



“eDefence” Solutions

Energy Storage Solutions for Defence Applications

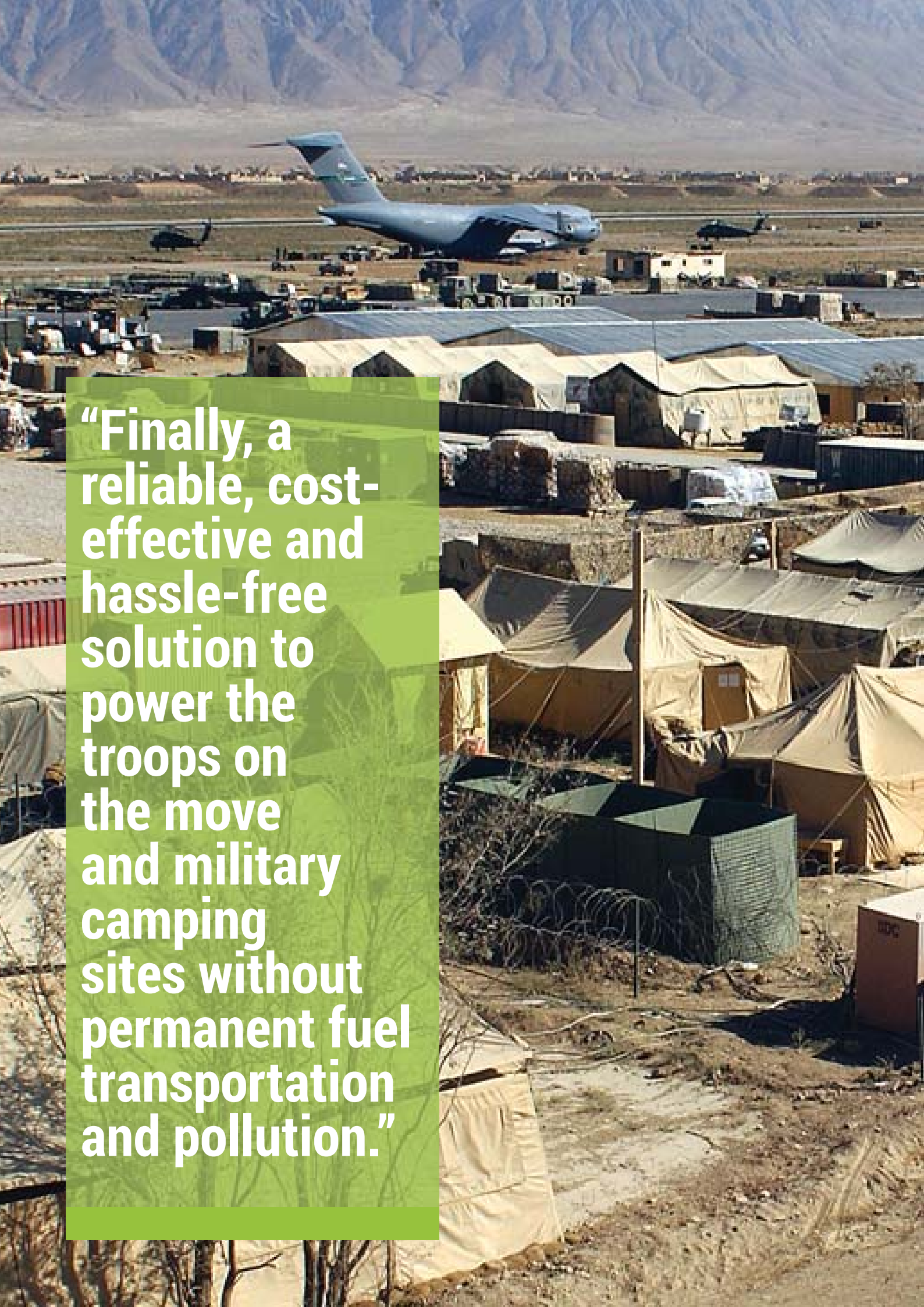
eDefence is a turn-key Energy Storage Solution, developed specifically for the Defence industry allowing to power troops on the move or stationed in camping sites in a manner to avoid the use of fuel.

eDefence provides a key strategic advantage to the defence industry by providing a user friendly mobile and completely silent energy source to the field allowing to avoid the encumbrance of generators while eliminating the dangers and costs of maintaining a permanent line of fuel supply.

eDefence is modular and infinitely scalable allowing to power any number of troops or applications on 24/7 basis.

eDefence connects automatically to the cloud for full data visibility to command centers and key personnel.

