WRENCH REALITIES

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From time to time I get calls to inspect systems that I did not sell or install. I recently got a call from a gentleman in Oregon complaining about an RE installation. This horror story is particularly interesting because the system in question was designed and installed by a licensed electrical contractor.

Mr. A requested an inspection of his renewable energy electrical system due to his displeasure with the system design and installation, and its failure to pass examination by the local electrical inspector. The system design and installation were performed by XX of XX Electric. According to Mr. A, the installation took place in late April or early May of 2000. My inspection was performed on October 27, 2000.

Qualifications

I hold California CSLB C-10 license #613554. I have been licensed since 1991, and specialize exclusively in renewable energy design and installation. I am a participant in the CSLB Industry Expert program, and a founding member of the Independent Power Providers (IPP) group. I have authored numerous published articles on renewable energy, and have been commissioned by the federal Department of Energy to report on the Utilities for Photovoltaics Group.

Observations

Mr. A's RE system is poorly designed at best. Numerous *National Electric Code (NEC)* and RE industry standards violations were observed. The worst violation observed is the lack of any kind of overcurrent protection between the batteries and the inverters. This presents a clear and severe fire danger.

XX Electric had clearly abandoned the job, since there has been no work performed by them for over six months. The job was left in an unfinished and unsafe condition. Mr. A has an invoice from XX Electric showing charges for components and labor. The description of the labor charges states, "hook up inverter, wire from batteries, set up charging room." But my observation shows that XX Electric did not complete the work that they billed Mr. A for.

Observed *NEC* Violations

Photo 1

- Single conductor wires not in conduit; *NEC* 300.3(a)
- No conduit box; *NEC* 300.15
- Conductors not protected from physical damage; *NEC* 300.4
- No overcurrent protection; *NEC* 240.3

Photo 2
- Single conductor wires not in conduit; *NEC* 300.3(a)
- No conduit box; *NEC* 300.15
- Conductors not protected from physical damage; *NEC* 300.4
- No overcurrent protection; *NEC* 240.3
- Incorrect marking of ungrounded conductor; *NEC* 310-12(c)

Photo 3
- Single conductor wires not in conduit; *NEC* 300.3(a)
- Conductors not secured; *NEC* 300.11
- Conductors not protected from physical damage; *NEC* 300.4
- No overcurrent protection; *NEC* 240.3
- No battery acid spillage protection; *NEC* 480-7(b)
- No guarding of live battery parts; *NEC* 480-8(b), 690-71(b)(2)
- Ampacity of 12/2 NM Romex between generator and inverter substandard; *NEC* 310-15(a)

Photo 4
- Conductors not secured; *NEC* 300.11
- Conductors not protected from physical damage; *NEC* 300.4
- No overcurrent protection; *NEC* 240.3
- No guarding of live parts; *NEC* 480-8(b)690-71(b)(2)
- #4/0 inverter wire terminal not protected from corrosion; *NEC* 310-9

Observed Industry Standard Accepted Practices Violations
- No load analysis of customer needs done prior to designing system.
- Incorrect tower height specified for wind generators. Generators must be a minimum of 30 feet (9 m) *above* trees and house.
- Size or number of wind generators incorrect for needs and site.
- Too many batteries to be supported by RE system inputs.
- Incorrect type of wire terminals at inverter end of #4/0 inverter feed wires.
- No anti-corrosion measures (heat-shrink tubing, tape) used on battery/inverter feed wire terminals.
- Inverter conductors installed on incorrect battery terminals.
- No antioxidant applied to AL/CU screw lugs at inverter terminals.
- No electrolyte containment provided in the event of a spill.
- No battery monitoring equipment specified or installed.
- Only one inverter hooked up to charge batteries.
- Battery charger temperature monitoring system not installed.
- Abandonment; Client states that XX Electric was last at job site in late April or early May, 2000. Job site abandoned in an unfinished and unsafe condition.

Mr. A's poorly sized and sited wind generators.

Reported Industry Standard Accepted Practices Violations

- 12/2 NM Romex used for connection from inverters to main circuit breaker box. Inverters are each rated for 33.3 A continuous output.
- 12/2 NM Romex used for connection from inverter to generator.
  Both 12/2 NM Romex wire runs were laid across the concrete floor, unsupported and unshielded from physical damage.
- Generator is rated for 30 A output. Inverter was on default program (never programmed by XX Electric) to draw 30 A for the charger.
- Input wire from generator attached to wrong AC input terminal in inverter.
- No overcurrent devices on AC output of inverters.
- No overcurrent devices on DC input from wind generators.

Caveat Emptor

I hope that people hiring a "professional" to design and install their system will question that person or company. Having an electrician's license or electrical contractor's license is obviously not enough. Is the person or company experienced in RE system design and installation? Ask for references and check them out. I strongly recommend that anyone considering purchasing their system from an installing dealer read Richard Perez's article, *What to Expect from your RE Dealer,* page 84, this issue. It's *your* money—spend it wisely.

Access

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