Business Energy Tax Credits
Technical Requirements

Effective December 1, 2007
(Replaces January 1, 2006)

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The following technical specifications are required to be met, in addition to meeting all of the requirements of OAR 330-090-0105 through 150 (e.g. substantial savings, appropriate simple payback, application prior to start date, etc.).

HVAC Equipment

Combustion equipment (furnaces, boilers, water heaters, and burners) must have a minimum combustion efficiency of 86 percent Annual Fuel Use Efficiency (AFUE) rating. An exception may be granted if the system efficiency is proven to be higher due to application of a different distribution system (e.g.: radiant systems in high infiltration spaces), control strategies (e.g.: pony boilers), or reduced stand-by losses (e.g.: low-mass boilers).

Heat pumps must have an energy input that is entirely electric and be rated with a Heating Season Performance Factor (HSPF) or Coefficient of Performance (COP) as follows or higher:

Air source heat pumps	8.5 HSPF
Water source heat pumps	4.2 COP or 10 % greater than COP listed in 13-M of OR code
Air Conditioning	10 % greater than COP listed in 13-L of OR code

Building Automation Controls

For existing systems within service life: The baseline will be based on the existing system's capabilities in fully functional and operating condition (savings and costs associated with maintenance and repair activities are not eligible). Eligible costs will be based on the incremental cost and energy savings of the proposed system as compared to a fully functioning baseline system.

For systems beyond service life or new buildings: The minimum standard or baseline system will have the following features, plus any additional features required by code:

Start/Stop Program
Night Setback Program
Enthalpy Control Program (Economizer)
Lighting Control Program (Sweep>5,000 sq.ft.)
Variable Flow (10 hp and above)

The baseline system must incorporate similar technologies to the proposed system (e.g. do not compare a new DDC-based system with a new pneumatic-based system).

Eligible costs and energy savings will be based on the incremental cost and energy savings between the proposed system and the baseline system.

Only the components of the project that achieve energy savings will be considered eligible. For example, many control-based projects include additional scope that may be infrastructure upgrades or features that add convenience to the owner/operator but do not achieve energy savings. If the component does not achieve energy savings it will not be considered an eligible cost.

Residential Energy Tax Credit Qualifying Equipment

Equipment that qualifies for the Residential Energy Tax Credit (RETC) is eligible for the Business Energy Tax Credit (BETC) in either of the two following methods:

A facility that consists solely of equipment that is on the qualifying equipment list at the time of the application submittal may apply as outlined in the Oregon Administrative Rules 330-90-105 through150 using operating schedules, capacity, efficiency and cost information to prove qualification, or

That facility, made up of qualifying equipment may also choose to effectively take the RETC through the BETC Program by using the following formula.

Residential Tax Credit Amount ÷ 0.35 = BETC Eligible Cost
(from qualifying appliance list) (amount from which the 35% credit is calculated)

For example the AMANA Model NAV8005 clothes washer qualifies for a $115 RETC. Therefore, the eligible cost for the BETC would be $328.57 ($115 divided by 0.35)

Envelope Measures

Replacement windows must have a U-value of 0.35 or less for residences. U-values must be 10% better (lower) than code requirements for commercial.

Insulation that exceeds code requirements or when not required by code is an eligible measure if substantial savings and economic criteria required in the OARs are met.

Rental Weatherization

For purposes of meeting the requirements of ORS 469.207 when a utility audit is not available, a vendor-provided audit demonstrating substantial savings and approved by the Oregon Department of Energy will suffice. Another option would be a self-audit based upon the following list when accompanied by U-values, areas, and other appropriate general information regarding the measures.

Caulking, weather-stripping and other prescriptive actions to seal the heated space and ducts in a dwelling;

Insulation of ceilings or attics to R-38 if achievable in areas with R-19 or less, including insulation installed on flat roofs and associated ventilation;

Insulation of outside walls to a nominal R-13 if achievable in areas where no insulation is present, of unfinished walls adjacent to unheated areas to R-21 if achievable in areas where no insulation is present, and of finished walls adjacent to unheated areas to R-11 if achievable in areas where no insulation is present;

Insulation of floors over unheated spaces to at least R-25 if achievable in areas where no insulation is present, and materials to support the insulation and needed ground cover and ventilation;

Insulation and sealing of supply and return air ducts in unheated spaces to at least R-8 if achievable and no insulation is present and the ducts are in unheated areas;

Insulation of water heaters, water pipes, or steam pipes in unheated spaces and for at least 10 feet from the water heater in unheated areas to at least R-3 if achievable and no insulation is present;

Double-glazed windows (including sliding doors) with a U-value of 0.35 or lower, when replacing single-glazed windows.

