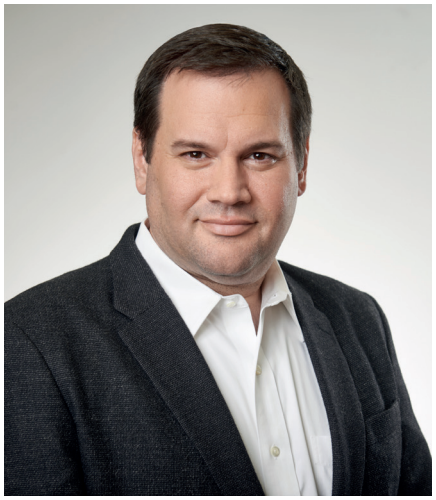
Making solar safer for companies: the why, what and how

Words: Meir Adest, Chief Information Officer and Founder of SolarEdge

Improved economics, governmental incentives, and increased awareness of solar energy as a viable alternative to grid power are leading more companies to go solar. With the potential to benefit businesses large and small, smart energy solutions are cropping up on unused rooftops of shopping centres, manufacturing plants, airports, schools, and hospitals. Much of the attraction is economic, especially in an environment of rising electricity consumption and costs. Its investment typically realised in a period of around 5-10 years, returns on a solar energy system comes in the form of lower electricity bills as power is generated by the solar system while dependency on the grid is diminished.

There is also a strong altruistic motive in installing a solar power system. Lowering a company's carbon footprint naturally benefits the environment, by cutting down on CO_2 emissions and helping to reduce the effects of climate change. Today a forward-looking corporate environmental program has become as essential as a balance sheet, with many Fortune 500 companies promoting their own ambitious zero carbon targets.

Accordingly, PV (Photovoltaic) systems are now viewed as long-term investments that



Meir Adest

need to be closely managed and monitored in order to maximise ROI and bottom line savings. As with any serious investment, stakeholders must ensure that the employees of those businesses, as well as the assets which they are financing, are safe and secure from physical harm.

Commercial buildings are high-value assets, and in the event of a fire, property loss and business interruptions can be costly. Another consideration is that some insurance companies extend coverage for buildings that include PV rooftop installations, should they provide adequate safety measures for these assets or for first responders.

To address these and other safety concerns, high-quality PV systems with enhanced safety features serve as an excellent solution.

Let's start with the basics...

It is important to note that PV systems are safe, reliable and do not inherently pose a danger to people or property. That being said, it's important to understand how solar systems work in order to know how to mitigate any potential safety risk.

The main components of solar systems are PV modules and inverters. The PV modules, also called solar modules, generate electrical power by converting solar radiation into direct current (DC). Inverters then convert the DC power to alternating current (AC) used to power homes, buildings and businesses. The risk of fire caused by the PV system itself is quite rare. But it's important to remember that they are also mini-power stations situated on the roof.

As long as the sun is up, high DC voltages energize the PV modules and wires, even when the main circuit breaker is shut down. This means that, in the unlikely event of a fire or an emergency, firefighters must wait until the sun is down in order to intervene. In order to ensure their safety, firefighters commonly cut off electric grid supply to burning structures as a precautionary procedure before extinguishing the fire. They assume there is no risk of electrocution once the grid has been disconnected, allowing the spray of water and creation of holes in the roof so that heat and smoke can dissipate. However, this assumption is not true in the case of a typical PV roof system.

While this scenario can present risks, by applying advanced system design and

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through careful product selection these risks can be mitigated.

Safety begins at the module level

Traditional string inverters typically have limited safety functionality since they do not necessarily reduce the DC voltage when switched off. To meet safety standards, additional safety-specific hardware needs to be purchased and installed, adding more costs and labour to the installation.

While it can be difficult and expensive to address these safety concerns, some solutions provide advanced safety functionality. For example, SolarEdge developed a module-level power electronic solution based on power optimisers. Power optimisers are electronics attached to each module that provide them with independence to maximise output. Power optimisers turn solar modules into smart modules, increasing the system’s energy output and enabling module level monitoring and control.