S370E



“Finally, a reliable, cost-effective and hassle-free solution to power the troops on the move and military camping sites without permanent fuel transportation and pollution.”

Why eDefence?

Challenges in the Defence Industry

The military are often compelled to install a camp site away from the grid or in areas where the grid is sporadically available. Generators are installed to power equipment and facilities, requiring the establishment of a constant line of fuel, oil and parts supply in order to maintain operational power.

The use of conventional generators poses a number of challenges:

- For troops on the move, and defence sites, generators are bulky to transport and tactically inappropriate.
- A permanent line of supply of fuel may sometimes be impossible to maintain
- Transporting fuel, oil and parts is extremely costly as it is often done by air.
- Reliably operating and maintaining generators requires substantial competence and management. These resources could be directed to other more efficient activities
- The 24/7 noise and pollution can be an aid to enemy forces locating an encampment 24/7 noise and pollution is cumbersome to everyone

Troops Health

Besides their CO2 emissions adding to global warming, generators emit dangerous gases including CO, NOx, SOx and microparticles that have extremely harmful effects, especially in cases of prolonged exposure.

Troops may install generators operating 24/7 within the area of camp sites that have a demonstrated negative effect on their health.

A Cost-effective Solution

E24 eDefence advanced technology overcomes these challenges by providing a fully integrated multi-source energy generation, energy storage, advanced AI-based energy management system, unlimited scalability and a tailored cloud connectivity platform for visibility and prompt decision making.



eDefence - A New Way to Power Troops

eDefence is made up two easy to use units: DMPU1 and DMPU3 that can interconnect together when needed to form a microgrid to scale to the desired power required. "DMPU" stands for Defence Mobile Power Unit. DMPU1 is a single phase unit and DMPU3 is a three phase unit.

DMPU1 and DMPU3 include the following:

- Temperature controlled shelter (optionally armored)
- Easy field deployable solar panels
- Lithium Based energy storage batteries
- Modular and redundant Inverters and rectifiers
- Centralized AI-based energy management system
- Diesel or propane generator with internal tanks
- Medium voltage and fibre optic backbone circuitry
- Cloud communication interface
- Smart Power distribution system

DMPU1 is a Single Phase input / output device that can be transported on a pick-up truck or a flatbed. It can be operated on site from the truck itself or placed on the field. DMPU1 is ideally suited for small army camps, small remote unattended loads or tactical missions.



DMPU1 Main Specifications

- Shelter Size HxWxD (m): 3.75 x 1.85 x 1.80
- Solar Power deployable (KWp): 13.5
- Energy Storage Size (Kwh): 104Kwh
- Output Power (KW): 10
- Generator Power (KW): 8
- Diesel tank size (L): 540L

DMPU3 is a Three Phase input / output device that can be transported on flatbed truck. It can be operated on site from the truck itself or placed on the the field. DMPU3 is ideally suited for large troop tactical deployments or military camp sites.



DMPU3 Main Specifications

- Shelter Size HxWxD (m): 6.06 x 2.44 x 2.9
- Solar Power deployable (KWp): 63
- Energy Storage Size (Kwh): 280 (upgradable to 560)
- Output Power (KW): 30
- Generator Power (KW): 24
- Diesel tank size (L): 2640L

General Principle of Operation

DMPU1 and DMPU3 have four sources of possible energy input:

- 1-) Solar energy (if panels are deployed and if there is a minimum of solar irradiance) (Priority 1)
- 2-) Utility energy if the eDefence unit is connected to a utility source and that source is live (Priority 2)
- 3-) Internal Generator (Priority 3)
- 4-) Microgrid (Priority 4)

The DMPU draws energy from the above sources in a balanced fashion according to its AI software as per the priorities above. Energy generated is charged into the energy storage system until the batteries are full. Energy generated that cannot be absorbed by the batteries are fed to the micro-grid if connected.

