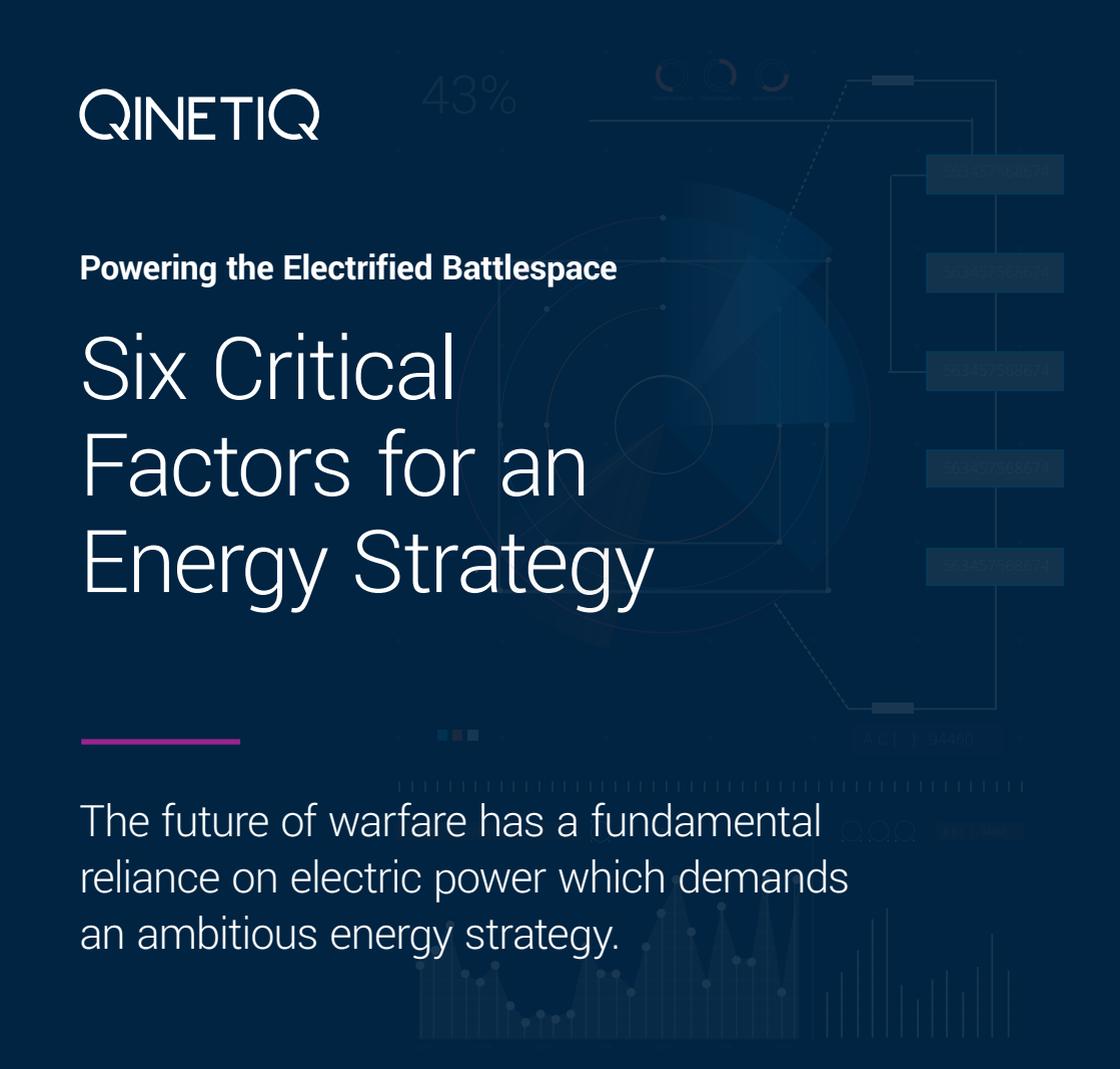


## Powering the Electrified Battlespace

# Six Critical Factors for an Energy Strategy



The future of warfare has a fundamental reliance on electric power which demands an ambitious energy strategy.

