Seattle Department of Construction and Inspections
sdci
Tip 420
GREEN
Seattle Permits
— part of a multi-departmental City of Seattle series on getting a permit

Solar Energy Systems

Updated August 5, 2022

This Tip was developed jointly by the Seattle Department of Construction and Inspections (SDCI) and Seattle City Light (SCL), to ensure that solar electric and hot water systems , are installed safely and provide their maximum benefit to the owner.

Benefits of solar energy systems include:

- Lower energy bills and energy conservation.
- Clean energy production that helps meet Seattle's greenhouse gas reduction targets and climate action goals
- New economic opportunities and green jobs
- Power from secure, local energy

In addition to this Tip, you can find more detailed information on solar access, sizing to fit your project's needs, and performance in SCL's Guide to Installing a Solar Electric System available at: **https://energysolutions.seattle.gov/renewable-energy/customer-solar.**

Types of Solar Energy Systems

You can use solar energy to produce electricity or to heat water.

Solar Electric Systems (also called Photovoltaic or "PV" systems) convert sunlight directly into electricity you can use in your home or business. With a solar electric system, you pay less for electricity from Seattle City Light. If your system produces more electricity than you need at any given time, it will supply the grid, spinning your utility meter backwards. This process is called "net metering."

Solar Hot Water Systems use the sun's heat to preheat water before it enters your conventional water heater. With a solar water heater, you pay less for the electricity or natural gas that you normally use to heat your water.

PERMIT REQUIREMENTS

You need to obtain the required permits to install your solar system. For specific information, you should contact SDCI's Applicant Service Center (ASC) at (206) 684-8850.

Building Permit

You may not need a building permit for solar electric systems when all the following are met and confirmed by the installer:

- The solar electric (photovoltaic) system is designed and proposed for a rooftop of a single-family house.
- The mounting system is engineered and designed for solar electric systems.
- The rooftop is made from lightweight material such as shingle.
- Panels aren't mounted higher than 18" above the surface of the roof where they will be attached. None of the system may exceed the highest point of a pitched roof.
- The total (dead load) weight of the panels, supports, mountings, raceways, and all other accessories isn't more than 5 pounds per square foot.
- The supports for the solar panels are installed to spread the weight across as many roof framing sections as needed to ensure that at no point are loads in excess of 50 pounds exerted on a single section.
- The attachment to the roof is specified by the mounting system manufacturer.

Building a Better Seattle

The green series is just one of many resources designed to help you build green and create value for your project from initial concept planning to permitting, construction and operation. To learn more, please visit seattle.gov/sdci.

- The method and type of weatherproofing roof penetrations, such as grommets or flashing, are provided.
- The structure meets land use regulations, such as setbacks and height.
- Fire code requirements are met.

You may need a building permit for solar energy systems when:

- Residential rooftop solar electric systems do not meet all of the above.
- The solar electric system is for a commercial or industrial application.
- The solar electric systems are not on a rooftop and require standalone support structures on the ground.
- The solar electric system is part of building alterations or additions, valued over $6,000 (not including the value of the solar equipment).

Even if you are exempt from the permit requirements, you must follow all relevant codes, laws, or ordinances.

Electrical Permit

You need to get an electrical permit for all solar electric systems as listed in the chart below.

For more information, visit: **http://www.seattle.gov/sdci/permits/permits-we-issue-(a-z)/electrical-permit**. Call our Electrical Technical Support at (206) 684-5383 if you have questions.

SCL requires an Interconnection Application and Agreement, which is conditional on the final approval of your electrical permit (see Interconnection and Net Metering Requirements on page 5).

Plumbing Permit

You need a plumbing permit when installing a solar hot water system. Plumbing permits are approved and issued by the Seattle/King County Public Health Department: **www.kingcounty.gov/healthservices/health/ehs/portal.**

Energy Code Requirements

The Seattle Energy Code, Section C412, requires on-site renewable energy for most "commercial buildings," meaning buildings other than single-family and low-rise multifamily buildings. This on-site renewable energy typically takes the form of solar PV arrays. Additional renewable energy is also one of the options available to comply with Section C406 for commercial buildings. for further information on energy code requirements, see Tip 422 - Renewable Energy and Solar-Ready Roofs.