The load is fed through three power controlled feeders, with three levels of availability:

- 1-) Super High Availability Line
- 2-) High Availability line
- 3-) Standard Availability Line

If for any reason, all the above mentioned energy sources are unavailable simultaneously, energy is supplied from the internal batteries. When the battery reaches 60% (user programable) of their charge value, Standard availability line is disconnected in order to give priority power to the first more critical loads. When the battery reaches 40% (user programable) of its value, the High availability line is disconnected in favor of the Super high availability line that remains available until the battery reaches 20% of its capacity. The benefit of such load management, it to keep the most critical loads active as long as possible while automatically disconnecting the less critical ones.

Of course, such scenario is extremely pessimistic as it is improbable that all four sources of energy including the internal generator are simultaneously unavailable.

Island Mode Operation

Both DMPU1 and DMPU3 can operate as stand-alone units (ISLAND MODE) or could be connected to other units through a medium voltage backbone to form a micro grid (MICRO GRID MODE).

When operated in ISLAND MODE, DMPU1 and DMPU3 have access to three sources of power: Solar, Utilities and Generator and will no longer be able to receive energy from the Micro-Grid.

The DMPUs are constructed using modules connected in a manner to avoid loss of power at the output in the event of any damage to one of the modules. The DMPU may degrade the

maximum power capacity and disconnect less critical loads while keeping the most important loads powered.

Upon such case, the DMPU that suffered a failure will signal such failure through the defence cloud while keeping the most critical loads on until the unit is repaired.

Micro-Grid Mode Operation

DMPU1 and DMPU3 have both a micro-grid medium voltage outlet allowing them to be connected together to share data and energy in an optimal fashion.

The benefits of connecting units on a micro-grid are:

1-) Unmatched Redundancy and Reliability:

When multiple units are connected on the same MV grid, they will all share energy between themselves until all their batteries have the same level of charge. Any units having suffered from any damage, may continue operating normally by using the other unit operational equipment. In other words, when connecting DMPUs together, they will operate as a single unit sharing energy resources and equipment. Even if a unit is completely destroyed, the load may still remain operational by using energy drawn from the other units.

2-) Interconnectivity of DMPU1 and DMPU3

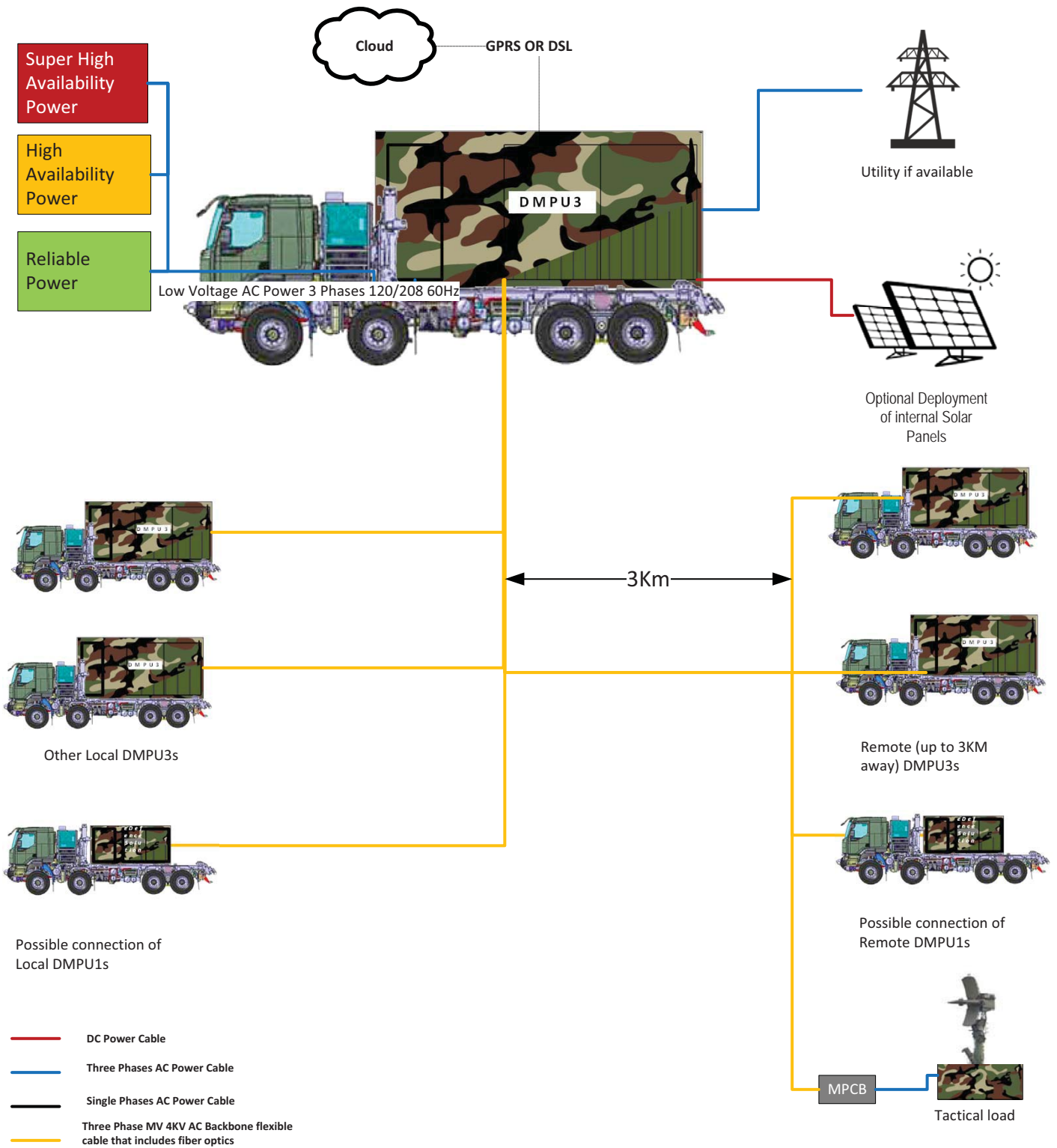
It is possible to connect DMPU1 single phase units to the same micro-grid used by DMPU3. DMPU1 simply connects to one of the phases and exchanges energy on that phase. Of course, when more than one DMPU1 are to be connected to the micro-grid, it is recommended to spread them over multiple phases to better distribute the energy over the three phases.