Insulated exterior doors with a U-value of 0.20 or lower (R-5 or higher).

Programmable thermostats;

Blower door tests and blower door assisted whole house air sealing or duct sealing performed by a contractor certified by the Oregon Department of Energy's Residential Energy Tax Credit technician certification program;

Waste-to-Energy Facility means a renewable energy resource facility that recovers materials and energy from a waste stream under conditions listed below. The BETC program intends to encourage the responsible use of all resources including waste streams. Generally, recovery of a material will be preferred in comparison to recovery of energy. In order to respect the embedded energy of a material stream the following criteria have been established to define facilities that do not meet the definition of a recycling facility, but provide environmentally responsible recovery from a waste stream. Therefore, equipment used to recover materials and energy from a waste stream is an eligible facility when all of the following conditions are met:

(a) The value of the marketable materials and energy resources recovered from the waste stream, less the value of the external energy resources consumed in the recovery process is greater than the magnitude of the costs incurred or revenues derived in disposal of the waste stream in standard industry practice.

(b) Recovered material/end product, exclusive of fuel or lubricant, exceeds 50 percent or higher on a dry mass basis.

(c) The facility does not increase the release of toxins, fossil-derived greenhouse gas emissions or other emissions.

(d) The facility does not divert materials from a higher value use.

(e) The facility has an acceptable energy balance as determined by the Director.

Combined Heat and Power (Cogeneration) A facility designed to generate electrical power and thermal energy from a single fuel source with a fuel-chargeable-to-heat rate yielding annual average energy savings of 10 percent. This facility could be eligible for a 35 percent Business Energy Tax Credit. The fuel chargeable to power heat rate calculations*, would need a heat rate of 6,120 Btu/kWh (10 percent better than the 6,800 Btu/kWh current standard generation). This is based on the 100 hour test fuel-chargeable-to-heat rate produced as public record for the most recent facility certified by the State of Oregon Energy Facilities Siting Council. Facilities that do not meet this requirement may still qualify in part for a credit relating to the heat recovery portion of the project.

*** FCP = (FI - FD)/ P, where:**

FCP = Fuel chargeable to power heat rate.

FI = Annual fuel input applicable to the co-generation process in Btu (higher heating value).

FD = Annual fuel displaced in any industrial or commercial process, heating, or cooling application by supplying useful thermal energy from a co-generation facility

P = Annual net electric output of the co-generation facility in kilowatt-hours.

High Efficiency Combined Heat and Power (Co-gen)

A renewable energy resource facility designed to generate electrical power and thermal energy from a single fuel source with a fuel-chargeable-to-heat rate yielding annual average energy savings of 20 percent is eligible for a 50 percent Business Energy Tax Credit. The fuel-chargeable-to-heat rate calculations*, would need a heat rate of 5,440 Btu/kWh (20 percent better than the 6,800 Btu/kWh current standard generation). This is based on the 100 hour test fuel-chargeable-to-heat rate produced as public record for the most recent facility certified by the State of Oregon Energy Facilities Siting Council. Facilities that do not meet this requirement may still qualify for a 35 percent tax credit (see Combined Heat and Power) or in part for a tax credit relating to the heat recovery portion of the project.

*** FCP = (FI - FD)/ P, where:**

FCP = Fuel chargeable to power heat rate.

FI = Annual fuel input applicable to the co-generation process in Btu (higher heating value).

FD = Annual fuel displaced in any industrial or commercial process, heating, or cooling application by supplying useful thermal energy from a co-generation facility

P = Annual net electric output of the co-generation facility in kilowatt-hours.