Renewable Energy Rating System	Is Online Permitting Available?	Is a Plan Required?	What is the Permit Fee?(As of 2021)
0-7.7 KW	Yes	Yes. You must have your plans and manufacturer installation instructions available onsite for the electrical inspector before calling for your first cover inspection. The preferred plan size is 11 x 17 inches.	$238.90 (3/4 base + $65.65 admin fee)
>7.7 - 26 KW	Yes	Yes. You must email your plans to **dpd_renewable_energy@seattle.gov** (underscore between words) after the online permit is issued. Your emailed plan, including manufacturer installation instructions, should be named as PermitNumber Address.pdf (6441142 1111 2nd Ave SW.pdf). The preferred plan size 11 x 17 inches.	$254 (1 x base + $64 admin fee
>26 KW	No*	Submit two plan sets and specifications including system layout and all system components at time of application.	Based on value of system

*Electronic plan review is available via SDCI's electronic plan review portal with permission from the Electrical Program Manager.

FIRE CODE REQUIREMENTS

Solar Photovalic (PV) systems present unique electric shock hazards for firefighters.

During firefighting activities, firefighters will disconnect the electricity to the building. The electric output of the solar system inverter instantly shuts down when utility power is interrupted. However, although the direct current (DC) isn't flowing, the PV system DC voltage remains and can be an electrical hazard to firefighters.

Locations of Direct Current Conductors

The following are installation requirements for the Seattle Fire Code:

- Conduit, wiring systems, and raceways for photovoltaic circuits are located as close as possible to the ridge or hip or valley and from the hip or valley as directly as possible to an outside wall.
- Conduit runs between sub arrays and to DC combiner boxes are installed in a manner that minimizes the total amount of conduit on the roof by taking the shortest path from the array to the DC combiner box.
- DC combiner boxes are located such that conduit runs are minimized in the access pathways between arrays.
- DC wiring is installed in metallic conduit or raceways when located within enclosed spaces in a building.

Additional Signage and Marking Requirements

In addition to the provisions of the Seattle Electrical Code, the Seattle Fire Code requires marking on interior and exterior DC conduit, enclosures, raceways, cable assemblies, junction boxes, combiner boxes and disconnects as follows:

- The materials used for marking must be reflective, weather resistant and suitable for the environment.
- Marking must have all letters capitalized with a minimum height of 3/8-inch white on red background, and read "PHOTOVOLTAIC POWER SOURCE."
- Marking must be placed on interior and exterior DC conduit, raceways, enclosures and cable assemblies every 10 feet, within 1 foot of turns or bends and within 1 foot above and below penetrations of roofs or ceilings, walls, or barriers.
- Provide an identification plate adjacent to the main service disconnect that is clearly visible from the location where the disconnect is operated to provide emergency responders with appropriate warning regarding the solar electric system.

Rapid Shutdown of PV Systems on Buildings

You may be able to get the Seattle Fire Code provisions for locations of DC conductors and additional signage and marking waived. To be eligible, your solar electric systems must comply with Seattle Electrical Code Section 690.12, Rapid Shutdown of PV Systems on Buildings, as approved by SDCI's Electrical Division.

Access and Pathways to Residential PV Systems for One- and Two-Family Dwellings

You are not required to comply with the Seattle Fire Code Section 605.11.3 provisions for roof access and pathways for one- and two- family dwellings that meet one of the following:

- The structure has an approved automatic fire sprinkler system installed.
- The roofs have slopes of two units vertical in twelve units horizontal (2:12) or less.
- The total combined area of the solar array does not exceed thirty-three percent (as measured in the plan view) of the total roof area of the structure, the solar array will measure 1,000 square feet or less in area, and where a minimum 18-inch wide unobstructed pathway is maintained along each side of any horizontal ridge.
- The structure is a detached, noninhabitable Group U occupancy, such as a storage shed.

For one- and two- family dwellings having PV systems that do not meet the above criteria:

- Roof access points must be located at strong points of building construction, in areas that do not require the placement of ground ladders over openings such as windows or doors, and in locations where the access point does not conflict with overhead obstructions such as tree limbs, wires, or signs.
- Each PV system array must be not be greater than 150 feet by 150 feet.
- Panels/modules must be located at least 18 inches below the ridge to allow the fire department to ventilate smoke Common Residential Roof Types.

Single Ridge. Panels/modules installed on one- and two-family dwellings with a single ridge must be located so that there are two, 3-feet-wide unobstructed access pathways from the eave to the ridge on each roof slope where the panels/modules are located.

