Affordable Clean Energy for All

A Guide to Installing Solar Photovoltaics on Multifamily Affordable Housing in Washington
Acknowledgements
Northwest Sustainable Energy for Economic Development (Northwest SEED) would like to thank Capitol Hill Housing, Emerald Cities Seattle, Everyday Energy, Seattle City Light, and the Washington State Housing Finance Commission for their input on the content presented in this guidebook.

This guidebook was made possible with funds from the Bullitt Foundation and the Laird Norton Family Foundation.

About Northwest SEED
Northwest SEED is a 501(c)(3) nonprofit organization with a mission to create communities powered by locally controlled clean energy. We believe community investments in clean energy move us toward a vital post-carbon economy and a cleaner, healthier environment. Northwest SEED’s services inform and empower individuals with diverse incomes, backgrounds, and lifestyles to address climate change through accessible information and action. To learn more about Northwest SEED’s Affordable Clean Energy for All program, please visit www.nwseed.org.

Author
Alexandra Sawyer, Northwest SEED

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Reviewers
Jennifer Grove, Linda Irvine, Mia Devine, and Jaimes Valdez of Northwest SEED

Juliana Williams of the Washington State Housing Finance Commission

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Executive Summary

Introduction
Driven by the goals of climate justice, equity of access, and long-term community resilience, Northwest SEED is committed to seeking solutions that bridge the “green divide” and enable low-income communities and affordable housing providers to access clean energy benefits. We envision a future in which every resident, regardless of income, lives in housing that is sustainable, affordable, and resilient.

While the price tag of solar has fallen nearly 50% in the past five years, upfront installation costs have kept solar energy out of reach for many. Simultaneously, lower-income households spend a disproportionately high percentage of monthly income on energy-related expenditures, while much of the housing stock available at accessible rental prices is dated and does not benefit from efficiency measures and renewable energy generation. As clean energy technologies become more widespread and affordable, it’s important that the benefits are distributed to all members of our community.

By lowering utility bills and stabilizing future electricity costs, solar can play an important role in ensuring that housing stays affordable for decades to come. Moreover, innovative mechanisms like virtual net metering and utility allowance reform are being deployed around the country to extend the benefits of clean energy to low-income tenants. By turning to solar as a source of long-term savings, environmental benefits, and tenant engagement, Washington’s affordable housing providers can lead the way towards bridging the green divide.

Through our Affordable Clean Energy for All program, Northwest SEED works with local stakeholders to bring down the barriers to solar energy deployment. Our work includes research into nationwide best practices, project feasibility and design with affordable housing providers, and policy advocacy to support long-term systems change that will level the solar playing field. Ongoing collaboration with housing providers, utilities, financing institutions, and foundations will create pathways to lower energy costs for those most in need, and increase community resiliency in the face of climate change.

Figure 1: Solar PV at King County Housing Authority’s Greenbridge development
(Source: King County Housing Authority)
Key Takeaways
This guidebook is intended as a tool for Washington State affordable housing providers and their partners to use in exploring solar feasibility, identifying potential sources of funding, and deploying solar projects that meet the needs of the affordable housing sector and low-income residents.

The bottom line? You don’t need to be a clean energy expert to install solar. Use this guidebook to learn about the basics, find a reputable contractor, ask good questions, and decide whether solar is right for your situation.

Low-income communities deserve equal access to clean energy. Solar is an important tool in bridging the “green divide.”

Solar works in the Pacific Northwest, integrates with almost any building, has no moving parts, and is easy to maintain.

Solar saves money by reducing electric bills and hedging against future electricity rate hikes. These savings help keep housing affordable over the long term.

Installing solar on multifamily buildings may present some unique challenges, but they’re not insurmountable.

Don’t fall victim to sticker shock – federal, state, and utility incentives and low-cost financing help to defray upfront costs.

Different solar ownership models will work for different housing providers. Consider your options, and pick one that works for your situation.
Solar Energy: Bridging the Green Divide

Low-income households are missing out on the clean energy economy. Approximately 5 million households currently reside in federally subsidized housing – most as renters in multifamily buildings – but solar energy policies and incentives are overwhelmingly geared towards homeowners. As renters, many low-income households are unable to make energy improvements that would save them money, and are therefore increasingly vulnerable to rising energy costs. On average, low-income households spend up to twice as much income on energy costs as their higher-income peers. This disparity is particularly troubling because low-income communities also face higher pollution exposure rates, will bear the brunt of climate change impacts, and would support clean energy if they had the choice.

The current landscape has created a “green divide” that prevents low-income households from tapping into the benefits of clean energy generation. However, affordable housing providers are well positioned to bridge this gap. With this guidebook, we endeavor to 1) demonstrate the benefits of bridging the green divide with clean energy, and 2) explore the tools, financial structures, and incentives to cost-effectively deploy solar photovoltaics (PV) on multifamily affordable housing.

Energy Savings
By supplying a consistent portion of energy needs, solar PV can lower a property’s electricity costs, which reduces pressure on operating budgets in the short term. Moreover, solar technology hedges against future utility rate increases, as a fixed amount of energy is effectively pre-paid upon system installation. A solar system can provide decades of clean, reliable power, and allows housing providers to both stabilize costs and invest in the future – keeping housing affordable over the long term.

Proven + Cost-Effective Technology
Solar technology is proven and has been deployed globally to meet energy needs. In 2015 alone, solar PV accounted for nearly 30% of all new electric generation in the United States. In Washington, as more residents and businesses adopt solar, equipment costs have dropped by nearly 50% in the past 5 years. Additional incentives further reduce costs, shortening payback timelines and increasing total lifetime benefits of the system. Better yet, solar can be scaled and configured to integrate with almost any property.