Sustainable Building Facilities

(1) To be eligible for a tax credit, sustainable building facilities must achieve a minimum rating of "Silver" using the U.S. Green Building Council's LEED-NC™, LEED-CS™, or LEED-CI™ rating facility in affect as of the project registration date. Projects receiving a "Gold" or "Platinum" rating will be awarded proportionally larger tax credits, as calculated by the Energy Office; or

A facility must be rated and certified by a program approved by the Oregon Department of Energy that provides comparable performance on environmental measures and equivalent or better energy performance as documented by whole building energy modeling, is commissioned and is verified by an independent third party. In addition a facility must:

(a) In achieving its LEED™ rating, the facility must earn at least two points under Energy & Atmosphere Credit 1 (Optimize Energy Performance).

(b) In achieving its LEED™ rating, the facility must earn at least one point under Energy & Atmosphere Credit 3 (Additional Commissioning).

(c) Each LEED-NC™ or LEED-CS™ facility must calculate and report the building's annual solar income in Btu (not the site income). The calculation must account for the contribution from each face (orientation with surfaces exposed to direct sunlight) and must take into account any existing or reasonably expected shading (by other buildings or vegetation, e.g.) of these surfaces. Calculations may ignore such things as rooftop or wall-mounted mechanical facility components.

(3) Eligible cost will be calculated in accordance with the following table:

Building Area	Silver	Gold	Platinum
LEED-NC™			
First 10,000 sq. ft.	$10.00/sq. ft.	$13.57/sq. ft.	$17.86/sq. ft.
Next 40,000 sq. ft.	$5.00/sq. ft.	$5.71/sq. ft.	$9.29/sq. ft.
>50,000 sq. ft.	$2.00/sq. ft.	$2.86/sq. ft.	$5.71/sq. ft.
LEED-CS™			
First 10,000 sq. ft.	$7.00/sq. ft.	$9.50/sq. ft.	$12.50/sq. ft.
Next 40,000 sq. ft.	$3.50/sq. ft.	$4.00/sq. ft.	$6.50/sq. ft.
>50,000 sq. ft.	$1.40/sq. ft.	$2.00/sq. ft.	$4.00/sq. ft.
LEED-CI™			
First 10,000 sq. ft.	$3.00/sq. ft.	$4.07/sq. ft.	$5.36/sq. ft.
Next 40,000 sq. ft.	$1.50/sq. ft.	$1.71/sq. ft.	$2.79/sq. ft.
>50,000 sq. ft.	$0.60/sq. ft.	$0.86/sq. ft.	$1.71/sq. ft.

(4) Facilities using on-site renewable energy production technologies such as photovoltaic or wind technologies may treat these elements as a separate renewable energy resource facility for tax credit purposes, provided that any points earned for such features in the LEED™ rating are not required to achieve the rating on which the Sustainable Building facility credit is to be based. In cases where subtracting such points would result in a lowering of the LEED™ rating (e.g. from Gold to Silver), the tax credit will be awarded on the basis of the lower rating. The rating point total, net of renewable generation credits, can never be less than that required for a Silver rating.

High Performance Home

(1) A dwelling unit constructed by a licensed builder under the Oregon Residential Specialty Code with its own space conditioning and water heating facilitys and intended for sale to an end-use homebuyer can qualify as a High Performance Home facility.

(2) To be eligible for a tax credit, a High Performance Home facility must be certified through the ENERGY STAR® Homes Northwest program, which includes builder technical assistance, independent home inspection and program quality assurance. A third party inspector certified by the Oregon Department of Energy to submit homes for certification is required. See www.northwestenergystar.com for more information and a list of certified home verifiers in Oregon.

(3) A qualifying facility must incorporate **all** of the following elements that are in addition or exception to ENERGY STAR® Homes Northwest requirements:

(a) Building shell shall be constructed to the following prescriptive path.

Ceilings: U≤0.030 (e.g. R-49 attic)

Walls: above grade U≤0.050 (e.g. R-21 cavity insulation plus R-3 continuous foam insulation, insulated concrete form, Structural Insulated Panel),

Walls: below grade U≤0.060 (e.g. R-21cavity insulation)

Floors: above grade U≤0.025 (e.g. R-38 batt/blanket insulation between floor joists 16" o.c. over vented crawl),

Floors: on grade, [slab edge] perimeter R-15 min. 2 feet vertical or combined vertical/horizontal – heated slab also requires R-10 foam board under slab. (This matches ENERGY STAR® Homes Northwest requirements.)

