Residential Photovoltaic Permit Process

In an effort to better serve the citizens of Buckeye, the City will be implementing a new procedure for Residential Photovoltaic permits. Effective Monday, November 2nd, 2015, Residential Photovoltaic permits that do not require de-rating of the main breaker or a panel upgrade will be issued over the counter with plan review being performed in the field at the time of inspection. In order to insure this program is successful all contractors shall submit the following documents to the City of Buckeye Development Services Department:

- (1) Complete Building Permit Application
- (2) Copies of the completed Photovoltaic System Plan Check Worksheet
- (2) Copies of array mounting, module and inverter cut sheets
- (2) Copies of the Photovoltaic plans
- (1) Complete Solar Panel Policy Acknowledgement letter signed by homeowner and solar representative

We look forward to streamlining the permit process for our citizens and contractors without jeopardizing a safe and proper Photovoltaic installation. If you have any questions please contact: Building Plans Examiner Emily Diver at (623) 349-6237.

Residential Photovoltaic System Checklist

- ☐ (1) Completed Building Permit Application
- ☐ (2) Copies of the completed Photovoltaic System Plan Check Worksheet
- ☐ (2) Copies of array mounting, module and inverter cut sheets
- ☐ (2) Copies of the Photovoltaic plans
- ☐ (1) Complete Solar Panel Policy Acknowledgement letter signed by homeowner and solar representative
- ☐ Note on drawings:
  - Existing SES panel model #
  - Existing SES panel UL listing
  - List of all existing breakers

BUCKEYE, AZ

CITY OF BUCKEYE
DEVELOPMENT SERVICES DEPARTMENT

530 E MONROE AVE, BUCKEYE AZ 85326
Phone 623-349-6200, Fax 623-349-6221

Photovoltaic (solar) Panel Policy Modification

(Effective Date 8/1/2011)

Purpose:
The purpose of this policy modification is to revise the requirements for structural engineering analysis and permitting requirements related to rooftop solar panel installations.

Policy:
The following items are required for the installation of Photovoltaic (solar) panels attached to a residential building:

1. A complete Building Permit Application that includes the following information:
   a. Arizona State Contractors License number
   b. Arizona State Re-sale License number
   c. City of Buckeye Business License number
   d. Assessor's Parcel Number
   e. Project Value
   f. Owner Contact Information

2. Acknowledgment signed by the Photovoltaic (solar) panel Contractor and the homeowner to acknowledge responsibility for any structural inadequacy of installation and acknowledge that the City of Buckeye reserves the right to require structural engineering approval of installation when deemed necessary.

3. Two sets of plans to include the following:
   a. Manufacturers specifications of installation
   b. Note on plans that photovoltaic equipment shall be installed in accordance with the 2011 NEC article 690 and posted with applicable warnings, signage and plaques per 2011 NEC article 705-10, 690-17, 690-64, and 2012 IFC section 605.11.
   c. DC disconnect required prior to inverter per City of Buckeye standard.
   d. Integrated disconnect not acceptable as a primary means of disconnect of inverter.
   e. Show all dimensions to include distance from roof surface to top of panels, distance from ridge to top of panels, panel tilt angles, parapet heights and roof slopes, as well as clear space from panels to roof edge.
   f. Cut sheets for all equipment, conduit and wiring.

4. A site and/or plot plan (showing where the house is located on the site, building setbacks, etc.) and location of roof mounted panels.

5. Electrical layout with one-line and three-line diagrams to the main service.

6. The Photovoltaic (solar) panel installer will be required to request an inspection of the installation. Typically, one final inspection is conducted; however, actual inspections may vary depending on the project. Please note that the required inspections of the panels, wiring, combiners and other components will require inspector access to the roof, interior attic space and various exterior locations. The City will not require a Structural Engineer inspection and certification, unless during the inspection conditions are found that warrant structural analysis, such conditions may include:
   a. Obvious inadequacies of roof truss system.
   b. Modification of original roof truss system.
   c. Substandard installation of solar equipment with respect to roof truss system.

7. Safety requirements for inspections:
   a. Provide locks or lockout/tag out procedures after combiner(s) panel is wired.
   b. Provide ladder for roof top inspection and for combiner panel location in attic.