Hip Roof Layouts. Panels/modules installed on one- and two- family dwellings with hip roof layouts must be located so that there is a 3-foot-wide clear access pathway from the eave to the ridge on each roof slope where the panels/modules are located. The access pathway must be located at a structurally strong location on the building capable of supporting the fire fighters accessing the roof.

Roof Hips and Valleys. Panels/modules installed on one- and two- family dwellings with roof hips and valleys must be located no closer than 18 inches to a hip or a valley where the panels/modules are to be placed on both sides of a hip or valley. Where panels are to be located on only one side of a hip or valley, the panels are permitted to be placed directly adjacent to the hip or valley.

Please refer to Appendix 1 for graphic examples of depicting pathways for residential one-and two-family dwellings.

For further information for multifamily and commercial systems please reference the 2015 Seattle Fire Code at: **http://www.seattle.gov/sdci/codes/codes-we-enforce-(a-z)/fire-code.**

LAND USE REQUIREMENTS

The following information is excerpted from the Seattle Municipal Code (SMC), but does not substitute for reading the full code.

In general, your alterations and additions to existing buildings must be permitted and conform to the lot coverage and height and setback (yard) requirements described in the Land Use Code. Solar energy systems referred to in the Land Use Code as solar collectors are permitted outright as an accessory use. Solar collectors are defined as "any device used to collect direct sunlight for use in the heating or cooling of a structure, domestic hot water, or swimming pool, or the generation of electricity" (SMC 23.44.046). This means the collectors are incidental to and support the principal use of the lot, such as a home or business.

Figure 3 (at the end of the Tip), summarizes how solar systems fit in with land use and zoning requirements.

DESIGN AND INSTALLATION CONSIDERATIONS

Rooftop Installations

If you install elevated PV panels on a flat roof, covered usable space may be created that could be classified as an additional story.

Solar Access and Performance

For optimal solar performance your solar energy system should be in a location that has clear unobstructed access to the sun (free of shading from roofs, trees and other landscape features) for most of the day and throughout the year. During a site evaluation, a solar contractor should evaluate potential collector locations using a tool like a Solar Pathfinder that illustrates annual shade impacts.

Tree Removal

If you are considering pruning or removing trees to improve solar access, it is important to review applicable regulations and permit requirements while planning your solar array. Permits for solar energy systems do not consider adjacent trees or give property owners special permission to remove trees that could interfere with their system.

- Tip 242, *Tree Protection Regulations in Seattle*, summarizes tree regulations for private property.
- Regulations for street trees (trees located in the public right-of-way) are available at: **http://www.seattle.gov/transportation/permits-and-services/permits/street-tree-permits.**

Rooftop Structural

If you are unsure about the structural integrity of your roof, or if it needs repair, have it professionally inspected to verify its condition and suitability. You may need to make roofing improvements prior to mounting solar panels.

If you are installing your solar energy system on your roof, be sure to provide a stable and durable connection to the roof structure for the size and weight of the components used. Take extra care to ensure a leak-proof installation. Consult an experienced building contractor or structural engineer for unusual, complicated, or heavy installations. We may require engineering documents in some circumstances.

Electrical

Connecting solar equipment safely to an existing electrical service requires careful consideration and planning. You may need to make modifications to branch circuit wiring or the panel board. You must have a solar electric system breaker connected to the breaker furthest from the main breaker. You must include information about all changes to the electrical system n your electric permit application. Be sure to follow all manufacturer installation instructions.

All components of your solar electric system, such as photovoltaic modules and inverters, must be listed by a nationally recognized testing laboratory. See Article 690 of the National Electrical Code for requirements specific to solar photovoltaic systems, and SCL's Interconnection Standards for more detail about electrical requirements.

INTERCONNECTION AND NET METERING REQUIREMENTS FOR SOLAR ELECTRIC SYSTEMS

Net Metering Benefits and Options

The advantage of interconnection and net metering, compared to solar electric systems operated independently of a utility grid, is that customers on the grid are assured of electricity needs being met year round regardless of solar availability and the size of system installed. With net metering any excess electricity generated by the customer during a billing period is credited back to the customer. In addition, a battery-less, interconnected system avoids inefficiencies and maintenance costs associated with battery storage.

Customer-owned, grid-connected generating systems (solar, wind, biomass, hydro, and fuel cell systems) of 100 kW or less qualify for SCL's Net Metering program and are subject to inspection. Some arrays up to 250 kW in the Large Solar Program are also eligible for net metering.

