

Case Study

AT&T Cell Site, California, USA – Powered by Sirius Energy Storage
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Mr. Marty Snyder of CIC, is a Kilowatt Labs Reseller in the USA and has installed and commissioned the first Sirius installation in the telco industry in the USA.

Preparation and Evaluation

We evaluated the cost benefit of the Kilowatt Labs Super Capacitors over Lead Acid batteries. **We built this spreadsheet in collaboration with AT&T and Kilowatt Labs.** The first tab was where we entered power demands for the specific AT&T sites. It is specifically relevant for AT&T off-grid solar sites. They have another planning tool for on-grid sites. We then calculate the size of the solar system based on how much land they have. This will then tell us how much additional power, if any, is required from a generator. For example in the winter we have less sun irradiance, so we need more power.

AT&T then did their calculations for how long that generator has to run to recharge lead acid batteries, using their standard battery. That's the second worksheet. I then worked with Kilowatt labs to create the third worksheet to determine how long the generator has to run to charge Super Caps. Then I calculated the various operating parameters for both options and summarized the results in the fourth worksheet. That's the "Presentation page" which summarizes what matters, i.e. money. Those things are:

- Cost of fuel delivered to the site, in this case propane at 5.50/Gal.
- Cost of generator maintenance that has to happen after so many hours of run time.
- Cost of replacing energy storage (batteries or Super Caps) after their usable life span. For batteries that's 5 years, for Super Caps that's 45 years.

The presentation page summarizes those variables and provides a compelling case for using Super Capacitors, which AT&T chose to do immediately after seeing this evaluation, part of which they helped to create.



So now that we have installed one and it has been running for 10 days, here is what we are finding.

Results

Before installing the super caps, the generator was running about 6 hours per day. After the installation we saw it go down to 50 minutes a day. The first day of the super caps being installed it actually ran twice in the first day for about 50 minutes, but then each day after that it only came on once in a 24 hour period, about 1:00 AM. The generator runs for 50 minutes at that time and they start to discharge when it turns off, until sunrise when they are at about 49 Volts (47 Volts is when we need to begin charging again). But as the sun comes up, the solar panels take over charging the Super Caps. The solar panels put off an excess amount of power and all of that energy goes into the Super Caps. The Super Caps reach their full charge around 1:00 PM. The sun continues to supply energy for the site until about 4:00 and then tapers off. The super caps take over and begin to discharge until about 1:00 AM when the generator comes back on to charge them and we start the cycle over again.

The reason the Super Caps can charge faster is a factor called absorption rate. The absorption rate for batteries is about 1/5th the absorption rate of Super Caps. This is just one benefit of the Super Caps. Because we can charge them much faster, we can reduce the amount of time a generator runs and hence the amount of fuel we burn for each charging. The charge time in our case of 50 minutes vs. six hours seems consistent and we have not yet installed all the rectifiers we planned for. More on this later, but more rectifiers means more energy at one time going into the charging process. We will install the additional rectifiers next week.

We set up a monitoring system so we can remotely log into the site and look at them. The Super Caps have a very sophisticated monitoring software that allows us to see all the metrics of what is going on inside them. So far, we have nothing but positive feedback from our first installation and I believe it will only get better when we install the other rectifiers.

As far as the other benefits of the Super capacitors (wide operating temp range, long life, safety, etc.), those items will play out over time.

I will point out one other very interesting experience we had while wiring the units. There was a lot of cables because each super Cap is 48V, and we attach them to the buss in PARALLEL and therefore have a cable for each module. It's a lot more cable than we are used to when installing batteries, which are wired in SERIES, and have short bars that go from terminal to terminal on each module.



Because of the increased number of cables at the buss, the technician made an error, confused two cables and crossed polarity on one of the Capacitors. When it was turned on, it fried the internal fuse of the Super Cap Module. Nothing externally happened, it just didn't turn on. If the technician had done that with a regular battery, it would have vaporized the entire cable and likely killed or at a minimum burned everyone in the room with exploding molten copper! Needless to say, the Super Caps have so far proven themselves to be extremely safe.

The Way Forward

So far everything promised by Kilowatt Labs for their product has proven to work in a practical and demanding situation. I am a convert. Another skeptic has also been converted, which is worthy of note. Our solar installer subcontractor is Ameresco. They are a multi-Billion dollar a year outfit that does energy projects for governments, utilities and private entities. I contracted with Ameresco and originally they were going to install new regular lead acid batteries. When I announced that we were going to install the Super Caps, they wanted to cancel the entire contract. They were not willing to take the risk on the first installation of a Super Cap at a US telecom site. They were very upset at first, but I talked them into agreeing to finishing the solar portion by giving them an indemnification agreement and paying them their fee in advance. Then I invited their managers to the commissioning of the first Super Caps. After the commissioning, their managers who were against the idea at first, are now recommending the Super Caps to the Ameresco leadership and I am meeting with Company leadership next Wednesday at the National Energy Storage Convention at the San Diego Convention Center. Ameresco is going to install the next site we have coming up.

I am giving high marks to Kilowatt Labs and I think this technology is going to grow very rapidly. Last week we gave a presentation to Verizon Wireless. We had the Kilowatt Labs inventor on the phone. The Verizon person we spoke with is the battery and energy buyer for Verizon corporate. He was very skeptical at first, bordering combatant, but as we got into the presentation and he asked more and more questions he started to warm up. By the end of the call he asked for 2 samples to be sent to his lab and told us he was going to move other product tests out of the way so they could test the Super Caps right away. He made a comment, which I put in quotes, "if what you are saying is true [including the price], we need to change all of the batteries in our network to these".



I am happy to provide you guys with any other data points you might need. Just let me know. I can also do that web ex and show you these Super Caps and how they are currently functioning.

I would definitely stay away from Lithium Ion investments.

Information provided by Kilowatt Labs

The BTS is off-grid with a load of 6kW and is powered by 15kWp PV solar and 60kVA generator.

CIC replaced the 98kWh Lead Acid battery bank with 12 x 3.55kWh modules (42.6kWh) reducing generator runtime from 6 hours to 50 minutes.