City of Bellevue

Public Information Handout **B-10**

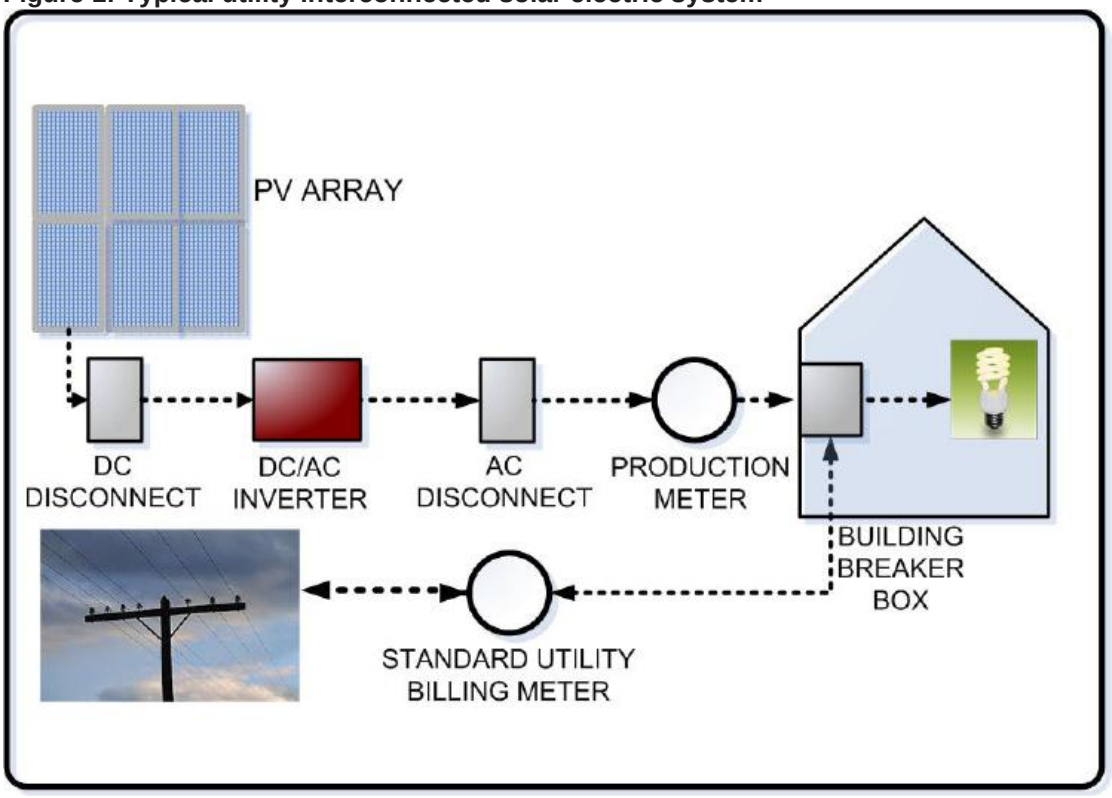
Solar Electric (Photovoltaic) Rooftop Single-Family Residential

February 2014

Solar electric systems can displace a portion of utility power used to meet home or business electricity needs. Solar electric systems may be operated independently (off grid) or they may be interconnected to the grid. Off-grid systems require storage for a back-up battery. A grid-connected, customer-owned generation system is operated parallel to the SCL electricity distribution system for the purpose of offsetting part or all of a customer's electricity needs.

Net metering refers to an interconnected customer generation system with a meter that reads the net difference between the customer's electricity generation and consumption. Any excess electricity generated by the customer during a billing period is credited to the customer. Seattle City Light offers a net metering program for interconnected systems up to 100 kilowatts (kW). Figure 1 shows the basic solar electric system components.

Figure 1: Typical utility interconnected solar electric system



Permit Requirements

In general, the person installing the solar system obtains any required permits. For specific information, contact staff in the Development Service Center at 425-452-4121.

