Washoe County
PLAN SUBMITTAL

Solar Photo Voltaic Systems

Electrical Generation Systems

PERMITS+PLUS ZONE

Washoe County
Permits Plus Zone
1001 East Ninth Street
PO Box 11130
Reno, NV 89520-0027

Solar Photo Voltaic System

Submittal Guide and Application Form

The following is an outline and application form for the requirements for a Solar Photo Voltaic electrical System Plan submittal. This list is for reference purposes only and may not include all items needed to complete the plan check process.

Plan Sets

Your submittal will consist of **two** complete sets of plans. Engineered diagrams used for construction require the engineers wet/stamp.

The following **additional** plans are required for other departments:

Ground Mount: 3 Site Plans **or** 4 Site Plans if property has a septic system (see note below)
Roof Mount: 1 Elevation Plan

Note: See attached Health Department guide for septic site plan requirements (Minimum 18" x 24" plan sheet with a maximum plan sheet size of 24" x 36")

Required Information

Please <u>fill in all the blanks</u> and submit with your plan sheets. Indicate {Yes, No, N/A, specific data}

☐ Provide electrical generation capacity. _____ Watts, _____Volts, _____Amps.
☐ Provide square footage of panels. _____
☐ Provide number of DC to AC inverters. _____
☐ Provide number of panel boxes installed **after** the inverter _____
☐ Provide number of electrical combiner boxes installed between the solar panels and the inverter_____
☐ Will you be upgrading the existing electrical service panel box for this installation? _____ Yes/No
☐ Will the system include batteries? _____Yes/No
☐ Battery type? _____
☐ Will an equipment shed be used to house electrical panels or batteries? _____Yes/No
☐ Will the system use a motorized tracking panel support structure? _____Yes/No
☐ Are solar panels ungrounded? _____Yes/No
☐ Does the site have wind electric power generation? _____Yes/No
☐ Does the site have a gas, diesel or propane power generator? _____Yes/No
☐ Will the system incorporate a lighting arrestor? _____Yes/No
☐ Will the system incorporate surge protection? _____Yes/No
☐ Did you provide a site plan? _____Yes/No
☐ Did you provide an elevation view plan sheet? _____Yes/No
☐ Did you provide an electrical single line diagram? _____Yes/No
☐ Indicate if REC meter is used. _____Yes/No

If this installation is not connected to the Power company grid system; provide minimum residential service load calculations as per {2006 IRC 3502}.

Grid Tied Systems

You must notify NV Energy or Plumas Sierra Power for their safety notification requirements. Indicate your contact person and contact date. Name _____Date_____

Ground Mount Applications

The following information needs to be present on the site plan:

See attached example site plan.

- ☐ Clearly show placement of solar array with dimensions to structures, property lines, propane tanks, electrical pedestals, etc.
- ☐ If a septic system is on the property include all Health Department required information on the (Min 18" x 24" and Max 24" x36") site plan sheet.
- ☐ Combiner box(s)
- ☐ DC disconnect location.
- ☐ Transfer switch location.{2005 NEC 705-40}
- ☐ AC disconnect location.
- ☐ REC meter location.
- ☐ Main service meter location.

Provide solar panel array footing plan.

- ☐ Is the footing, a grid assembly of embedded posts design? _____Yes/No
- ☐ Is the footing a slab? _____Yes/No
- ☐ Is the footing, grade beam strips? _____Yes/No
- ☐ Is the footing, a single caisson/pier design? _____Yes/No

The dimensioned footing plan will show dimensions between footing piers, concrete grade beam footing strips, slab size and thickness, and rebar placement.

The dimensioned concrete footing plan will show details for connections (anchor bolt or expansion bolt size, bolt spacing, and depth of embedment). Arrays over eight (8) feet in height may require engineering. For rack assemblies with multiple post connections, you may utilize a **prescriptive** footing design which will provide a minimum of 0.403 cubic feet concrete per square foot of array. (2.46 sq.ft. of array per cubic foot concrete). The number of the bolted connections (minimum 3/8 diameter with a minimum 2" embedment) anchoring the array to the concrete shall be one (1) for each ten (10) square foot of array. Rack framing shall be spaced no greater than five feet apart.

