

Advanced Technology Gears Up to Protect Renewable Energy

(Image courtesy of Magal Security Systems)

As the renewable energy market grows, it experiences new risks and threats. The blazing sun and powerful winds place solar and wind farms in lonely areas, making it difficult to secure via manpower. Electronic security plays a pivotal role for the remote protection of large-scale green energy farms.

BY MARIKO HIGASHIYAMA

Wind and solar farms are mostly situated in unpopulated and isolated areas. Their relative isolation can be used as an effective barrier against possible intruders. "While this makes sense for a mountain top, the remote location is exactly the factor that make farms vulnerable to theft," said Gregory Johnston, CTO of Jet Protect. "Once a photovoltaic (PV) panel has been lifted, it can be placed anywhere to generate electricity, making it a commodity. In fact, theft at solar farms has exploded these past six months." Aside from simply stealing panels, the removal of one panel can often cause damage to a secondary panel, said John Bowerman, MD of GPS Perimeter Systems.

Other risks posed to wind and

solar farms include vandalism, said John Downie, Sales and Marketing Manager for Europe, CBC. "All these threats are combined with challenges posed in protecting large sites with exposed perimeters, and the need to adequately monitor the movements of people and vehicles legitimately entering the site, while ensuring that others are detected before they cause any harm."

Terrorism is another threat. As renewable energy is expected to become a significant power source by 2020, deliberate attacks could severely damage the economy. "The cost to replace these sites will be tremendous," said Hagai Katz, Senior VP of Marketing and Business Development, Magal Security Systems.

Most security now is basic for

green energy farms, and there is certainly a market for such systems. "But as we move on to bigger sites, which will happen within this decade, we will see more sophisticated systems with smarter intrusion detection, radars and smarter cameras," Katz said. "The 'heart' of the site where the energy is collected and fed into the grid will be protected by another layer. First responders will be nearby with vehicles geared with communication equipment as part of the full command and control solution to quickly arrive at the site, if an incident were to occur. This will become more popular in the next two or three years and companies are currently researching and placing investments into this type of setup."

Prevention is the main goal.

The hot sun and harsh winds can pose a problem for the equipment deployed in these areas.

Removing all 5,000 panels from a 1-megawatt (MW) farm would take up to 10 people working all night, said Gaetano Capula, Director of Marketing, GPS Standard. "Therefore, there is enough time to react once an alarm sounds, however, the purpose of the system is not to catch the thieves, but to keep them away or to rapidly expel them from the farm."

OUTSIDE IN

Like many installations, the first level of protection lies in the perimeter system. Many sites implement barriers, such as metal fences, to keep out intruders. Still, this may not be enough to protect certain farms from the above-men-

tioned threats.

A good perimeter system can do more to secure assets. "The system has to be long-lasting and robust, so as to keep long-term maintenance to a minimum," Katz said. "It should have very low false-alarm rates since a massive area, sometimes up to 10 square kilometres or more, is being covered and there are often no observers on-site to verify false alarms."

INTRUSION DETECTION

Intrusion detection placed under ground is an effective and discreet option, since it cannot be stepped over like a microwave sensor. "However, with all intrusion detection technologies such as this

one, they are potentially exposed to false alarms caused by earthquakes," Capula said.

Another way to check for intrusion is with radar, which often integrates with surveillance. "Radar can detect and track any person or vehicle moving within its detection zones. It can then control the most appropriate camera to follow the intruders and produce a visual image in real time as the incident unfolds," said Philip Avery, cofounder and MD of Navtech Radar. "Over the last few years, we have seen several instances where existing perimeter systems have been insufficient; intruders are able to gain access long before security services can respond due to the remoteness of the site. Thus, there



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is now a requirement to supplement existing security and surveillance systems with technology which facilitates monitoring areas outside the perimeter of the farm."

