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Ready to Roll with Battery Power: Robe PowerDolly

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It wasn't that long ago that using batteries to power stage lighting, audio, and video was virtually unheard of. It was 2023 when I first worked on a show that used large banks of batteries and solar panels for that purpose. We supplied the power on three stages at Willie Nelson's Luck Reunion in Austin, Texas, including a Stageline 320 portable stage and two smaller stages. After we set everything up, I took a picture of one of the solar farms and some of the battery energy storage units and posted it online. Most of the live event community was very supportive and positive. But a few people were very skeptical, to say the least, and some were confused.

"Solar will never be reliable enough, and batteries will never be cheap enough," said one person.

"One day, just not one day soon," said another.

"The sooner this pointless fad dies, the better off we'll be."

You get the idea.

These reactions caught me by surprise, especially because I wasn't posting about an imaginary project or some project in the distant future. It was already happening. By the time people said it couldn't be done, we were already doing it.

I know some people misunderstood, based on some of the responses. Some thought we were powering the stage directly from the solar panels. Even in the hot Texas sun, that would not work for a couple of reasons. First, it would have taken many more solar panels than we had, and second, when the sun goes down, so would the lighting and audio.

So, we had banks of batteries from 5kWh to 120kWh that we used to power the stages, and solar panels to

charge the batteries to the extent possible. We had roughly twice as many batteries as we needed, and we would swap the depleted ones for freshly charged batteries from the solar farms.

grid power. We only had 100A single-phase available, which would not have been enough to power the lighting and audio systems on the main stage, but it was plenty to keep the batteries charged should we need it.



The Robe PowerDolly looks like an ordinary dolly except the base has a 5kWh lithium iron phosphate battery.

When failure is not an option

Being the first live concert that we powered this way, we didn't quite know what to expect. No one really did. So, on the main stage, we built in triple redundancy. Besides the main battery bank, we had a backup unit, and both were connected to a portable power generator and the grid. In case the state of charge on the main battery got too low, we would switch to the backup. And if the state of charge did get too low, we could fire up the generator and recharge the batteries. And if the generator failed, we could charge the batteries from grid power. The grid power was not nearly enough to power the entire stage, but if we had to, we could trickle-charge the batteries.

And that's one of the first lessons I learned about using battery power. You can use batteries to "amplify" the

We had a similar setup at another, smaller stage. The only power available was a single 20A 120V circuit, which we used to trickle-charge about 20kWh worth of batteries. And it was self-sustaining. Meanwhile, on the main stage, we used a lull to swap the batteries every night.

New form factors

Working on this show and similar shows fired my imagination. I started wondering about other form factors for batteries, and how they could be integrated into the set and stage. The battery energy storage units we have used on different shows range from about 7,000lb to about 22,000lb. Each of them houses multiple 3.5U rack-mountable battery units, each made up of 16 prismatic cells connected in series. The basic unit cell is probably 1" wide by 5" or 6" tall and probably 16" deep. But there's no rea-



Posted online, this picture of solar panels and battery energy storage units elicited a range of responses from the live event community, mostly supportive, but some people were skeptical.

son they have to be in that form factor.

Why not put them in a smaller package that could be distributed around the stage, maybe even in the truss?

Introducing the PowerDolly

Last LDI, I ran across the Robe PowerDolly. It looks like an ordinary 29.5"-by 29.5" dolly except the base has an enclosure, with a 5kWh lithium iron phosphate (LFP) battery. It had a vertically mounted 6' stick of truss and five moving lights mounted horizontally on the truss like a typical truss tower, except on wheels.

The dolly has a load capacity of 441lb and has eight M12 mounting points plus eight ¼-turn locking points. There is a fixture mounting bracket to fasten a single light fixture to the dolly and a truss mounting bracket to build a truss tower.

At LDI, the lights mounted to it were LEDBeam 150s, which are rated 220W

max, so it was a total of 1,100W. The PowerDolly can output up to 2,000W for two-and-a-half hours, but, in a real show environment, the charge would likely last much longer. That's because of the difference between the connected load and the maximum demand, which are two very different things. In live event production, a lighting system is seldom turned on full for any significant amount of time. Most of the time, some fixtures are off, some are on, some are full white, and others are in color. And when an RGBW light is in a color, then the power consumption is less than the maximum.

When we started powering shows with batteries, we had little idea how much energy would be required, so we started logging the power data. What we found is that the maximum demand is typically less than 50% of the connected load, with a peak around 75% of the connected load. (Your mileage may vary.) Based on that, I would think those five lights

could be powered for about eight to 10 hours before the battery is depleted of charge, depending on the programming and intensity levels.

Comfort level

One thing I've learned using battery power is that it's a very uncomfortable feeling when the state of charge drops below 20%. We always have a plan for charging the batteries: Typically, we charge them when they reach about 20%, then we charge them to 80%. That's because they charge fairly quickly between 0 and 80%, but the battery management system (BMS) slows down the charging rate above 80% to protect it from overcharging, which could cause catastrophic failure.

Which leads to the safety issue. We have all seen videos of lithium-ion batteries catching fire and "venting with flame," as manufacturers describe it. But lithium-ion is a broad category that includes several chemistries, including lithium cobalt oxide (LCO),

lithium nickel manganese cobalt oxide (NMC), and lithium iron phosphate (LFP). Of these, LFP is significantly more thermally stable and far less prone to runaway reactions. In addition, modern battery systems, including the PowerDolly, incorporate battery-management systems that monitor temperature, voltage, and operating conditions and will shut the system down if limits are exceeded.

Another safety consideration of the PowerDolly is a 5kWh unit. That means they are treated differently in fire codes, standards, and transportation. In the UK and parts of Europe, smaller energy storage systems are often subject to less stringent fire engineering and separation requirements. In the US, similar capacity thresholds affect how systems are classified under fire codes.

Charge management

When it comes to recharging batteries, it's important to know the voltage and connector required to charge batteries, because you don't want to get caught short. The PowerDolly can be charged from 120V at 60Hz or 185-240V at 50Hz using a True1 connector at a maximum of 16A. According to the literature, it takes about four hours to charge to 90%. It also has BD-24-2 connectors to charge with solar panels. These are much better (and more expensive) connectors than the MC4 connectors we've used on our shows.

The unit weighs about 176lb, about as much as four or five sandbags, and

that reduces the likelihood of tipping while providing better stability than a traditional pipe-and-base configuration. The user manual cites a floor stand as the only mounting position, but I would love to see a version that could bolt to a horizontally flown truss.

It has built-in wireless DMX and an LCD display that indicates input and output voltage, frequency, percentage of load, PV voltage and current, working mode, and fixture status. There are also LEDs indicating charging status, power status, temperature status, CRMX (wireless DMX) link, and a battery level indicator. The housing is rated IP65 for outdoor use and IK07 for impact resistance.

Our original motivation for using battery power on shows was to replace diesel power and reduce the carbon footprint. But we soon found many other benefits. Besides eliminating generator noise and foul smell, battery power can also remove cable tripping hazards, reduce shock hazards due to faulty cable insulation, provide power where it wasn't feasible, and, in some cases, save money. The PowerDolly delivers these benefits and one more. It could introduce battery power to a whole new generation of lighting, audio, and video techs who might not otherwise have the opportunity to use it. It's a way of getting their feet wet with new technology, getting used to charge management, and becoming comfortable with battery safety. 📶



At LDI 2025, Robe showed the PowerDolly with a 6' vertically mounted stick of truss and five moving lights mounted horizontally like a typical truss tower, except on wheels.