Net Metering Required Forms

You are required to fill out an Interconnection Application and Agreement in order to connect to SCL's grid. The agreement holds you accountable for meeting specific interconnection standards and safety requirements. You are responsible for the proper installation and operation of your solar electric systems. Your system installation and operation must conform with all applicable codes, regulations, and manufacturer's safety and operating manuals.

CHOOSING A CONTRACTOR

If you have the required construction and electrical experience, you may install your own solar electric systems. However, we highly recommend using a licensed contractor. Considerations for selecting qualified contractors are:

- Do they have a business license?
- Are they licensed for the work you want them to do (mechanical, electrical, structural, etc.)?
- How long have they been in business?
- How many solar energy systems have they installed?
- Will they provide references?
- Have they attended manufacturer, trade association, or other training on solar electric installations?

Please check the Washington Labor and Industries website at **www.lni.wa.gov/TradesLicensing/Contractors/HireCon** to learn more about the listed contractor, licensing status, violations, etc.

The North American Board of Certified Energy Practitioners (NABCEP) runs a quality credentialing and certification program for renewable energy professionals. In order to be NABCEP certified, a practitioner must meet installation experience requirements, sign a code of ethics, and pass a four-hour exam. Look for the NABCEP seal on contractors' websites. More information about NABCEP and a list of certified installers can be found at their website at **www.nabcep.org.**

A complete bid to install your system will include the total cost of getting it up and running, including all equipment, wiring, installation, grid connection, permits, sales tax, and warranty.

FINANCIAL INCENTIVES

Federal Tax Credit

Individuals and businesses that install solar energy systems are eligible for a federal tax credit of 30 percent of the system cost (the total of the installation and materials). Individuals need to fill out Residential Energy Credits IRS Form 5695 and businesses need to use the Investment Credit IRS Form 3468. Updated forms can be found on the IRS website at **www.irs.gov**. For questions on the tax credits please consult your tax advisor.

State Sales Tax Exemption

Solar electric systems are eligible for a partial reduction or exemption from state sales taxes, depending on the system's size and year of installation. Consult your contractor for details on this tax exemption.

FURTHER ASSISTANCE

Contact SDCI's Applicant Services Center, before you begin your project, to talk with a permit specialist or land use planner about specific code requirements and installation considerations for your project. Call SLC's Energy Advisory Line at (206) 684-3800 if you have general solar-related questions.

SDCI Applicant Services Center and Public Resource Center

You can find information about permit applications and issuance, plan review, and permit history through SDCI's Applicant Services Center (**http://www.seattle.gov/sdci/about-us/who-we-are/applicant-services-center**) and Public Resource Center (**http://www.seattle.gov/sdci/about-us/who-we-are/public-resource-center**).

SCL Conservation Resources Division

SCL's solar homepage, **www.seattle.gov/light/solarenergy**, provides the necessary applications for interconnection and net metering, production metering, and Washington State Department of Revenue system certification.

For information and assistance on City Light renewable energy and energy efficiency programs for home or business, contact an energy advisor at:

(206) 684-3800
SCLEnergyAdvisor@seattle.gov
www.seattle.gov/light/conserve

Resources for City Light Customers

The **City Light website** includes several resources for customers who are considering a rooftop solar array. It describes the steps that customers will take to apply for a renewable energy production credit for residential solar PV systems, including interconnection and net metering, production metering, and Washington State Department of Revenue system certification.

For information and assistance on City Light renewable energy and energy efficiency programs for home or business, contact a City Light **Energy Advisor** at (206) 684-3800.

For assistance with energy strategy development, daylighting design guidance/simulation, and whole building energy modeling for commercial, education, and healthcare facilities contact the City Light design partners at the **UW Center for Integrated Design** at (206) 616-6566.

SCL Service Centers

Providing interconnection, net metering, and production metering assistance:

SCL North Service Center
(for projects north of Denny Way)
1300 N. 97th Street
(206) 615-0600

SCL South Service Center
(for projects south of Denny Way)
3613 Fifth Avenue South
(206) 386-4200

Solar Washington

The local chapter of the American Solar Energy Society promotes the development of solar and renewable energy through education and training. Events, articles, newsletter, and links are posted on their website at **www.solarwashington.org**.