Roof Mounted Systems

Provide roof plan views (as viewed from above) showing;

- ☐ Roof plan with dimensions showing panel placements relative to roof eave, gable end edges and ridgeline.
- ☐ Spacing of rack support standoffs (horizontal & vertical spacing dimensions).
- ☐ Details showing lag bolt sizes and placement. Clearly show standoff connection details. If using a manufactures racking system, provide on the roof plan the page numbers for the details that correspond to the connections.
- ☐ Provide details for panel support rack to roof standoff connections. Indicate bolt size and number of bolts.
- ☐ Provide details for solar panel to support rack rails connection.

Provide Elevation Views

Show location of electrical panels on all structures and/or pedestals.

- ☐ Provide an elevation view showing;
  - o Combiner boxes
  - o Inverter
  - o AC disconnect
  - o REC meter panel
  - o Main service disconnect locations. *This may require more than one elevation view.*
- ☐ Provide dimension to grade for panels and working space clearances in front of panels.
- ☐ Indicate conduit size, type & location.
- ☐ Provide a dimensioned roof elevation view showing solar panel height above grade.

Structural Design Considerations for Solar Panel Installation

Roof loading (weight of panels): If existing roof material & sheathing exceeds eight (8) pounds per square foot, provide structural calculations. Asphalt shingled roofs that have only one layer of shingles in place may utilize a manufactures' rack stand-off spacing design, provided the vertical placement of stand-off spacing does not exceed 48 inches on center (parallel to eave). Metal structures and tile roofs need their structural frames reviewed for the added loading from panel installation. Snow loading (drift & sliding snow) of panels and roof structure needs to be addressed for elevations above: (6750' East of Highway 395), (5350' West of Highway 395), and Incline Village.

Wind Uplift Connection

Provide documentation for roof rack stand-off bracket connections:
Provide lag screw size, spacing, and depth of lag screw penetration.
Your design is based on a minimum 100 mph exposure 'C' (3-sec gust) Component and cladding design wind uplift requirements. {ASCE 7-05}

Solar Panels

Provide specification sheets for the solar photo voltaic panels.
Provide details and clearly show on your plans the grounding wire connection which connects all the panels and the rack assembly.

Rack Assembly

Provide specifications and details for the support rack frame. Indicate on your plans how rack is grounded.

DC Combiner Boxes

Provide listing and ratings for combiner boxes and define the number of;

- ☐ Number of series strings _____ and the output operating voltage _____ Volts
- ☐ Number of parallel source circuits _____ and the output operating current. _____ Amps

Indicate if:

- ☐ The DC electrical circuits are fused. _____ Yes/No
- ☐ There are Blocking diodes in the circuit. _____ Yes/No
- ☐ The parallel circuits are switched. _____ Yes/No

- ☐ The combiner box will have the following signage permanently and durably affixed to it.

Operating Current ____ amps

Operating Voltage _____ Volts

Maximum system voltage _____Volts

Short-circuit Current (Max) Isc _____Amps

DANGER HIGH VOLTAGE
Access by Qualified persons only

(2005 NEC 690.7) (2005 NEC 690.8)
Note that the Max Isc is 125% of the PV panels Isc value.

Inverters

Provide specifications Cut sheet for inverters.

- ☐ Indicate if inverter has multiple inputs (i.e. functions as combiner). _____Yes/No
- ☐ Indicate the individual amps for each circuit feeding the inverter from the separate combiner box(s). _____ Amps
- ☐ Indicate if transfer switch is integral to inverter. _____Yes/No
- ☐ Indicate if ground fault protection device is integral to inverter. _____Yes/No
- ☐ Provide rated output power of inverter (used to size conductors & panel boxes). _____Watts
- ☐ Provide inverter maximum output current. _____Amps
- ☐ Provide inverter output voltage. _____Volts
- ☐ Indicate if inverter is: Single phase two-pole_____, Single pole_____, Or Three phase_____
- ☐ Is the inverter {IEEE 1547.1} listed? _____Yes/No
- ☐ Is it {UL 1741} listed? _____Yes/No
- ☐ What approved agency provided the listing? _____

AC Disconnect

Provide Amperage rating for AC disconnect. _____ Amps.
Is the AC disconnect a visible exposed blade (no dead front) panel box? _____ Yes/No

If the panel box does not have a dead front (power company requirement) then provide **a note on your plans** stipulating: A tamperproof wire lock is required on the NV Energy compliant AC disconnect switch panel box cover. An owner installed padlock is also required on this cover. 2005 NEC 110.27, 408.38

Renewal Energy Credit Meter Panel (REC)

Provide specification for meter socket. Minimum amperage rating is dependant on the inverter rating.

