Title: SAFETY ARTICLE: Danger from the Sky

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Providing light, heat and awesome tans, the sun hangs up there in the sky for about half the day shining down upon us. It has also become a source of electrical power for both residential and commercial properties, signs of all types, landscape lighting, navigational aids and a myriad of other applications.

The sun emits sufficient power so that after its almost 93 million mile trip, the sun delivers the potential for about 1000 direct current (DC) watts per square meter to the earth's surface. This power is collected in photovoltaic (PV) solar panels which can be found just about anywhere including on the ground, on roof tops and providing double duty as shade for cars in parking lots while collecting power and so on. The wattage collected goes through a wiring harness to a junction box (known as a combiner box). From the combiner box(es) conductors move the DC power to an inverter or micro inverters (mounted on the PV panels). The inverter converts the DC power to alternating current (AC). From the inverter, the AC power goes to the electrical panel of the home or facility to provide AC electrical power. While some systems, either off the electrical grid or by the preference of the owner have battery banks to store unused power, most systems do not. Not having batteries reduces system costs and unused solar power can be fed back into the electrical utility grid with suitable compensation to the owner.

Solar power is here to stay and while it is currently called an alternative source, we may find that term giving way to primary source with the grid as backup. It is clean, affordable and always there (even on cloudy days). A typical home installation is a 5000 watt, 600 volt system that after rebates and tax credits costs about $7000. It pays for itself in about 7 years and then yields almost 14% return per year on the investment. In the future (by 2014 latest) we will see roofs being painted with PV paint that replaces the panels and clothing made of PV thread that will charge the electrical gizmos you carry. This is a rapidly evolving industry and every day it seems another application is discovered. What it does for us as firefighters is another story.

With photovoltaic systems becoming more and more common place, another dimension is added to safely conducting suppression operations. Our discussion from this point forward will focus on residential applications. It is strongly suggested that you survey your first due area and get with your inspectors and with your local utility who has a data base of PV systems in the area to get a grasp on the population of photovoltaic systems that exists.

The threats to firefighters during suppression operations from photovoltaic systems are as follows:

- **Recognition** - The ability to identify that a PV system is supplying a home with power is key to safe operations. What you don't know can and will hurt you!
- **Structural** - Our light-weight roofs are designed for normal conditions, not fire conditions. Even though the panels add less than two pounds per square foot to the roof load, you can expect that roof failure will occur sooner. Wiring harnesses are supposed to be suspended to a level where a firefighter cutting a vent hole (why would you) would not hit them. The danger here is that weekend warriors doing their own install and or an oversight of inspection might find them secured to the underside of the trusses and just might result in an electrical shock.

- **Electrical -** The good news is that if the grid goes down, the PV system will stop supplying power to the electrical panel to prevent back feed. The bad news is that so long as the PV panels are receiving power from sun (also from bright moonlight and strong lighting) the system is producing power and if the system has storage batteries there will be stored power to deal with as well. This means that if the grid is up, the PV system will continue to provide power to the electrical panel. At least one or more disconnects are normally in the system, one usually disconnects the inverter from the electrical panel. While that helps us, the PV panels continue to collect and transmit power to the inverter. In order to stop the generation of power, the panels must be covered completely by tarps. Some tarps like the inexpensive blue or green ones do not stop the generation. Six mil black plastic works quite well instead.
- **Toxic substances** - Adding to the current toxic cocktail of gases that a residential structure fire produces, PV systems add arsenic, boron, gallium, phosphorus, tellurium, and silicon. Another reason to use SCBA for suppression operations, including overhaul, and cleaning your gear in addition to yourself after an operation.

What resources are out there to assist us?

- The resources listed below provide excellent information on the subject.
- Contact your local solar system installer / sales companies. There may also be a local association of solar system sales and installation.
- Rodney Zancanata, Deputy Fire Marshal Coconut Creek, who brought this issue up and stimulated this article, has been working with large scale commercial PV system applications for the past couple years.

I would like to thank Deputy Fire Marshal Zancanata and Mr. Patrick Altier, Operations Manager of Solar Trek in Ocala FL for their guidance and input on this article.

As always your feedback is appreciated and encouraged. Contact Charlie.brush@myfloridacfo.com or dial 352-369-2836.

Resources for this article:
http://www.fsec.ucf.edu/en/education/cont_ed/pv/handbook/SolarContrac_PermitFlorida.pdf
http://osfm.fire.ca.gov/training/pdf/Photovoltaics/Fire%20Ops%20PV%20lo%20resl.pdf
http://osfm.fire.ca.gov/training/pdf/photovoltaics/lp01introduction.pdf
http://content.learnshare.com/courses/73/352901/player.html - This is a UL on-line interactive training program
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