3-) Wide area of power coverage

The DMPU micro-grid is designed to operate on 4KV allowing to minimize power loss in the cables and connect DMPUs at a distance of up to 3KM away from each other. This allows to spread the decentralized production of energy over a large geographical area with minimal cabling.

4-) Remote powering of tactical loads

Another benefit of the MV micro-grid, is its capability to power a load positioned at a 3KM distance from the nearest DMPU. To do so, a Mobile Power Connection Box (MPCB) which is a small man-carried box is required. The benefit of such a scheme is to keep the power supply far from the actual load for tactical reasons.



eDefence Solution : Micro-grid Connectivity topology

eDefence Technical Features and Benefits

Multiple Energy Input Management

eDefence can be connected to a utility source if available. eDefence includes artificial Intelligence to minimize the use of utility power while at the same time avoid the use of diesel generators.

In the remote event where neither sun, nor optional utility source are available and the batteries are depleted, eDefence includes an internal generator that will start automatically and will automatically shut down the generator when battery energy level is restored.

Long time operation without sun or utility

eDefence is designed to operate for up to a year without (depending on solar irradiation and load) without utilities and without diesel refills (based on an initial full tank).

Clean and Silent

eDefence allows you to avoid the use of noisy, polluting diesel generators that release harmful gases (eDefence is designed to almost never use the generator).

Resilient & Redundant

eDefence uses redundancy in its storage and electronics in a manner to keep operating in case of a failure. Under such a case the eDefence will automatically notify the control centre through its cloud connection in order for the service team to replace any damaged equipment before any power disconnection occurs. Even in the case of a total damage to its electronics, eDefence will automatically start the generator giving the service team the time to fix any technical problem before power interruption.

Unattended operation and low maintenance

eDefence's smart system automatically switches between power supplies and manages energy storage, requiring no human intervention. Its remote monitoring tools ensure smooth operation and get notified in case of any issues. Batteries require only one check up every 6 months.

Safe and Reliable

eDefence accepts a wide input voltage fluctuating between 80Vac to 140Vac, as well as a wide input frequency between 40 to 70Hz.

Modular and Upgradable

eDefence's modularity means that it is possible to add more inverters in parallel to increase power and reliability, and more battery modules to increase backup time, dynamically growing with your evolving energy needs.

