CASE STUDY

WITH BACKUP RESPONSE SPEED CRITICAL FOR AI DATACENTRE RESILIENCE, NYOBOLT NEEDED A BIDIRECTIONAL POWER SYSTEM WHICH WOULDN'T LIMIT THEIR AMBITIONS.

Artificial intelligence is revolutionising the modern world. Routine tasks are being automated, with personalised analysis of large datasets often possible in seconds. Typical uses include search engines and image generation. However, AI platforms are increasingly being used across many industries to lighten workload and streamline results.

All of the additional user functionality must come at a cost. AI datacentres drive much higher peak power demands at significantly faster rates than traditional IT loads. Demand is far more unpredictable over the course of a day. Events such as AI training create large current transients, which existing grid infrastructure was not designed for.

To alleviate demand, typically peak shaving systems use supercapacitors for short transients. Battery banks then provide hold-up power for longer events or grid loss.

Nyobolt use niobium-based anode materials within their batteries. This allows for low impedance, long cycle life and rapid C-rates when compared to existing technologies. For example, a 350kW supercar can be charged from 10% to 80% in under 5 minutes.

The company have developed the DRS (Dynamic Response System) for AI datacentres. A battery management system, cells and chargers are combined in one enclosure. The DRS responds in microseconds and catches transient spikes before they cause damage, replacing supercapacitors. The cells contain enough energy to also serve as back-up during low grid power.

Nyobolt used the bidirectional G5-RSS power system during testing. Dan Collingwood, Test System Lead, stated "we are demanding discharge pulses well over 1000A at speeds of 100µs. The G5-RSS can keep up with the high C-rates and rapid slew rates of our batteries. It's an order of magnitude faster than anything else on the market."

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REAL RESPONSES, REPLICATED

The G5-RSS features industry leading response speeds of <25µs for quadrant step changes. This allows Nyobolt to both test batteries under realistic conditions, as well as emulating their energy storage system. Back-to-back batteries were previously used to achieve the real world response times.

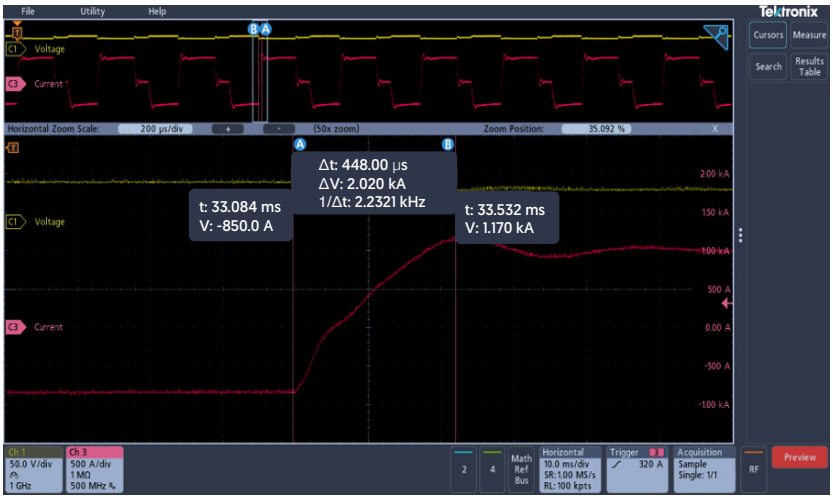
When asked about the features of the power system, Dan responded, "The analogue interface lets us playback realistic high-speed GPU power commands while monitoring real-time current and voltage. The bidirectional G5-RSS lets us test both sides of the DC-DC converter while keeping the batteries at their optimum state of charge."

Dan added, "Working with ETPS has been first class. We've received great communication and detailed demonstrations to explain the system's comprehensive features."

Founded in 2019, Nyobolt was originally a University of Cambridge spin-out company. They were established to commercialise ultra-fast charging battery technology. Unlike many other deep tech companies, Nyobolt is already shipping their products worldwide and had a recent valuation of over $1 billion USD.

Beyond datacentres, Nyobolt's technology is being deployed across high performance industries where downtime for charging needs to be minimised. This includes off-road vehicles, autonomous robotics, humanoids and super cars.

> **WORKING WITH ETPS HAS BEEN FIRST CLASS. WE'VE RECEIVED EXCEPTIONAL COMMUNICATION AND DETAILED DEMONSTRATIONS TO EXPLAIN THE SYSTEM'S COMPREHENSIVE FEATURES.**

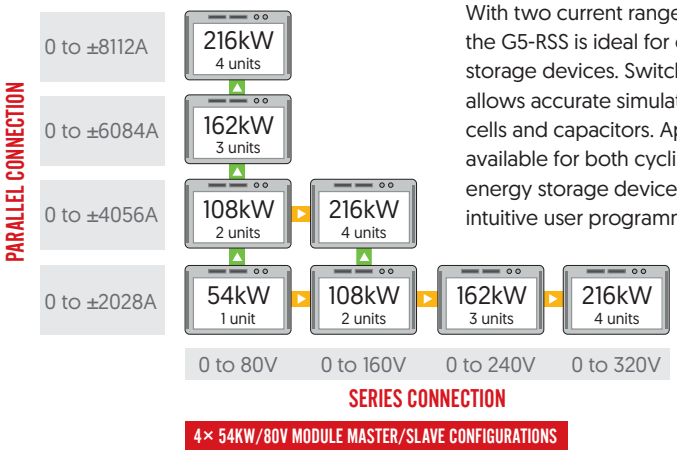


The example scope shot (left) shows a current step through quadrants during Nyobolt's testing using the G5-RSS. The user adjusted the slope rate to perform a transition of 2020A in 448µs, as was required for their testing.

Faster slope rates are programmable within the dynamic capabilities of the G5-RSS power system. Advanced users have access to the controller settings enabling the response to be optimised for particular loads.

Where users have a particularly sensitive DUT, adjustable overvoltage, overcurrent and overpower protection limits are provided. Upper and lower levels can be set across the full range of the system, with programmable delays to allow for transient events.

ABOUT THE G5-RSS



With two current ranges for high accuracy, the G5-RSS is ideal for cycling energy storage devices. Switchable capacitance allows accurate simulation of batteries, fuel cells and capacitors. Application GUIs are available for both cycling and emulating energy storage devices, to allow quick and intuitive user programming.

Modules are available with nominals from 9kW to 54kW, at 60V to 1500V. Up to 120 units can be arranged in master/slave configurations. Outputs up to 3000V are possible into the megawatt range. Multi-module systems based around a midpoint earth create a +/- voltage output.

A fibre optic interface with Aurora protocol is available to support integration into platforms such as Speedgoat, Opal-RT and Typhoon. For users who implement drive cycles and battery waveforms via LabVIEW, Python or alternative superposed control system - an API is provided.

If you'd like to discuss our range of DC power systems can super charge your test schedule, please contact us today.

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