LTS UK Technical - White Paper

The use of Solar Powered Towers in the UK

LTS UK ltd

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How best to use Solar Power to power Mobile CCTV Surveillance Towers in the UK Geography and climate?

The purpose of this article is to discuss the pros and cons of powering Mobile CCTV Towers in the UK. The issue is much more complex than you first think.

Why Use Solar to power a mobile CCTV Tower in the UK?

A simple but at the same time quite complex situation and subject to a whole host of variables including;

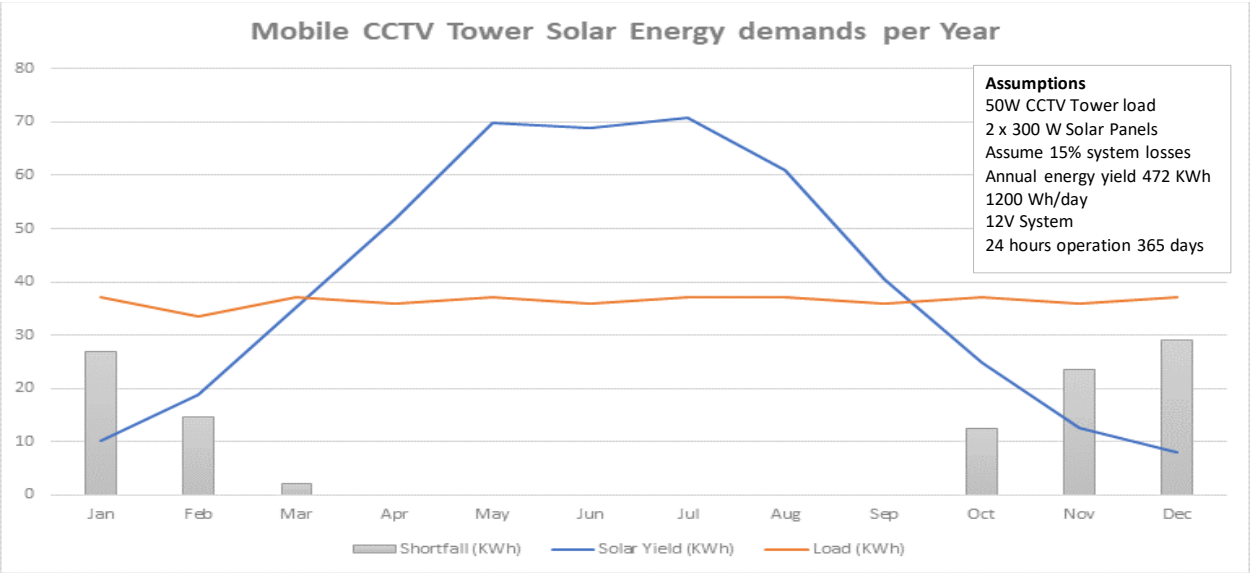
- Tower power budget
- Alarm monitoring hours
- Amount of activity or on-site traffic present
- Ready access to (ideally) a South facing aspect without shading of the sun
- Number and size of the solar panels available to capture the sun's rays
- Portability of the complete system. After all these are 'mobile' CCTV Towers!
- Battery type and overall capacity
- Protection and vulnerability of the solar panels
- Availability of another source of power charge e.g. fuel cells, generators, mains supply, etc.

All of the above need to be considered before actively considering the use of purely solar to power a mobile CCTV Tower in the UK. The sheer number of variables mean that there is no one size fits all and certainly there is a big misconception that a surveillance power budget say of 50 W can be easily serviced by solar panel of say 200 Watts many times over. It's just a pipe dream!

The reality is even if you have a massive solar panel system of several kilowatts on the site, you may still struggle in the depth of winter December and January because of a sheer lack of sunlight available to charge the batteries, and thus keep the tower running.

A typical power budget for a tower can be graphically demonstrated on a simple chart. As you can see, the solar yield is good enough throughout the year to cover the power of the tower and then in late autumn early Winter, suddenly the power of the sunlight drastically reduces. Thus, the need potentially for a supplementary source top-up the battery or the need to change out batteries, both have an Operational cost to weigh up.

See the example chart, typical predicted solar yields and predicted power supplementation required (below) –



This should be not taken lightly as in most cases the mobile CCTV tower is an integral part of a security system protecting assets or personnel on the site, and as a result, needs to work 365 days a year, 24 hours a day, 7 days a week.