May 6, 2014

George Flores, Development Services Director — Date

Homeowner Acknowledgement — Date

Solar Representative Acknowledgment — Date

Property Address:_____

BUCKEYE, AZ

CITY OF BUCKEYE

Development Services Department

PV SYSTEM – 2011NEC & 2012 IFC PLAN CHECK WORKSHEET (TWO COPIES REQUIRED)

Property Address: _____

Center Fed Main ☐ Yes ☐ No
Panel Upgrade ☐ Yes ☐ No
Panel Derate ☐ Yes ☐ No

1.0 - SUPPLIED DIAGRAMS The following shall be included in the permit package:

☐ Yes ☐ No (A) A basic site diagram
☐ Yes ☐ No (B) The location of electrical equipment is identified on the plan
☐ Yes ☐ No (C) The Array Configuration including roof access and pathways, any existing Rooftop Equipment, Plumbing Vents, Exhaust Vents or Flues. IFC 605.11.3.2.
☐ Yes ☐ No (D) A 3-line diagram

2.0 - INVERTER INFORMATION

☐ Yes ☐ No (A) Cut sheets for the Inverter.
☐ Yes ☐ No (B) The Inverter(s) listed utility-interactive *(see CEC list of eligible inverters)*
_____ (C) Inverter Model Number.
_____ (D) Maximum overcurrent protection rating permissible *(from Cutsheet or listing Label)*
_____ (E) Input voltage range of Inverter
_____ (F) Separate DC disconnect prior to inverter (see City approved list of inverters not required)

3.0 - PV MODULE INFORMATION

☐ Yes ☐ No (A) Cut sheets for the PV modules
☐ Yes ☐ No (B) The modules are listed *(see CEC list of eligible modules)*
_____/_____ (C) Open-circuit voltage (V_{OC}) from the listing label
_____/_____ (D) Maximum system voltage from the listing label
_____/_____ (E) Short-circuit current (I_{SC}) from the listing label
_____/_____ (F) Maximum Power (P_{max}) at STC from listing label
_____/_____ (G) Maximum power-point voltage (V_{mp}) from listing label
_____/_____ (H) Maximum power–point current (I_{mp}) from listing label

4.0- ARRAY INFORMATION (Provide calculations required for strings of varying numbers)

_____/_____ (A) Number of modules in series
_____/_____ (B) Number of parallel circuits
_____/_____ (C) Total number of modules
_____/_____ (D) Operating Voltage = (number of modules in series x module voltage at V_{mp})
_____/_____ (E) Operating Current = (number of parallel source circuits x module current at I_{mp})
_____/_____ (F) Maximum system voltage 690.7 = (V_{oc} * 1.12 * number of modules in series)
_____/_____ (G) Short-circuit current 690.8 = (I_{sc} * 1.25 * number of parallel source circuits)

5.0 - WIRING AND OVERCURRENT PROTECTION (Provide calculations for each Inverter)

☐ Yes ☐ No (A) Conductor type is 90°C and suitable for wet locations
☐ Yes ☐ No (B) All conductor ampacities are sufficient
☐ Yes ☐ No (C) Provide adjusted ampacities for temperature with calculations NEC 310.15(B)(2)
☐ Yes ☐ No (D) Point of connection meets provisions of NEC 690.64
_____ (E) Point of connection panel buss bar rating NEC 705.12

6.0 - ROOF INFORMATION *(for rooftop systems on single family dwellings)*

_____ Please provide the age of home. If different than home, age of roof structure_____.

☐ Yes ☐ No (A) Are the conductors from the PV Array run through the house? (If yes, indicate what method will be used to address the protection issues).

_____ (B) Weight of array for rooftop systems. (Lbs. per Sq. Ft. including mounting hardware)

(C) For single family dwellings under 30 years old and the array weight is less than 5 lbs/sq. ft., then engineering calcs are unnecessary for roof loading

☐ Yes ☐ No D) If the roof structure is over 30 years old, describe the structural elements:

_____Spacing of rafters (e.g. 24" O.C.) _____Span of rafters (e.g. 14')

_____Size of rafters (e.g. 2" x 6")

_____ (E) Identify roofing type (e.g. comp. shingle, masonry tile, shake, etc.)

☐ Yes ☐ No (F) The detail of PV panel mounting attachment to the roof-framing members is provided?

_____ (G) Identify method of sealing the roof penetrations (e.g. flashing, sealed with urethane caulk etc.)

☐ Yes ☐ No (H) Maintain 3' clearance from roof edges and roof peak per Fire Department.

