

MJR Power & Automation and ELSYS Complete ABS-Approved Life Extension & Repowering of Specialist Research Vessel



Turnkey electrical power, propulsion, automation and control system modernisation for a research vessel supporting the world's only fully ocean-depth rated and classed manned submersible.

In 2026, MJR Power & Automation and ELSYS successfully delivered a major turnkey life extension and repowering project for a specialist research vessel supporting the world's only fully ocean-depth rated and classed manned submersible. The project represented the culmination of almost two years of detailed design, engineering, construction, installation, commissioning and testing. The vessel was redelivered to the owner in March 2026 with full ABS approval and certification, marking a significant milestone in the modernisation of one of the world's most technically capable deep-ocean research platforms.

The scope of work covered a comprehensive upgrade of the vessel's electrical power, propulsion, automation, control & monitoring systems, including the in-situ rebuild of the main 600V propulsion switchboard and DC drive line-ups, 450V ships services switchboard, 450V emergency switchboard, generator control systems, 24VDC and UPS systems, bridge and ECR control desks, and the integration of an advanced vessel-wide automation and power management system.

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Scope of Work

For this project, MJR and ELSYS carried out the installation and commissioning in late 2025 and early 2026 at Astican Shipyard, Las Palmas de Gran Canaria, Spain. The scope included:

- Full upgrade of the 600V Switchboard
- Full upgrade of the 450V Switchboard
- Full upgrade of the 450V Emergency Switchboard
- Full upgrade of the Propulsion System (DC motors)
- Integrated Automation & Machinery Control System
- New Extension Alarm System
- New Dead Man Alarm System
- Main Switchboard Rebuild
- Power Management System Replacement
- Vessel Automation & Machinery Operating System (VAMOS) Replacement
- Generator Control & Protection

Key Outcomes

- ABS-approved redelivery completed March 2026
- Full electrical propulsion, automation and PMS modernisation
- Extended vessel operational life
- Improved redundancy, maintainability and long-term supportability
- Successful integration of modern systems into legacy marine infrastructure



Bridge Console complete with VAMOS 24" Operator Stations.

Throughout 2024, MJR Power & Automation carried out the basic and detailed design of the upgrade. Manufacturing of the electrical hardware was carried out at MJR's Teesside facilities, while the automation system was manufactured at ELSYS facilities in Vigo, Spain.

Design and Engineering

- Single Line Diagram
- General Arrangement Drawings & Layouts
- Main Switchboard Electrical Schematics
- Short Circuit Calculations
- Protection Study
- Load Balance
- Harmonic Compensation
- I/O List
- Alarm List
- IAS Mimic Screen Design
- PMS System Design
- DC Drives Replacement

ABS Class Approval

MJR Power & Automation was responsible for ABS approval of the full electrical power and automation design, with IAS/PMS FAT carried out at ELSYS in Vigo.



Engine Control Room console with VAMOS 24" operator stations.

Main 600V Switchboard and Propulsion DC Drive Line-Ups

- ***Replacement of all switchgear, control gear, instrumentation and switchboard doors.***

The main 600V switchboard was extensively modified. The original GE equipment was of a different physical form factor to modern drives and circuit breakers, requiring significant internal reconfiguration.

- ***Reconfiguration of the main bus to include remotely and automatically operated bus-tie circuit breakers.***

This fully integrated the bus ties with the PMS and IAS.

- ***Replacement of the main propulsion and bow thruster DC variable-speed drive systems, incorporating enhanced redundancy features.***

Each propulsion motor has duty and standby field drives. Failure of the duty field drive immediately inhibits the armature drive; changeover to the standby can be made when the motor is stopped.



Main Switchboard fully rebuilt with new PMS, instrumentation & controls.

Main 600V Switchboard and Propulsion DC Drive Line-Ups

- ***Redundant main propulsion motor armature changeover system.***

New dedicated armature changeover contactor frames were designed, fabricated on site, and installed for both port and starboard propulsion circuits, retaining the capability to operate both motors from a single armature drive in the event of a drive failure.

- ***Dual redundant feeds for the bow thruster.***

A new ACB was added to the 600V main switchboard to allow the bow thruster to be fed from either the port or starboard bus, with new crossover cables installed via a dedicated cable ladder and switchboard transit.



Armature drives for port/starboard propulsion and bow thruster.



Control panel for the bow thruster, complete with PLC and controls for the added ACB.

