CASE STUDY

WMG
THE UNIVERSITY OF WARWICK

POSITIVE PROBLEM SOLVING +=

WHEN RESEARCHING SECOND LIFE BATTERY PACKS, WMG AT THE UNIVERSITY OF WARWICK NEEDED A DC-DC POWER SYSTEM TO HELP CONVERT THEIR GOALS INTO REALITY.

A growing concern for xEV batteries is what will happen to them at the end of their lifetime. Many batteries have significant capacity left for other uses. Grid storage is one such application, as the performance demands aren't as high.

One of the main research goals for the Energy Innovation Centre at WMG, which recently underwent a £20m expansion funded by the Energy Research Accelerator (ERA), is to evaluate and test these second life batteries. This includes the ability to integrate energy generated by renewable sources.

In order to propel their research forward, a bidirectional programmable DC-DC converter was needed. This would need to perform charge/discharge tests on batteries, as well as emulating them.

As nothing was commercially available to meet the requirements of the project, ETPS provided a non-standard solution. This involved replacing the standard AC grid-tied line of bidirectional LAB-GSS power systems with a 750V DC line voltage.

All the operating features of the original power system were maintained, meaning that the new converter could perform a multitude of research tasks.

Dr Alex Ridge, Research Fellow for Power Electronics remarked: "By using the architecture of a well adopted existing product, it gave us a high level of confidence that the new development would be technically sound."

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WMG POWERING SMART GRID RESEARCH

During the initial project, the CON-DSS was required to provide an interface between a common 750V DC bus and battery packs. These would be made up of various voltages/capacity configurations originating from vans, buses and passenger cars. Renewables are also fed on to the same DC link (shown below).

As the power sources to be interfaced to the DC link could have many different voltage and current permutations, the converter needed to be incredibly configurable. Voltages from 0-900V to and from the CON-DSS are possible by combining modules in master-slave, allowing the group to perform varied research.

Dr Ridge added "Having a programmable converter with such varied capabilities ensures that we are future proofed for new areas of research."

The Energy Research Accelerator (ERA) is a multi-centre project comprised of six Midlands universities. The aim of the ERA programme is to meet the challenges of developing affordable low-carbon energy and technologies for greater energy efficiency.

Besides second life battery research, other areas that ERA is focussed on include: new battery chemistries, investigating the electro-mechanical behaviour of energy storage devices, as well as researching super-capacitors and high rate chemistries.

An academic department of the University of Warwick, WMG is a key member of ERA. WMG's unique mix of leading academics, industry engineers, and professional project managers help deliver maximum impact for industry, working with 1000 companies cross-sector.

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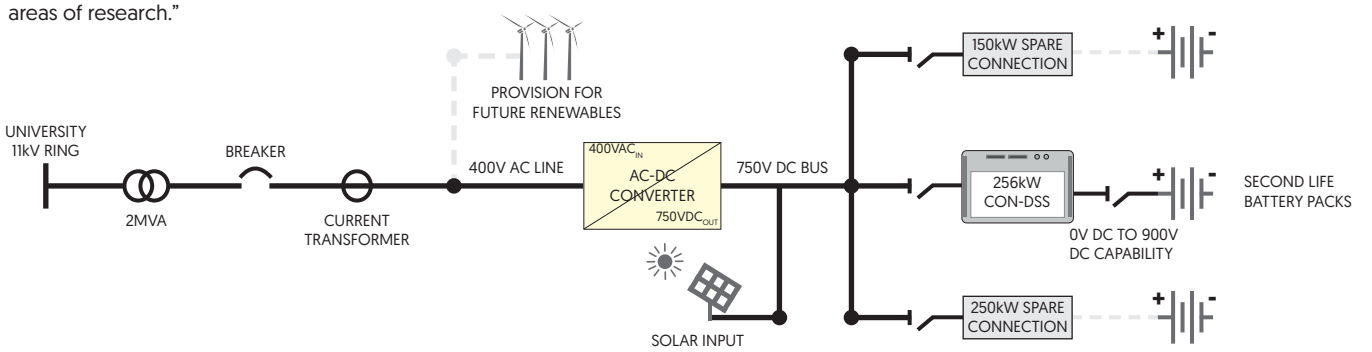

SIMPLIFIED DIAGRAM OF ERA SECOND LIFE BATTERY TEST FACILITY

ABOUT THE CON-DSS

Since the ERA project, the CON-DSS is now a standard commercially available product. The bidirectional series of DC-DC converters feature an adjustable input/output on the low voltage side. Modules are available with high voltage side nominals from 58.8V up to 600V. Outputs up to 1500V are possible when combining units in master-slave.

Current and voltage slopes can be set and protection levels tweaked. This helps ensure the unit is optimised for a particular research application.

Other useful features include programmable PID parameters, an 8 channel recording scope and integrated safety relays. Adjustable power and resistance limits are provided.

An optional embedded function generator is available for the modules, which can create almost any complex DC waveform.

Along with RS232 and isolated analogue interfaces, a master-slave interface is provided as standard. This allows the modules to be connected in series, parallel or matrix configurations should users need higher voltage, current or power outputs.

Each module's hardware is complimented by application software. Specific tests can be performed including battery cycling, electric drive testing, PV simulation battery emulation as well as capacitor emulation and testing.

If you'd like to discuss how the CON-DSS could accelerate your research, then please contact ETPS today.