7.0 - GROUND MOUNTING STRUCTURE *(for ground-mounted structures)*

☐ Yes ☐ No (A) The weight of array is indicated (pounds per square foot – including mounting hardware)

☐ Yes ☐ No (B) The details of the array supports, framing members, foundation posts and footings

☐ Yes ☐ No (C) Building setbacks are provided

☐ Yes ☐ No (D) The information on the mounting structure(s) construction is provided *(If the mounting structure is unfamiliar to the local jurisdiction or is more than six feet above grade, engineering calculations are required)*

8.0 - INSPECTION GUIDELINES FOR ALL PHOTO VOLTAIC SYSTEMS

- Equipment, conduit, and wiring are installed according to approved plans.
- At a minimum a copy of the three-line diagram and the plot plan should be available at the site for the inspector's use during field inspections.
- If any deviation exists between the reviewed plans and the site installation, those changes should be submitted to the City prior to inspection.
- Marking shall be placed on interior and exterior DC conduit, raceways, enclosures and cable assemblies every 10 feet within 1 foot of turns or bends and within 1 foot above and below penetrations of roof/ceiling assemblies, walls or barriers. "WARNING: PHOTOVOLTAIC POWER SOURCE."
- The materials used for marking shall be reflective, weather resistant and suitable for the environment. Marking shall have all letters capitalized with a minimum height of 3/8 inch white on red background as required in IFC Sections 605.11.1.2 through 605.11.1.4.
- All required inverter disconnects shall be in line of site of inverter.

9.0 - FIELD INSPECTION CHECKLIST FOR ELECTRICAL THREE-LINE:

- PV module model number matches plans and cut sheets
- PV modules are properly grounded
  - Modules shall be bonded with listed / identified lugs or equipment grounding screws on each module and mounting rails or other approved method.
  - Another method is to attach a bonding conductor from each module to a listed / identified lug on the rails with the grounding conductor attached to a lug on the rails.
- Check that the wiring is consistent with the callouts on the plans (number of modules)
- Check that the cable and conduit is properly supported.
- Where plug connectors are used for module wiring, inspect a sample of the connections to make sure that the connectors are fully engaged.
- Grounds made to non-listed connection points shall have the nonconductive material removed before connection.

10.0- STRUCTURAL ATTACHMENT

- The array is attached to structure according to the plans and manufactures installation instructions.
- The contractor is responsible and shall review the structural attachment to confirm it matches the supplied detail.

11.0- SIGN INSTALLATION REQUIREMENTS

☐ Sign Construction:
- Signs or labels shall be of sufficient durability to withstand the environment.
- For outdoor signs, the sign should be either metal or plastic with engraved or machine printed letters, or electro-photo plating, in a contracting color to the sign background.
- Plexiglas-covered paper or laminated paper directories are also acceptable provided that the signs are sufficiently protected from the environment involved. The signs or directories shall be permanently attached to the electrical equipment or located adjacent to the identified equipment.

☐ Direct-Current Photovoltaic Power Source. (690.53)
<u>This permanent label provided by installer at photovoltaic disconnecting means.</u>
- Rated maximum power-point current.
- Rated maximum power-point voltage.
- Maximum system voltage 690.7
- Maximum circuit current 690.8
- Maximum rated output current of charge controller (if installed)

☐ Interactive System Point of Interconnection (690.54)
<u>To be placed on the Solar AC Disconnect and AC Point of Connection locations</u>
This permanent label must include:
- Rated AC output current. I_{RATED}
- Nominal operating AC voltage (120, 208, 240 or 480 volts)

☐ Check that Inverter matches callouts on one-line diagram.

☐ Facilities with Utility Services and PV System 690.56(B)
- A sign should be mounted on or next to the PV system disconnecting means with the words to the effect of "PV Utility Disconnect" in a minimum of 3/8" high letters.

If this PV disconnect is not located at the service disconnecting means, follow the requirement in NEC 690.56 (B): Buildings or structures with both utility service and a photovoltaic system shall have a permanent plaque or directory providing the location of the service disconnecting means and the photovoltaic system disconnecting means if not located at the same location.

☐ Photovoltaic power source breakers are back feeding do not relocate this over current device NEC 705.12

☐ WARNING SIGN REQUIRED BY NEC 690.17.
Explanation: Any time a switch can have the load side energized in the open position, a warning sign must be placed on the switch. **WARNING: ELECTRICAL SHOCK HAZARD–LINE AND LOAD MAY BE ENERGIZED IN OPEN POSITION**

☐ **Facilities with Stand-Alone Systems. 690.56(A)**

- Any structure or building with a photovoltaic power system that is not connected to a utility service source and is a stand-alone system shall have a permanent plaque or directory installed on the exterior of the building or structure at a readily visible location acceptable to the authority having jurisdiction. The plaque or directory shall indicate the location of system disconnecting means and that the structure contains a stand-alone electrical power system.