Environmental Benefits
In addition to saving money, solar energy lowers the carbon intensity of our electric system. Utilities across the Pacific Northwest pride themselves on having a high percentage of hydroelectric power with low carbon emissions. However, these resources deliver electricity through a regional grid, which includes coal and natural gas generation. Reductions in energy load lessen the need for fossil fuel-based energy resources, and solar represents a tangible commitment to generating local, clean energy.

Education + Job Creation
Investment in solar creates jobs throughout the supply chain, including in manufacturing, design, and installation. Affordable housing providers can play a role in supporting the development of these jobs in their communities, and local solar installers and manufacturers can be innovative partners in working to expand solar access and career pathways. As an educational tool, solar also provides an opportunity for additional outreach regarding energy efficiency and ways that tenants can take an active role in managing household electricity use.
The Solar Landscape: Technology + Terms + Trends

Let’s get started by reviewing some fundamental aspects of solar technology and the electricity market. While some market trends continue to evolve, the basic technology is based on physics and proven materials that were developed by NASA decades ago.

Solar Works in the Northwest

Does solar work in the Pacific Northwest? Absolutely! In fact, more and more people are opting to install solar systems every year throughout Washington and Oregon. Although many think of our climate as grey and rainy, the maritime Northwest actually receives 15% more annual sunlight than Germany, one of the world’s leading solar markets. East of the Cascades, our solar resource is similar to that of Spain.

Our cool climate actually helps solar modules operate more efficiently than they do in warmer climates. So, while we may not see as much annual solar resource as California or Arizona, a solar array in the Pacific Northwest is able to produce more electricity relative to the sunlight we do receive.

Figure 2: Photovoltaic solar resource in the United States - Spain - Germany

Annual average solar resource data are for a solar collector oriented toward the south at a 45° latitude. The data for Hawaii and the 48 contiguous states are derived from a model developed at NREL/Albuquerque using geostationary-weather satellite data for the period 1998-2005. The data for Alaska are derived from a 40-km satellite and surface cloud cover database for the period 1984-1990 (NREL, 2003). The data for Germany and Spain were acquired from the Joint Research Centre of the European Commission and is the yearly sum of global radiation on an optimally tilted surface for the period 1981-1990.

States and countries are shown to scale, except for Alaska.
Overview of Solar Technology
Solar photovoltaic (PV) modules operate by converting light energy from the sun into electricity, and have no moving parts. A solar installation will produce peak electricity output in direct sunlight, but also produces some electricity in cloudy and overcast conditions. Most modern solar systems are designed to maintain an instantaneous synchronization with the utility grid, and thus rely on the grid for operation. Without some sort of battery backup, most solar systems will not provide any electricity in a power outage, though backup power options do exist and are becoming increasingly cost-effective.

Overall, solar is a predictable, scalable technology that has low maintenance needs and a long system life. Solar modules typically carry warranties of 25 years or more, and have an anticipated useful lifespan of 30+ years. There are a variety of mounting techniques that allow solar modules to be integrated into almost any building. Roof-mounted systems are most common, though solutions also exist to mount solar modules to the sides of buildings as awnings or in parking lots as canopies.

While there is a considerable amount of ongoing solar research, there has not been a radical increase in commercially available module efficiency in the past decade. Rather, the drastic improvements have presented via reduced equipment costs.

Key Energy Terms
Solar can play an important role in helping affordable housing providers manage energy costs. As we further explore these impacts, a brief description of energy terminology will be useful.

- **A kilowatt (kW)** is a measure of instantaneous energy usage or generation capacity. A solar system is sold based on the peak output capacity in kW. For commercial buildings, which may include multifamily, the utility may apply a peak demand charge measured in kW of peak load that the building consumes. Solar can help offset these charges if production coincides with peak demand.

- **A kilowatt-hour (kWh)** is a measure of energy usage over time, and is used to quantify consumption and savings. For example, if a building uses one kW of energy for an hour, it has used one kWh. Annual energy savings are calculated by multiplying the utility electric rate (cents/kWh) by the total annual output of the solar system. Depending on shading, position, and annual variation, a solar system in the Puget Sound area will generate 950-1,100 kWh each year per kW capacity installed. A solar system east of the Cascades will generate up to 1,400 kWh each year per kW capacity installed.

Solar Market Trends
Both solar costs and utility electric rates are dynamic and subject to regional and global forces. In the solar marketplace, the rapid influx of solar modules from Asian manufacturers has reduced prices, while maintaining a high level of quality. From October 2011 to October 2015, solar installation costs declined by nearly 50% in local markets. While equipment costs are starting to level off, there are still reductions to be made in various “soft cost” elements, such as permitting.

The trends in electric rates are somewhat more predictable, at least in the medium term. For example, in 2014 Seattle City Light announced planned increases in all rates, averaging 4.4% per year until 2020. In all likelihood, this will not be the end of rate increases — energy experts foresee greater pressure on utility operations and further infrastructural investments needed. To the extent that affordable housing providers want to insulate themselves from rising rates, an investment in solar energy provides an attractive option.
How Solar Saves You Money

Solar PV can be a financial boon to affordable housing property managers. Not only does it result in immediate energy savings, but it also provides a hedge against future energy price increases. Moreover, state and federal incentives can drive down net installation costs. After upfront costs are recouped, a solar system will generate free electricity for decades to come.

The Big Picture

Before we delve into solar potential, it is important to consider how solar fits into the greater energy picture. An investment in solar will yield the greatest benefits if the property is already energy efficient. The energy pyramid, as shown in Figure 3, is a good way to think about how solar relates to energy saving foundations: conservation and efficiency.