Windows and glass doors: U≤0.32 (weighted average). Exception: solar glazing that is part of a Renewable Energy Facility used to qualify the home as a High Performance Home may have a higher U-factor.

Glazing area: glazing to floor area ratio ≤16%. (including windows, skylights, and glass doors considered as glazing in the code).

Shell tightness: 5.0 $ACH_{50\ Pa}$ confirmed by blower door test

(b) HVAC facility and air ducts shall be incorporated into conditioned space, or eliminate forced-air ductwork.

(c) Space conditioning equipment shall meet one of the following requirements:

Two-stage gas or propane furnace, minimum AFUE 0.92,

Gas or propane boiler, minimum AFUE 0.88

Central AC SEER ≥ 14 (if installed)

Ducted heat pump ≥ HSPF 8.5, air source, and ground source COP ≥ 3.0

Ductless mini-split heat pump with inverter drive, no incorporated electric backup heat, sized and installed as per ENERGY STAR® Homes Northwest specifications

(d) A Renewable Energy Facility, as described in these Technical Requirements, shall provide on-site energy savings or generation of not less than 1kWh/yr per square foot of conditioned floor space.

(e) Water heating facilities shall meet ENERGY STAR® Homes Northwest specifications (e.g., gas: 0.61 EF for tanks ≤60 gallons, 0.60 for tanks > 60 gallons; electric: 0.93 EF for tanks ≤70 gallons, 0.92 for tanks > 70 gallons), including secondary water heating equipment that backs up solar domestic water heating facilities.

(4) A High Performance Home facility shall include at least **one** of the following measures:

(a) Obtain certification through a Green Building program recognized by the Oregon Department of Energy.

(b) Meet ENERGY STAR Homes Northwest ventilation specifications through the use of a heat or energy recovery ventilator, except that the sensible recovery efficiency shall be > 50% at 32ºF and the EUI shall be <1.5 Watts/cfm.

(c) Use a gas or propane water heater with a minimum EF of 0.80 for primary water heating. The water heater may not also be used for space heating or as the backup to a solar water heating facility to be considered a qualifying measure under this section.

(5) Applicant may propose a package of alternate shell or HVAC measures that are equivalent to these requirements. Shell measures may be increased to offset HVAC efficiency, however HVAC measures may not be used to reduce minimum shell requirements.

(a) Shell measures shall be a combination of assemblies that together have a total U x A no higher than a base case home described in section (3a), above. Trade-offs will be evaluated according to the thermal trade-off procedure in Oregon Residential Specialty Code Chapter 11, Energy Efficiency, Table N1104.1(1).

(b) Mechanical facilities will be evaluated for comparable annual energy use.

(6) The amount of the tax credit for a High Performance Home available to the builder shall be $3,000, which is in addition to a tax credit allowed for the Renewable Energy Facility installed on the home for a total tax credit of $12,000. A High Performance Home tax credit will not be granted to a homebuilder without a Homebuilder-Installed Renewable Energy Facility tax credit.

Homebuilder-Installed Renewable Energy Facility

(1) The amount of the tax credit for homebuilder-installed renewable energy facilities shall be capped at $9,000. Eligible renewable energy facilities must meet the following criteria:

(a) Photovoltaic - Eligible installations have a Total Solar Resource Fraction of at least 75 percent. Total Solar Resource Fraction (TSRF) method as described in the Business Energy Tax Credit (BETC) application. Installations must be verified by a Tax Credit Certified Solar PV Technician. This verification must cover performance, longevity, and proper documentation of the facility design, operation and maintenance. Installers must provide a warranty covering all parts and labor for two years. The credit amount is based on $3 per watt of installed capacity.

(b) **Solar Domestic Water Heating -** Solar thermal domestic water heating installations must have a Total Solar Resource Fraction (TSRF) of at least 75 percent and be designed to provide no less than 25 percent but not more than 70 percent of the annual domestic water heating load. Installations must be OG-300 certified. Installations must be verified by a Tax Credit Certified Solar Thermal Technician. This verification must cover performance, longevity, and proper documentation of the facility design, operation and maintenance. Installers must provide a warranty covering all parts and labor of the facility for two years. The credit amount is equal to $0.60 per kWh saved as determined by the ODOE solar domestic water heating yield table.

