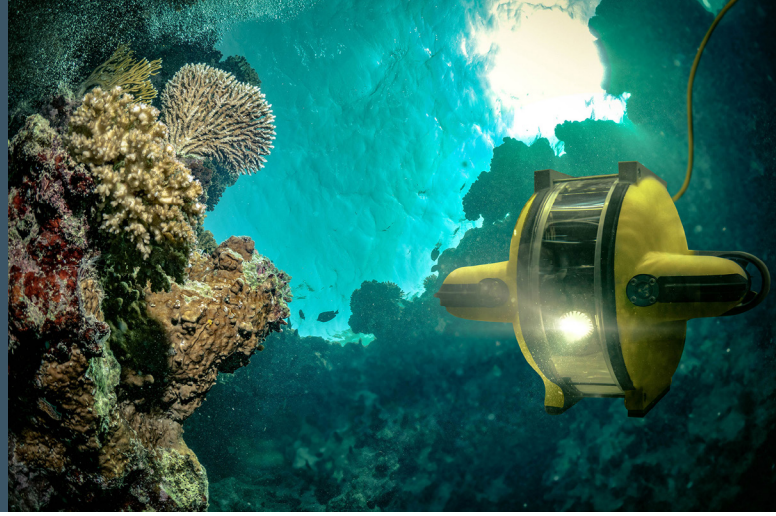
VICOR

Case study: Tethered ROVs



Reducing I^2R losses to enable extended missions

Customer's challenge

Powered and controlled via a tether from a ground-based power source, tethered remote operated vehicles typically require a 1 – 5kW ground power supply tethered to the ROV to provide unlimited run time and greater control. A high-voltage tether (500 to 800V) delivers power to the vehicle. The power delivery network (PDN) inside the vehicle must be capable of down converting the tether's high voltage power source with high efficiency and take up less real estate to free up important payload space. The key goals were:

- Optimize the power delivery through the tether
- Rugged, highly integrated power supply for high reliability
- Efficiently convert high voltage to safe 48V SELV

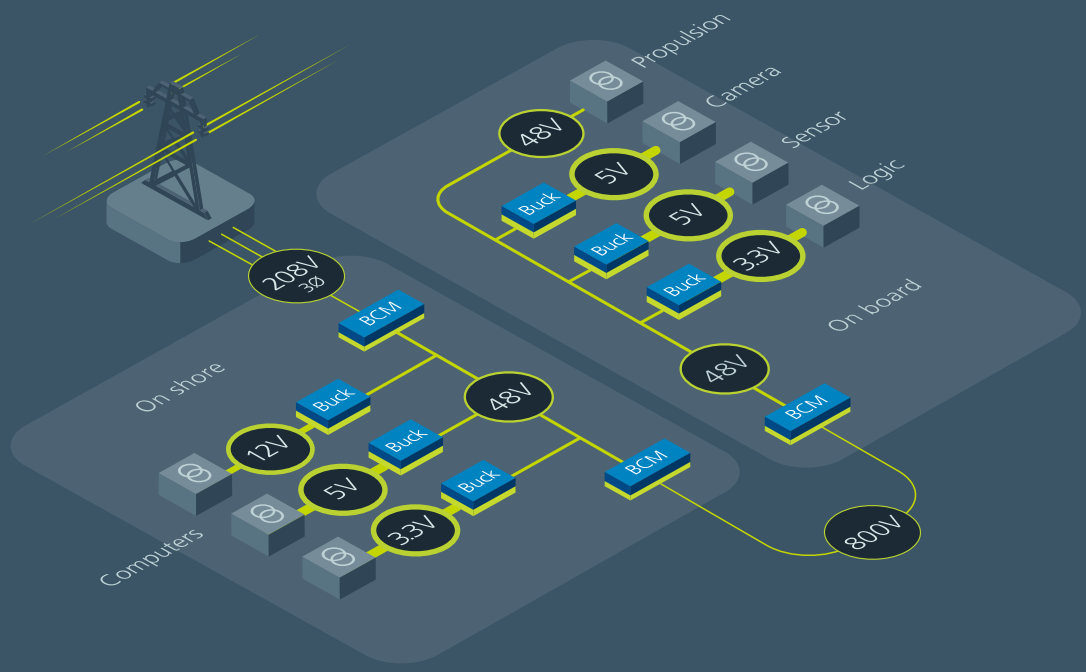
The Vicor solution

Vicor high-voltage, fixed-ratio bus converter modules and Zero Voltage Switching (ZVS) buck regulators create a power solution that optimizes the system for SWaP-C. On shore, the bidirectional Vicor BCM® converts SELV to high voltage at 98% efficiency for the tether. The high-voltage tether is a much smaller and lighter cabling with lower losses, helping to conserve energy and thereby extending the operational time under water, increase functionality and carry more payload. Key benefits were:

- Significantly reduced tether size, weight and drag
- Optimum efficiently converting high voltage to SELV voltages
- Lightweight conversion solution on board the ROV

The Power Delivery Network

From the ground station, the BCM4414 isolates and steps down the rectified output from a single or three-phase AC supply to 48V. A second BCM4414 steps up the 48V to 800V for distribution across the tether. A third BCM4414 is used to step down the 800V to 48V onboard the vehicle. Downstream of the BCM4414, ZVS buck regulators offer maximum power density and flexibility for high efficiency point-of-load DC-DC regulation. The integration of a high-performance Zero-Voltage Switching (ZVS) topology increases point-of-load performance, providing best-in-class power efficiency up to 98%.





MIL-COTS BCM® bus converter

Isolated fixed-ratio

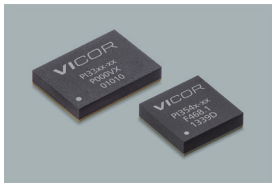
Input: 200 – 400V, 400 – 700V, 500 – 800V

Current: Up to 35A

Peak efficiency: 98%

As small as
1.28 x 0.86 x 0.26in

vicorpower.com/mil-cots-bcm



ZVS buck regulator

Non-isolated regulated

Input:12V (8 – 18V),
24V (8 – 42V), 48V (30 – 60V)

Output: 2.2 – 16V

Current: Up to 22A

Peak efficiency: 98%

As small as
10.0 x 10.0 x 2.56mm

vicorpower.com/buck

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