Eco-friendly image and values

Choosing solar energy demonstrates a commitment to lowering carbon emissions. eDefence improves your image, sending a message of environmental responsibility.

Temper Proof

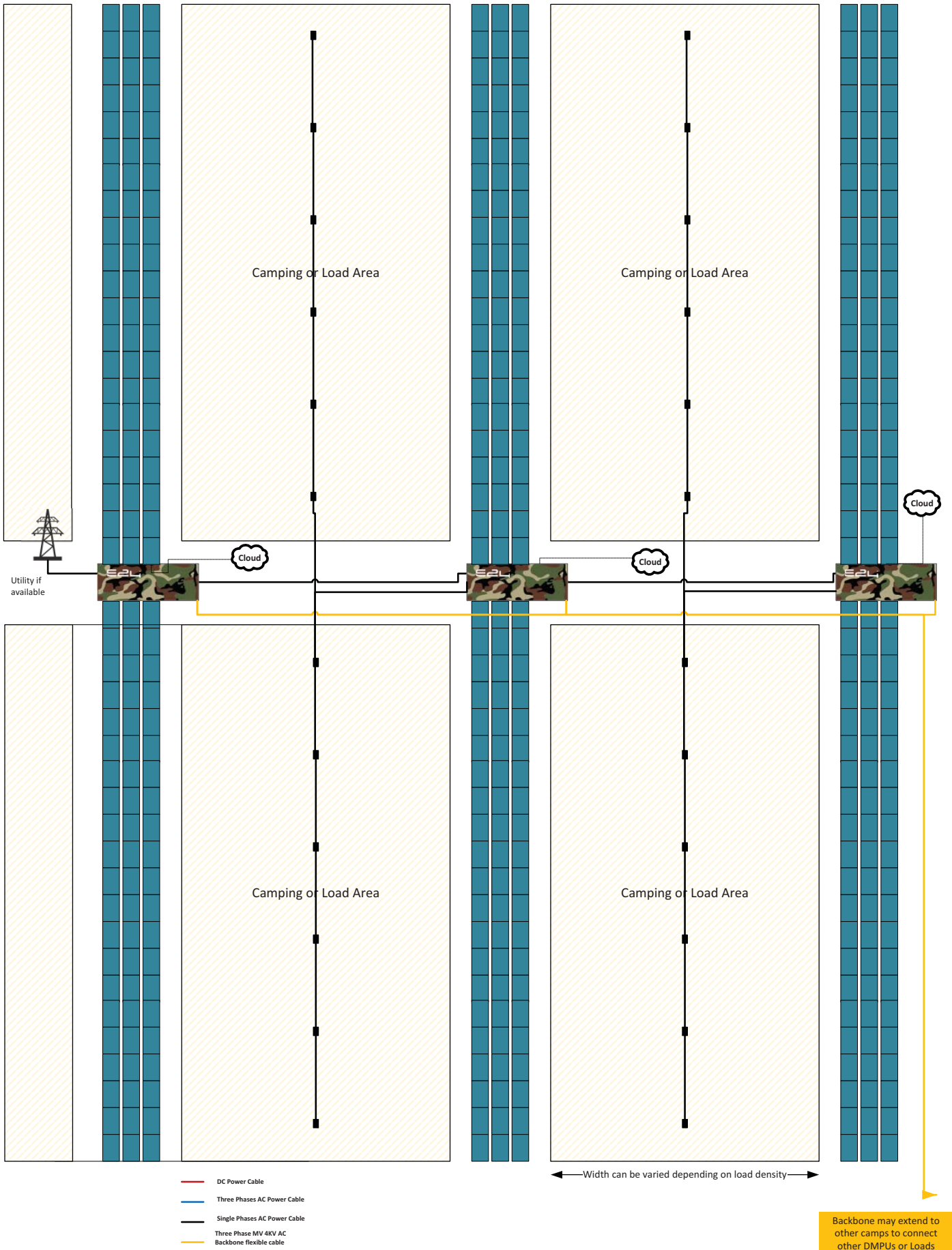
eDefence includes all the technology within a single 20ft container making it impossible to steal any equipment or diesel. eDefence also includes a finger scanning technology to make sure the guard is awake coupled with an advanced alarm system which will immediately notify all parties in case of a security breach.