Main Service Panel (existing or new)

- ☐ Provide load rating for panel_____
- ☐ Provide busbar rating_____
- ☐ Provide main service breaker rating_____
- ☐ Provide back-fed circuit breaker amperage rating_____ Amps (Breaker must not be labeled with separate line/load contacts)
- ☐ Provide AIC (arc interrupt capacity) rating for service panel_____ Amps. (this is a commercial installation requirement, not required for residential installation)
- ☐ Provide available arc fault current supplied by the Power Company _____amps (this a commercial installation requirement, not required for residential installation)
- ☐ Will the main service disconnect circuit breaker be reduced in size to allow the connection of the solar electrical source? _____Yes/No

☐ Provide calculation showing the sum of ampere ratings of over-current devices in circuits supplying power to the main busbar does not exceed (120% for residential) rating of service panel busbar {2005 NEC 690.64 (B) (2)}

_____

_____

_____

If the sum of the over current devices supplying the main busbar is greater than 120% of its rating, provide a complete load calculation for the structure being supplied by the service.

Provide an Electrical One-Line Diagram

Show all major field-installed electrical components

- ☐ Provide wire insulation identification for each circuit segment (insulation type & conductor size).
- ☐ Show each circuit segments maximum ampacity value.
- ☐ Provide conductor size for each circuit segment.
- ☐ Provide conduit type and sizing per 2005 NEC 690.31 (metallic raceways).
- ☐ Provide conduit lengths. (metallic conduits in attics with lengths greater than 30 feet require expansion design) {2005 NEC 300.7, 352.44}
- ☐ Provide equipment grounding conductor size. (ground mount solar minimum # 6 copper)
- ☐ Provide system grounding conductor sizing.
- ☐ Exposed wires must be sunlight resistant rated.
- ☐ Show PV source current 125% amperage design value increase (for irradiance).
- ☐ Show your conductor de-rating calculations (for temperature).
- ☐ Provide wire sizing calculations for temperature de-rating. Attic mezzanine temperatures can be expected to be significantly higher than base design values. {2005 NEC table 310.16}. ASHRAE fundamentals has a 36 degree Fahrenheit above ambient for attics.
- ☐ Provide wire sizing calculations for temperature de-rating, for roof top run electrical conduits.
- ☐ Show your conductor sizing calculations for voltage drop. (wire length-resistance)
- ☐ Show solar PV source current conductor sizing calculated at 125% amperage design value increase (for continuous duty). These are the conductors traveling from the combiner box to the first inverter.

Net Metering Systems

Follow all power company regulations and 2005 NEC. {NV energy} Sierra Pacific standard ‘ENG03U’.

http://www.nvenergy.com/renewablesenvironment/renewablegenerations/resources.cfm
http://www.nvenergy.com/renewablesenvironment/renewablegenerations/documents/NetMeteringStandard_ENG03U_sppc.pdf

Signage

- ☐ Provide: Note on plans that PV equipment shall be installed in accordance with 2005 NEC 690 and posted with applicable warnings, signage & plaques per NEC 705-10, 690-17 & 690-64(b)(5) NV Energy will install three signs when they provide their NET metering pre hook-up visit. **Signs applied by the power company do not fulfill the NEC signage requirements.**
- ☐ Signage at power source (first panel with source wires from panels) example: [Combiner box]
- ☐ Signage identifying switch/disconnect for alternate power system. (At source) example: at inverter with integral or separate adjacent AC disconnect.
- ☐ At AC disconnect. Example: [Solar power system, AC Disconnect, 240 volt}
- ☐ The dedicated circuit breaker in the main service panel box MUST be clearly and durably labeled as a power source.
- ☐ Signage at main service disconnect (702.8) notifying the type and location of the optional standby system.
- ☐ Signage shall have minimum lettering size of (3/16”), Arial Font size #16 or equivalent.

At service meter

Interactive System Point of connection

Operating AC Current _____ amps

Operating AC Voltage _____ Volts

On The Combiner box

Operating Current ____ amps

Operating Voltage _____ Volts

Maximum system voltage _____Volts

Short-circuit Current (Max) _____Amps

DANGER HIGH VOLTAGE
Access by Qualified persons only

Signage required at all electrical power sources.
Signage identifying transfer switch for alternate power system.
Signage at main service disconnect
All signage must be permanent and durable. (Consider metal engraved plaques)

REFERENCES

Please note: Washoe County does not endorse the sites behind these links. They are offered for information and additional research. These links should be used for educational purposes only.