(c) **Active Solar Space Heating -** Active solar space heating installations must demonstrate a whole building annual energy savings of at least 15 percent to be eligible. Installations that combine space heating and domestic water heating are allowed providing that the solar storage tank is not heated by a backup heat source (e.g. gas or electric water heater). Only 50 percent of the domestic water heating savings shall be counted toward the requirement for 15 percent annual heating and cooling load reduction. Installations must be verified by a Tax Credit Certified Solar Technician. This verification must cover performance, longevity, and proper documentation of the facility design, operation and maintenance. Installers must provide a warranty covering all parts and labor of the facility for two years. The credit amount is equal to $0.60 per kWh saved based on a calculation procedure approved by ODOE staff.

(d) **Passive Solar -** Passive solar design strategies must demonstrate a whole building annual energy savings of at least 20 percent to be eligible. This can be achieved by either meeting the prescriptive requirements for a passive solar home under the residential energy tax credit or demonstrated with whole building energy modeling and certified by a professional engineer. The credit amount is equal to $600 per home plus $0.60 per square foot of heated floor space.

(e**) Ground Source Heat Pumps** - Ground source heat pumps must have a coefficient of performance (COP) of 3.5 or greater. The savings is based on the incremental savings over the energy savings provided by the ground source heat pump with a COP of 3.0. The credit amount is equal to $0.60 per kWh saved.

(f) Other Renewable Energy Resource Facilities - Other renewable energy resource facilities (e.g. wind turbines, fuel cells) will be evaluated on a case-by-case basis and the credit amount will be equal to $0.60 per kWh saved. Facilities must be connected to home's main service panel and installers must provide a warranty covering all parts and labor of the facility for two years.

Solar Energy Facilities

Maximum Eligible Cost

The Oregon Business Energy Tax Credit provides incentives for solar energy facilities equal to 50 percent of the eligible cost. This eligible cost for solar facility facilities is equal to the lesser of the facility cost or the maximum eligible cost as defined in this document. In no case, shall the maximum eligible cost exceed the $20 million cap per facility.

The purpose of the maximum eligible cost is to ensure that tax-credit eligible facilities meet a reasonable threshold. (For example, a building with a roof made of solar collectors does not qualify the entire building cost or even the entire roof cost to a 50 percent tax credit.) The Oregon Department of Energy will periodically determine and adjust, if necessary, the maximum eligible cost to reflect changes in the marketplace.

Solar Facility Completion Period
The pre-certified eligible costs will be recognized for 12 months, after which time the applicant would need to re-apply for a new preliminary certification. Publicly owned facilities will be allowed 36 months to complete the facility before being required to re-apply. The purpose of this is to reduce spurious pre-certifications

Total Solar Resource Fraction (TSRF)
TSRF is the fraction of a fixed axis solar thermal or solar electric facility's annual performance when compared to a facility that has no external shading and no losses from sub-optimal tilt or orientation. Facilities with a TSRF less than 75 percent are not eligible for a tax credit. Facilities with a TSRF less than 85 percent may be inspected or confirmed by ODOE prior to issuing the preliminary certification.

