost Savings: $300,000 (@$0.15/kWh)

Using a portfolio approach, Santa Barbara County Housing Authority was able to install 1.7 MW on 250 buildings, benefitting 863 units. While about half of the costs were covered through federal funds, other incentives were captured using PPAs with Surf Solar, Inc. The PPA was a cost of $0.03/kWh to save a retail cost of $0.15/kWh. Many of these tax incentives would not have been possible for SBCHA to capture without the PPA.

Colorado Energy Resource Center (CO, 2016) | Case Study
WAP/Energy Efficiency and Solar, Single family home
System Coverage: One house (2kW)
Project Financing: US Department of Energy Weatherization Assistance Program (WAP)
Cost Savings: $6,200 over 20 years

In the firsts of its kind, Energy Resource Center used the Weatherization Assistance Program funding to complete energy efficiency measures with solar PV on a single family home. All home performance improvements were cost-tested through an approved energy audit to determine that the savings-to-investment ratio is one or greater, a requirement when utilizing the Weatherization Assistance Program.

Grand Valley Power (CO, 2015) | Case Study
Community solar, utility owned solar
System Coverage: Four year subscriptions of 3.5kW for each of seven qualified families (24 kW total)
Cost Savings: $600 in electricity costs per household each year for four years

Grand Valley Power, an energy co-op, provided community solar projects on its own property for qualified low-income participants. This project was built as part of a job training program, further extending benefits to those who need them. The 24kW system was shared among participants, with each participant benefitting from the net metering program for four years at zero upfront cost. At the end of each four year cycle, the next participant would be brought on.

Northeast Denver Housing Center (CO, 2007) | Case Study
3rd party finance, PPA, Master metering, single family homes, submetering
System Coverage: 30 multifamily and multiple scattered site single family residences (47.72 kW)

Project Financing:
- 3rd party investing
- Federal ITC (1603)
- Utility Rebates

- MACRS
- Production incentive
- Grant from Governor's Energy Office

Cost Savings: If the 18 duplex units maintain their historical usage, NDHC will have a negative cash flow of $2,908 at the end of the year. After the first six years, NDHC can purchase the system and earn $13,000-$14,000 in energy savings.

Northeast Denver Housing Center (NDHC) combined innovative third party financing with job training to install a 1.88kW solar PV system on each individual home on multiple sites, with submetering used to track energy production and use. Solar PV systems also went on 12 multi-family buildings. An additional 9.4-kW system was installed on the roof of one Del Norte property. To account for the potential increased tenant energy cost from switching to submetering (previously property owner paid the utility bills with that cost factored into rent), an energy conservation incentive program was also implemented to ensure tenants with a solar PV system would maintain or decrease their energy consumption.

Lessons from Case Studies for Housing Providers

Master-metering is the simplest way to install solar for multifamily, but also comes with the added risk of increased energy usage for each tenant: Since tenants would not be paying their individual energy bills, there is no incentive to conserve electric use and it is difficult to pass benefits of solar directly to tenants. Under a master metered building scenario, tenants can benefit from maintaining reduced rents by lowering operation costs, and/or usage the proceeds from the solar PV project to provide other tenant benefits.

A well designed community solar program will allow housing providers to directly benefit tenants in an individual metered building by passing the benefits of the solar PV through virtual net metering. All, some, or none of the costs of the project can be passed through to tenants as well, but in no circumstances should tenants be worse off financially as a result.

Look to long term savings: With NDHC's installation, they expected to operate at a loss for the first six years, but for the overall 25 year lifespan of the project would receive a net income of $158,000, with a net present value of $67,000.

Look for opportunities to incorporate education and workforce training for tenants: Engaging tenants early on conservation can reduce building energy use and maximize the benefit of solar. Grid Alternatives and other programs have been able to lower the cost of installation by encouraging sweat equity and on the job learning.

Combine with energy efficiency and reduced consumption with solar to maximize the benefits: It should be stressed to users that solar only reduces energy costs if energy use remains the same or decreases. This is why solar should ideally be paired with energy efficiency.