Radar is suitable for outdoor installations because it sees through all types of weather, Johnston said. "Once the radar is triggered, a camera can pick up on the target from up to a mile and a half away, which negates the need for an abundance of cameras to be set up around the perimeter."

For offshore wind farms, radar allows for the monitoring of vessels approaching a zone's perimeter. "By zoning the area, it ensures an effective prealarm zone is created to give authorities time to react to an event, while allowing legitimate shipping traffic to pass by outside of the zones without triggering false alarms," Downie said.

Analytics can integrate with the radar and camera to log in, keep track, analyze and determine if an object is a threat before it even breaches the perimeter, said Chuck Scifers, Head of Business Development, Jet Protect.

CAPTURING IMAGES

Verification tools, such as cameras, are placed on top of high posts to effectively capture large areas. "Zones can be used to coordinate the system so the ability to keep a clear image of the intruder jumps from one camera to another as he crosses into different areas. Even if first responders are dispatched at the first sign of someone approaching the perimeter, performing a semifull track is important because by the time the responders arrive, the intruder could be anywhere on the farm, and having tracked them can

help shorten the search time," Katz said.

Poor lighting conditions and harsh natural environments may make it difficult to capture usable images. "Thermal imaging cameras can be used to capture a person's features clearly," said

Robert Putnam, Head of Media Relations, LRAD Corporation. Thermal imaging and IR cameras are placed in strategic areas to be used alongside normal surveillance cameras, said Ted Campbell, Senior VP of Renewable Energies Business, Schneider Electric.

Megapixel and HD solutions are also being deployed for added clarity. "Because solar and wind farms are situated on such large plots of land, it is important that the camera can capture clear and detailed images from miles away. HD cameras and big lenses are being used to accomplish this," Johnston said.

Megapixel cameras provide better coverage, although they are limited by line-of-sight (LOS). "Everything is also taking a shift into IP, and in another five years, it may be hard to find a good analog camera," Katz said.

MONITORING FROM AFAR

The total amount of power generated determines the size of the farm, which in turn affects the need for manned guards to be present on the farm at all hours. "A 2-MW farm takes up roughly 20 acres of land on average — this may vary depending on the size of the panels and the type of panels used," said Chuck Scifers, Head of Business Development, Jet Protect. "There are several farms that



▲ John Bowerman, MD of GPS Perimeter Systems



▲ John Downie, Sales and Marketing Manager for Europe, CBC

produce more than 5 MW of power, and guards are often placed on these farms to patrol the area."

However, there is always margin for human error. "Round-the-clock human monitoring is not a very effective way to provide security and surveillance for projects as large as these," Putnam said. The aim is to remove the human element and rely more on technology, Scifers said.

Monitoring is often outsourced to private security companies with control centers located as close to the site as possible, Capula said. "Many times, the monitoring stations for these unattended sites can even be in another country. This is why it is important to have video motion detection software in place to notify authorities and dispatch local aid quickly. First responders can have monitors set up in their cars to efficiently receive information and communicate with the monitoring station," Katz said.

Information can be displayed on an aerial map or a drawing of the site. "It will then follow the intruder in real time, while providing an accurate direction, location and speed of the intruder," Avery said. "This enables fast deployment of patrols to where a breach is taking place."

Additionally, energy farms can involve sites with varying



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topography and terrain. Security system needs to interface effectively with the site's manned response team to ensure any intruders are intercepted quickly, Downie said.