US Department of Energy

Energy Efficiwwency and Renewable Energy

This division of the Department of Energy has a focus on enhancing renewable and sustainable energy production. You can find information about types of energy, state information, funding, and a consumer guide on their website at **www.eere.energy.gov**.

Energy Star

Energy Star is a joint program of the U.S. Department of Energy and the U.S. Environmental Protection Agency, providing consumer information on energy-efficient products and practices. Visit their website for more information at **www.energystar.gov.**

Northwest Solar Communities

Northwest Solar Communities is a coalition of jurisdictions, utilities, industry partners and citizen groups, working together to make rooftop solar electricity more cost-effective for all. The coalition grew out of the Evergreen State Solar Partnership, led by the Washington Department of Commerce and Northwest SEED. For more information, visit their website at **www.nwsolarcommunities.org.**

Access to Information

Links to SDCI Tips, codes and forms are available on our website at **www.seattle.gov/sdci**.

Figure 3: Land Use Requirements for Solar Collectors. The following is excerpted from the Seattle Municipal Code (SMC), but does not substitute or complete information.

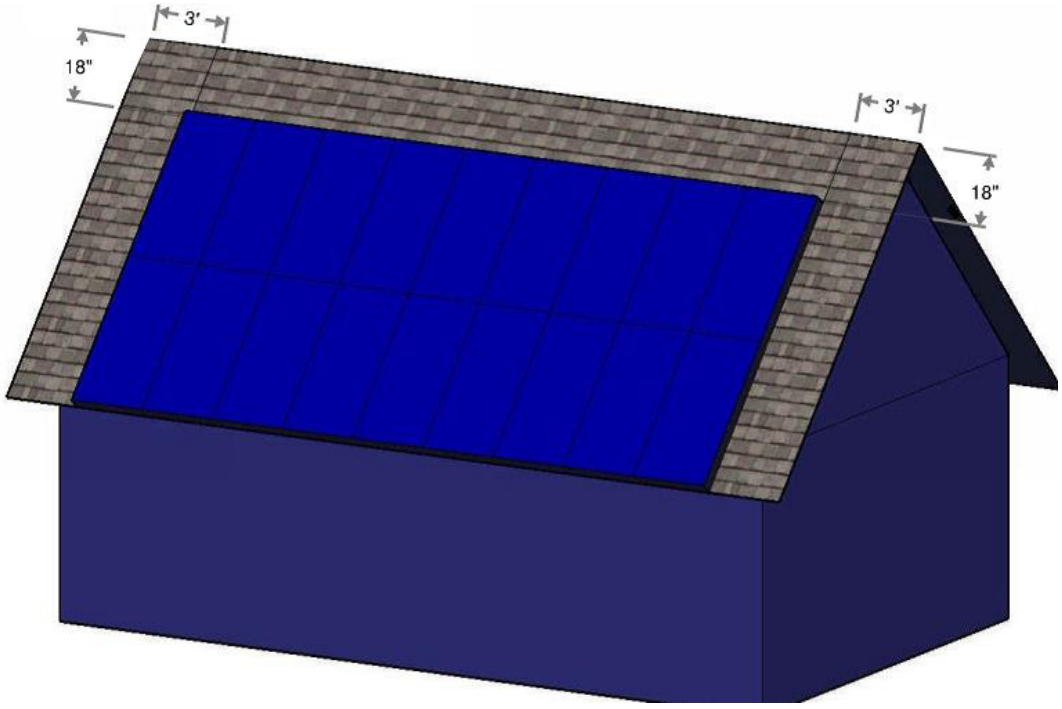
Requirements	Single Family/ Residential Small Lot	Lowrise Multifamily	Midrise and Highrise Residential	Commercial Neighborhood Commercial with 30 and 40 foot height	Commercial Neighborhood Commercial with 65 foot or more height	Industrial	Seattle Mixed	Downtown
Height	SMC 23.44.046	23.45.545	23.45.545	23.47A.012	23.47A.012	23.50.020	23.48.010	23.49.008
Max. Height	**4 feet** above the height limit, or **4 feet** above the ridge of a pitched roof. Total height from existing grade to the top of the solar collectors no more **than 9 feet** above height limit	**4 feet** above height limits (additional height for pitched roofs may not be counted in this measurement) or **4 feet** above the height of elevator or stair penthouse(s)	**10 feet** above the maximum height limit or **10 feet** above the height of elevator or stair penthouse(s)	**4 feet** above height limit, with unlimited rooftop coverage or **15 feet** above the applicable height limit, as long as the combined total coverage does not exceed **20 percent of the roof area** or *25 percent of the roof area if the total includes stair or elevator penthouses or screened mechanical equipment.*	**7 feet** above height limit, with unlimited rooftop coverage or *15 feet* above the applicable height limit, as long as the combined total coverage does not exceed **20 percent of the roof area** or *25 percent of the roof area if the total includes stair or elevator penthouses or screened mechanical equipment.*	**7 feet** above height limit, with unlimited rooftop coverage or **15 feet** above the applicable height limit, as long as the combined total coverage does not exceed **20 percent of the roof area** or *25 percent of the roof area if the total includes stair or elevator penthouses or screened mechanical equipment.*	**7 feet** above height limit, with unlimited rooftop coverage or **15 feet** above the applicable height limit, as long as the combined total coverage does not exceed **20 percent of the roof area** or *25 percent of the roof area if the total includes stair or elevator penthouses or screened mechanical equipment.*	**7 feet** above the height limit with unlimited rooftop coverage or **15 feet** above the applicable height limit when combined coverage of all rooftop features, does not exceed **35 percent of the roof area** or *55 percent of the roof area for structures that are subject to maximum floor area limits per story.*
Protection of Solar Access		Locate at least **15 feet from the north edge of the roof** unless a shadow diagram is provided that demonstrates that locating such features within 15 feet of the north edge of the roof would not shade property to the north on January 21st at noon more than would a structure built to maximum permitted height and FAR		Locate at least **10 feet from the north edge of the roof** unless a shadow diagram is provided that demonstrates that locating such features within 10 feet of the north edge of the roof would not shade property to the north on January 21st at noon more than would a structure built to maximum permitted height and FAR			Locate at least **10 feet from the north edge of the roof**, or provide shadow diagrams to demonstrate that the proposed location of such rooftop features would shade property to the north on January 21st at noon no more than would a structure built to maximum permitted bulk	