Look to a community based solarize campaign to increase participating: Cooperation between

solar purchasers allow cost effective group purchasing and the use of a number of different financing strategies.

Look to a portfolio approach as often as possible: Maximize the number of structures to potentially install solar to generate economies of scale. Look to partnerships with large non-profit housing providers or other public housing agencies.

Understand your goals: Achievable goals can be based on total installed capacity, energy offset percentages or cost savings targets. Consider which of these is most important for both provider and tenants.

Identify key stakeholders and engage early and often: Ensure engagement, information sharing, and decision making. This can include asset managers, legal and finance departments, facilities managers, tenants and property owners. Engage with them early in the process to understand their concerns and ideas.

Discuss ownership options with investors: Understand any constraints on funding. Present the tax benefits of potential partnerships as a solution to these constraints.

NEXT STEPS FOR AFFORDABLE HOUSING PROVIDERS

Build Organizational Support

Determine the benefit of solar to specific properties and how it could work towards your organization's goals. It can be environmental, economical, equitable - or a combination of the three! Share information with decision makers, and find an internal solar champion. Resources are available, including from the ETO, to support this work.

Gather Necessary Property Information

The ETO or a solar installer can assist with this. Helpful information includes:

- Utility bills -- How large a system will depend on electricity usage. Determine if the building should undergo energy efficiency work either prior to or in tandem a solar PV system.
- Building and roofing schematics -- How much space is on a roof and within the electrical panel will matter to the size and cost of the project. Roof age and durability in addition to roof obstructions will impact the project. If a roof does not look promising, look to parking lot, community space, public building or even brownfield nearby that can be used for solar panels.
- Property ownership -- If outside investors are involved in decision-making, it may affect the financing of the solar PV system.

Contact a Solar Installer for a Bid

Check the ETO website for a qualified Trade Ally. Look for qualifications such as North American Board of Certified Energy Practitioners (NABCEP) certification, length of time in business, and a history of successfully installing similar projects, especially those with nonprofits, tenants, or multifamily housing.

Consider Cost and Financing Options

- Insure you are aware of all the solar incentives that are available and qualification requirements.
- Determine if you need financing. If so, which lenders or state programs are a good fit for your needs? How does the property's ownership/organizational structure impact solar decision-making and financing options?
- Who are your tenants, and how can your system provide equitable benefits for them?

Source: NW SEED, Affordable Clean Energy for All

NEXT STEPS FOR SOLAR PROVIDERS

For solar providers, there are numerous opportunities to look to in the affordable housing market which do not exist in other markets. Consider the following benefits to affordable housing market when looking to whether expanding into the affordable housing market:

- **Large potential customer base:** Over 500 developments in Multnomah County have more than three units, adding up to over 10,000 customers in less than 500 buildings. This provides an opportunity for much larger installations and more customers with lower customer acquisition and installation materials costs for the installer.
- **One point of contact:** Many of these communities are run by a small number of organizations, meaning once one project was complete, there would be a possibility of other projects under the same management identified, meaning a decrease in the marginal costs as more projects came online.
- **Timing of recapitalization:** Many projects are required to undergo recapitalization schedules, in which developers look at their portfolio of housing and decide which development needs what improvement. This timing is usually in succession to allow tenants to be placed in other developments, providing a perfect opportunity for ongoing solar installations as buildings are remodeled for efficiency and safety improvements.
- **Creative funding sources:** Given the constraints identified in this report, solarizing affordable housing tends to be more complicated than traditional solar projects. This also means the business case is underdeveloped in this space, and affordable housing developers must find creative financing solutions to balance capital costs with revenue. With this in mind, housing developers are ideal potential partners to solve problems with funding solar projects, because they can share project development expertise with solar developers.

