

## ALTERNATIVE ENERGY PLAN REQUIREMENTS

### ++PHOTO VOLTAIC (PV) SYSTEMS++

#### ELECTRICAL REQUIREMENTS

##### UTILITY APPROVAL

• Approval from the utility company for the system. This should include the location of any mandated disconnects, if required. Depending on which utility gives their approval they will look different and list different information. CSU for example, will list the number of modules (Solar panels), whether or not it has a battery, and the size of the system. Mountain View Electric Association will provide a mandated location for the service disconnect.

##### SITE PLAN

- North arrow.
- Location of all existing/new service gear and electrical equipment relative to structures involved in this scope of work.
- Location of all equipment.
- Routing of all raceways clearly showing interior and exterior.
- Module layout.

On the site plan, make sure the address matches the utility approval in the previous document. Once we verify that the addresses match, we then review where the modules are being placed (roof of a building or structure or ground mount) and where the electrical gear will be located. Ensure a North facing arrow is also on the site plan in order to verify location of mandated disconnects.

##### MANUFACTURER'S SPECIFICATIONS

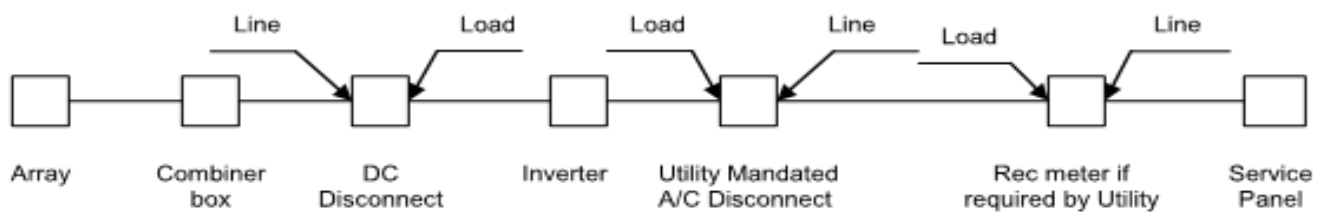
- Module spec sheet.
- Inverter spec sheet.
- Optimizer spec sheet.
- Document showing the rack and modules have been evaluated together as a system for grounding the modules per 690.43 NEC (Usually found in the rack installation manual).

The manufacturer's specifications document should contain only the listed specs as they pertain to your project. The module, inverter, and optimizer spec sheets can be found on the manufacturer's web site and can be provided with this document. Ensure the equipment spec sheet matches what is on the one-line. In addition to the spec sheets mentioned above, please provide the module compatibility document that complies with 690.43 NEC. This document tells us that the racking system, in conjunction with your panels, can be used together as a system for grounding the modules. This document can be found in the back of the racking installation manual.

##### ONE-LINE

- Conductor/Conduit size, type, and quantity.
- Bus and over current device size for all panels.
- Must comply with 705.11(B) NEC. Line-side taps must be a minimum of 6 AWG CU or 4 AWG AL. Only three conductors for single phase. (L1, L2, N (grounded conductor)).
- Effective January 1, 2023 pressure connectors and devices for splices and taps installed on service conductors shall be marked "suitable for use on the line side of the service equipment" or equivalent.
- Energy Storage Systems (ESS) must comply with 706.15 NEC. (In dwellings, required disconnects must be located at a readily accessible location outside the building. See 706.15(A)(2) NEC for required labeling).

One-line for basic Utility Interactive Photo Voltaic System: **Diagram is for illustration purposes only.**



## ++PHOTO VOLTAIC (PV) SYSTEMS (cont.)++

### CONSTRUCTION REQUIREMENTS

#### ROOF MOUNT

- Site plan
- Configurator printout/charts from racking manufacturer OR letter from Colorado licensed design professional stating the following:
  - \* Design criteria
    - ◇ Snow load of 30 PSF if property is below 7000' in elevation
    - ◇ Snow load of 40 PSF if property is above 7000' in elevation
    - ◇ Wind load (Vult) of 130 MPH, Exposure C
  - \* Roof connection spacing requirements. May be different for portrait and landscape orientations.
  - \* Fasteners to be used to connect racking system to roof structure
  - \* **IF ELEVATED ROOF MOUNT** - A letter from a Colorado licensed design professional is required regarding the structural ability of the roof framing to accept the point loads from the system.