Conservation, the base of the energy pyramid, hinges on reducing the energy needed to power building operations. Behavior changes like encouraging tenants to lower the thermostat and take shorter showers are good examples of conservation, as are building improvements like upgrading insulation and windows. Efficiency goes one step further, making the most out of the energy that is needed by upgrading to products that use less. The ENERGY STAR program rates product efficiency, and is a good reference when swapping out anything from light bulbs to refrigerators.

Conservation and efficiency alone will shrink your property’s energy footprint, but a solar installation will help stretch those savings even further. Solar allows housing providers to generate their remaining energy load with clean, renewable energy – and the more efficient your property already is, the less solar will be needed to meet that demand. Combining conservation, efficiency, and solar makes a cost-effective package that will result in deep savings for housing providers.

Net Energy Metering

Net metering is a utility billing arrangement that allows you to produce your own solar electricity, use it on-site, and connect to the grid. Every solar kilowatt-hour that you produce comes off your bill, so that you only pay for your “net” consumption. At any given time, if your solar system is producing more energy than the building is using, the excess will flow to the grid.
When you install a solar PV system, your standard billing meter may be swapped out with a bi-directional “net meter” that enables this push/pull relationship with the utility grid. The net meter credits your account when you energy into the grid, and deducts from your account when you pull energy from the grid. All solar production is credited against your consumption at the retail electric rate, and net excess generation is credited to your next bill. Most net metering arrangements tie the value of solar energy to the retail electricity rate, which means that it will rise in tandem with energy prices.

At the end of an annual billing cycle, unused net excess generation credit is granted to your utility – so it pays to size your system to match the property’s annual load.

Paying for Solar: Incentives + Financing Options
A variety of incentive policies and financing mechanisms exist to spur the deployment of solar energy. And, unlike other capital improvements, a solar installation produces savings over the lifetime of the system by reducing electric payments. What other improvement pays for itself with such certainty?

Federal Investment Tax Credit (ITC)
OVERVIEW The federal government provides a tax credit equal to 30% of the total installed cost of a solar system. If the system owner does not have the tax appetite to take the entire credit in the first year, the remaining credit can be rolled over to subsequent tax returns. This incentive was recently extended through December 31, 2019, after which it will step down incrementally to settle at 10% in 2022.

CONSIDERATIONS Generally, a nonprofit 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 tax credit.

Federal Low Income Housing Tax Credits (LIHTC)
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” those credits 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)
OVERVIEW Businesses can lower their taxable federal income through accelerated depreciation. Most renewable energy property – including solar PV – has a six year depreciation schedule.

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.
**Washington State Solar Incentives**

**OVERVIEW** Washington State offers an annual production incentive that pays system owners for every kilowatt-hour of electricity that their solar system produces. The rate varies from $0.15-0.54 per kilowatt-hour produced, with the higher incentive reserved for systems manufactured in Washington and community solar installations receiving double incentives. Incentives accrue annually, and expire June 30, 2020. Washington also exempts the purchase and installation of solar systems from state sales tax, for systems sized below 10 kilowatts. This incentive expires June 30, 2018.

**CONSIDERATIONS** The state production incentive is capped at $5,000 per year, per system owner. This is optimal for residential-scale solar arrays, but prevents commercial-scale arrays from capturing proportional incentive benefits. It may also prevent a single entity, such as a housing developer, from capturing incentives for multiple arrays on multiple properties. Some utilities may reach a cap on the state funds they can pay out as early as 2016, which will affect payments to existing and new customers.

**WSHFC Sustainable Energy Trust Loans**

**OVERVIEW** The Washington State Housing Finance Commission (WSHFC) has designated approximately $7 million to the Sustainable Energy Trust, a revolving loan fund to assist affordable housing providers in deploying energy efficiency and renewable energy projects. Loans are available with interest rates of 2-4% and terms of up to 10 years.

**CONSIDERATIONS** These funds represent an excellent opportunity for housing providers to access low-interest financing for energy upgrades. The Housing Finance Commission is eager to deploy the funds, and has expressed willingness to be flexible on project types and terms.

**WA DOC Ultra-High Energy Efficient Affordable Housing Demonstration Program**

**OVERVIEW** As part of the Capital Budget for the 2015-2017 biennium, the Department of Commerce has been allocated $2.5 million for the design and construction of ultra-high energy efficient affordable housing projects. Funds can be used as grants or loans to housing developers. Applicants must be Housing Trust Fund recipients, and must demonstrate energy-saving and renewable energy systems designed to reach Net-Zero Energy use after housing is fully occupied.

**CONSIDERATIONS** These funds are intended for housing providers pursuing new developments, and the opportunity to take funds as a grant is particularly attractive. Multifamily projects may be awarded $500,000-$1,000,000, and awards accrue in addition to Housing Trust Fund award. Net-Zero Energy may be a high bar for many nonprofit housing providers, though partial demonstration is acceptable.

**Seattle City Light Green Up Grant Program**

**OVERVIEW** Seattle City Light will invest a portion of its customer Green Up funds in renewable energy projects that provide community benefits through education, innovation, or community support. Nonprofit customers are eligible to apply for competitive grants to fund the costs associated with installation of a solar array.

**CONSIDERATIONS** Green Up grants are an excellent opportunity for Seattle-based nonprofit housing providers looking to close the solar funding gap. The first application period launches in 2016, and the opportunity will be available on an annual basis.
Sample Project Cash Flow

The following example models costs and benefits associated with the installation of a sample 10 kW solar array. The example assumes that federal tax benefits can be claimed by the housing provider, or by equity investors in exchange for a proportional capital contribution to the project.

