

Step-by-step Installation of 20ft High Cube 5MWh Utility-scale BESS for Agricultural Irrigation

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The Real (and Hidden) Cost of Running Irrigation Pumps

Honestly, if you're managing a large-scale farm in California's Central Valley or the plains of Nebraska, you already know the drill. Peak irrigation season hits, the sun is beating down, and your electricity bill from running those massive center-pivot pumps goes through the roof. According to the [National Renewable Energy Laboratory \(NREL\)](#), agricultural irrigation can account for over 30% of a farm's total operational energy costs. But it's not just the cost - it's the timing. You're competing with every home and business cranking up their AC, paying peak demand charges that can feel punitive.

I've been on sites where farmers are literally scheduling irrigation for 2 AM to avoid these rates, dealing with the complexity and wear on equipment. The other pain point? Grid reliability. An unexpected outage during a critical growth window isn't just an inconvenience; it's a direct threat to your yield. The traditional "solution" has been diesel generators - noisy, polluting, and with their own volatile fuel costs. This is the real problem we're solving: energy cost predictability and operational resilience for one of the most energy-intensive parts of farming.

Why a Modular 20ft Container is Winning Over Farms

So, why are we talking about a 20ft High Cube container specifically? In my 20+ years, I've seen the evolution from bespoke, poured-concrete battery rooms to today's plug-and-play approach. The 20ft shipping container is a global standard. It's modular, secure, and incredibly easy to transport and site. For a 5MWh system, this density is a sweet spot. It provides enough energy to shift multiple large pumps for several hours, but it doesn't require massive site preparation or special permitting for oversized loads like a 40ft or multi-container system might on day one.

This approach directly addresses the agitation points: speed and safety. A pre-integrated, pre-tested container from a manufacturer like Highjoule that's built to UL 9540 and UL 1973 standards from the get-go bypasses months of custom engineering. The local AHJ (Authority Having Jurisdiction) inspector sees a certified unit, not a one-off construction project. It de-risks the entire process. I've witnessed projects in Germany where this modularity allowed a system to be permitted and connected in half the time of a traditional build.





A Step-by-Step Walkthrough: From Delivery to First Megawatt-hour

Let's get practical. How does this actually go down on your land? Here's the typical sequence, stripped of the marketing fluff.

Step 1: Site Prep & Foundation (Week 1-2)

This isn't just pouring a slab. We're talking about a level, reinforced concrete pad with precise anchor points. We also trench for medium-voltage cabling and conduit from your main substation or meter to the pad location. The goal is to have a "landing zone" ready so the container can be placed and immediately secured. Good drainage is critical - you don't want water pooling around it.

Step 2: Delivery & Positioning (Day 1)

The container arrives on a flatbed. With a competent crane operator, this is a 2-3 hour operation. The key is placement accuracy. Those anchor bolts need to line up perfectly. Once it's down, we bolt it securely and install seismic restraints if you're in a zone like California. The container itself is a rugged, weatherproof shell protecting the heart of the system.

Step 3: Electrical Interconnection (Week 3)

This is where the magic - and the permits - really come in. Certified electricians pull the heavy cabling from the pad trenches into the container's designated entry points. Inside, they're connecting to a pre-wired busbar. The power conversion system (PCS) and the battery racks are already integrated and tested at our facility. Externally, we're installing the step-up transformer (if needed) and the grid interconnection switchgear. Everything is built and labeled to comply with NEC (in the US) or IEC standards (in the EU), which makes the utility inspector's job smoother.

Step 4: Commissioning & Grid Sync (Week 4)

This isn't just flipping a switch. We methodically power up subsystems, run self-diagnostics, and verify communication between the battery management system (BMS), the PCS, and the energy management software. Then comes the

critical moment: the first grid synchronization test. We inject a small amount of power, then absorb some, ensuring the system perfectly follows the 60Hz (or 50Hz) waveform and complies with IEEE 1547 for grid support. Only after dozens of test cycles do we start a full-capacity charge/discharge cycle. Honestly, this phase is where you see the value of a pre-assembled unit - fewer variables, fewer surprises.

The LCOE Game-Changer for Your Operation

Let's talk numbers in a way that matters: Levelized Cost of Energy (LCOE). It's a fancy term for your all-in cost per kWh over the system's life. For irrigation, a 5MWh BESS crushes the LCOE of diesel gensets. You're swapping fuel and maintenance costs for predictable capital amortization. The real trick is thermal management - a dry, technical term for keeping the batteries at their happy temperature. A poorly managed system degrades faster, killing your LCOE.

Our containers use an indirect liquid cooling system. Think of it as a precision climate control system that quietly sips energy compared to loud, less efficient air conditioning. This maintains optimal cell temperature, which directly translates to hitting that 10,000-cycle lifespan spec. More cycles over more years means a lower cost per kWh you use to pump water. That's the engineering detail that makes the business case work.

What Happens After the Battery is Switched On?

The installation is just the beginning. The software is what turns this capital asset into a profit center. You set simple rules: "Charge from the grid or my solar panels when rates are below 8 cents/kWh. Discharge to run Pumps 1-4 when grid rates exceed 22 cents/kWh." The system automates it. I've seen a cooperative in Texas use this same 20ft/5MWh model not just for irrigation, but to participate in the ERCOT demand response market during heatwaves. When every other farm was paying peak rates, they were getting paid.

That's the final piece Highjoule brings: we're not just shipping a box. Our local service partners provide the remote monitoring and annual maintenance check - checking connections, coolant levels, and software updates. It's about ensuring that five years from now, this system is still delivering the same ROI it did on day one.

So, what's the biggest hurdle you see for deploying a solution like this on your land? Is it the upfront CapEx, the interconnection process, or simply visualizing how it fits into your daily ops? Let's discuss.

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