Designed for Harsh environmental Conditions

eDefence uses sophisticated isolation and temperature regulation technology to ensure safe operation from -60°C to +60°C.



eDefence Military camping or distributed load application



eDefence Operational Features and Benefits

For a Solution to be adopted systematically, it has to be simple to understand, easy to use and easy to service. E24 has precisely focused its design to make operation and service simple.

Easy Logistics

Only 2 possible units to choose from:

DMPU1 is used for single phase applications to power up to 20 army personnel. DMPU1 is a lighter, smaller units better suited for tactical missions or small army camps

DMPU3 is used for three phase applications to power up to 60 army personnel. DMPU3 is better suited for camp sites.

DMPU1 and DMPU3 are carried on standard military trucks and may be operated directly from the truck or removed from the truck for an operation directly on the ground.

Easy Deployment and Un-deployment

eDefence is simple to deploy. While on its carrying truck, the DMPU has a side opening that allows the release of folded solar panels on wheels. To deploy solar power it only takes 2 men to deploy the panels as per the below schematics. Un-deploying the panels takes the same process in reverse.

Easy start-up and operation

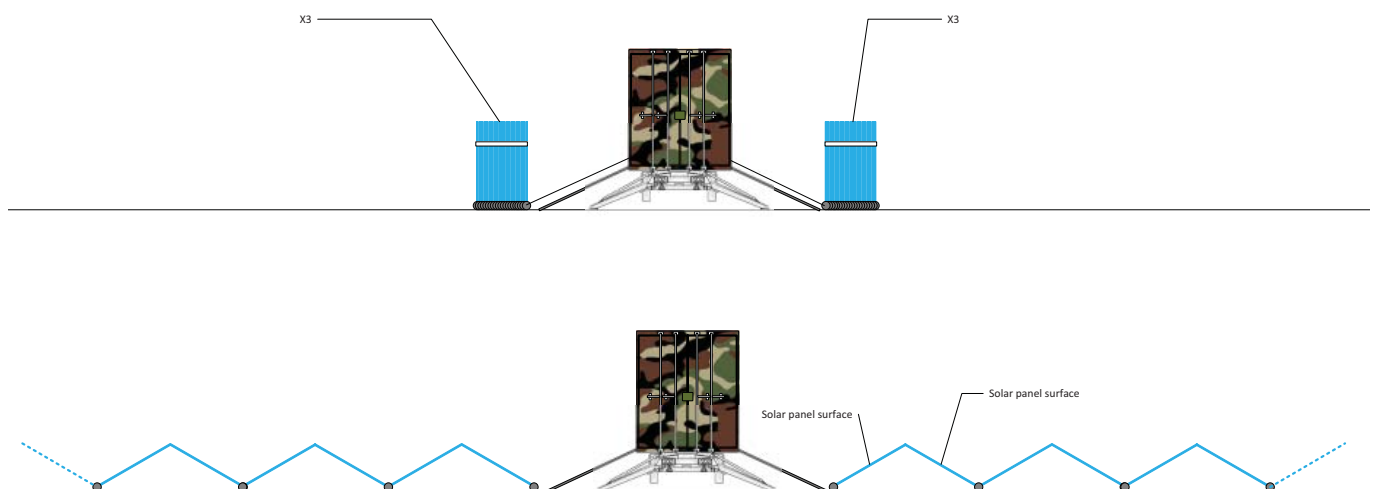
The start-up and operation of the DMPU uses a intuitive graphical touch screen making it a child's play to operate. Once the unit is started, there is nothing further to do as the system takes its own decisions based on its advance artificial intelligence software.

Inter operability

DMPU1 and DMPU3 use the same modules. Any module that get damaged in DMPU1 can be replaced from the same module taken from a DMPU3 and vice versa for most parts.

Built-in spare parts and modules

DMPU1 and DMPU3 include extra modules and extra parts that can be immediately plugged-in in case of a failure.



Substantial Operation & Maintenance Cost Savings

Avoid 99% of cost of fuel

eDefence's is designed to operate for up to a year without (depending on solar irradiation and load) without utilities and without diesel refills (based on an initial full tank).

Avoids the cost of transporting fuel

Being mainly relying on solar energy, eDefence solution avoids the costs of transporting fuel and most of all any risks of loss of life or equipment during such transportation.