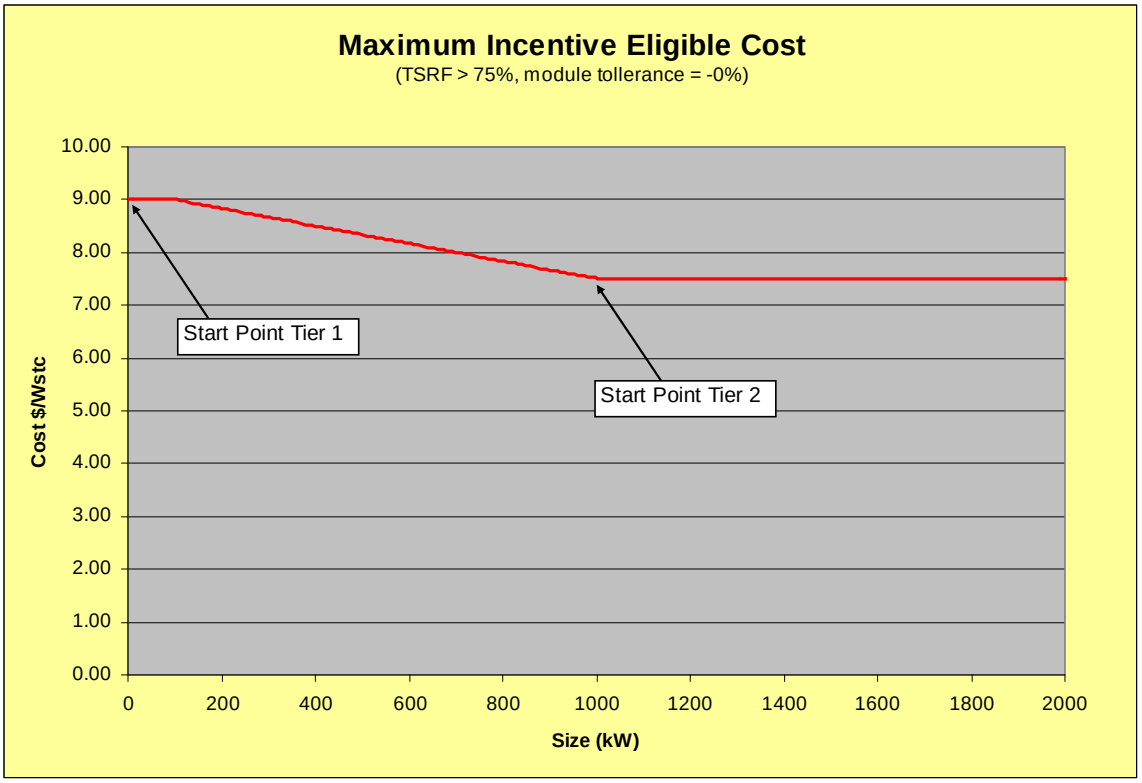
Photovoltaic Facilities

Maximum Eligible Cost for Photovoltaic (PV) Facilities
The maximum eligible cost for PV facilities is expressed in terms of $/watt. It is a function of the total facility size as determined by the minimum module performance at standard test conditions. (e.g. The maximum eligible cost for a modules with a rated output of 100 watts +/- 5% will be considered a 95 watt module.)

The function that sets the maximum eligible cost is divided into two tiers. Tier 1 is flat rate until 100 kW and then declines to meet Tier 2. Tier 2 is a slightly declining rate for facilities over 500kW. The start points of these two tiers will be reduced each time ODOE issues a cumulative amount of 4 MW in preliminary certifications in each of the two tiers.

The cumulative watts of these two tiers will be divided into facilities that have received a preliminary certification since January 1, 2007. Facilities with total STC rated output under 250 kW will count toward the Tier 1 cumulative total, facilities over 250 kW will count toward the Tier 2 cumulative total. This will result in a series of steps that gradually reduce the maximum eligible cost for PV facilities over time.

Graph 1 shows the maximum eligible cost for PV facilities. As this graph will change over time, ODOE will regularly post the cumulative amount of watts installed for the two tiers, and the most current graph, and the start point values for the subsequent step.



Graph 1 – PV Maximum Eligible Cost Curve

The data used generate the maximum eligible cost curve is provided in the following table for the first five steps. Future step rates will be added as needed. Future rates will be set by the Director based on market conditions and rate of market development.

STEP	*kW to date* Tier 1 Trigger	*$/W* Tier 1 Start	*kW* Tier 1 End X	*kW to date* Tier 2 Trigger	*kW* Tier 2 Start X	*$/W* Tier 2 Start
1	4000 kW	$ 9.00	100 kW	4000 kW	1000 kW	$ 7.50
2	8000 kW	$8.50	100 kW	8000 kW	1000 kW	$ 7.00
3	12000 kW	TBD	TBD	12000 kW	TBD	TBD
4	16000 kW	TBD	TBD	16000 kW	TBD	TBD
5	20000 kW	TBD	TBD	20000 kW	TBD	TBD

PV Maximum Eligible Cost Adjustment for Minimum Module Performance

Module manufacture warranty for initial module performance is typically 3% to 10% below the rated output at standard test conditions. A PV facility's maximum eligible cost is based on total array output adjusted by the performance tolerance specified by the module manufacturer. This is consistent with a national effort to get more reliable performance ratings from PV manufacturers. For example, a 200 watt module with a +10%/ -0% performance tolerance would be treated as a 200 watt module, whereas a 208 watt module with a +5/-5% performance tolerance, will be treated as a 197.6 watt module (208 x 95% = 197.6).