NVEnergy (formerly Sierra Pacific Power)
http://www.nvenergy.com/renewablesenvironment/renewablegenerations/resources.cfm

Sierra Pacific power
http://www.nvenergy.com/renewablegenerations/

Washoe County Building Department
www.washoecounty.us/bldgsafety Click on handouts.

Nevada State alternative energy regulations: NRS 278.0208
www.leg.state.nv.us/NRS/NRS-278.html

New Mexico State University
http://www.nmsu.edu/~tdi/Photovoltaics/PV-Energy.html

Inspection Checklist

Signage

Indicate a [Y] for yes, [N] for no

_____Verify all signs and labels are in place and are durable (must withstand years of weathering)
_____ Sign on combiner panel box
_____ Sign on DC disconnect
_____ Sign on AC disconnect
_____ Label adjacent to Circuit breaker connecting system to main busbar, in main service panel box.
_____ Sign on main service disconnect (external) providing notification of the type and location of the secondary power source(s).

Approved plan set one-line diagram comparison

_____ Inverter model number matches plans and specifications.
_____ PV panel module model number matches plans and cut sheets.
_____ PV modules are properly grounded with lugs on each solar panel {or equivalent (listed) approved grounding method. Note sheet metal screws are not code compliant connections, need fine threaded screws.
_____PV array is consistent with plans. {Number of modules, number of inverters)
_____ Verify all **grounding** wires and connections are tight and of correct size.
_____Check that **ground** wires and conduits are properly supported.
_____ Verify minimum wire sizes are consistent with plan. (wiring from array to combiner, combiner to inverter)
_____ Verify that plug connections (PV modules) are fully engaged and NOT accessible to unqualified persons.
_____ Verify that Solar panel support stand offs or footings are spaced and installed as per plan diagram.
_____ Verify that the attachment of the panels to the rack/frame matches the plans.
_____ Check that ground wires and conduits are properly supported.
_____ Verify minimum wire sizes are consistent with plan. (inverter to disconnect, disconnect to REC meter, Rec meter to main disconnect circuit breaker (clearly labeled))
_____ Verify that circuits with voltages of greater than 150 volts to ground are NOT accessible to unqualified persons.
_____ Verify footings are spaced and installed as per plan diagram.

NAME:

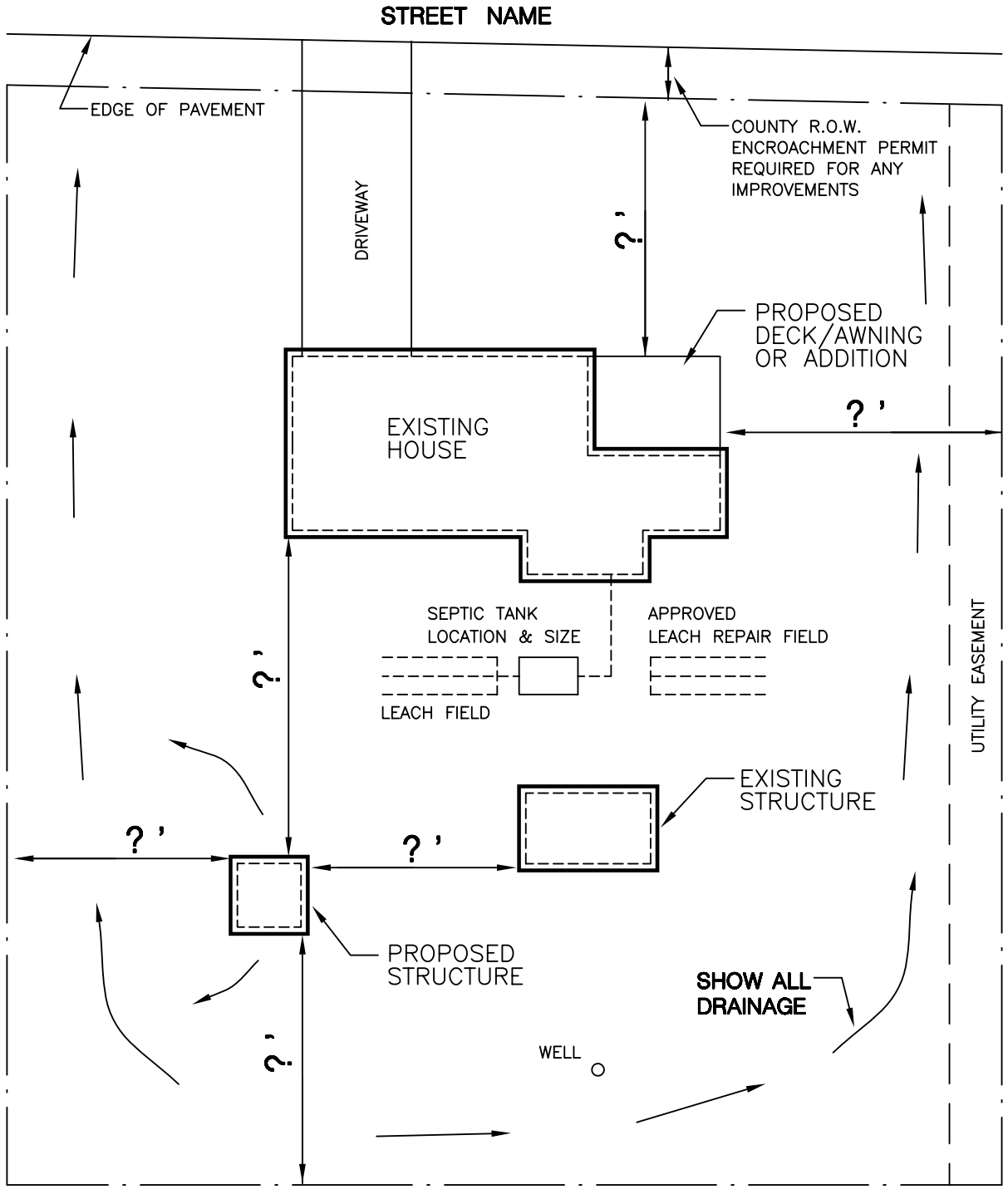
ADDRESS:

