INTERCONNECTING SMALL PHOTOVOLTAIC SYSTEMS TO FLORIDA'S ELECTRIC UTILITY GRID

Florida Solar Energy Center Recommendations

August 3, 2000

The Florida Solar Energy Center (FSEC) recommends the following interconnection requirements for small (10 kW ac or less) photovoltaic systems:

A. STANDARDS AND CODES

1. Inverter(s)

The inverter(s) must be listed and in compliance with *Underwriters Laboratories (UL) 1741, Standard for Static Inverters and Charge Controllers for Use in Photovoltaic Systems.*

Comments:

Utility-interactive inverters that pass the tests of the new UL 1741 standard will be, by definition, "non-islanding" inverters and will comply with all elements of the new IEEE interconnection standard. The *1999 National Electrical Code* requires that all utility-interactive photovoltaic systems use listed inverters that pass UL 1741. In essence, this means that any small utility-interactive PV system that is properly inspected and is in compliance with the *1999 National Electrical Code* will, by default, comply with the new IEEE 929-2000 interconnection standard.

2. Photovoltaic Modules and Panels

a. Photovoltaic modules and panels must be listed and in compliance with *Underwriters Laboratories (UL) Standard 1703, Standard for Safety: Flat-Plate Photovoltaic Modules and Panels*.

b. Photovoltaic modules must be in compliance with *IEEE Standard 1262-1995, IEEE Recommended Practice for Qualification of Photovoltaic (PV) Modules* (or, equivalently, IEC 61215).

3. System Installation

The PV system must be installed by a licensed contractor and be in compliance with:

a. *IEEE 929-2000, Recommended Practice for Utility Interface of Photovoltaic Systems.*

b. All relevant articles of the *1999 National Electrical Code*® (or subsequent revisions).

Comments:

PV systems installed in compliance with the 1999 National Electrical Code (NEC) will also be in compliance with IEEE 929-2000. Consequently, FSEC recommends that compliance with the 1999 NEC (and subsequent revisions) be included in Florida interconnection requirements.

Responsibility for verifying compliance with the NEC rests with local code officials. FSEC offers both training for code officials and assistance in inspecting systems, upon request. FSEC also offers similar training and assistance to any utility that chooses to inspect system installations for code compliance.

B. LIABILITY INSURANCE

The maximum amount of liability insurance that may be required of the PV system owner or end user is $100,000. A standard homeowners policy meets this requirement.

Comments:

The Florida Solar Energy Center opposes special requirements for liability insurance for owners or operators of grid-tied PV systems. These systems, which have been in operation for two decades and number in the tens of thousands around the world, have had an impressive record of safe operation. Although future injuries cannot be ruled out, it is clear that grid-connected PV systems, using listed equipment in a code-compliant installation, are inherently safe.

Other states have recognized that grid-tied photovoltaic systems do not pose unusual safety hazards. California, Maryland, Nevada and Oregon have explicitly prohibited additional insurance requirements for utility-interactive systems. In Idaho, New York and Vermont, utility proposals for limits of liability ranging from $500,000 to $2 million were rejected in favor of lower limits of $100,000.

In summary, the requirement of excessive levels of liability insurance will impede the installation of small utility-interactive photovoltaic systems, and will discourage customers from choosing this renewable technology to meet a portion of their energy needs. Certainly economic considerations should not outweigh safety considerations. However, our twenty years of experience in researching, testing and evaluating utility-interactive photovoltaic systems leads us to the conclusion that the risk of injury or equipment damage from these systems is extremely low, and there does not appear to be a need for special insurance requirements. We view the requirement for excessive levels of liability insurance as inconsistent with the historical safe performance of PV systems and even more inappropriate in light of the new standards that are in the process of being adopted.

C. METERING AND BILLING

The utility shall inform the photovoltaic system owner or end user of their option to choose "net metering." If the energy produced by the PV system exceeds the premises load for any billing period, the utility will allow a monthly carryover credit. However, the owner or end user will not be paid for excess energy delivered to the utility and, at the end of a 12-month period, the utility may cancel any remaining credit.