Photovoltaic Facility Requirements

All qualifying installations must meet the following minimum facility specifications:

1. The facility must be designed to last at least 25 years (with minimal maintenance) and deliver or exceed performance expectations of a well designed facility.
2. Installation must meet industry standards.
3. Facility must be permitted and in compliance with all applicable building and electrical codes.
4. All facility equipment must be rated for the temperature and exposure conditions in which it will operate continuously for 25 years or more.
5. All facility components must be new (modules, inverter, batteries, mounting hardware).
6. Array mounting must not reduce the expected life or durability of the structure on which it is located.
7. The facility must be designed for optimal performance without sacrificing good aesthetics
8. The facility must include all code required signage and a customer manual.
9. A customer manual must contains the following information:
    a. Facility documentation
        i. As-built drawings that accurately describe the components installed and the wiring design, including wire sizeds, and estimated length of wire runs.
        ii. Facility site plan that indicates array and inverter location.
        iii. Sunchart used to determine facility total solar resource fraction
        iv. Operation and maintenance requirements including the name and phone number of person(s) or company to call in the case of a facility failure.
    b. Warranties and installation documentation
        i. Minimum two-year contractor warranty for materials and workmanship
        ii. Manufacturer's warranty for PV modules and inverter
        iii. Permit documentation
    c. Manuals and data sheets
        i. Bill of material listing all primary facility components including part numbers
        ii. Inverter owner's manual

iii. Manufacturer data sheets for major components, including but not limited to: inverters, modules, racking/mounting facility, charge controller and batteries.

10. All facilities must include one or more meters that are capable of recording the facility's total energy production. Meters must be equivalent to American National Standards Institute (ANSI) certified revenue meters with a 0.5 or better accuracy class and, if digital, it must have non-volatile data memory.

11. Array must be sized to operate within the current, voltage and power limits approved and warranted by the inverter manufacturer. The temperature-adjusted voltage must remain within the inverter limits at the historical record low temperature for the location in which it is installed.

12. Wires must be sized to keep the total voltage drop below 2 percent on the DC conductors from the array to the inverter including the existing wire whips on the PV modules, and/or 2 percent on the AC conductors from the inverter to the point of interconnection (total not to exceed 4 percent).

13. Voltage mismatch caused by practical shading of the array, different orientations of string and localized shading events must be minimized.

14. Installing contractor must provide a minimum 24-month full warranty on parts and labor to the facility owner.

Solar Thermal Facilities

Maximum Eligible Cost for Solar Thermal (ST) Facilities

The maximum eligible cost for solar water heating facilities (not including pool heating facilities) is calculated using the following formula:

Maximum Eligible Cost = SOC x Number of modules x Solar Thermal Rate

Where, the Solar Thermal Rate is broken into three different tiers based on the total facility size. (see table below) SOC is rated output of a solar thermal panel under "Standard Oregon Conditions" (SOC).

Solar Thermal Rate Table

Tier	System Size	$/kBtu
1	<100	220
2	<250	220
3	>250	220

Initially the value at each of the three tiers are the same, however as ODOE collects data on facility costs as a function of size and as the market develops these values will be adjusted on an as needed basis.

Standard Oregon Conditions (SOC)

The rated output of a solar thermal panel is expressed in kBtu/day under a specific set of test conditions. Standard Oregon conditions are a weighted average from the Solar Rating and Certification Corporation (SRCC) OG-100 test results for daily energy production. Standard Oregon conditions are calculated using values from the Mildly Cloudy (1500 Btu/sq ft – day) column on the collector thermal performance rating table with following formula:

SOC = 10% Category A +
20% Category B +
30% Category C +
40% Category D

Example Facility Calculation

The following table shows an example SRCC collector performance data table for typical a 4'x10' black chrome collector.