Roadmap to Solar for Affordable Housing in Multnomah County

BEST PRACTICES FROM OTHER STATES

California - Virtual Net Metering under Multifamily Affordable Solar Housing (MASH) and Multifamily Affordable Housing Solar Roofs Program (MAHSRP) has allowed multifamily affordable housing owners to share the benefits of solar and address the split-incentive issues of traditional net metering. Owners can choose one of two incentives, with the higher incentive offered if installers provide virtual net metering for at least half their tenants, as opposed to just common area load. The MASH and MAHSRP has provided focused funding for affordable housing providers who go solar, with additional funds if the benefits go to most of the tenants.

Colorado - Similar to Oregon's upcoming Community Solar Program, Colorado Community Solar Gardens allows on and off-site solar electric generations for 2MW or less when there are at least 10 or more customers. While Oregon and Colorado both have a requirement for at least 5% of subscriptions to be available for low-income households, Colorado did not include incentives to assist this requirement, which developers say has severely inhibited expansion to low-income households.

Poudre Valley Rural Electric Association (CO) - Low-income households were offered the option of subscribing to utility owned and operated solar farms, where the co-op provides the installation, land, and maintenance of the panels and subscribers sign-up and pay for the systems through their existing utility bills. Subscribers who meet certain income requirements can apply for "PV for All Program," which provides no-cost subscriptions to access solar panels for four years, with a portion of the savings earned automatically paid back into the program on their bill.

New York - Phase 1 of New York's community solar program requires 20% of a project's subscribers be low-income residents, or siting of the project in a utility distributed generation priority area, in order to interconnect the project to the grid. It also allows its community solar program to expand to other clean energy sources, such as biomass, wind, geothermal, and aggregated efficiency and weatherization. Systems must be sited to "provide the greatest locational benefits to the larger power grid" to support "economically distressed communities."

Washington State - Aimed at more holistic building energy savings, both the Evergreen Sustainable Development Standard and Ultra-Energy Efficient Affordable Housing Demonstration Program provide direct incentives and loans to low-income housing developers of both single and multifamily housing projects to reduce the energy use through both conservation and production of energy. Washington also provides a community solar program, which allows solar installations on either a public entity or utility-determined location.

Successful Funding Mechanisms

- Direct Incentives – These can cover the cost of subscription prices for community solar or PV systems, subsidized utility bill credits, or provide cash directly to community solar projects serving low-income households.
- Loan Loss Reserve – A loan loss reserve fund is a type of credit enhancement, public funds are reserved to protect loan providers from potential losses that may incur if a customer defaults on

a loan. This reduces possible risk to the lender allowing the lender to offer better interest rates, better terms and/or to extend lending to individuals with low credit scores.

- On-Bill Repayment/Recovery (OBR) – Common in energy efficiency, customers can make loan payments through their electric bills. This allows the loan to stay with the meter and transfer to a new occupant upon sale or a new tenant moving in. Lenders like this system too because loans that are repaid through the utility bill have a lower default rate. This typically allows lenders to extend credit to borrowers with lower credit scores. OBR can also be easier to understand – customers can see utility bill savings from solar offsetting loan payments – making the connection to energy use and production more clear.
- Revised Underwriting Criteria – Increased access to loans and credit can be achieved by focusing on successful bill-repayment history rather than credit scores to determine eligibility.

MOVING FORWARD: ROADMAP TO SOLARIZATION

Statewide Program Advocacy

Revision of Weatherization Assistance Program for Solar
Currently, the Weatherization Assistance Program (WAP) does not include renewables in its allowable projects. However, the County should work with Oregon Housing and Community Services to examine the costs and benefits of possible uses of the WAP program to support solar. This could include a funding bonus for affordable housing projects that include solar PV with energy efficiency (like San Diego's Reduce and Produce program), or using the WAP program to cover some of the administrative costs of outreach to low-income households (like Minnesota's LIHEAP program). While this can be a regulatory change, LIHEAP funds are already available to use on solar PV, and the County should look to the variety of programs it can implement through combining solar PV with weatherization and energy efficiency.