Self preventive maintenance

eDefence performs regular self checks and can email stake holders of any irregularities before a technical failure occurs. This feature allows to save substantial downtime and allows the O&M team to plan for the needed parts, resources and time before any failure occurs.

Savings due to remote diagnostics

Upon any email received alerting for a possible failure or abnormalities, it is possible for a central O&M support center to diagnose the problem remotely.

E24 advanced diagnostic software allows to go back up to 10 years in time and check the log file of any parameter to read data at a rate of 10 readings per second. This powerfull tool allows the remote technical support team to issue a accurate diagnostics of the problem and plan accordingly.



eDefence VS Standard Generators

eDefence offers a substantial improvement over the use of Diesel generators on a number of levels:

Purse Sine Wave signal

Diesel Generators do not provide pure sine wave outputs especially when they are small or when they start aging. sophisticated military equipment are sensitive to harmonics and operating them on generators degrades the quality of operation and may cause they are operated on an old generator.

Generators have an unstable voltage and frequency

Generators do not offer a fixed voltage and frequency which may vary depending on load, temperature, etc.

eDefence offers a fixed voltage and frequency independently of the load.

Cumbersome setup

Generators must be connected to fuel tanks and the exhausts must be directed away from army personnel. Initial setups take time and human resources that may not be available.

Heavy operation and maintenance

Generators require a change of oil and filters every 200-300 hours of operation. This requires continuous supply of parts, oil and filters and human resources that may not be always available.

eDefence does not require any maintenance besides some cleaning of air filters once a year.

Generators have a High probability of failure

Generators are mechanical devices that may heat in hot environment or stop operation due to dirty fuel etc. Diesel generator often fail and a continuous mechanic must be on site permanently to keep the generators in good operation.

eDefence is a static technology with no moving parts. The MTBF of electronics is far higher than any generator. Any failure is repaired by replacing a plug and play module in minutes.

Generators are noisy

Generators produce substantial noise. Even silent generators still produce a humming sound.

eDefence is totally silent

Generators require constant refuelling

Generators require constant refuelling which may not be available in certain remote areas.

eDefence operates for extended periods without any fuel.

Generators are ambient temperature sensitive

Should the ambient temperature rise beyond 40 degrees C, Generators must be derated. Even at lower ambient temperature, generator heat up if operated for more than 15 hours without any interruption. Under low temperature, generators often are unable to start due to the fuel being too cold or because of battery malfunction or generator freezing.

eDefence operates smoothly from -60 degrees to + 60 degrees C with no need to any derating.

Generators get damaged if operated on low load

Generators must be operated with a minimum of 30% load in order to avoid degrading the engine.

eDefence may be operated at any load without any degradation.,

Generator	eDefence
<ul style="list-style-type: none">• Distorted Sine wave which may damage electronic equipment as generator ages• High operational cost• Air & noise pollution• Continuous maintenance• Power cut between utility and generator• Minimum 30% load• Bulky (fuel tank and exhaust required)• Continuous refuelling• Narrow temperature operation (deration)	<ul style="list-style-type: none">• Pure sine wave output• Low operational cost• Silent and non-polluting• Low maintenance• Reliable• Stable voltage and frequency• Can be installed in any space• Install once - replace batteries every 8 to 15 years• Wide temperature operation• Ready to be coupled with Solar PV



Advanced Cloud Monitoring

General Operation

eDefence solution is equipped with an advanced software that permanently collects data from all the modules present in the DMPUs. The information is collected at a rate of up to 10 readings per second allowing to closely monitor and record all parameters and detect any abnormality occurring on any of the internal modules.

The data generated is stored remotely on secure servers allowing to go back in history to up to 10 years. A copy of the data can be also saved on a USB chip inside the E24 control panel of the DMPU to keep recording the data even in the event of an interruption with the internet.

System self-preventing maintenance

Each DMPU performs regularly self check-up routines and upon sensing any abnormality, the AI software immediately sends an alarm message to pre-programmed stake holders with the information about the nature of the problem. The receivers of the information can then log into the particular unit from a remote location and analyse the reasons of the abnormality and take the proper support decisions.

Web interface showing live data

The data of all parameters is visible in real time on the cloud through an encrypted communication available to a pre-programmed number of stake holders with different levels of

access privileges.

