

## PRODUCT NEWS

# Powering Up: Benefits of Solar & Lithium Technology for Powering APU Systems

Steve Carlson

Dir. of Sales & Business Development,  
Xantrex

**Y**ou've probably heard the adage that power changes everything. It's never more true than with lithium ion and solar technologies. They are game changers in the trucking industry. Using a solar-energy collector with a Lithium-Ion battery (Li-Ion) offers considerable benefits — Li-Ion batteries super-charge your power supply while solar gives you that little extra “umph” for charging energy reserves.

Over-the-road truckers can either idle their engine when they shut down to power their loads, or shut down completely and use battery power or an onboard generator to run devices, including air conditioners, heaters, microwaves, etc.

A good majority of truckers use APUs for their power during mandated rest periods. The APU market is essentially divided into two types: combustion-power and all-electric (battery power). Diesel-powered APUs represent the majority of installations — and the reason is simple: with a small generator you have a virtually endless supply of auxiliary power. Two unavoidable drawbacks — noise, consumption of fuel and pollution. Also, the engine based APUs are restricted in some areas.

Battery-powered APUs have historically been at a disadvantage — especially when operating in the summer in southern states. They simply can run out of juice, then the trucker will need to fire up the main engine to keep cool, while recharging the batteries. What's more, it can take 6 to 12 hours to recharge the batteries for an all-electric APU, either by running the truck engine or plugging directly into an outlet.

Li-Ion is changing everything about power and APUs because it makes battery-based systems longer lasting.

*Q: What are the benefits of a Li-Ion battery over traditional Absorbed Glass (AGM) Mat or lead acid batteries?*

A: The biggest benefit of Li-Ion batteries is that you can use the entire charge. The maximum you can discharge a traditional lead acid battery is 50 percent — many OEMs in the truck market are going so far as to recommend not going past 80 percent. If you do, not only can you void the warranty, but also affect the life of the battery. Even with the Li-Ion battery, we tell users not to go lower than 10 percent to ensure they'll have a power reserve until they can get it charged again. Life cycles are a big factor too. A Li-Ion battery can provide 1,500 to 3,000 cycles. A traditional battery might only last 600 cycles, requiring it to be replaced every year. Li-Ion may cost more initially, but is a better investment in the long run as it offers 4-6 times more cycles than a traditional battery. A lithium battery gives you the same voltage all the way through the entire cycle of the battery. An AGM battery, on the other hand, when you start hitting 70-80 percent of the battery's capacity, is going to be dropping. Because everything in the truck has been designed to work on 12 volts, once you drop below that mark, not only will it be more difficult to start the truck's engine, but everything else drawing off an inverter will be less efficient.

### Is Bigger Better?

You might think more capacity means more bulk. Just the opposite is true. As the world's lightest metal, lithium provides a huge weight advantage, Li-Ion batteries are 60-80 percent lighter than their lead



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counterparts. A typical Group 31 battery weighs about 75 lbs. while a similar Li-Ion battery only weighs 28 lbs.

*Q: Are Li-Ion batteries safe for use in trucks?*

A: Accidents related to fires and explosions of Li-Ion batteries have occurred worldwide, especially involving cell phones, laptops, electric vehicles, and airplanes. For example, the Tesla electric car battery fire, the Boeing 787 Dreamliner battery problems, Samsung Note 7 fires and explosions have attracted mass media attention. When Li-Ion batteries were first adopted, users often overlooked the fact that they required different charging algorithms than a traditional battery and because of that, the batteries often failed. That is why we advise ONLY using Li-Ion batteries certified with the UL 1973 rating for auxiliary vehicle power applications. Manufacturers have also improved the safety of Li-Ion batteries by embracing Li-Ion technology over pure lithium devices, and giving closer scrutiny to the actual chemical compounds used within these batteries. They further safeguard against “thermal runaway” with a



Pictured above is an example of an Li-Ion battery.

patented Ion Extinguisher Technology where, should the temperature exceed normal standards, a nano-ceramic polyamide separator coating within each cell boosts charge and discharges rates. It essentially forms a “shutdown curtain” to prevent the chance of critical overheating.

*Q: Can I use my existing inverter with a Lithium-Ion battery?*

A: In “most cases” yes. And that’s another benefit. If it is just an inverter then all

you're doing is taking power from the battery and turning it into AC power. As long as the voltage is at the right level, the inverter does not care what type of battery is being used—it’s obviously going to perform best with a Li-Ion battery because the voltage is going to remain steady through the cycle. One thing to note—the majority of new trucks straight from the factory are equipped with an inverter/charger. In that case, you need to verify that the unit is capable of being adjusted for the specific charging needs of a lithium ion

battery. Even if there is a Li-Ion setting, you should check what voltage it is set at. Saying all that, newer inverter/chargers can be configured easily to work with Li-Ion batteries.