Building Permit

Building permits will generally not be required for solar electric systems when all the following are met and confirmed by the installer:

- ❑ Photovoltaic (PV) System is designed and proposed for single-family house.
- ❑ Photovoltaic System is design for rooftop of a single-family house that is in general compliance with applicable codes.
- ❑ Mounting system is engineered and designed for photovoltaics.

- ❑ Rooftop is made from lightweight material such as shingle.
- ❑ Panels are mounted no higher than 18" above the surface of the roofing to which they will be affixed. (Except for flat roofs, no portion of the system may exceed the highest point of the roof PD).
- ❑ Total dead load of panels, supports, mountings, raceways, and all other appurtenances weight no more than 3½ pounds per square foot (PSF).
- ❑ Frameless panels on at least 3/12 pitch roof weighing no more than 4½ PSF.
- ❑ Frameless panels on at least 5/12 pitch roof weighing no more than 5 PSF.
- ❑ Supports for solar panels are installed to spread the dead load across as many roof framing members as needed to ensure that at no point are loads in excess of 50 pounds.
- ❑ Attachment to the roof is specified by the mounting system manufacturer.
- ❑ Method and type of weatherproofing roof penetrations are provided.
- ❑ Structure is code compliant to zone setbacks and height.

Building permits will generally be required for solar energy systems when:

- ❑ Residential rooftop photovoltaic systems do not meet all of the above.
- ❑ Solar systems are for commercial or industrial application.
- ❑ Solar systems are not on rooftops and require a standalone support structure.

Electrical Permit

Electrical permits are required for all solar electric systems. Electrical contractors can apply for an over-the-counter (OTC) permit where the PV system meets the following basic requirements (see more detail in the permit checklist):

- ❑ PV modules, utility-interactive inverters, and combiner boxes are identified for use in PV systems.
- ❑ Maximum load added to the panelboard is based on the rating of the panelboard's bus/main OCPD combination and is limited to (one of the following combinations):
  - ❑ 225 amp bus/200 amp main OCPD-13,440 watts, maximum 70 amp inverter OCPD.
  - ❑ 225 amp bus/225 amp main OCPD- 8,640 watts, maximum 45 amp inverter OCPD.
  - ❑ 200 amp bus/200 amp main OCPD- 7,860 watts, maximum 40 amp inverter OCPD.
  - ❑ 150 amp bus/150 amp main OCPD- 5,760 watts, maximum 30 amp inverter OCPD.
  - ❑ 125 amp bus/125 amp main OCPD- 4,800 watts, maximum 25 amp inverter OCPD.
  - ❑ 100 amp bus/100 amp main OCPD- 3,840 watts, maximum 20 amp inverter OCPD.
- ❑ The ac interconnection point is on the load side of service disconnect. See NEC 690.64(B).
- ❑ For Split-Buss panels the ac interconnection must be one of the six service disconnects.
- ❑ The system meets all current NEC, City of Bellevue, and Washington Cities Electrical Code requirements.
- ❑ Using template one-line diagram provided by City of Bellevue

Contractors will need to make their first application for a residential PV OTC permit at the City of Bellevue Development Services Center and make an appointment with an electrical plan reviewer to go over the plans at the first submittal. The electrical plan reviewer will verify the Checklist and PV Design to ensure they meet all the requirements for the OTC permit process. If the first submittal and subsequent field inspection meet the National Electrical Code and Bellevue Electrical Code, the requirement for plan review on future PV installations will be waived and the contractor can apply for all future residential small-scale PV permits as an over-the-counter permit in person in the Development Services Center or electronically through MyBuildingPermit.com. The project will have field inspection(s).

Electrical systems that do not meet the streamlined over-the-counter process require plan review.

Design and Installation Considerations

Solar Access and Performance

For optimal solar performance your collectors 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.

Rooftop Structural

For rooftop installations, 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. For unusual, complicated, or heavy installations, consult an experienced building contractor or structural engineer. If you are unsure about the structural integrity of your roof, or if it is in need of repair, have it professionally

inspected to verify its condition and suitability. It may be necessary to make roofing improvements prior to mounting solar modules.