Energy is increasingly demanded and contested, within the battlespace and with Net Zero targets rapidly approaching, the opportunity is there to reduce cost, extend capability and save lives. A proactive energy strategy will empower decision makers to embrace a new, integrated and innovative approach to powering the electrified battlespace.

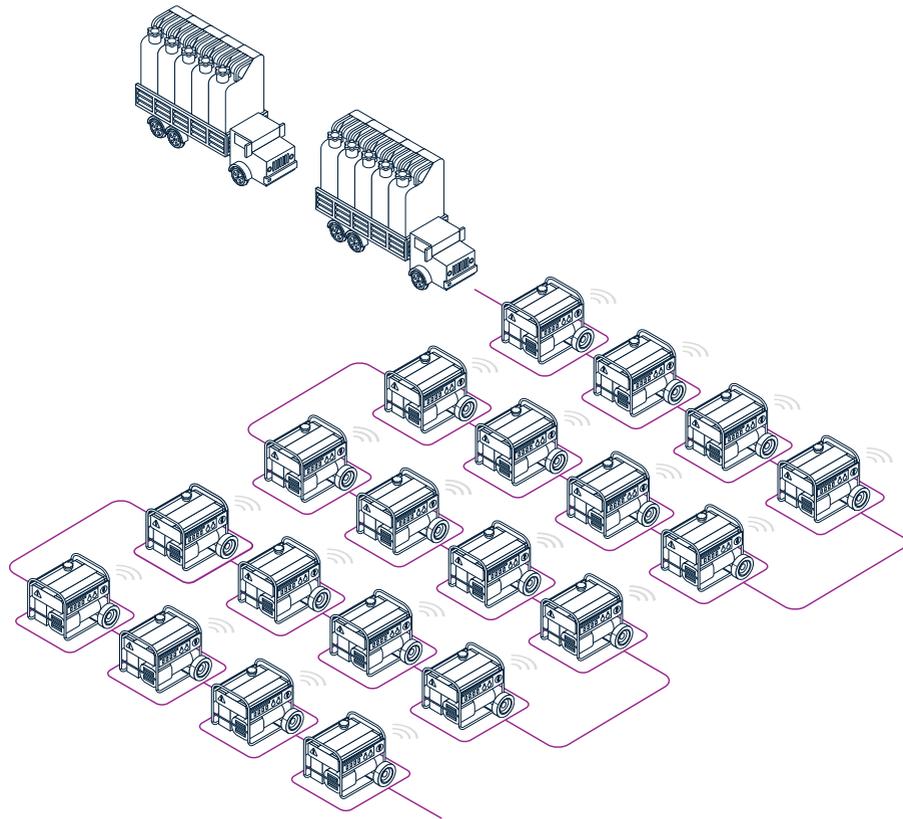
But electrification is complex. Balancing the immediate need to maintain legacy system performance and accurately measure current energy usage with the development of solutions will require deliberate effort. It is critical that forces adapt to meet evolving threats, by using new power technologies that optimise capabilities and find new ways of working in order to maintain operational advantage.

Here are our six critical electrification success factors for consideration:

## 1. Plan for Power

Create an ambitious Energy Strategy that incorporates fixed and mobile infrastructure and assets. Consider increasingly sophisticated power use monitoring and management and a dramatic shift from traditional centralised electrical systems to distributed, interconnected systems that incorporate smart power generation, storage and control.

A key challenge to deploying electrified technologies in battle is that the right power supply infrastructure does not yet exist. A new piece of electrical equipment, such as a directed energy system or electrically-driven autonomous platform, may not be able to simply plug into an existing grid. Therefore, without forward planning at the specification stage integrating new systems like this can result in rampant multiplication of batteries, generators and other power system components, each often devoted to powering a single piece of equipment. It is critical that consideration is given to cross platform power.



**Before:** The lack of energy storage and smart grid control means that excess supply capacity is needed to ensure reliability leading to excessive fuel consumption and multiple single points of failure.

## 2. Thinking forward

Forward Operating Bases (FOBs) have a major role to play in reducing fossil fuel demand. The need is currently met almost entirely by generators fuelled with diesel. At best, generators run at only 30% fuel efficiency. However, most generator systems run at part load, wasting huge quantities of fuel to be ready for peak demands. Urgent action must be taken to reduce dependency on fossil fuels by making power generation more efficient.