Main 600V Switchboard and Propulsion DC Drive Line-Ups

- ***Installation and integration of an advanced Power Management System.***

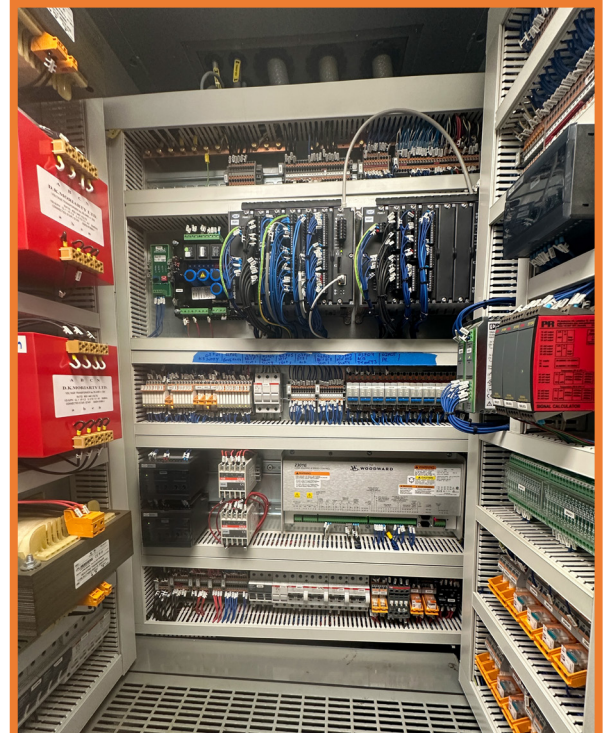
This provided automatic synchronisation and paralleling for the four 600V, 600kW generators. The PMS also included symmetrical and asymmetrical active and reactive load sharing, load-dependent auto start/stop, heavy consumer start blocking, fast propulsion load reduction for blackout prevention and bus tie automation.

- ***Replacement of generator AVR's and installation of electronic governors.***

New electronic governors and replacement AVR's were installed on all four main generators, integrated with the PMS to provide isochronous load sharing with droop backup and remote voltage trim for kVAR sharing.

- ***Installation of active harmonic filters for propulsion-drive harmonic mitigation.***

Two active harmonic filter units were installed adjacent to the 600V main switchboard, supplemented by 4% passive line reactors in series with each armature drive feeder.



Generator switchboard, with added AVR's and electronic governors.



Two active harmonic filters for harmonic mitigation.

450V Ship Services Switchboard & 450V Emergency Switchboard

450V Ship Services Switchboard

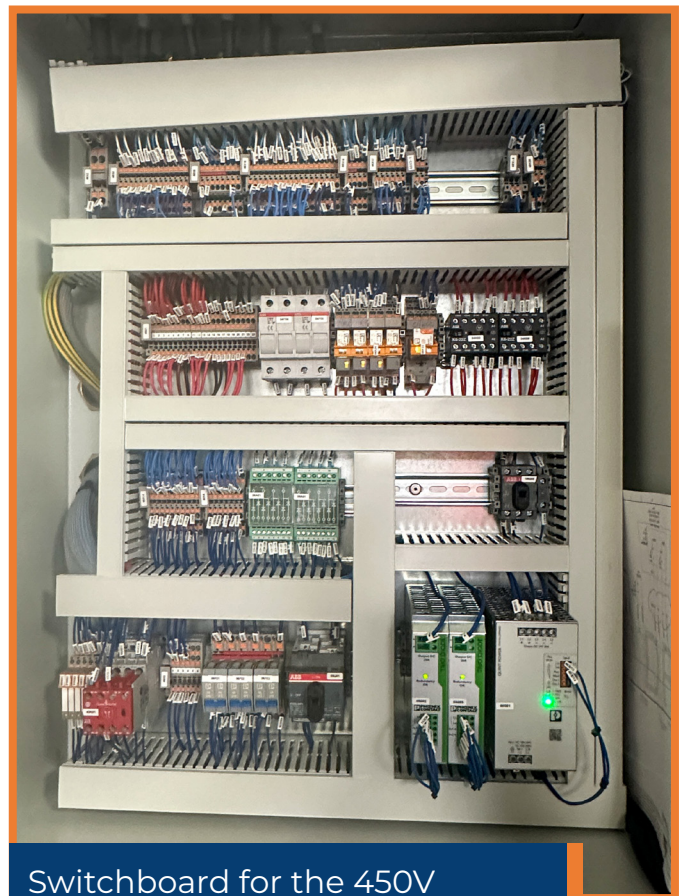
- Replacement of all main switchgear and control gear.
- Full integration into the advanced Power Management System.