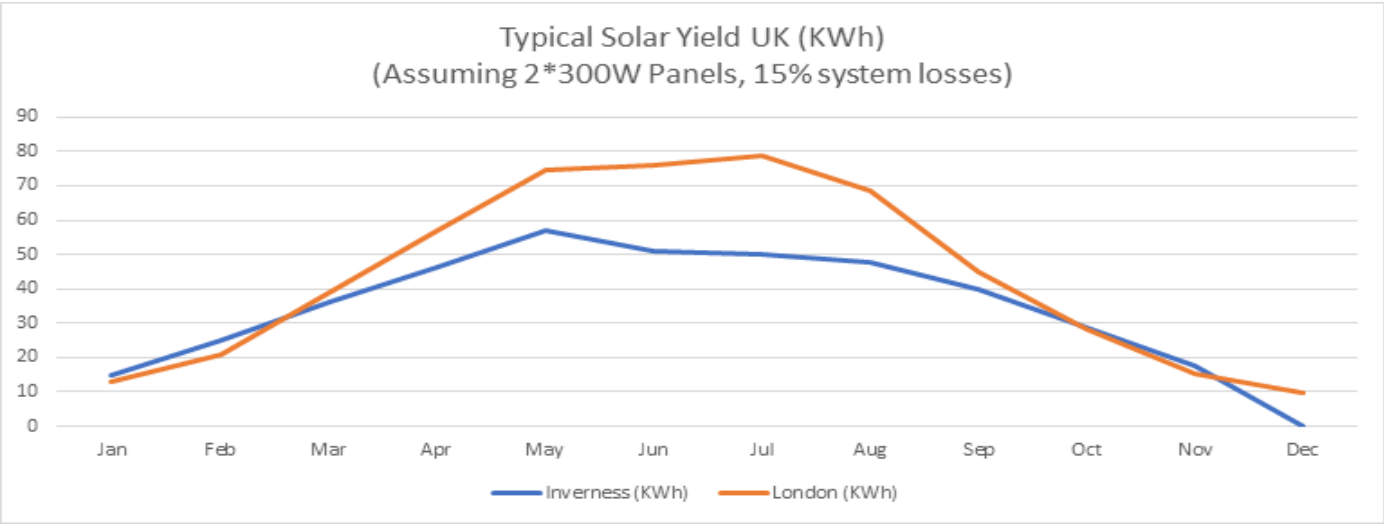
So the obvious question is, can it actually be done? The simple answer is yes it can, but the power budget of the surveillance equipment needs to be Uber low and the panel charging technology and battery storage capability needs to be robust enough to account for any shortfalls in sunlight during the darkest days of winter. This issue though is so unpredictable given the good old UK weather! The variable at one end of the scale is a home run, at the other end, complete disaster! Because after all, none of us know when the sun will actually shine and where and when, ultimately.

Moving forward, there is the possibility using new battery technology such as lithium to allow the batteries to discharge more and more deeply (with larger number of charge recycles), perhaps giving a little more breathing space on the above equation.

All this of course is just pure theory. Then the reality of real site situations takes over. The potential for shading trees coverage, and other objects that potentially obscure direct sunlight for many hours on a daily basis. This just adds even more complexity to a fluid equation. This makes a one size fits all solution almost impossible, and really emphasises the need for accurate pre-site surveying, and clear operating protocols with end users who potentially leave large obstructions in front of solar panels.

The pitfalls of using purely solar to power a mobile CCTV Tower in the UK

Whilst it can be assumed there would be plenty enough sunlight to power a Mobile CCTV Tower for 365 days a year, 24/7. It purely depends on the geographical location, the size and number of solar panels available and ultimately the access to direct sunlight. Having a South facing aspect is next to useless if say a structure, or tree blocks of direct access to sunlight!
Geography also plays its part here as with our calculation above in the most Southern parts of the UK with an ideal site South facing aspect may achieve the following compared to a site on the Northern tip of the British Isles. See the chart below plotting predicted Solar Yields from a London and Inverness Location.



Supplementing power shortfalls

In most reasonable performance systems the use of real time video, 2-way Audio comms, and night vision of around 50 Metres as a minimum per tower, there will be a point in the year even with a large solar panel rig that there are not enough sun hours to power the tower effectively. The calculation in some cases may be extremely close, but the reality is unless you are a gambler that a separate power source will be needed to augment the Solar charged batteries contained within the tower. There are many ways of doing this including –

- The use of Diesel generators
- Use of a fuel cell hydrogen or methanol
- Wind turbine
- Swapping batteries (still adding more charge to an equation so valid in this context)

Since the demise of red diesel the use of the generator has generally declined, ironically putting more pressure on a solar solution. Many take a chance and with (or without) monitoring swap batteries into towers. The question here is clearly the operational cost of doing this compared to say the use of a fuel cell. That is of course something only the individual can make that assessment on, but when considering distance and also the chance of a tower going down on a weekend or holiday period are actually quite high, and always inconvenient!

Fuel cell technology is relatively simple, the key barrier to entry is the up-front Capital costs here. Current technology also enables remote connections to get feedback on fuel levels and charge data, all helpful in maintaining a top up facility for any battery system. Given the potential for towers to be deployed Nationally, and therefore into unknown geography at times, fuel cells probably represent the safest way to ensure shortfalls in solar yield are translated into charge.