Please note: This example is intended for demonstration purposes only. Actual figures will vary from project to project depending a variety of factors, including installation size, product pricing, electric utility rates, and ability to capture incentives.

<table>
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<tr>
<th>Line Item</th>
<th>Cost or Benefit</th>
<th>Timing</th>
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<tbody>
<tr>
<td>Solar PV installation</td>
<td>($40,000)</td>
<td>Upfront</td>
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<tr>
<td>10 kilowatt solar array at $4.00 per watt installed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Federal LIHTC 4% tax credits over 10 years</td>
<td>$16,000</td>
<td>At syndication</td>
</tr>
<tr>
<td>Federal ITC 30% tax credit; eligible basis decreases by 50% of LIHTC value</td>
<td>$9,600</td>
<td>At syndication</td>
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<tr>
<td>State solar incentive $0.54 per kilowatt-hour, capped at $5,000 per year</td>
<td>$5,000</td>
<td>Annually, through 2020</td>
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<tr>
<td>Net metering savings $0.08 per kilowatt-hour</td>
<td>$800</td>
<td>Annually, through life of system</td>
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<tr>
<td>Year 1 Net</td>
<td>($8,600)</td>
<td></td>
</tr>
<tr>
<td>Simple Payback</td>
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<td>Approximately 2.5 years</td>
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How Solar Integrates with Your Building

Solar photovoltaic (PV) systems convert sunlight into electricity to power your home or business. When the sun shines on a solar PV array, it produces direct current (DC) electricity. This DC electricity flows through an inverter, which “translates” the power to the alternating current (AC) electricity that is used on-site. The AC electricity flows from the inverter to the production meter, which measures every kilowatt-hour produced by your system. The electricity then flows through your breaker box and powers the property’s energy load. Any excess electricity flows through the net meter and into the utility grid.

As shown in Figure 4, modern solar systems rely on grid synchronization and will not provide electricity in a power outage. However, it may be advantageous for affordable housing providers to explore energy storage options that will provide backup power and bolster resiliency. This is especially relevant for housing providers that have critical building loads serving vulnerable populations. Critical loads may include elevators, fire alarms, mobility devices, medical equipment, or climate controls.

Storage options range from traditional battery backup systems to specific electrical outlets fed by the solar array when the grid is down. Although the addition of energy storage may result in additional upfront cost, it is important to remember that – with the proper controls – storage can provide services beyond backup power, including demand management and helping renewables “play nicely” with the electric grid. Moreover, access to basic, necessary services in the event of a power outage can enable tenants to shelter in place in the event of a power outage or emergency situation.

When considering storage, think about the needs of your tenants and the essential services of your property. Which loads are critical during a power outage? How long will you need to power them? What other sources of backup power are available?
Considerations for Multifamily Affordable Housing

While many multifamily affordable housing properties are ideal sites for solar PV, there are certain characteristics that distinguish a multifamily installation from a standard residential installation. Consider your property’s unique characteristics, and how they may impact solar siting, metering, and finances.

Metering Arrangements

Most multifamily properties are interconnected to the utility through one of three metering arrangements. The type of metering arrangement at your property impacts how your solar array will interface with the on-site energy load.

- In an *individually-metered* arrangement, every tenant has their own electrical meter associated with the unit and pays the bill. Common areas and loads related to HVAC systems are also often metered and paid for by the property manager.
- In a *master-metered* situation, the building has one central meter and the property manager allocates costs to tenants based on a proportional relationship, often based on per-unit square footage.
- *Sub-metering* is a hybrid of the two approaches, where a property manager has a central meter with the utility, but has metering technology in the building that allows some reference to how much each unit consumes.

Increasingly, housing providers are trending toward individual metering. In these cases the solar array would likely be connected to the meter that best matches the generation output – often the common area meter. Additionally, it may be possible to work with your utility to aggregate loads from multiple meters across buildings owned by the same entity, so that the electricity produced by a solar array on one building can offset the loads of multiple buildings.

Split Incentives and Utility Allowances

Affordable housing providers will also need to consider the issue of “split incentives.” As individual metering becomes more common, it is increasingly likely that the property owner is not the person who pays per-unit electric bills. Accordingly, there may be little financial incentive to install a solar array that would benefit tenants, unless some solar savings are shared back to the housing provider.

Many housing providers circumvent the split incentives issue altogether by choosing to serve only common areas with the solar array. This may be an appropriate route for some housing providers, in that it reduces the property’s operating costs and thereby helps maintain affordability. However, sizing a system to meet solely common area needs limits the possible size (and associated energy benefits) of the solar array and precludes low-income tenants from directly participating in clean energy.

Utility allowances – rent reductions to account for tenant utility costs – determined by the regional public housing authority may also impact the housing provider’s desire to share energy savings with tenants. High or inaccurate utility allowances effectively reduce the amount of rent paid to the housing provider, and simultaneously may over-compensate tenants who live in highly efficient or solar-powered units. However, utility allowances may be adjusted downwards to reflect the decrease in tenant bills due to energy improvements.
When possible, housing providers should consider sharing the benefits of solar energy with their tenants. Although this route will require more pre-development work, housing providers may find that sacrificing a small portion of energy savings is justified by the resulting tenant bill reductions, energy education, and engagement opportunities that follow. To facilitate sharing of energy benefits, housing providers may consider the following actions:

- **Pursue utility allowance adjustments.** The Actual Usage and Energy Consumption Model utility allowance methodologies have been used to obtain more accurate utility estimates in energy-efficient buildings. While no explicit model exists for reconciling utility allowances and solar, some states have pursued utility allowance reform to ease the process of integrating renewables into the affordable housing energy mix. Utility allowances calculated based on actual usage reflect solar production. In addition, there is a campaign to encourage the US Department of Housing and Urban Development to address the issue at the national level.