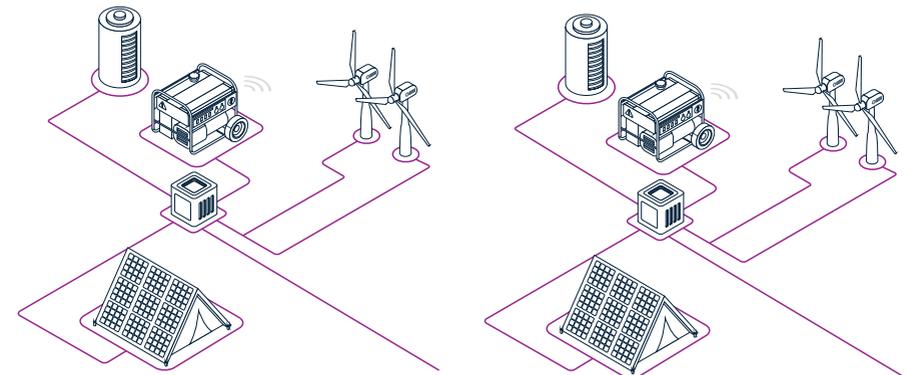
Hybrid systems that incorporate energy storage, renewable sources and adaptive control will enable modular and scalable solutions that balance supply and demand. For command posts a hybrid field power unit could reduce diesel consumption by up to 80%. Generators will create energy to store in batteries for round-the-clock provision and combine with ultra-high power batteries, flywheels or supercapacitors for the bursts required to operate directed energy systems and other power-hungry systems. With this approach, generators can be switched on and off by an automated smart hub, to maximise efficiency and maintain low acoustic and thermal signatures.

For larger bases, energy storage and smart grid controls can improve reliability and efficiency while reducing deployment weight and maintenance liability.

## 3. Make it easy to update

With a scalable, modular, integrated power infrastructure comes the flexibility to incrementally adopt modern and renewable technology such as solar panels and turbines driven by wind or water. Military-hardened variants will be needed to prevent opening up new vulnerabilities to enemy forces.

Successful implementation also demands open architectures and clear specifications to support development of compatible systems that connect physically and integrate seamlessly with intelligent power management software. It must be easy for users to 'plug and play' without a training burden.



**After:** Smart microgrids and interoperable power sources will transform deployed power

## 4. Rethink Power Flows

Rethinking fundamental design principles could deliver new formats of vehicle and weapons platforms. Many believe that the hybridisation of military vehicles drive trains is inevitable. Hybrid vehicle power systems can be used in an adaptive smart grid systems to store energy in their battery systems or supply energy from their inbuilt auxiliary generators. This would work in a similar way to using consumer electric vehicles for grid balancing, delivering instant power where required by the operation.

## 5. Reinvent, Retrofit and Innovate

From the smallest drone to the largest aircraft carrier, the challenge now is to increase energy provision and improve safety while maintaining or reducing the volume and mass of the power sources. All platforms will face missions where success is largely dependent on the electrical power available to it.

## 6. Power Up Logistics

Managing power is managing logistics. Artificial Intelligence (AI) will have a role in predicting and managing power. Designs already exist for power packs and robotic systems to communicate their remaining battery levels wirelessly to an AI managed local microgrid. Critically, it must be possible to match power generation to demand – not just within each Forward Operating Base, or on-board each platform, or for each soldier, but across the whole system of systems.

As autonomous and robotic vehicles are deployed, logistics opportunities multiply. The vulnerabilities of a single, heavy resupply convoy can be avoided through distributed delivery. More than that, remote charging stations can be used to extend platform range and reduce reliance on a central base.

## Take command of power

Generating, storing and conserving energy might, in the future, become the domain and responsibility of a new member of the military leadership, an 'energy czar' who oversees all of the electrical deployment across the entire battlespace. This will position power as, rightly so, as important to winning a conflict as deciding where to deploy troops or missiles.

This whitepaper covers just one area of the future of power in the battlespace. For the bigger picture, please download our **Electrified Battlespace** report or other whitepapers and collateral from [www.QinetiQ.com/power](http://www.QinetiQ.com/power).

Or contact our team at [electricbattlefield@QinetiQ.com](mailto:electricbattlefield@QinetiQ.com)