450V Emergency Switchboard

- Replacement of switchgear, control gear, instrumentation and switchboard door plates.
- Replacement of the emergency generator AVR.
- Integration into the advanced Power Management System.



450V Switchboard control panel.



Switchboard for the 450V supplies.

24VDC and UPS Systems

A new 24VDC automation system was installed to provide control power to the new generator control panels, the PMS, the IAS, and other automation consumers throughout the vessel. This comprised new batteries, battery chargers, and a DC distribution board.

- **New Batteries and Battery Chargers**

Two battery chargers were installed with independent AC supply feeds to provide redundancy, with charger #2 and the ECR UPS being powered from the emergency switchboard if the main 450V ships services supply is lost.

- **DC Distribution Systems**

The original 24VDC system in the emergency generator room was retained and integrated with the new DC distribution arrangement; both are connected to the generator control panels via diode redundancy units for dual-supply redundancy. A new 120V emergency distribution board was also installed to supply automation consumers requiring power after loss of main supply.

- **Monitoring and Protection Systems**

A new 24VDC insulation monitoring instrument was installed in the ECR console for continuous earth fault monitoring of the 24VDC network.

- **UPS Systems**

New UPS systems were installed at the ECR and on the bridge to provide protected power supplies to the automation servers, IAS operator stations, and associated control and monitoring equipment.



24VDC distribution display on the engine control room desk.

Engine Control Room and Bridge Desks

- **New Control Plates for Vessel Control, Monitoring and Propulsion Control**

All propulsion control functions were tested from the ECR as part of the propulsion commissioning programme, confirming correct operation of all armature drive, field drive, and bus management functions from this location.

- **Upgrades Covering the Bridge Centre Console and Bridge Wing Locations**

New backplates and control equipment were installed into the bridge centre console, providing updated interfaces for propulsion control, steering gear, and vessel monitoring. IAS operator station and server PCs were installed in the bridge centre console, with network connections commissioned and tested.



Engine Control Room Desk.

Bridge wing locations were upgraded with new HMI panels for main propulsion, bow thruster, and rudder angle indication at both port and starboard wings.



Bridge Wing Desk.



Bridge wing HMI panels for port, starboard and bow thruster motors.

LARS HPU Starter

A dedicated VFD power conversion solution was developed for the Launch and Recovery System (LARS) hydraulic power unit starter.

This was designed to eliminate motor-starting current transients when operating large motor loads from generator-fed supplies.

Generator Control System & Integration Upgrade

The emergency generator and its associated switchboard were upgraded as part of the project scope.

- ***Replacement of Main and Emergency Generator Control Systems and Panels***

The vessel's main and emergency generator control systems and panels were completely replaced, with new Power Management System (PMS) controllers and generator control panels being supplied and installed.

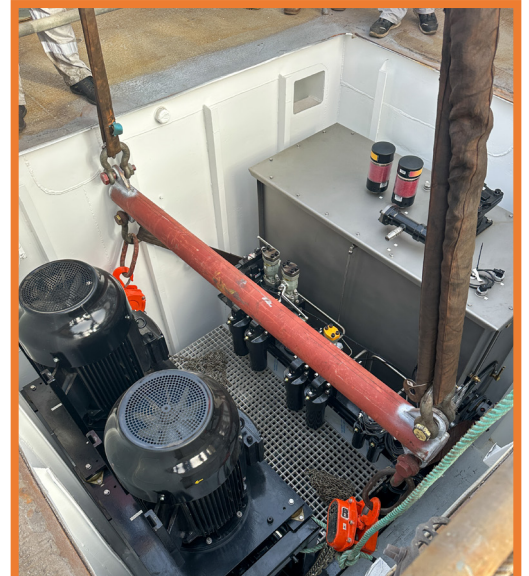
- ***Replacement of Generator Instrumentation***

New generator switchboard cells were fitted with instrumentation for each machine including voltage, power (kW and kVAR), frequency, winding temperature, and phase current metering on the 600V main switchboard.

Power management controller units were installed in each generator cell providing local indication of generator parameters, load sharing status, protection functions, and synchronising displays.

- ***Replacement of Generator Sensor Wiring Looms***

Sensor wiring looms were manufactured and installed for all four main generators.



HPU motors installed for the Launch and Recovery System.



Four new generator control panels installed, one for each main generator.

Integrated Automation and Machinery Control System (VAMOS)

The existing Integrated Automation and Machinery Control System was replaced with the VAMOS platform (Vessel Automation and Machinery Operating System).