- **Explore virtual/community net metering.** Virtual net metering (also known as community net metering) enables individual customers to receive net metering credits on their electric bill for their share of the energy produced from a remote solar array. For example, virtual net metering would allow a single large solar array on the roof of a multifamily housing complex to offset electric usage for multiple tenant accounts in the building. This is a valuable tool for affordable housing providers that want to direct energy benefits to individual tenants, and can also facilitate the administration of Community or Shared Solar. Many utilities already offer virtual net metering to their customers, and more are looking to formalize the practice in coming years.

**Common Challenges**

- **An old roof.** Since most solar modules are warranted at 25 years or more, it makes sense to avoid installing solar on a roof that will need to be replaced in a few years. Solar professionals generally recommend that the roof have at least 10-15 years of remaining life. Alternatively, the roof can be replaced in conjunction with a solar installation, or the property owner may elect to replace just the portion of the roof where the solar array will be located. Once installed, solar PV will actually extend roof life by protecting it from weather and UV radiation. If the roof is not a good candidate for solar, housing providers may explore options for solar awnings or solar carports.

- **An old building.** Beyond roof life considerations, it is important to assess whether your building can support the added weight of a solar array. Solar generally adds at least 3-4 pounds of load per square foot of roof space. While this is not a problem for most buildings, in some cases older buildings may not have the structural stability to sustain additional weight. Discuss any concerns with your installer, and if necessary ask for help identifying a structural expert who can assess your roof’s capacity for additional load.

- **A tall building.** Whereas low-rise multifamily buildings are likely to have ample roof space for solar, tall buildings will have less roof space relative to the property’s number of units. Additionally, while a standard solar installation only requires a ladder to move modules onto the roof, buildings without 1-2 story roof access may require a lift or crane to do the same job. The need for extra equipment may add to the cost of your solar installation, though adders are generally small. If you have multiple buildings that could host a solar array, discuss with your installer which roof spaces would make for the most cost-effective installation.
• **Competing priorities.** Many affordable housing providers recognize the value of clean energy, but may be bound by tight budgets that prioritize excess funds for the highest need projects. Relative to pest management or long-overdue building maintenance, solar often takes a backseat. Moreover, it is a common misconception that a solar system will just be one more hassle for property managers to deal with. But remember – solar is low maintenance, has no moving parts, reduces utility costs, and is warrantied to produce free electricity for at least 25 years. Long-term, solar is a money saver! If upfront capital is scarce, there are several state programs that provide low-cost financing, and numerous incentives that quicken payback. See Paying for Solar: Incentives + Financing Options for more information.

• **Nonprofit tax status.** Affordable housing providers organized as nonprofits may be limited in their ability to capture existing federal solar benefits – namely a 30% tax credit and accelerated depreciation. These incentives play a key role in bringing down the upfront costs of a solar installation. However, properties financed by LIHTCs, and within the 15-year compliance period, may be able to work with equity investors to negotiate capture of tax credits in exchange for a capital contribution to the solar project. Consult a financial professional for more information.

• **Property ownership structure.** While buildings financed by LIHTCs may be able to negotiate beneficial arrangements that enable capture of tax credits, the involvement of outside investors in building ownership may also stymie solar development. After syndication, investors may not want housing providers to make capital improvements that change the cash flow of a project or alter the equity basis for calculating tax credits. Ideally, solar would be incorporated into a LIHTC construction or rehabilitation project during the planning and syndication stage. Pursuing a solar installation will be easier for affordable housing providers that own their properties (and roofs) outright.
Solar Models for Multifamily Affordable Housing

Let’s look at a few different ways that affordable housing providers can go solar. In all cases, the relationship between the utility and the customer remains generally unchanged, and all customers are eligible for net metering benefits. Capture of additional incentives may require specific ownership or tax structures, as described below.

Direct Ownership

Direct ownership provides the simplest mechanism for developing and managing a solar system. The housing provider and associated investors allocate capital or seek financing to construct the solar project, maintaining 100% ownership in the system. The housing provider is responsible for monitoring system output and performing any required maintenance. State-level production incentives accrue to the housing provider, and there are relatively few transaction costs associated with project development. The project may be eligible for federal tax credits, depending on the ownership structure of the housing provider and associated investors. However, in situations where there is no tax liability, direct ownership does not currently allow for transfer of these tax credits.

Housing providers may also explore using virtual net metering to allocate solar energy benefits to their tenants. In individually metered buildings, virtual net metering would allow a solar array to partially offset common area loads, and partially offset tenant loads. Though allocating energy savings to tenants may extend the simple payback of the solar array, it can also result in positive outcomes. For example, low tenant electric bills may reduce turnover, or encourage tenants to adopt energy conservation measures that maximize solar benefit.

Example: Holistic Savings with Solar + Energy Efficiency

By bundling solar PV with energy efficiency upgrades, housing providers can maximize energy savings and reduce brain pain. Programs like Emerald Cities’ RENEW Multifamily Housing help identify best-fit upgrades, bundle projects, seek bids, and match projects to qualified technical experts. Low-cost financing can help housing providers start saving money from day one.