New Incentive Recommendations
The RETC program is scheduled to sunset on December 31, 2017. The Oregon legislature has not decided how-or if-to replace the incentive program. Multnomah County, as the most populous county in Oregon, could argue for equitable incentives, which do not just focus on increasing the total number of solar projects, but also focus on equitable access to solar projects. This means a separate or tailored program for lower income households that does not require tax liability to benefit – for example a tax credit.

Community Solar Advocacy

There are many changes coming up for solar in Multnomah County and across the state. The County should use its voice to advocate for statewide regulatory changes which will increase low income participation in solar PV.

Future Community Solar Program

Community solar incentives for low income participation: At least 14 states and DC have enacted some sort of community solar program. However, only a few have a low-income requirement, including California, New York, and Colorado. Of these, only California has placed financial incentives specifically targeted towards low-income households. In order for Oregon's community solar program to successfully promote solar for low income families, the County should advocate for targeted incentives to go to lowering the cost for purchasing or subscribing to community solar if a household meets certain income requirements. Additionally, incentives should be made available for affordable housing facilities who provide solar for tenants or go above and beyond the 5 percent requirement.

Allowing on-bill repayment for solar, including community solar: As part of the community solar program, the County should advocate for utilities to allow on-bill repayment to account holders to pay for solar projects. This will allow greater transparency about the costs and benefits of participating, and help overcome any "split incentives" barriers.

Remove caps on community solar: Minnesota is currently the only state which has done away with caps on community solar. This removes the "pilot program" feel, allowing developers to take on as many contracts as possible. This removes the additional hurdle of making an application deadline, when there are already a number of hurdles to successfully providing solar.

Explore trading program to support low-income participant in community solar: Some community solar developers may have difficulty in identifying low-income households to participate in their community solar project, making it difficult to meet the 5 percent participation per project requirement. There may be an option for these projects that don't meet the target to pay a certain price per watt to a "bank," which will use these funds to incentivize low income households who have shown interest in participating in community solar. Alternatively, there may be some groups, such as affordable housing projects, that have a large number of low-income subscribers. They may be able to use this larger percentage as a "credit" that they can trade to projects that do not meet the target in exchange for funding.

LOCAL PROGRAMMING RECOMMENDATIONS

Look for alternative locations for community solar projects, like public land and brownfields
As community solar comes online, the County can look to brownfield sites and public buildings to provide locations for developing solar projects linked to affordable housing projects that do not have solar potential on their own roofs. While the County may not have many buildings to provide, a "brownfield to greenfield" approach is a way to provide access to land for many different solar projects, including shared solar. A solar farm was installed on a former landfill in San Miguel County which was built in collaboration with GRID Alternatives to benefit qualified low-income residents.

Establish Rural Renewable Energy Development Zone Outside Urban Growth Boundary
In Oregon, a Rural Renewable Energy Development Zone (or RRED Zone) is a way to encourage renewable energy outside of an urban growth boundary (UGB). It is currently being used in ten counties in Oregon, including Clackamas County. This Zone creates a tax exemption for 3-5 years from local taxes on property that has renewable energy activities. The property is also qualified to a locally-set cap of $250 million or less in initial market value. Currently, Multnomah County does not have any affordable housing projects outside of the UGB, but the establishment of this zone in conjunction with community solar coming online may provide an opportunity for affordable housing projects to collaborate with developers outside the UGB, and to benefit on their property within the UGB (depending on how the County writes their rules).

Green Banks
A major barrier for going solar for affordable housing providers and their low income tenants is finding financing for upfront costs. A green bank, essentially a quasi-governmental financial institution that leverages public money to raise private capital and deploys funds into projects that benefit the public typically through the production of green energy, can provide a variety of financing opportunities targeted a low-income housing. A green bank could develop tools such as on-bill repayment for solar. New York and Connecticut's green bank programs provide useful models to look to for ideas.