*Many manufacturers have a design tool, often called a configurator, which will produce a report for connection spacing and uplift requirements. The correct design criteria needs to be input for the report to be correct and accepted. If a configurator is not available from the manufacturer, there are usually published charts used for design. The applicable charts need to be provided with the applicable design criteria indicated (clouded, highlighted, circled, etc.). Along with the charts or configurator, uplift limitations for the attaching hardware, for example lag bolts, needs to be provided showing the physical connection can withstand the uplift forces. Another option is to provide an engineer stamped letter or plan that shows the design criteria and the attachment criteria. If an engineer letter/plan is provided, no further documentation is required.*

#### GROUND MOUNT

- Site plan, must indicate the tallest point of the array. Only arrays exceeding 7' require a building permit (electrical permit still applicable).
- Configurator printout/charts OR letter from Colorado licensed design professional stating the following:
  - \* Design criteria
    - ◇ Snow load of 30 PSF if property is below 7000' in elevation, Snow load of 40 PSF if property is above 7000' in elevation
    - ◇ Wind load (Vult) of 130 MPH, Exposure C
  - \* Foundation requirements to include depth, diameter, and spacing

*All site fabricated elements require a design that is stamped by a Colorado licensed design professional.*

## ++SOLAR-THERMAL SYSTEMS++

### MECHANICAL/PLUMBING REQUIREMENTS

- Show the floor layout to include new and existing equipment, floor drains, and doors.
- Show isometric of solar system - one line drawings allowed.
- Provide manufacturer's specifications
- Specify type of system: drain back or glycol
- Show required backflow devices and connections to the domestic water lines
- Include general notes on all fixtures, materials used shall be listed and accessible
- IPC 504.5 Relief valve approval
- IRC combination pressure and temperature relief valves required to be shown on water heaters and storage tanks.

### CONSTRUCTION REQUIREMENTS

#### ROOF MOUNT

- Site plan
- Letter from Colorado licensed design professional stating the following:
  - \* Design criteria
    - ◇ Snow load of 30 PSF if property is below 7000' in elevation
    - ◇ Snow load of 40 PSF if property is above 7000' in elevation
    - ◇ Wind load (Vult) of 130 MPH, Exposure C
  - \* Roof connection spacing requirements. May be different for portrait and landscape orientations.
  - \* Fasteners to be used to connect racking system to roof structure
  - \* A statement regarding the structural ability of the roof framing to accept the additional weight from the system.

#### GROUND MOUNT

- Site plan, must indicate the tallest point of the array. Only arrays exceeding 7' require a building permit (mechanical/plumbing permit still applicable).
- Configurator printout/charts OR letter from Colorado licensed design professional stating the following:
  - \* Design criteria
    - ◇ Snow load of 30 PSF if property is below 7000' in elevation
    - ◇ Snow load of 40 PSF if property is above 7000' in elevation
    - ◇ Wind load (Vult) of 130 MPH, Exposure C
  - \* Foundation requirements to include depth, diameter, and spacing

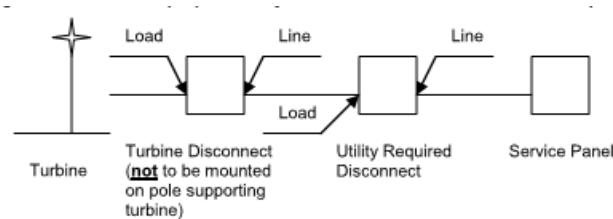
*All site fabricated elements require a design that is stamped by a Colorado licensed design professional.*

# ++WIND TURBINES++

## ELECTRICAL REQUIREMENTS

- Wind power generation plans must be organized so that required items are presented in the order they appear on the checklist. Plans not correctly organized must be submitted and will not be reviewed as a walk through and additional charges will apply.
- Pikes Peak Regional Building Department( PPRBD) will require approval, in writing, from your Utility specifically approving your turbine/ inverter and the location of Utility mandated A/C disconnect and/or metering.
- Floor/Site plan showing the following.
  - \* The direction north
  - \* All existing and new service gear and electrical equipment relative to the structures involved in this scope of work.
  - \* The location of all Utility mandated equipment.
- Manufacturer's specifications for all equipment being installed as part of this scope of work. (Charge controllers, turbines, grounding methods, etc.)
- Calculations page showing in order:
  - \* Calculation of conductor size (Turbine output maximum \* 125% gives the ampacity to be used for calculations)
  - \* Bus in backfed panel shown to be loaded less than or equal to 120% of the bus rating.
  - \* Calculations must use methodology and terminology found in the National Electrical Code.
- One-line diagram ,on a separate sheet, showing:
  - \* Conductor size, type, and quantity.
  - \* Conduit size, type, and quantity.
  - \* Rating/Size of all overcurrent devices.
  - \* Rating of all panel buses involved in the scope of work
- Requirements for disconnect locations and labeling.
  - \* Turbine disconnect must not be mounted on pole supporting turbine.
  - \* All exterior disconnects must have an engraved label mechanically fastened, mounted on the exterior of the disconnect. NOTE: DO NOT COVER MANUFACTURER'S INFORMATION!
  - \* For turbines with A/C output, a disconnect is required at the pole. This disconnect is not allowed to be mounted on the pole.
  - \* The service panel must be marked to comply with NEC. The wording, as follows, must appear on the exterior of the panel: "Multiple electric power sources present on the premises", to include utility power source, PV power source. wind generator, internal combustion generator, etc. (Every source must be listed).

**Diagram for illustration purposes only and must include all information as specified above.**



## CONSTRUCTION REQUIREMENTS

- Site plan
- Soils report
- Engineered foundation design
- Manufacturer's information regarding support pole
  - \* If support pole is to be site fabricated, engineering will be required for the pole.