Example: Capital Lease

Affordable housing providers leery of taking on additional debt may be interested in financing a solar system via a “capital lease.” WSHFC or other lenders may be able to structure a loan as a lease by acquiring a lease originated by a third party. This arrangement effectively makes loan payments on the solar installation an operating expense rather than conventional debt.
Community or Shared Solar

Community solar (sometimes referred to as shared solar) allows an organizing entity – such as a utility or nonprofit – to develop a solar project and sell “subscriptions” of that solar project to other utility customers. The solar project may be sited on property owned by the organizing entity, or on another utility customer’s property. The benefits generated by the solar system (which may include energy savings, production incentives, and tax credits) may be divvied up amongst the organizing entity, host, and customer-participants such that the arrangement is beneficial for all involved. After a pre-determined contract period, the solar system may be transacted to the host, or stay with the organizing entity.

By nature, a community solar project has higher transaction costs than a direct-ownership project. Additional resources will be needed to draw up contractual relationships between the parties, market the opportunity, calculate each participant’s annual piece of the solar pie, and distribute benefits. Depending on the situation, a housing provider may elect to administer the project themselves, or may be able to enlist the help of the local electric utility.

In this model, a low-interest loan from the WSHFC Sustainable Energy Trust may prove particularly useful. With a low-interest loan, an affordable housing provider could finance the upfront installation costs of a community solar project. Most or all of the loan principal would be recouped within the first year of system operation via incoming participant subscriptions. Participants would receive the production incentive, while the housing provider could benefit from the full value of energy savings from day one. If necessary, the housing provider could split energy savings with participants to make participants whole by the end of the subscription term.

![Community solar schematic](image-url)
Low Income Housing Tax Credits + Solar

When available, LIHTCs can help defray the upfront cost of a solar installation. Housing providers planning to apply for LIHTCs to finance new construction or existing building rehabilitation are strongly encouraged to include solar PV in their development plans. Stacking LIHTCs with federal solar incentives will enable the added solar array to pay for itself in relatively short order.

In this model, the housing provider would include a solar PV installation in the slate of building upgrades to be completed under a LIHTC syndication. Energy savings from the solar installation increase the property’s net operating income, generating increased mortgage proceeds. LIHTCs are then stacked with the federal solar tax credit and accelerated depreciation, and captured by the equity investor(s) in exchange for a proportional capital contribution. The model assumes an investment by the equity investor equivalent to the cumulative value of the LIHTC and the solar tax credit; actual values may vary on a case-by-case basis.

Due to the structure of the LIHTC program, we envision the LIHTC + solar model as a back pocket tool for new construction or existing building rehabilitation projects in the early stages of syndication planning.

![Figure 8: LIHTC syndication model schematic](image)
Next Steps to Go Solar

1. **Build organizational support**
   ✓ Determine the benefit of solar to your property. Solar plays a variety of roles in bridging the green divide, including increasing building resiliency, acting as a hedge against future electricity rate hikes, and serving as a tool for job creation and environmental education.
   ✓ Educate up! Share information about solar with organizational decision makers, and find an internal solar champion to move the project forward.
   ✓ Consider the property’s solar-readiness. If the property needs energy efficiency improvements or a new roof, consider making those first maximize your solar investment.
   ✓ Prepare to deal with dissent. Depending on the scenario, there may be challenges to deploying solar. But, solutions abound – information and resources are your best allies.

2. **Gather relevant property information**
   ✓ Utility bills for historical energy usage data.
   ✓ Building and roofing schematics for structural, electrical context.
   ✓ Property ownership – are any outside investors involved in decision-making?

3. **Contact a solar installer for a site assessment and bid**
   ✓ Check to see whether your utility has a list of solar installers in your area:
     o Seattle City Light [Solar Installers List](#)
     o Puget Sound Energy [Contractor Alliance Network](#)
     o Snohomish PUD [Registered Solar Contractors](#)
   ✓ 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.
   ✓ Compare your options – get at least three bids!
   ✓ Make an informed decision by asking questions and checking references. See Appendix 3: Choosing a Solar Contractor for a list of sample questions.

4. **Evaluate costs and financing options**
   ✓ Which solar incentives do you qualify for?
   ✓ Do 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?

5. **Prepare for twists and turns**
   ✓ If your roof is unsuitable for solar, are there other spaces like a parking lot, covered parking garage, or attached community space that could host a solar system?
   ✓ If your building could use an efficiency boost, consider combining solar with energy efficiency measures to maximize your energy savings.
   ✓ If utility allowances are keeping you from realizing the full benefits of a solar installation, consider pursuing utility allowance reform.
   ✓ If feasible, discuss allocating energy benefits to low-income tenants via virtual net metering.
Appendix 1: Is Your Roof Right for Solar?

General Considerations
Start by taking a look at your roof’s orientation to the sun. While south-facing roofs are best for solar, east- and west-facing roofs work too. An east-facing solar array will produce about 85% of the electricity of a south-facing array, while a west-facing solar array will do slightly better at about 88%. Generally, solar modules are mounted parallel to the roof slope, though flat-roofed buildings can optimize tilt with the addition of upright racking.

Also consider the age and condition of your roof. Since most solar modules are warrantied at 25 years or more, it makes sense to avoid installing solar on a roof that will need to be replaced in a few years. Solar professionals generally recommend that the roof have at least 10-15 years of remaining life. Alternatively, the roof can be replaced in conjunction with a solar installation, or the property owner may elect to replace just the portion of the roof where the solar array will be located. Once installed, solar PV will actually extend the life of your roof by protecting it from weather and UV radiation.

Keep an eye out for sources of shade that will reduce solar production. Potential sources of shade include nearby trees or buildings, power lines, and other structures on the building’s roof. Don’t forget that trees and vegetation that are below the roof’s edge now may become a shade source in the future!

Solar installers use a special tool to assess site-specific shade impacts as the sun moves across the horizon. Based on this assessment, your installer may suggest using micro-inverters or power optimizers to mitigate the effects of partial shade.