Requirements	Single Family/ Residential Small Lot	Lowrise Multifamily	Midrise and Highrise Residential	Commercial Neighborhood Commercial with 30 and 40 foot height	Commercial Neighborhood Commercial with 65 foot or more height	Industrial	Seattle Mixed	Downtown
Setbacks/yards	23.44.046	23.45.545	23.45.545	23.47A.014	23.47A.014	NA	NA	NA
Setback/yards Front	Same as principal structure	Same as principal structure	Same as principal structure	Three (3) feet to any lot line that abuts a residentially zoned lot.	Three (3) feet to any lot line that abuts a residentially zoned lot.	NA	NA	NA
Side	3	3	3	Three (3) feet to any lot line that abuts a residentially zoned lot.	Three (3) feet to any lot line that abuts a residentially zoned lot.	NA	NA	NA
Rear	15	No closer than 5 feet to any other principal or accessory structure.	No closer than 5 feet to any other principal or accessory structure.	Three (3) feet to any lot line that abuts a residentially zoned lot.	Three (3) feet to any lot line that abuts a residentially zoned lot.	NA	NA	NA
Other	No closer than 5 feet to any other principal or accessory structure.	No closer than 5 feet to any other principal or accessory structure.	No closer than 5 feet to any other principal or accessory structure.	Three (3) feet to any lot line that abuts a residentially zoned lot.	three (3) feet to any lot line that abuts a residentially zoned lot	NA	NA	NA
Lot Coverage	Not counted	NA	NA	NA	NA	NA	NA	NA
Non-Conforming Structures	Applicant's should contact the SDCIs Applicant Service Center (ASC) at (206) 684-8850 or www.seattle.gov/sdci/about-us/who-we-are/applicant-services-center							