Remove "Soft Costs" of Solar

Within Multnomah County, a coordination to ensure that going solar is as easy as possible should start with looking at what barriers the cities and counties are creating themselves. Many cities and counties across the US are finding incredible success by removing "soft costs" of time, effort and money to going solar. Examples of soft costs include planning and zoning; permitting; financing; customer acquisition; and installation labor. For the County, this can include reviewing the permitting processes across municipalities, clear zoning codes and historic district restrictions, and cross-training city staff. Cities like Santa Monica and New York have reduced the permit processing time and developed a regular communication schedule with solar installers to solicit recommendations for procedural changes.

Energy Efficiency Funding with Solar PV

There are multiple ways to combine energy efficiency and assistance funding with solar. Colorado has started using WAP funding to combine energy efficiency with solar, ensuring systems needed are as small as possible while still making an impact. Energy assistance programs like WAP and LIHEAP provide an option for identifying eligible households. However, as emergency energy assistance meets a critical community need, especially for home heating during the coldest months, diversion of any existing energy assistance funding to solar projects should be carefully considered. Securing new resources to serve low income programs should be prioritized. In Minnesota, the Rural Renewable Energy Alliance has worked with low income families who qualify for LIHEAP to combine energy use reduction services with solar. Using LIHEAP to cover the costs of administration and acquire information on potential solar customers, the program offers grants of up to $4,700 to qualifying low-income households.

Roadmap to Solar for Affordable Housing in Multnomah County

MOVING FORWARD IN MULTNOMAH - SOLARIZE!

Through collaboration between cities, counties, and nonprofits (as well as interested members of the community), Solarize campaigns have worked to educate participants, simplify the process by removing many decisions, and provide bulk purchasing discounts. Originally developed in Oregon, Solarize campaigns in Portland and Clackamas County have led to hundreds more households participating in solar. Like other Solarize campaigns, a Solarize Affordable Housing Campaign could ensure the easiest possible process for affordable housing providers to pursue solar projects. This campaign would take much of the guesswork out of going solar for affordable housing providers, overcome many market barriers to going solar, and be tailored to this housing market. (Source: NREL, The Solarize Guidebook).

Benefits from the campaign include:

Ease of Project and Contractor Identification

A major part of a Solarize campaign is competitive contractor selection, which is tailored to each campaign. Many campaigns include either a nonprofit or government body identifying potential buildings and organizing group interests to identify preferences for contractors. This can be by focusing on smaller, local businesses or businesses that can handle a large number of installations or can give the best discount to the group.

Bulk Purchasing

The main benefit of the Solarize campaign is the reduced price for each group based on bulk purchasing of equipment. Installers will be able to provide a lower cost per installation than if each developer purchased individually because of increased certainty and volume price breaks.

Increased Solar Awareness

Not only do Solarize campaigns help solar contractors who participate in the campaign, previous campaigns in Portland showed an increase in installations by non-participating installers during the time of the Solarize campaign. This is thought to be from increased awareness of solar energy working in Portland, as well as publicity around pricing and ease of installation.

Tailored Pricing Understanding

Prior to campaigns kicking off, the program manager will be able to work with local affordable housing organizations, solar installers, and incentive groups like HUD or the ETO to create a simplified financing and funding process, thus keeping financing as simple as possible for developers.

ASPECTS OF A SOLARIZE CAMPAIGN

Awareness

The grassroots campaign is advertised in fliers, emails, neighborhood newsletters, blogs, local events, and by word of mouth. Because this campaign will work specifically through affordable housing projects, word of mouth and meetings with individual developers is also incredibly effective.

Education

Workshops and Q&A sessions are offered throughout so that the developer groups provide all stakeholders in an organization a chance to ask questions and go over the steps of participation.

Enrollment

Participants are enrolled in the program through an online registration page or through the program manager, who will screen enrollees to ensure they are able to participate.

Site Assessment

The installation contractor provides site assessments and bids to all enrollees. A program manager could pre-screen applicants using desktop tools such as MapDwell, Google Project Sunroof or Solar Sketch-up to help figure out the exact generation per a building, further lowering the project development cost.

Decision

The developer decides whether to accept the contractor's bid at the Solarize program price. If using descending price tiers, the contractor may ask the customer to accept the current price tier, with the guarantee of a discount on their final invoice if volume targets are met. The intent is to offer few variables, so the customer's decision can be simple: "yes" or "no."