Look into the zoning and fire code regulations specific to your area. In Washington, the fire code has been modified to ensure adequate ventilation and roof access to first responders without unnecessarily limiting solar PV options.

Recap: What Does a Solar-Ready Property Look Like?
If your property meets the following criteria, you’re ready to pursue a solar installation:

- Roof faces south, east, or west
- Roof is in good condition and has at least 10-15 years of life remaining
- For roof-mounted system, roof warranty not voided by penetrations
- For ballasted system, roof can hold additional weight
- No significant sources of current or future shade
- System design is compliant with local zoning and fire codes
- Property has sufficient electrical load to match annual solar production
- Property ownership permits solar installation
General Considerations

How much solar PV could fit on your building? It depends on the size of your roof, the efficiency of the solar modules that you select, and your building’s energy load. A typical solar module is roughly 5 feet by 3 feet, but modules differ in how much power generation capacity they pack into that square footage. Modules on the market today are generally rated at 250-300 watts each.

A good rule of thumb is that one kilowatt of solar takes up 80-100 square feet. So, a 10 kilowatt solar array might require 800-1,000 square feet of roof space. As module efficiency improves over time, this area will shrink.

Beyond roof size and module efficiency, it is important to consider the energy needs of your building when sizing a solar array. In Washington, your ability to net meter the solar electricity produced on your roof is capped at the building’s annual electric load. If your solar array produces more electricity than the building uses in a year, the utility will claim the excess generation. In some cases, it may be possible to work with your utility to “aggregate” loads from multiple meters across buildings owned by the same entity, so that the electricity produced by a solar array on one building can offset the loads of multiple buildings.

Determining Your Energy Load

Your monthly or bi-monthly electricity bill tells the story of your property’s energy usage. Though you may be accustomed to scanning your bill for “Total Amount Due,” understanding the details of your electricity bill will help you determine your property’s electric load, the rate you pay for electricity, and how your electricity consumption changes over time.

Figure 9: Sample Seattle City Light electric bill (Source: Seattle City Light)
• **Expanded Usage Graph (4).** The graph on the left hand side of your electric bill shows up to two years of consumption history, by average kilowatt-hour use per day. By multiplying your average daily usage by the number of days in each billing period, you can approximate your total annual kilowatt-hour consumption.

• **Detailed Billing Information (5).** This section shows consumption billed at the utility’s various rate levels. Rate levels vary by type of customer, season (summer vs. winter), and in some cases time of use. Generally, consumption charges can be understood as follows:
  a. Base service charge every residential customer is charged regardless of consumption. For non-residential customers, this will appear as a “minimum charge” and is billed only if the total electricity bill is less than the minimum charge amount.
  b. Consumption and charges at the current, first tier rate level
  c. Consumption and charges at the current, second tier rate level

• **“Peak,” “Time-of-Use,” and “Demand” Charges.** Large or commercial facilities may see a variety of rates applied to their energy use. Peak, time-of-use, or demand charges may apply during times of the day when electricity use is high across the utility’s customer base, or when the property’s utility account has surpassed a certain threshold of energy use. These rate structures are designed to encourage consumption during less expensive off-peak periods. Installation of a solar array can help housing providers cut down these charges, in cases where the array’s production coincides with peak periods.

*If you haven’t saved your past electric bills, you can contact your electric utility to recover at least one year’s usage history.*
Appendix 3: Choosing a Solar Contractor

Use the following questions and tools to guide selection of a solar contractor for your property.

**Firm Experience + Services**
1. How long has your firm been installing solar? How many installations have you completed in my city or county? Have you worked with my electric utility before?

2. What experience does your firm have working on multifamily (affordable housing) projects? What were the primary challenges, and did any unexpected issues arise?

3. What are your firm’s staff qualifications? How many years of experience do key staff have? Are installers NABCEP certified?

4. If the property needs additional work to be made solar-ready (e.g. electrical panel upgrades, structural support upgrades, new roof), how will your firm manage this? Do you have in-house staff, subcontractors, or relationships with other service providers?

5. What additional services does your firm provide (e.g. wiring for/installation of energy storage, energy efficiency upgrades, electric car charging stations)?

6. Can your firm provide references for recent, similar projects? Ask for 2-3 references.

**Project Cost + Timeline**
7. Walk through the solar bid. Why are the proposed products appropriate for this project? Are there any “adders” (e.g. for roof access, roof slope, additional supports, additional electrical work, monitoring system)?

8. Are there any additional fees that are not included in the bid price?

9. Where will the solar installation be located? Where will the conduit run? Where will the inverter(s) and production meter be located? Is my current electrical panel sufficient to accommodate this equipment?

10. How will the solar equipment be mounted to the roof? Will there be roof penetrations? If so, are they waterproof? Is my roof sufficiently sound to accommodate the added weight of a solar system?

11. What warranties and guarantees does your firm provide for the proposed products, and what do they cover? Make sure to ask about both equipment guarantees (hardware, performance) and workmanship guarantees.

12. What is your firm’s current workload? Do you have any major ongoing projects that may result in changes to the anticipated construction timeline for this project?
Customer Care
13. Does your firm help customers with utility and incentive paperwork? Is the customer responsible for any ongoing reporting of system performance or production?

14. What kind of training does your firm provide the solar system owner (materials/manuals, customer care books, support for later questions and system performance)?

15. What ongoing maintenance services does your firm provide? How often do you check performance data? How do you check data – on-site visit or remote monitoring?

16. How does your firm handle incident reports (installation problems, warranty calls, service calls)? What are your hours of service for customer service calls, typical response time, and process for providing status reports after an incident is logged?

