

**HUMBOLDT COUNTY BUILDING DEPT
&
CITY OF WINNEMUCCA BLDG DEPT

SOLAR PHOTO VOLTAIC SYSTEMS
SUBMITTAL GUIDE**

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 consists of **two** complete sets of plans. Engineered diagrams used for construction require Nevada engineer's wet stamp.

REQUIRED INFORMATION

Please fill in all the blanks and submit with your plan sheets(Yes, No, N/A, specific data)

- Provide electrical generation capacity. _____ Watts, _____ Volts, _____ Amps
- Provide number 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 existing electrical service panel box for this installation? Yes/No
- Will the system include batteries? Yes/No
- Battery Type? _____
- Will an equipment shed to be used to house electrical panels of batteries? Yes/No
- Will the system use a motorized tracking panel support structure? Yes/No
- Does site have wind electric power generations? 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

GRID TIED SYSTEMS

You must notify NV Energy for their safety notification requirements.

GROUND MOUNT APPLICATIONS

The following information needs to be present on the site plan (see attached sample)

- Clearly show the placement of solar array with dimensions to structures, property lines, propane tanks, electrical pedestals, septic tank etc.
- Combiner box(s)
- DC disconnect location
- AC disconnect location
- REC meter location
- Main service meter location

Provide solar panel array footing plan.

- Is footing, a grid assembly of embedded posts design? Yes/No
- Is the footing a slab(footings for slab shall be 24" deep)? Yes/No
- Is the footing, grade beam strips(footings shall be 24" deep)? Yes/No

- Is footing a single caisson/pier design (shall be 24" deep)?

Yes/No

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

ROOF MOUNTED SYSTEMS

Not allowed on manufactured home roofs

Provide roof plans views (as viewed from above) showing:

- Roof plan with dimensions showing panel placements relative to roof eave, gable end edges and ridgeline.
- Provide roof construction details (trusses, hand stack, slope, etc).
- Spacing of rack support standoffs (horizontal & vertical spacing dimensions)
- Details showing lag bolt sizes and placement. Clearly show standoff connection details. If using a manufacturer's 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 panels to support rack rails connection.

Provide Elevation Views

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

- Provide an elevations showing:
 - Combiner boxes
 - Inverter
 - AC disconnect
 - REC meter panels
 - 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 and 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 exceed eight (8) pounds per square foot, provide structural calculations stamped by a Nevada engineer. Asphalt shingled roofs that have only one layer of shingles in place may utilize a manufacturer's 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 added loading from panel installation.

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 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 panel 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 fuse Yes/No
- There are Blocking diodes in the circuit Yes/No
- The parallel circuits are switched Yes/No

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 inverter IEEE 15471 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.

RENEWAL ENERGY CREDIT METER PANEL (REC)

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

MAIN SERVICE PANEL (existing or new)

- Provide load rating for panel _____
- Provide bus bar 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 interrupter capacity) rating for service panel _____ amps (This is a commercial installation requirement, not required for residential installation)
- Provide available arch fault current supplied by the power company _____ amps (this is 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 electric source? _____ Yes/No
- Provide calculation showing the sum of ampere rating of over-current devices in the circuits supplying power to the main bus bar does not exceed 125% for residential rating of service panel bus bar (NEC 2017 690.8 & 690.4).

If the sum of the over current devices supplying the main bus bar 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 segment
- Provide conductor size for each segment
- Provide conduit type and sizing per 2017 NEC
- Provide conduit length. (metallic conduits in attics with lengths greater than 30 feet require expansion design) 2017 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
- 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. 2017 NEC Table 310-15(B)(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 calculations at 125% amperage design value increase (for continuous duty). These are conductors traveling from the combiner box to the first inverter.

SIGNAGE

- Provide note on plans that PV equipment shall be installed in accordance with 2017 NEC 690 and posted with applicable warnings, signage & plaques per NEC 705.12 & 690. NV Energy will install signs when they provide their NET metering pre hook-up visit. **Signs applied by the power company do not fulfill NEC signage requirements.**

NEC 690.13(B)

Place this label on all disconnecting means where energized in an open position

WARNING
ELECTRIC SHOCK HAZARD
DO NOT TOUCH TERMINALS
TERMINALS ON BOTH THE LINE AND
LOAD SIDE MAY BE ENERGIZED IN
THE OPEN POSITION

NEC 705.12(2)(b)

Place this label at P.O.C. to service distribution equipment (i.e. main panel (and subpanel if applicable))

WARNING
INVERTER OUTPUT CONNECTION
DO NOT RELOCATE THIS
OVERCURRENT
DEVICE

NEC 705.12(D)(3)

Place label on all equipment containing overcurrent devices in circuits supplying power to a bus bar or conductors supplied from multiple sources

CAUTION
CONTAINS MULTIPLE POWER
SOURCES

NEC 690.31(g)3 & 4; 2018 IFC 605.11.1

Place on all junction boxes, exposed raceways every 10' and 1' from bends and penetrations, adjacent to the main service disconnect

WARNING
PHOTOVOLTAIC POWER
SOURCE

NEC 690.56(C)(1)(a)

For PV systems that shut down the array and conductors leaving the array> The rapid shutdown label shall be located on or no more than 3' from the service disconnecting means to which the PV systems are connected and shall indicate the location of all identified rapid shutdown switches if not at the same location.

SOLAR PV SYSTEM IS EQUIPPED WITH
RAPID SHUTDOWN
TURN RAPID SHUTDOWN SWITCH TO
THE "OFF" POSITON TO SHUT DOWN
PV SYSTEM AND REDUCE SHOCK
HAZARD IN ARRAY

NEC 690.56(C)(1)(b)

For PV Systems that only shut down conductors leaving the array:

SOLAR PV SYSTEM IS EQUIPPED WITH
RAPID SHUTDOWN
TURN RAPID SHUTDOWN SWITH TO
THE "OFF" POSITION TO SHUT DOWN
CONDUCTORS OUTSIDE THE ARRAY
CONDCUTORS IN ARRAY REMAIN
ENERGIZED IN SUNLIGHT

NEC 690.56(C)(3)

A rapid shutdown switch shall have a label located on or no more than 3' from the switch that includes the following wording.

RAPID SHUTDOWN SWITCH FOR
SOLAR PV SYSTEM