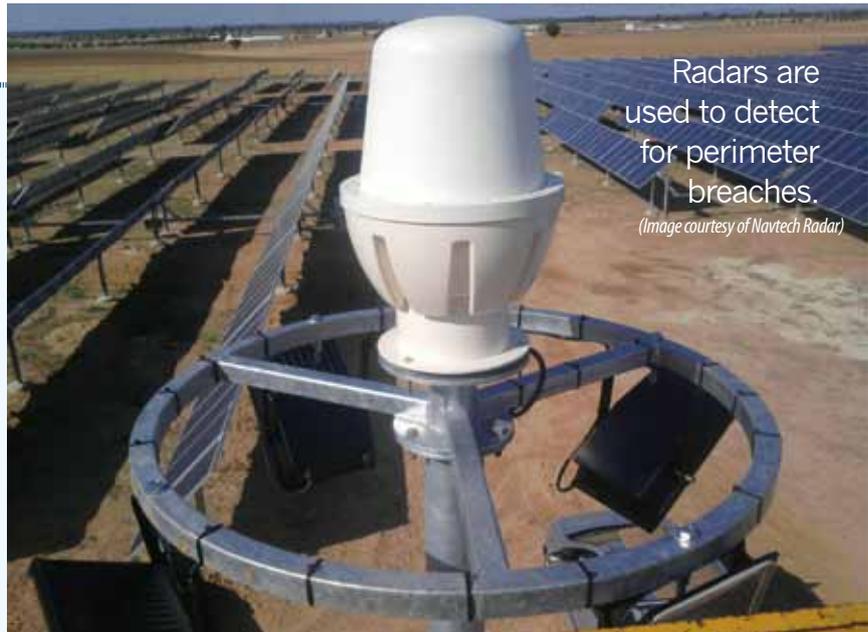
SENDING DATA ACROSS FAR DISTANCES

While the size of the farm determines the type of security required, the level of security deployed establishes the type of transmission used. "It can be completely wireless, or it can run on copper or fiber from the farm to the central station and then to the cloud. Because the farm itself is a closed segment, it can receive an adequate amount of bandwidth; however, it must be rationed carefully between all the first responders who are expecting to receive data," Scifers said.

Farms selecting the right communication and transmission solution should consider the distance, site location, telecommunication status in the area and their budget, said Ippazio Martella, President of Marss.

Many of the sites that will be constructed or have recently been completed are built with a communication plan. "Wires are needed to carry the electricity from the grid to the station, and the same infrastructure can be used for communication," Katz said.

The electronic devices themselves rely on a number of transmission methods to deliver data to monitoring stations or to each other. "Copper cables, fiber-optic cabling and wireless are all being used," Downie said. "Radar units, for example, can be wireless and solar- or wind-powered so they can be positioned almost anywhere with no need to dig up the site. Whichever transmission method



Radars are used to detect for perimeter breaches.

(Image courtesy of Navtech Radar)

is chosen, the system's operating parameters should ensure full functionality in terms of image and data output rate."

However, wireless is more prone to interference compared to wired transmission. "Just as some cellphone calls drop, wireless transmission can be problematic if the wind farms are in remote locations," Putnam said. "Wired transmission is more reliable and since wires are already in place for the transmission of electricity, it is a preferable option."

ENVIRONMENTAL CONSIDERATIONS

The hot sun and harsh winds are what optimize a solar or wind farm's energy productivity. However, they can pose a problem for the equipment deployed in these areas. "It is important that the selected security system resists the weather and the environmental stress, which are very strong and can affect the operation of the system," Martella said. "One must keep in mind that the system must run properly 24/7."

To overcome the harsh environment, electronic components

are shielded within appropriate hard-casing enclosures and designed to ensure noninterference with the energy-generating systems' electronic circuitry, Downie said.

A clear LOS is necessary for radars to work effectively. "Luckily, solar farms are isolated and rarely have tall structures surrounding them," Scifers said.

R&D efforts are also in place to maximize the range of the radars. "Currently, the largest radius for such applications is 1,600 meters," Avery said. Longer-range radars and a clear LOS would require fewer devices to sufficiently protect a large area.

Security measures for solar and wind farms differ from residential or commercial sites. "Some places are trying to force small-area solutions to fit a wide-area problem. It simply will not work," Scifers said. "Proper consideration to the site has to be made, and the solution should be tailored to it." As the market for renewable energy expands, so will the necessary knowledge required to protect and ensure the smooth operation at sustainable power farms.