Roof SolarEdge SafeDC

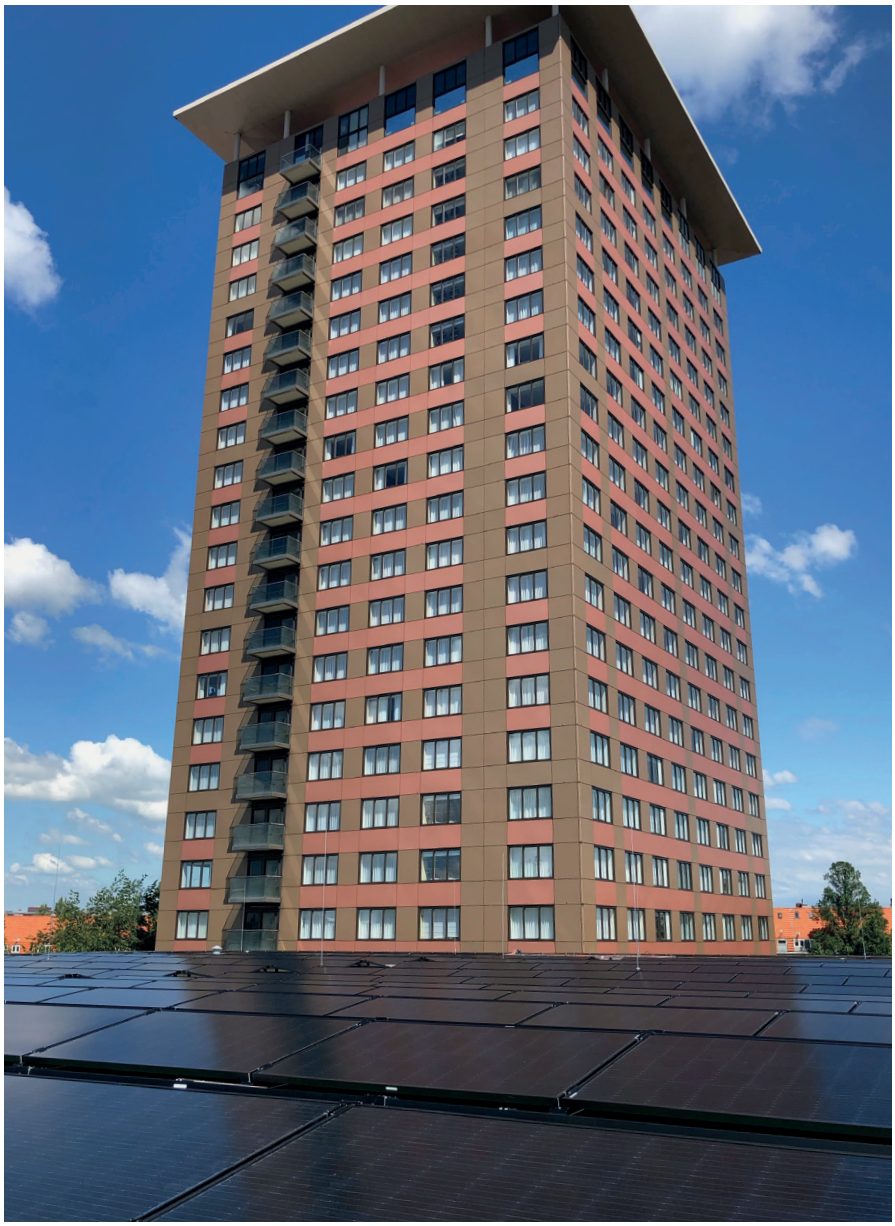
No less important, they provide enhanced safety. As part of its solution, SolarEdge’s SafeDC™ functionality reduces the module voltage to 1 volt upon inverter shut down. This is important because even if firefighters are unaware of the existence of a PV system, safety mode at the module-level is initiated when they disconnect the power.

The SafeDC™ functionality also helps to avoid the extra cost of installing safety-specific hardware, reducing installation time and room for error. In addition, with power optimisers each module can be constantly monitored to determine its performance and alert the installer or system owner of possible faults and potential safety risks. Maintenance personnel can therefore remotely monitor and troubleshoot, instead of performing diagnostics on site.

System safety is especially important where people are concerned. The Okura Hotel in Amsterdam, a high-end venue known for hosting prestigious business conferences, decided to lessen its reliability on the grid and turned to Solnet Group to install a proven PV system on its rooftop.

Solnet Group then turned to SolarEdge, since its solar offering is designed to mitigate potential fire and electrical safety issues that can occur in traditional string inverters. The embedded safety measures, including SafeDC™ and arc fault detection and interruption for the prevention of electrical fires, gave the investors additional peace of mind, especially important when hotel guests are involved.

This confidence in SolarEdge’s SafeDC™ technology extends to firefighters installing SolarEdge on the roofs of their own fire stations. In the UK, a fire and rescue service selected SolarEdge for 700kW of PV systems on 12 different fire stations and 3 headquarter buildings. This was due to our advanced safety features, such as its firefighter gateway, which enables central safety management for the PV



Hotel Okura Amsterdam

systems, including automatic and manual system DC shutdown, real time indication of system DC voltage for safety assurance, and an emergency stop button for the entire PV system.

Know Your Government Regulations and Insurance Requirements

Due to these safety concerns in combination with the proliferation of the solar energy market, safety regulations are being addressed by insurance companies, fire authorities, and utility companies around the world. While PV safety requirements are the responsibility of each individual country and may vary according to region, progressive regulations are having a collective impact on leading the solar industry towards improved system safety. Germany's VDE-Fire Safety standards dictate that after switching off the AC power supply, first responders are not exposed to the risk of electrocution from direct contact with high-voltage DC cables. The United States, a leader in PV system safety regulations, in its provision of NEC 2017 has included a rapid shutdown functionality requirement for all rooftop systems. This states that controlled conductors beyond one foot (30.5cm) the solar array must be reduced to 30 volts or less within 30 seconds, allowing installers, maintenance workers, and firefighters to quickly handle the system after shutdown.

Another important area of focus is arc detection. Advanced safety regulations require the implementation of arc detection functionality designed to mitigate the effects of arcing faults that potentially pose fire risks. The arc detection standard in the U.S, UL 1699B, calls for detection of specific arcs as they occur. While underway, the United Kingdom has yet to implement arc detection requirements, however, insurance companies may request it. In fact, a leading risk assessment and insurance company has recommended DC optimised PV solutions as their preference for rooftop systems.

Globally, more governments are announcing their commitment to a new environmental policy of becoming carbon neutral by 2050. This signifies a shift to a low-carbon economy and an opportunity to encourage investment and innovation in renewable energy. While global safety standards, technological innovation, and the consumer awareness of solar energy systems evolve swiftly, so do the financial rewards and environmental benefits to commercial businesses. SolarEdge remains committed to leading the development of safer solar solutions that meet the evolving needs of commercial enterprises, government regulations, insurance requirements, and long-term sustainability goals.

About the Author:

Mr. Meir Adest founded SolarEdge in 2006 and currently serves as our Vice President, Core Technologies. He is responsible for SolarEdge's certification and long-term reliability of products and research of future technologies. Prior to co-founding SolarEdge, Mr. Adest spent 7 years managing power electronics development teams and directing large-scale, techno-operational projects.

Mr. Adest holds a B.Sc. in mathematics, physics, and computer science from the Hebrew University in Jerusalem.