Comments:

FSEC supports net metering, whereby the system owner or operator is compensated at the retail rate for PV-generated electricity fed back to the grid.

Thirty states now require net metering. Establishment of net metering programs is typically the result of actions taken either by public utility commissions (PUCs) or by state legislatures. Programs established by PUCs usually affect investor-owned utilities only, whereas legislated net metering programs typically affect all utilities in the state. The most recent national trend has been toward state-legislated net metering programs, with four programs being established in 1997, four more in 1998, and seven more in 1999.

A strong argument for net metering is the simplicity it brings – not only the elimination of a second meter, but also the administrative savings associated with not having to install the second meter, not having to read it, and not having to separately account for the electricity supplied by and delivered to the utility. These equipment and administrative savings from net metering at least partially offset any revenue losses suffered by utilities in crediting the customer (at the retail rate) for electricity delivered to the grid. One approach to alleviating the fear of utility revenue losses associated with net metering is to impose a statewide limit on the total amount of electricity that may be produced from net-metered systems. For example, the states of New Jersey, New York, Virginia and Washington limit the penetration of net metered systems to 0.1% of peak demand for the previous year.

Despite the associated revenue losses, there are good reasons for utilities to adopt net metering programs. For example, net metering may be viewed as a low-cost subsidy for a renewable energy technology that offers significant long-term benefits for society. Such benefits include reduced greenhouse gases, a cleaner environment, greater energy security, and slower rates of consumption of fossil fuels. In short, the use of net metering to help develop sustainable markets for photovoltaic systems is a small investment for a better future.

For the penetration levels anticipated in Florida over the next couple of decades, net metering of photovoltaic systems will have an insignificant effect on utility revenues, but will provide major benefits to PV system users.

D. SATISFYING THE INTERCONNECTION REQUIREMENTS

To satisfy all interconnection requirements, all items of the attached application and compliance form must be completed and properly signed. No additional paperwork is required.

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APPLICATION AND COMPLIANCE FORM

A. Applicant Information

Name: _____

Mailing Address: _____

City: _____, **FL Zip Code:** _____

Street Address (if different from above): _____

Daytime Phone: _____ **Fax:** _____ **Email:** _____

Electric Utility Name: _____ **Account No.:** _____

B. Photovoltaic System Information

System Name/Model: _____ **PV System Power Rating** _____ **ac watts**

List Manufacturer/Model for:

Modules: _____ **Inverter:** _____ **Batteries (if applicable):** _____

Array Location: _____ **Inverter Location:** _____

AC Disconnect Location: _____ **Permission to Monitor?** 9 **Yes** 9 **No**

C. Installation Contractor Information

Installation Contractor: _____, **FL License No.:** _____

Address: _____

City: _____, **FL Zip Code:** _____

Daytime Phone: _____ **Fax:** _____ **Email:** _____

Proposed Installation Date: _____

D. Hardware and Installation Compliance

1. **The system hardware is in compliance with *Underwriters Laboratories (UL) 1741, Standard for Static Inverters and Charge Controllers for Use in Photovoltaic Systems* and *UL 1703, Standard for Safety*: *Flat-Plate Photovoltaic Modules and Panels*, and *IEEE 1262-1995, IEEE Recommended Practice for Qualification of Photovoltaic (PV) Modules.***

b. **The system has been installed in compliance with *IEEE Standard 929, Recommended Practice for Utility Interface of Photovoltaic Systems* and the *1999 National Electrical Code® (NEC).***

Signed (Contractor): _____ **Date:** _____

Name (Print): _____ **Company:** _____

E. Owner Acknowledgment

The system has been installed to my satisfaction and I have been given system warranty information, and an operation manual. Also, I have been informed of the option to choose net metering, and have been instructed in the operation of the system.

Signed (Owner): _____ **Date:** _____

F. Electrical Code Inspection and Utility Approval

1. Satisfies Code Requirements

Inspector Name (Print): _____

Inspector Signature: _____ **Date:** _____

2. Satisfies Utility Interconnection Requirements

Utility Representative Name (Print): _____