Finally, wind turbines seem like a great idea given the UK in an island. The issue comes with maintaining a constant speed in order to maintain a charge sufficient enough to charge the batteries. In other words if used in a built-up area, how would you guarantee a constant windspeed to supplement the solar panel shortfall? Height and safety concerns around the blades turning are also concerns to be taken seriously when using wind turbines.

Popular misconceptions regarding batteries vs fuel cells

In terms of solar the key is capturing the 'sunny' periods of weather to maximise the solar yield. Which at first might sound obvious, but when you consider 600w of solar panels will only generate 10w or less in poor weather, the thought pattern changes somewhat. Even doubling up and running with 1.2kw of panels (which is generally not possible on a tower without a ground array), this would only improve the yields up to 20w. Still not enough to generate enough power to cover the night time.

Then the key metric becomes how much power you can store to capture those 'sunny' periods to provide backup power. As we know LiFePO4 technology allows us to maximise storage and efficiency, but this needs to be weighed up against the KW/h back up provided compared to Methanol power (from a fuel cell). With a simple Volts x Amps calculation, we know a 300AH LiFePO4 could provide 3.6kwh. But an MT60 Methanol cartridge approximately 54kwh. Dividing one into the other and you would need 15x 300AH batteries to equal one MT60 in stored power.

I would then add to that a weight comparison. LiFePO4 batteries are about half the weight of a standard AGM / Lead Acid with a 300ah being 32kg approx. Whereas an MT60 cartridge is 55kg. To equal the power storage of the MT60 you would need 480kg in weight of LiFePO4 batteries. In terms of weight per kwh provided –

LiFePO4	–	8.8kg per kwh
MT60 Cartridge	-	0.98kg per kwh

The metric becomes even worse with AGM / Lead Acid as not only are the batteries heavier, but they aren't designed to take a full depth of discharge frequently.

Monitoring performance to enhance margins, and reduce operational costs

Monitoring a Mobile CCTV tower in terms of Comms, and power performance is vital in so many ways. Basic metrics of tower health, including data ping, signal strength, battery voltage and charge, solar panel yield and other metrics are absolutely vital to gaining an understanding of where your tower is at, and the likelihood of a failure. It also gives you a timeline to plan interventions for whatever reason.

Modern GUI based monitors are a great way of visualising the tower health with a swish dashboard like layout that can be configured to allow both a focused drill down into specific data to ascertain potential problems, or just work by alarm and exception.

Without these, you are most certainly flying blind and prone to a phone call from an irate customer whose site is either stop working or even worse being broken into, leading to awkward questions and conversations. The potential for lost customers and revenue is huge on one side of the equation. On the other side the scope for maximising margins, by having the ability to proactively plan service and repair visits is huge in terms of maximising margins.

In short this is an absolute ‘must have’ on any serious player in the mobile surveillance field.

Summary

The use of Solar to provide power for Mobile CCTV Towers is nothing new. What is staggering given this is first and foremost a Security industry is the lack of care and diligence in some installers in ensuring their towers are in a position to be able to comply with their Operational Requirements (OR's) simply because they are flawed in the most basic of elements, that of the power supply.

Any system will have a baseline specification, and a way of supplementing power when the solar yield becomes deficient at certain times of the year. Whether that be through use of fuel cells or simply swapping out batteries, unless there is an uber low power budget for the surveillance equipment there has to be a way of bridging the shortfall gap. Even then these can only be approximations as every site is different, not least on a season basis.

It all starts with a site survey and basics;

- Site layout
- What is the risk being protected?
- South facing clear sun access
- Any obstructions e.g. hedges, trees, signs, bridges etc.
- How will the site evolve? Likely changes over what time periods
- Rough calculation of solar yield
- How to make up any predicted charge shortfall, and method of delivery?
- How will all of this be monitored and checked?

Without all of this, the use of Solar can be very much a gamble!

About LTS UK Ltd.

LTS UK are one of the UK's largest manufacturers of Mobile CCTV Towers, independent of any large installation Company. Privately owned, and specialists in developing Technology in all aspects of Mobile Surveillance Equipment.

We work with leading industry Partners related to bring the very latest in all things 'Mobile CCTV Tower' to the Surveillance Industry.

The key is always about continual development and emphasis on quality and value added!

Real Mobile CCTV Towers, for the Real World, that Really Work!

UK LTS Professional CCTV

Contact us @ LTS UK ltd.

Contact us at LTS UK for fantastic deals on Mobile CCTV Surveillance Towers, as well as set up and maintenance advice and tutorials.

Services Include – Bespoke CCTV Tower Build, Front line UK Based tech support team, R&D facility, Tower hire services (from our Partner Companies), Tower Services and Installation support and best in class CCTV Tower Design & Scenario Modelling facility.

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