Collector Thermal Performance Rating (www.solar-rating.org)

Thousands of Btu Per Panel Per Day					
	Category (Ti - Ta)	CLEAR DAY 2000 Btu/ft^2-day	MILDLY CLOUDY 1500 Btu/ft^2-day	CLOUDY DAY 1000 Btu/ft^2-day	Weight
A	-9 ºF	n/a	49	n/a	10%
B	9 ºF	n/a	40	n/a	20%
C	36 ºF	n/a	31	n/a	30%
D	90 ºF	n/a	16	n/a	40%
E	-144 ºF	n/a	0	n/a	0%

The SOC rating of this collector is

SOC = 10% x 49 + 20% x 40 + 30% x 31 + 40% x 16
= 28.6 kBtu/day

A water heating facility with 5 of these collectors would have a facility SOC of 143 kBu/day. Such a facility would have and maximum eligible cost value of:

MEC = 100 x Tier1 Rate + 43 x Tier2 Rate + 0 x Tier3 Rate
= 100 x $220/kBtu + 43 x $220/kBtu + 0 x $220/kBtu
= $31,460

Solar Thermal Facility Requirements

All qualifying installations must meet the following minimum facility specifications:

1. The facility must be designed to last a minimum of 20 years (with minimal maintenance) and deliver or exceed performance expectations of a well designed facility.
2. Installation must meet industry standards.
3. Facility must be permitted and in compliance with all applicable building and electrical, and plumbing codes.
4. All equipment must be rated for the temperature and exposure conditions in which it will operate continuously for 20 years or more.
5. All primary facility components must be new (collectors, controls, pumps).
6. Array mounting must not reduce the expected life or durability of the structure on which it is located.
7. The facility must be designed for optimal performance without sacrificing good aesthetics
8. The facility must include all code required signage and a customer manual.
9. A customer manual must contain the following information:
    a. Facility documentation
        i. As-built drawings that accurately describe the components installed.
        ii. Facility site plan that indicates array and inverter location.
        iii. Sunchart used to determine facility total solar resource fraction
        iv. Operation and maintenance requirements including the name and phone number of person(s) or company to call in the case of a facility failure.
    b. Warranties and installation documentation
        i. A minimum two-year contractor warranty for materials and workmanship
        ii. Manufacturer's warranty for collector and heat exchanger (if present)
        iii. Permit documentation
    c. Manuals and Data Sheets
        i. Bill of material listing all primary facility components including part numbers
        ii. Facility controller owner's manual

iii. Manufacturer data sheets for major components, including but not limited to: collectors, controllers, pumps, Btu meter, expansion tank, etc.

10. Facility is sized appropriate for load. The solar savings fraction not to exceed 0.70, without a means of rejecting heat once load is met.

11. Thermal storage is adequate to accommodate daily use pattern. For typical domestic load profiles this is defined as a minimum of 1.25 gallons per square foot of collector area. For facilities with loads that are coincident with solar generate this storage amount may be reduced if documentation is provided.

12. Tank Insulation: All solar storage tanks must be insulated with not less than R15 insulation.

13. Pipe Insulation:
    a. Collector loop insulation must be rated for conditions in which it operates. Pipe insulation shall have a minimum R-value of 3. Closed loop facilities must be able to handle stagnation temperatures of the collector (300+ °F)
    b. Potable water pipe insulation must have a minimum R-value of 12. Pipe insulation must be protected if located in exposed conditions. U-V rate tape or pipe jacket is required. U-V paint is not sufficiently durable.

14. Anti-convective pipe loop or trap is required on the inlet and outlet of the storage tank. These loops or traps shall have a minimum 8-inch vertical drop to constitute an effective convective heat barrier. Heat trap nipples alone are not reliable in stopping heat migration, and will not meet this requirement.

15. Install thermometers on collector supply and return pipes. One movable thermometer for two wells is sufficient.

16. Install a BTU meter capable of measuring total delivered energy on all facilities with standard Oregon conditions rating greater than 250 kBtu/day.

17. Install a tempering valve on the output of the domestic hot water system to ensure that delivered temperature does not exceed 140°F.

18. Solar thermal facilities must be installed in compliance with the Oregon Mechanical Specialty Code (Chapter 14 OSMC), the Oregon Residential Specialty Code (Chapter 23), the Oregon Plumbing Specialty Code and all other local regulations with jurisdiction.

19. Facilities must be designed and installed for complete automatic operation including protection from freeze damage and overheating of collectors.

20. Pressurized storage tanks must not be allowed to be heated above 180°F.

21. Pressure and temperature relief valves must be installed to protect all components according to manufacturer's recommendations.