Electrical
A safe electrical connection of solar equipment to an existing electrical service requires careful consideration and planning. Modifications to branch circuit wiring or the panel board may be necessary. A photovoltaic breaker must be connected to the breaker furthest from the main breaker. Information about all changes to the electrical system must be included in the electric permit application. Be sure to follow all manufacturer installation instructions.

All components of the solar electric system, such as photovoltaic modules and inverters, must be listed by a nationally recognized testing laboratory. Article 690 of the National Electrical Code has requirements specific to Solar Photovoltaic Systems.

Interconnection and Net Metering Requirements for Solar Electric Systems

Net Metering Benefits and Options
The advantage of interconnection, 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. 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.

Net Metering Required Forms
To connect to a utility provider's grid, an Interconnection Application and Agreement are required. The agreement holds customers accountable for meeting specific interconnection standards and safety requirements. Customers are solely responsible for the proper installation and operation of solar electric systems. The system installation and operation must conform with all applicable codes, regulations and manufacturer's safety and operating manuals.

Choosing a Contractor

Although individuals with the necessary construction and electrical experience are not prohibited from installing their own solar electric systems, using a licensed contractor is highly recommended. 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 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.

Resource: Labor and Industries: **www.lni.wa.gov/TradesLicensing/Contractors/HireCon**
NABCEP: **www.nabcep.org**

A complete bid for a job will include the total cost of getting a system 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% of the system cost (the total of installation and materials). Individuals use Residential Energy Credits IRS

Form 5695 and businesses use the Investment Credit IRS Form 3468. Updated forms can be found on the IRS website, **www.irs.gov**. For questions on the tax credits please consult your tax advisor.

Washington Renewable Energy Production Incentive
As of August 2006, Washington State provides financial incentives for electricity generated from renewable energy resources. Eligible electricity producing renewable energy sources include solar, wind, and biomass. The incentive is based on the total number of kilowatt-hours of electricity generated between July 1 and June 30 (or the closest regular billing cycle) of the following year. Customers who want to receive the incentive must have a production meter installed. Customers with eligible generation systems certified by the Washington State Department of Revenue will qualify for annual incentive payments as follows:

- $0.15 /kWh for a PV system with no "Made in Washington" components
- $0.18 /kWh for a PV system with a "Made in Washington" inverter
- $0.36 / kWh for a PV systems with "Made in Washington" panels
- $0.54 / kWh for a PV systems with "Made in Washington" panels and inverter

The program is capped at $5,000 per year per customer and expires in 2020. Further information and application forms are available at
http://dor.wa.gov/Docs/forms/Misc/RenewEnerSystCertInvCstRecIncPrgm.pdf .

Further Assistance

Northwest Solar Center
A program of the WSU Cooperative Extension Energy Program, the Center provides solar energy resources and educational opportunities. 206-396-8446 **www.northwestsolarcenter.org**

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

US Department of Energy – Energy Efficiency and Renewable Energy
This division of the Department of Energy has a focus on enhancing renewable and sustainable energy production. Their website provides a wealth of information and links to information on types of energy, state information, funding, and a consumer guide. **www.eere.energy.gov**

Energy Star
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. **www.energystar.gov**

Northwest Solar Communities
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 (ESSP), led by the Washington Department of Commerce and Northwest SEED.
www.nwsolarcommunities.org

Bellevue Contact Information

- Permit Processing, 425-452-6864 or PermitTech@bellevuewa.gov
- www.bellevuewa.gov/developmentservices.htm
- www.mybuildingpermit.com
- Building Desk in Development Services Center, 425-452-4121 or BuildingReview@bellevuewa.gov
- Building Inspections, 425-452-4570

This document is intended to provide guidance in applying certain regulations and is for informational use only. It cannot be used as a substitute for the Construction Codes or for other city codes.