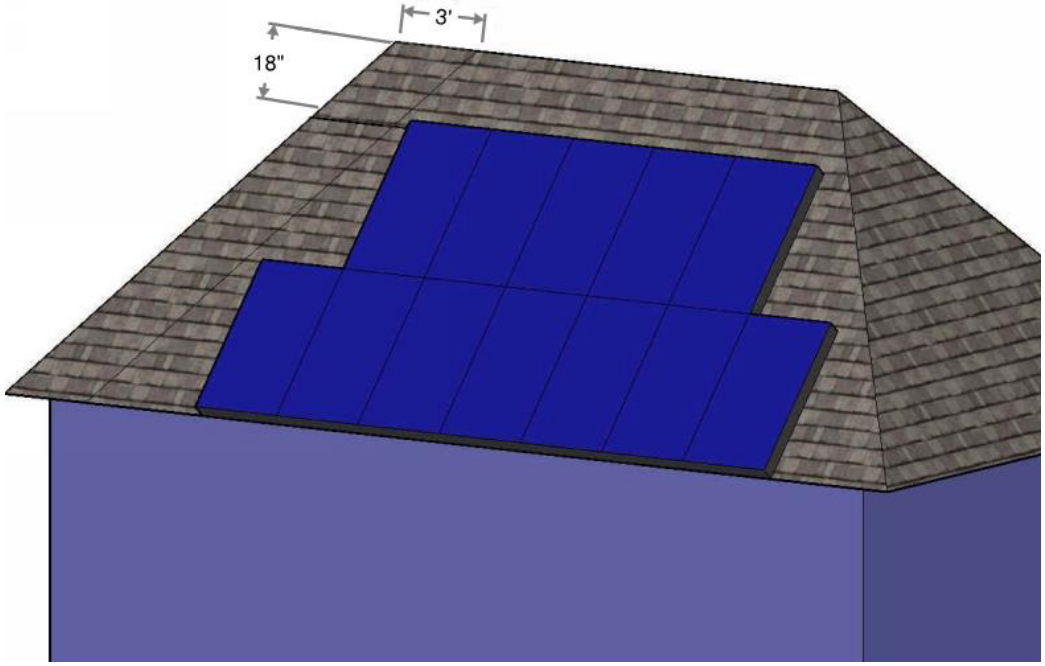
Appendix 1:

Examples of Pathways for Residential PV Systems for One- and Two-Family Dwellings

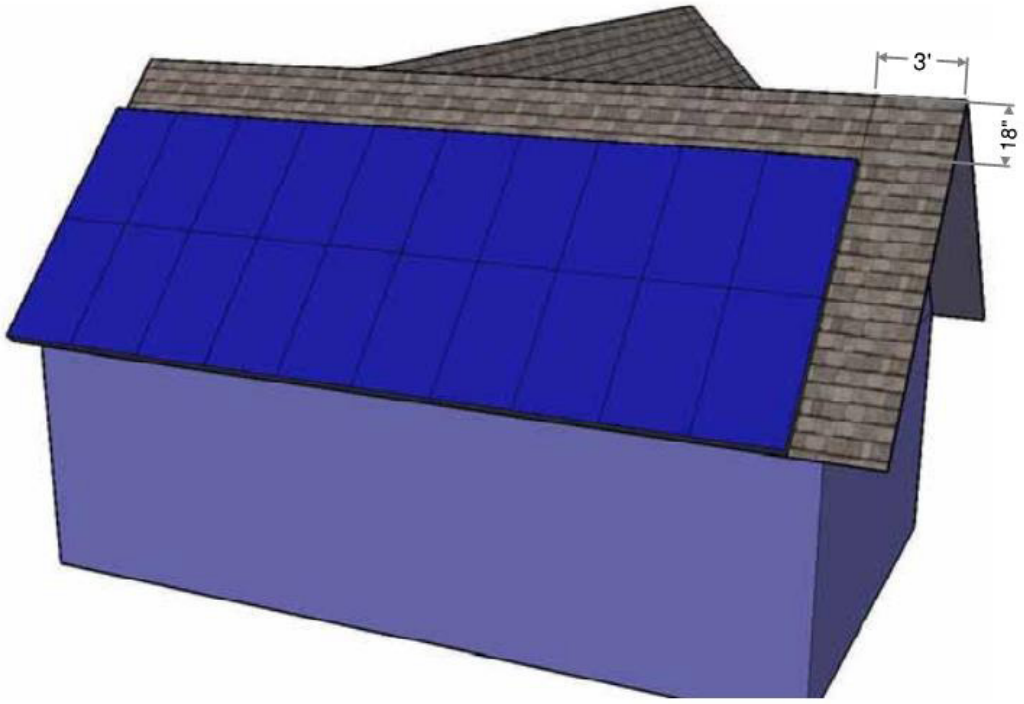
Single Ridge Full Gable



Single Ridge Full Hip Roof



Cross Gables with One Valley



Cross Gables with Two Valleys