SILENT POWER

Mark Findlay *discusses the electrified future of the defence sector and how the industry can prepare for electric and hybrid vehicles.*

For defence, electrification goes beyond sustainability – it's a catalyst for battlefield transformation. In an era defined by multi-domain warfare and dispersed operations, energy resilience, stealth and mobility are vital. The defence sector is undergoing rapid technological change. In the UK Government's 2025 Spring Statement, at least 10 percent of the Ministry of Defence's equipment budget was earmarked for emerging technologies – a clear signal of intent to modernise across all operational domains. While the spotlight falls on AI-enabled command systems, drones and advanced surveillance tools, one equally vital innovation is the electrification of land systems

Hybrid and electric platforms can reduce energy use on the battlefield. This means platforms can be present in theatre for longer, enabling greater survivability, enhanced manoeuvrability and logistical independence in complex and contested environments. By reducing reliance on fuel convoys, lowering acoustic and thermal signatures and supporting flexible mission profiles, electrified vehicles are set to redefine how military operations are conducted, unlocking a new level of capability for modern forces. So, how can electrified vehicles support the defence sector?

STEALTH AND SIGNATURE REDUCTION

Electrified vehicles bring a critical tactical edge: stealth. Traditional military vehicles powered by internal combustion engines are noisy and produce heat signatures detectable by infrared and thermal imaging. Electrified drivetrains, on the other hand, can be much quieter and emit considerably less heat when required.

This directly enhances silent watch capabilities, which are critical for reconnaissance, surveillance, and covert insertion missions. Forces can remain stationary or move slowly without compromising their position. Electric powertrains allow troops to approach enemy positions with a significantly lower risk of detection, increasing the probability of mission success and survivability in hostile environments.

While this advantage is most obvious in special operations, it applies equally to armoured vehicle patrols, logistics resupply and combat vehicle manoeuvres, especially in the context of modern asymmetric warfare where surprise and stealth often determine outcomes.

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An all Terrain Electric Mission Module (ATeMM) trailer pushing along a squad carrying vehicle

FLEXIBILITY AND POWER EFFICIENCY

Electrified propulsion systems provide an unprecedented level of tactical adaptability. Hybrid vehicles can intelligently switch between propulsion modes (internal combustion or electric) based on mission needs, terrain and energy availability. This ensures optimal energy usage, enabling vehicles to operate more efficiently and for longer durations, even in fuel-limited conditions.

This dual energy offers commanders greater choice in how and when energy is used during missions. For instance, a hybrid vehicle can rely on its combustion engine during high-demand activities or long-range transit, while switching the combustion engine off for silent watch and stealth manoeuvres.

Advanced hybrid architectures may also incorporate integrated starter/generator (ISG) systems, enabling a seamless and near-instant transition from a stationary electric state to internal combustion power. This is particularly advantageous when quick repositioning or rapid engine activation is required.

PERFORMANCE ON DEMAND

In some configurations, particularly parallel hybrid systems, a 'boost power' mode allows the electric motor and internal combustion engine to operate simultaneously. This delivers instant torque, which is especially valuable for rapid acceleration or climbing steep terrain. In dynamic combat scenarios, this capability provides a vital performance edge, supporting fast tactical movements and responsiveness under load.

MOBILE POWER SUPPLY FOR THE BATTLEFIELD

Modern defence vehicles must power more than just their own movement. Communications gear, advanced sensor suites and even directed energy systems need significant onboard energy. This capability helps detach tactical units from fixed power infrastructure, enabling more agile operations. Electrified fleets become decentralised power sources, crucial in modern warfare where rapid movement and dispersed operations are the norm.

ENHANCING FUEL RESILIENCE

One of the biggest vulnerabilities on the battlefield is fuel supply. Traditionally, a sizeable portion of military logistics is dedicated to transporting and protecting fuel and ammunition convoys, a critical but exposed element of support operations. Electrified vehicles reduce this dependency.

Hybridisation enhances operational endurance and effectiveness by eliminating the need for idling engines, while providing electrical power at inefficient operating points of the combustion engine. This energy autonomy maximises time in theatre, increasing resilience if supply lines are disrupted and reducing exposure to enemy attacks on fuel infrastructure.

Successfully integrating electrified vehicles into the defence landscape will require a broad shift in thinking and planning. The benefits are significant, but they come with challenges that must be addressed across multiple fronts.

SYSTEM-LEVEL OPTIMISATION

Electrification is not a static upgrade, it's a dynamic, evolving system. As new battery technologies, power electronics and thermal management solutions emerge, defence vehicle designers must constantly re-balance key system attributes such as weight, endurance, power output and survivability and keep in mind the requirement for proven trustworthy technologies.

Fuel cells also represent a promising addition to hybrid architectures, either complementing or replacing traditional battery systems. They offer the potential for extended range, rapid refuelling, and low acoustic and thermal signatures, making them especially valuable for missions where endurance and stealth are critical.

ADVANCED SIMULATION TECHNIQUES

Advanced simulation techniques like digital twins, virtual models of physical systems that replicate performance in real-time, can help evaluate and optimise these trade-offs. So, it ensures vehicles are configured for the demands of each mission type while maximising efficiency.

CROSS-SECTOR COLLABORATION

Realising this transformation will also demand deep collaboration across the defence ecosystem. OEMs, system integrators, technology startups, energy providers, and armed forces must work together. Not only to develop electrified vehicles, but also to create the standards, cybersecurity frameworks, and interfaces needed to make electrification scalable and secure.

This collaboration must go beyond just infrastructure. It should involve shared R&D initiatives, upgrades and maintenance, dual-use technology programmes and co-investment strategies that accelerate the adaptation of proven commercial technologies for military use.

STRATEGIC INVESTMENT

Government investment is a powerful enabler, but the industry must take the lead in embedding electrification into the very foundation of defence planning. Electrification is not just about acquiring new vehicles. It's about rethinking how defence forces move, fight and sustain operations.

It should be viewed as a core part of long-term force modernisation, rather than an optional or experimental programme. That includes prioritising technology transfer from the civilian EV sector, leveraging experience in battery systems, thermal management and drivetrain control architectures that can be hardened and adapted for defence conditions.

The transition to electrified defence vehicles is both a strategic imperative and an operational upgrade. From enhanced stealth and mobility to decentralised power and reduced logistical burden, electrification unlocks new capabilities for 21st-century warfare.

Tomorrow's battlefield will demand greater agility, resilience, and autonomy. Electrified platforms will form the backbone of this transformation, enabling silent manoeuvres, energy independence and seamless tech integration.

Our challenge will be to repower our existing fleet of platforms, which have internal combustion engines that have not been designed to accommodate hybridisation. We anticipate that there needs to be significant advances in the development of internal combustion engines, to allow package space for hybrid components. The time to act is now. With the right investment and collaboration, the UK can lead this global shift - building a defence force that is smarter, stronger and more sustainable. The future of defence mobility is electrified ●