PARCEL NUMBER:

CHECKLIST

- SHOW ALL DIMENSIONS BETWEEN STRUCTURES
- SHOW NEW STRUCTURE DIMENSIONS
- SHOW DISTANCES TO PROPERTY LINES
- SHOW PROPANE TANK LOCATIONS
- SHOW DISTANCES FROM WELL TO LEACH FIELDS
- SHOW ADDRESS & PARCEL NUMBER
- SHOW SEPTIC TANK LOCATION & SIZE
- SHOW ALL UTILITY & ACCESS EASEMENTS

** ADDITIONAL GRADING INFO MAY BE REQUIRED



PLOT PLAN EXAMPLE

SCALE (1" = 30'–0" IS RECOMMENDED) b1dwg1

Washoe County Department of Building & Safety 1001 E. Ninth Street
P.O. Box 11130 Reno, NV 89520-0027
Phone (775) 328-2020 FAX (775) 328-6132
or FAX (775) 325-8016
www.washoecounty.us/bldgsafety

BUILDING & SAFETY

EFFECTIVE MARCH 1ST, 2009

In an effort to reduce the review time, speed up the permitting process and reduce Building Department man hours the following submittal changes will be implemented March 1st, 2009.

NUMBER OF PLAN SETS REQUIRED FOR SUBMITTAL

Residential:

Full Sets-2 Two complete sets, wet or electronically sealed according to applicable NRS requirements, with all supporting documents i.e. energy compliance statement, structural and truss calculations, coverage calculations if approaching 25000 sq ft of disturbance etc. *(Building-Office & Field)*

Partial Sets-3 or 4

Three sets (copies of stamped sets) consisting of site plan, floor plan and elevation sheets. *(Community Development, Engineering & Fire)*

AND

If the project requires TRPA review, One additional set consisting of site plan, floor plan and elevation sheets. *(TRPA)*

Site Plans-1 or 3

One additional site plan (copy of stamped sets). *(Water Utility)*

AND If the project is on a septic system, Two additional site plans (copies of stamped sets). *(Health)*

Commercial:

Full Sets-2 Two complete sets wet stamped or electronically sealed according to applicable NRS requirements with all supporting documents i.e. energy compliance statement, structural and truss calculations, soils reports where applicable, specifications, etc. *(Building-Office & Field)*

Partial Sets-5

1. Five sets (copies of stamped sets) consisting of all civil sheets, including all site (MEP) plans, architectural floor plans, elevations and **all MEP** sheets. *(All other reviewing agencies)*

These additional plan sets allow concurrent review by all Washoe County departments and outside reviewing agencies. Plans will be distributed simultaneously to every department or agency involved.

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