Installation

The contractor installs the system and helps the customer through the paperwork for the any incentives or tax credits.

BEST PRACTICES IN SOLARIZE CAMPAIGNS

Time Campaign with Community Solar

In order for many affordable housing communities to have the most successful solar project, tenants must be able to benefit from the systems as well. With this in mind, it would be ideal for community solar and virtual net metering to be available before the campaign launches.

Use Multiple Small Contractors

In some campaigns, like in Salem, OR, the committee organizing the campaign decided to award half jobs to one contractor and half to another to promote local businesses but also handle the large number of installations.

Make Contractors Responsible for Site Assessments

Prior to any on-site assessment, work with contractors to provide remote web-based solar assessment. This can be done using a freeware program, such as MapDwell (used in the County's initial assessment) or Google's Project Sunroof, or through other technology. This can allow for multiple buildings in an affordable housing developer's portfolio to be assessed in one phone call, with plans to do a more thorough assessments once the most promising buildings are identified.

Used Tiered Pricing Structures

Tired pricing structures based on participation motivate communities to get others to participate or add more of their own building stock. In Massachusetts, for example, Harvard's first 100kW contracted would be quoted at $5.50/watt, but if more contracts were signed with the installer (over 100kW) the price would drop to $5.00/watt. Pricing would continue to drop as more contracts were signed, buildings more and more momentum. However, this may lead to some pricing confusion, as early enrollees may sign on before the final price is determined. To work with this, some contractors may wish to quote the highest price, and adjust the final payment installment to the dropped price, or offer a rebate at the end of the program. Securing anchor participants who are able to buy a large volume from the beginning of the program will help to motivate participation and ensure that the volume targets are met.

Massachusetts Case Study

Combine Energy Efficiency Programs with Solarize

The San Diego Solarize campaign through California Center for Sustainable Energy (CCSE) worked with home performance contractors to launch the "Reduce then Produce" campaign, which required a Home Energy Rating System (HERS) rating of 100 or lower or an energy upgrade before going solar. By including home performance contractors in the solar business, smaller systems were needed to

cover a home's energy bill, increased buy-in from contractors, and better home performance while saving money for homeowners by reducing total solar system size.

Recognize Efficiency Efforts

Requiring housing providers to improve their building performance AND go solar means multiple steps, and may increase the chance of fatigue in the program prior to following through with the installation. By encouraging providers to reduce AND produce, they can find the best combination for each project.

Single Program Management

Most Solarize campaigns work best when there is at least one project manager working between asset developers and installers to decode what are the priorities and goals of each group, and tailor the campaign. A service-organization volunteer, graduate student intern, or Americorps volunteer would be a good possible program manager, especially one with an understanding of both affordable housing and solar PV. Although solarize campaigns for residential properties have been organized by local individuals, due to the complicated nature of solarizing affordable housing an institutional program manager may be better situated for success.

Involve the Community in Decision Making

Solarize campaigns are successful because they are tailored to their community. In order for a program in such a new market like affordable housing to work, program managers and installers must understand the ins and outs of affordable housing, and challenges that must be overcome. By including participation from residents of the affordable housing in the program design, many potential obstacles can be obviated.

On-Bill Repayment

If residents use borrowing to finance solar installation on bill repayment may be a good option for customers. Currently Craft 3 already offers on-bill repayment options for energy improvement loans. Establishing a solar on bill repayment program would require working with Portland General Electric and Pacific Power to offer on-bill repayment to groups within this program who go solar. This, especially if combined with community solar, could be used to help counter the split incentive by allowing tenants to use their utility allowance to pay towards a solar subscription.

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in Multnomah County

Institute for Sustainable Solutions
PORTLAND STATE UNIVERSITY

pdx.edu/sustainability/iss

sustainability@pdx.edu

Multnomah County
Office of Sustainability

multco.us/sustainability

sustainability@multco.us