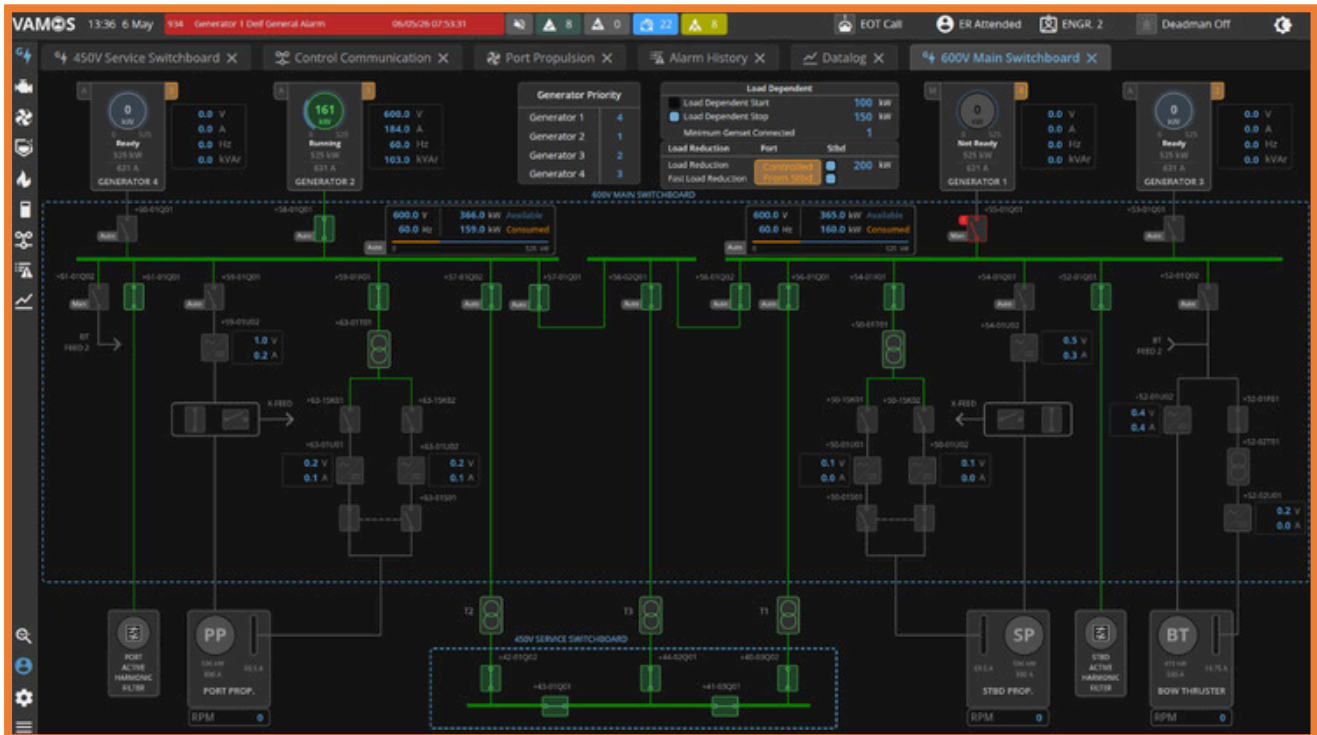
Delivered by ELSYS, this provides integrated power and energy management, as well as comprehensive alarm, monitoring and control coverage across generation, propulsion, bilge, watertight doors, fridge and freezer spaces, fire detection, and general ship services.

The system architecture uses two redundant fibre-optic ring networks: one for operator stations and engineer alarm stations, and one for the PLC and distributed I/O system. No two servers or operator stations share a common network switch, helping avoid a single point of failure across critical communications.

The new system features four main operator stations throughout the vessel, as well as five cabin alarm panels for the extension alarm system.



Bridge Console complete with VAMOS 24" Operator Stations.



Power Management Display.



Vessel Propulsion Overview.

Project Significance

This project demonstrates MJR and ELSYS's combined ability to deliver complex, class-approved electrical power, propulsion and automation upgrades on highly specialised vessels where reliability, redundancy, maintainability and regulatory compliance are critical.

By combining modern power management, upgraded propulsion drive systems, active harmonic mitigation, redundant automation architecture and enhanced generator control, the project extended the operational life of the vessel while improving system resilience, operational flexibility and long-term supportability.

The successful ABS-approved redelivery in March 2026 reinforces MJR and ELSYS as trusted partners for complex marine electrical power, propulsion and automation modernisation projects.



The vessel in dry dock in Las Palmas, during installation and commissioning.



ELSYS
MARINE AUTOMATION

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