*Q: Can Li-Ion batteries power an air-conditioner?*

A: No problem. Li-Ion is actually a perfect power supply for running an air conditioner. It provides enough power in a small package that there are zero issues, even with a 10-hour run time—as before, the drain on the battery doesn’t affect its ability to be recharged, and the voltage remains consistent throughout the cycle. Because of that, you can also upgrade to a more powerful a/c unit that does a more efficient job of keeping you cool.

*Q: Do I need to upgrade my wiring to install a Li-Ion battery?*

A: This is not usually an issue. Look at it this way — if you put a bigger gas tank on your vehicle, it doesn’t change anything — the engine still requires the same amount of fuel, only now you’ve got more in reserve.

### Temperature Control

The performance, life, and safety of Li-Ion batteries are all affected by the operation and/or storage temperatures. Xantrex systems are designed to discharge power at a much wider temperature range than the level at which the battery can be charged.

Li-Ion batteries work best when they are in an environment between 32°F and 95°F. Installing a Li-Ion battery inside your vehicle helps to control operating temp. You’re already maintaining the cab and sleeper at a reasonable temperate environment — not too hot or cold, just right. Adding temperature controls to an outside battery box is also an option.

When it comes to subfreezing temperatures, ALL batteries will perform poorly in cold environments, regardless of whether they are Li-Ion or lead-acid.

*Q: Which truck inverters can charge a Li-Ion battery?*

A: The Xantrex Freedom XC inverter/charger offers premium performance in a lightweight compact package — it is



available as a 1,000 watt model with a 50 amp charger, and 2,000 watt with 80 amp charger. Both models crank out full output in inverter or charge mode from -4°F to 104°F for operation in all climate temperatures. The overall operating temperature range is -4°F to 140°F. The extended surge rating of the Freedom XC makes it ideal to start difficult loads including your fridge and microwave. The quick connect terminals at AC IN/OUT make installation a breeze. One thing we excel at is that our voltage regulation (sine wave) is very “pure.” One issue with inverters is how consistent the wave form is when you’re really cranking on the power. Xantrex has focused on making sure our systems run at the maximum efficiency.

*Q: How does adding solar to my truck help with A/C power and charging needs?*

A: As an OEM for the trucking industry, we’ve been promoting solar for years because it simply makes a lot of sense. Park a truck and measure how much power is being depleted out of the battery—it’s significant. All the little sensors and electronic devices in the truck are constantly drawing power. Adding a solar panel—even a small one that can trickle charge and offset parasitic load, helps to keep charge levels stable. Solar alone isn’t going to run your air-conditioning unless you’ve got the entire roof of your trailer covered with panels. Adding a couple of 100-watt panels can, however, provide enough power back into the battery to give you a couple more hours of usage. Since battery life is linked to cycles, even though there’s some initial cost to adding solar, doing so can keep batteries from draining as quickly, potentially eliminating one to two battery replacements over five years.

*Q: Does solar feed directly into an inverter or battery?*

A: Solar panels are typically connected directly to the batteries. The way it works, is solar is connected to a “charge controller” that might be on the panel itself or exist as an external device mounted in the cab so that you can see the data on how the panel is performing. That controller then regulates the power that’s coming off the solar panel,

making sure it’s the right voltage for the type of battery. It’s a standalone system that bypasses the inverter and connects directly to the battery. Xantrex also has products that integrate with our inverters and chargers that display information about the solar system.

*Q: Can I add solar to my existing system?*

A: Simple answer. Yes, you can and very easily too because solar is really a stand-alone system. The solar panel and charge controller connect directly to your battery.

*Q: How much power can I generate using two 100-watt panels?*

A: With the sun shining directly onto the solar panels, you can achieve about 14 amps on perfect output. With five to six hours of daily sunlight, expect to generate 70 to 84 amp hours per day. Most truck battery systems are already in the 300 to 440 (amp hours) range, but, still, that small amount of power that you’ve collected from solar is capable of providing an extra hour or two of

air-conditioning or heating—and even enough for some microwave popcorn and a DVD movie.

*Q: How quickly can I charge my batteries using solar*

A: How far is the battery discharged? How big is the battery bank? There are several variables. But using a 200-watt panel as an example, if you had 210 amp hours that was halfway discharged, you could essentially recharge in a couple of days. You can’t count on solar being your main battery charger. But it’s definitely effective for extending battery charge life.

*Q: Can Xantrex help spec Li-Ion and solar systems and assist with installation?*

A: We started with OEMs, and we continue to work really closely with engineering and product management teams to help them accomplish their goals. On the aftermarket side, we are developing partnerships where a customer can go directly to a truck dealer and have a complete system installed.

## Hear Ye, Hear Ye!

Do you have a comment relating to TMC or the trucking industry in general? TMC wants to hear your voice! Future issues of *Fleet Maintenance & Technology* will feature a “Letter to the Editor” section, and we encourage everyone to participate. Please send emails to [rakpotu@trucking.org](mailto:rakpotu@trucking.org) or mail to: 950 N. Glebe Rd., Suite #210; Arlington Va. 22203



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