Other Tips
- Always get multiple bids before you sign a contract. Be wary of high-pressure sales techniques.
- Research firms on the Better Business Bureau and other consumer protection websites. Check to see whether your utility has a contractor qualification program (see Next Steps to Go Solar) and what the requirements of that program are.
- Investigate your ability to receive tax credits and other incentives before signing a contract (see Paying for Solar: Incentives + Financing Options).

Comparing Quotes
Solar contractors will present their bids in different formats, but they should always give you the following information so you can compare bids on an apples-to-apples basis. Use this table to compare pricing between different contractor bids.

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<th>Contractor A</th>
<th>Contractor B</th>
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<td>b. Inverter type</td>
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<td>c. System size (kW)</td>
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<td>d. System size (watts)</td>
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<td>watts = kW x 1000</td>
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<td>e. Energy production (kWh/year)</td>
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<td>f. Price (before incentives)</td>
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<td>g. Price per watt</td>
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<td>(f.) ÷ (d.)</td>
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<td>h. Estimated payback (years)</td>
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Appendix 4: Additional Resources

Publications

A Directory of State Clean Energy Programs and Policies for Low-Income Residents
Survey of state programs and policies that benefit low- and moderate-income individuals and communities. Published in January 2016 by the Clean Energy States Alliance.

Energy Efficiency and Renewable Energy in Low-Income Communities: A Guide to EPA Programs
Guidebook designed to help state and local governments connect with EPA programs that can help them expand or develop their own energy and climate initiatives in ways that benefit low-income communities. Published in January 2016 by the US Environmental Protection Agency.

Just Energy Policies: Reducing Pollution and Creating Jobs
Resource to spur states to ensure that their energy policies protect communities and provide equitable access to economic opportunities in clean energy. Published in January 2014 by the NAACP.

Low-Income Solar Policy Guide
Guide for policymakers, community leaders, and others working on solar access to drive the proposal and adoption of new low-income solar policies and programs. Published in March 2016 by GRID Alternatives, Vote Solar, and the Center for Social Inclusion.

Resilience for Free: How Solar + Storage Could Protect Multifamily Affordable Housing from Power Outages at Little or No Net Cost
Publication that explores the ability of solar + storage systems to reduce costs and increase power resiliency in multifamily affordable housing. Published in October 2015 by the Clean Energy Group.

Shared Renewable Energy for Low- to Moderate-Income Consumers
Guide for policymakers, regulators, utilities, developers, and program administrators to support the implementation of shared renewables programs that provide tangible benefits to low- and moderate-income households. Published in March 2016 by the Interstate Renewable Energy Council.

Step-By-Step Retrofit Process Toolkit
Roadmap for multifamily housing owners, investors, and developers that outlines a comprehensive, cost-effective approach to retrofitting multifamily affordable housing and the critical steps necessary for success. Published in January 2013 by Enterprise Green Communities.

Web Tools

Environmental Justice Screening and Mapping Tool
Environmental Protection Agency tool based on nationally consistent data that combines environmental and demographic indicators in maps and reports.

National Equity Atlas
A first-of-its-kind data and policy tool for community leaders and policymakers working to build a new economy that is equitable, resilient, and prosperous.

Renew300
Initiative by the US Department of Housing and Urban Development to triple the federal renewable energy target set in President Obama’s Climate Action Plan by including shared solar systems.
 Organizations

Northwest SEED
Northwest SEED is a nonprofit organization with a mission to create communities powered by locally controlled clean energy. Through our Affordable Clean Energy for All program, Northwest SEED is working with local stakeholders to bring down the barriers to solar energy deployment. Our work includes research into best practices, project feasibility and design with affordable housing providers, and policy advocacy to support long-term systems change that will level the solar playing field.

Emerald Cities Seattle
Emerald Cities is a national nonprofit collaborative of government, labor, business, and community organizations working together to advance a sustainable environment while creating greater economic opportunities for all. The Emerald Cities RENEW Multifamily Housing program provides a comprehensive approach to achieving energy and water sustainability.

Enterprise Community Partners
Enterprise creates opportunity for low- and moderate-income people through affordable housing in diverse, thriving communities. Enterprise Green Communities helps developers, investors, builders, and policymakers make the transition to a green future for affordable housing.

Network for Energy, Water, and Health in Affordable Buildings
NEWHAB works to expand healthy, efficient housing for all by leveraging the relationships between individuals, sectors, and policies. Network members collaborate to create a platform and community to share best practices, innovations, and successes; connect people working on policy and projects from multiple sectors; and leverage collective influence to change policy.

Washington State Housing Finance Commission
The Washington State Housing Finance Commission is dedicated to increasing housing access and affordability and to expanding the availability of quality community services for the people of Washington. The Commission offers tools to affordably develop energy-efficient buildings, upgrade existing buildings, and create or conserve energy for single-family homes, multifamily housing, and nonprofit facilities.

Washington State Energy Office
The Washington Department of Commerce State Energy Office provides technical and policy support, reviews key energy issues, and manages the Washington State Energy Program project and Clean Energy Fund programs. The Clean Energy Fund 2 enables a mix of projects that will support development, demonstration, and deployment of clean energy technologies.

Washington State University Energy Extension Program
The WSU Energy Extension Program provides training, on-site assessments, and analytical tools to meet evolving energy challenges. The organization partners with a wide range of agencies, organizations, institutions, and businesses to identify energy challenges and develop solutions based on world-class research. Energy experts work with customers to develop and deliver tools and resources to advance building efficiency, renewable energy, workforce and economic development, facility support, and more.