How do we know that our outdoor covert cellular PTZ pole camera systems really use so little power -- only 1/10 that of others ?

By Steve Morton, CEO, CTO, Boundless Security Systems, Inc.

Some people may be skeptical that our covert PTZ cameras' power consumption is SO much lower than anyone else's, enabling our gear to run far longer on an external battery, providing rapid deployment and ease of use anywhere there's cell service. We have customers, of course, who have bought our gear specifically to get long run time on a battery, and get it. But first and foremost, **I need to know** what our gear's power consumption is and that's why I designed extensive power monitoring capability into it. I'm the system architect and its developer, and have a BSEE and MSEE from MIT, and 25 U.S. Patents.

Few people understand anything about electrical power, or batteries, which is a problem for the public since electric cars and home solar power systems are becoming popular. So I'll do this analysis from a simple, power in vs. power out, point of view. This is technical but bear with me... I've tried to simplify it.

Some customers run our covert camera PTZ systems on solar power. This is useful for analysis because it gives us an **external verification** of each systems' power consumption. The reason is that we use a name-brand, high efficiency, solar charge controller in our solar-ready, pole-mount, battery box. It continually monitors and reports its solar power capture. We capture these reports in our latest covert camera systems and include them in our power reports every 60 seconds. We can compare the energy (watt-hours) our gear reports it used, to the energy the solar charge controller reports it captured.

When the run time is long enough, and I mean months, the original battery charge does not matter much and the energy consumed by our gear should be about the same as the energy captured by the solar power system. This gives us watt-hours of energy used, and in turn, average watts, given the run time (elapsed hours). And sure enough, they match.

As I write this, one of our covert camera systems in Pennsylvania has been online for 5 months on solar power. Even with much reduced sun in winter, it should keep running forever. A recent Power Report from it is below. Our systems, even with solar power, which is optional, are easily portable and are moved from time to time, restarting the reports. In the summer, a small (21.5" x 13.6" 30W) monocrystalline solar panel is often able to produce much more than the small amount of power required daily, so some of the available solar power is discarded by the solar charge controller so it does not overcharge the battery.

Below is a Power report from that outdoor covert PTZ camera system of ours. It has continuous internal 1920x1080 video recording. Its video capture runs continuously. Its cell modem is active 12 hours a day, in preparation for winter with its reduced sunlight. It also creates a high frame rate, time-lapse video every hour of the previous hour, which can be viewed over the air in just one minute, a big time saver. Its creation alone consumes a significant amount of power and is not done by any other covert pole-camera. I have color-coded the report to show what's related to what. Compared to a name-brand covert PTZ pole-camera system that CT State Police recently told me they have used, the battery capacity they used and the brief run time they obtained, their system uses about 30 watts, which is ten times our mere 2.9 watts. **Hence we would get ten times the run time, i.e., a month, on the same battery, a huge improvement. With a small optional solar panel, our gear can run even longer -- forever.**

Below is one of our Pennsylvania system's Power Reports. At the time of the report, it had been online for 3619 hours (150+ days). Its power is coming from the solar power system, which has only a small solar panel and recharges a battery so the system can run continuously, including at night, and in long periods of bad weather, when there's little sun. A small voltage drop in the power cable between the two can be

seen. The amount of energy (10525 watt-hours) used by our covert camera system closely matches the amount of solar energy (11107 watt-hours) captured by the solar power system. Dividing the amount of energy our system says it used, 10529 watt-hours, by our system's run time, 3619 hours, gives an average of 2.9 watts. Likewise, dividing the amount of solar energy captured by the solar power system, 11107 watt-hours, and dividing by the run time, 3619 hours, gives a slightly larger, 3.07 watts. Some of that small additional solar power went into power lost in the power cable and charging the battery more than it stored originally, accounting for the small difference.

This validates our assertion that our gear has ultra low power consumption for an outdoor, covert, cellular, true-PTZ, i.e., motorized, camera system with sharp, 1920x1080 video, continuous video capture and internal video recording. And, notice that on the day shown, the solar power system captured 111 watts, far more than the 24 x 2.9 watts = 70 watts used in 24 hours, resulting in charging of the battery for future use.

Here is the Power Report:

Linux epoch seconds = 1661384579
current date and time = 2022-08-24 19:42:59 (evening, so no solar power being captured then)
loop time mS = 3084
elapsed hours = 3619.12 (150+ days)
amps = 0.297
amp hours used = 793.08
power input voltage = 13.108 (there's a small voltage drop in the cable between the camera and the solar-charged battery)
watts = 3.9
energy (watt hours) used = 10525.9
average power (watts) = 2.9
power source = solar-charged battery
battery capacity (watt hours) = 1500
estimated run time hours remaining on initially fully-charged, solar-recharged, 12V LiFePO4 battery at 74F = 715.7
voltage minimum = 11.75
internal temperature degrees F = 86
Fan = off
Fan turn off degrees F = 90
Fan turn on degrees F = 95
UPS voltage = 12.696
modem status = on
CdS voltage = 0.14
IR-cut filter state indicated by CdS = on
IR-cut filter turn on voltage = 2.00
IR-cut filter turn off voltage = 3.00
IR-cut mode = auto
solar battery voltage = 13.310
solar panel voltage = 13.290
solar panel amps = 0.000
solar panel power (watts) = 0.000
solar charger state = off
solar energy received (watt hours) = 11107.384
solar energy received today (watt hours) = 111.570
dummy load power = off
ptz power = off

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