All the live data shown is graphed showing the latest history of every parameter of the DMPU.

Two-way communication

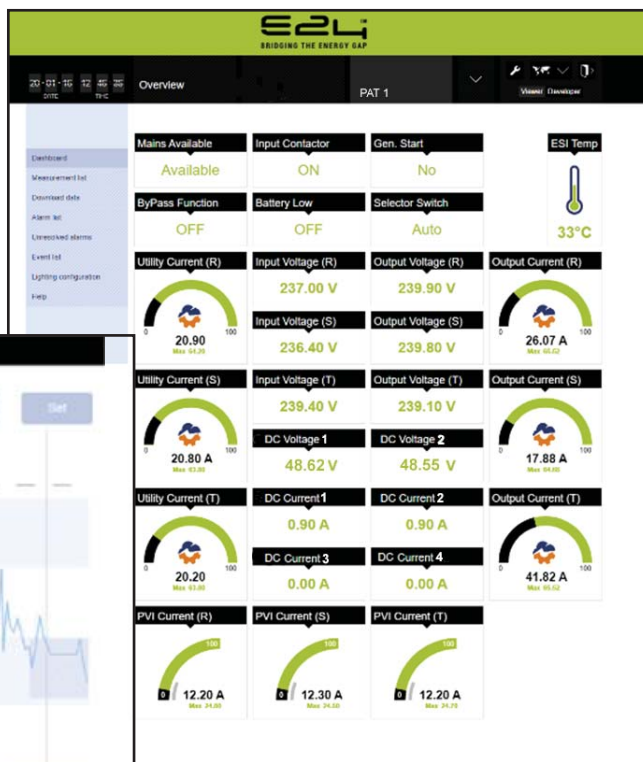
The eDefence web platform uses bidirectional communication allowing the command and control centre (or any authorized stake holder) to control the unit remotely. It is therefore possible to remotely disconnect one of the loads, start the generator, shut down the unit, etc.

Downloadable Data

All Data can be downloaded in different formats including tab delimited parameters for export to excel or other tools.



Fig. 6B It is possible to see the Historical values of each parameter on a graph that can go back up to 10 years. Data is recorded at a frequency of 10 recordings per second.



E24 Quality Pledge



E24 is the result of 30 years experience in the field of energy generation, conversion and storage technology. E24 engineers the most durable, efficient and reliable energy solutions on the market tailored for the most demanding applications and locations around the world.

E24 designs, engineers, manufactures, assembles, tests and delivers its solutions in modular components that are easy and cost-effective to assemble on customer's premises.

E24 commissions its solutions through a network of affiliates or business partners under strict quality standards and procedures to ensure the highest optimal performance and customer satisfaction.

E24 continuously invests in R&D and develops its own proprietary technology. Each part of the energy solution supplied is optimized to bring the highest customer value.

All solutions are designed to bring a fast and efficient deployment with minimal support requirements..

Energy Storage Solutions



eHome



eVilla



eBuilding



eBusiness



eFactory



eVillage



eTelecom



eGrid

Energy Generation Solutions



eSolar



eHybrid



eParking



eAgri

Comprehensive Energy Solutions

E24's broad portfolio of successfully completed projects ranges across a variety of sectors.

E24 built its reputation on attention to detail and focus on its clients' needs to successfully deliver tailored solutions. It is in this spirit that E24 develops targeted, personalized, seamless energy solutions for homes, villas, businesses, buildings, factories, villages, telecom, utilities etc.

E24 is constantly working towards enhancing the economics and lifestyle of its customers while saving on the planet.



Ordering Information

Ref. Number

S370-10K-104-10KD
S370-10K-104-10KI
S370-30K-280-65KD
S370-30K-280-65KI

Description

eDefence Solution, Single Phase, 120V, 50/60Hz 10KW, 104KWh Storage including 10.0KWp Solar
eDefence Solution, Single Phase, 230V, 50/60Hz 10KW, 104KWh Storage including 10.0KWp Solar
eDefence Solution, Three Phase, 30KW, 120/208V, 50/60Hz, 680KWh Storage including 65 KWp Solar
eDefence Solution, Three Phase, 30KW, 230/400V, 50/60Hz, 680KWh Storage including 65.0KWp Solar





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QUALITY STANDARD



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