ENERGY STORAGE SOLUTIONS

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DRM POWER CONVERSION & STORAGE SYSTEM

Ensuring the Stable and Secure Operation of Smart Grids and Energy Production Plants

UPS SOLUTIONS

ENERGY STORAGE FOR A SUSTAINABLE WORLD

Fundamentally, countries worldwide are actively making steps towards creating more energy efficient and yet cleaner cities. As the energy industry moves away from carbon-heavy production, renewable energy and storage is being critical for delivering on the demand while securing the future of world energy and playing a prominent role in a grid that is migrating to a higher penetration of renewable energy, smarter grids, and flexible grids.

However, high penetration creates power transmission instability challenges, thus Grid Operators require stringent dynamic and static grid support features for Power Conversion Systems .

FOR THE CHALLENGE OF ENERGY STABILITY, UPS SOLUTIONS HAS SOLUTIONS FROM KW TO MW

For a stable transmission and distribution, the power grid operators need a real-time match between electricity supply and consumption.

Challenges that energy storage can adress:

- Output variability,
- The temporal (time-related) mismatch between generation and demand,
- Uncertainty regarding weather forecasts, and
- Undesirable electrical effects on the electrical grid caused by some RE generation

UPSS DRM solution offers proven hardware to meet storage and grid support challenges.

BENEFITS:

Beyond enabling the Increased use of renewable electricity generation, energy storage technologies have several benefits:

01

Security:

A more efficient grid that is more resistant to disruptions.

02

Environment:

Decreased carbon dioxide emissions from a greater use of clean electricity.

03

Economy:

Increase in the economic value of wind and solar power and strengthened competitiveness in clean energy.

04

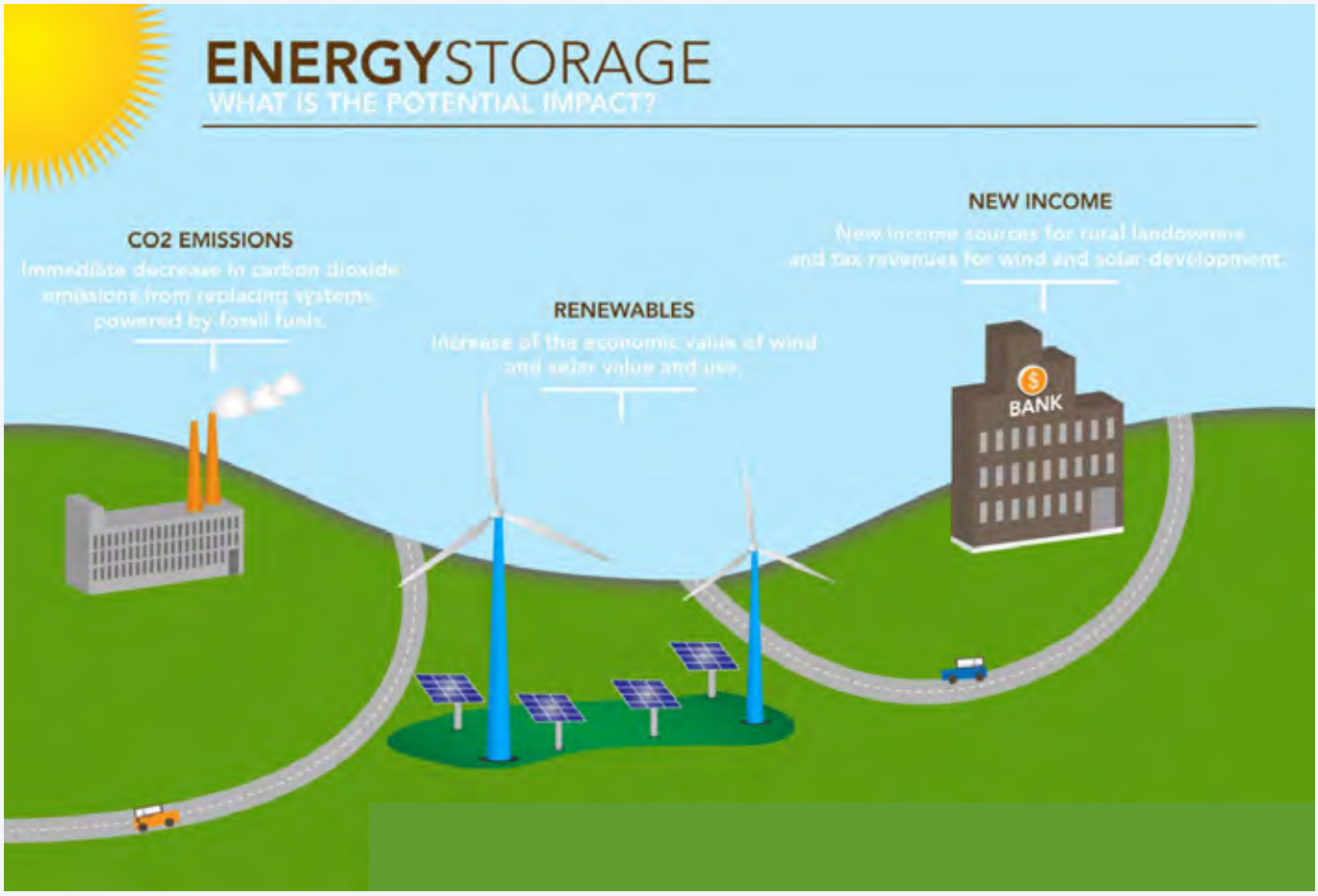
Jobs:

New income sources for rural landowners and tax revenues for wind and solar development areas.

05

Renewables:

Increased use of renewable electricity generation. Managing the intermittence of renewable energy production.



WHAT IS UPSS'S DRM - ENERGY STORAGE SOLUTION?

DRM is a fully integrated turnkey energy storage solution that are ready for connection to medium- or high-voltage grids and cover a power range of hundreds of megawatts.

With over 40 years experience in power eletronic, Makelsan has developed DRM Energy Storage System for on grid and off grid application with typical loads between 440 kW and 1 MW.

The DRM system is fully compliant with grid systems to import and export power inline with the voltage and frequency regulations, FFR and DFFR schemes required by utilities to support the grid. The DRM can be used to support the stabilisation of the grid to manage the consumption and the production of renewable energy.

APPLICATIONS:

The DRM can perform following grid support functions

- Peak Shaving
- Ramp Rate Control
- Frequency and Voltage Regulation
- Load Leveling

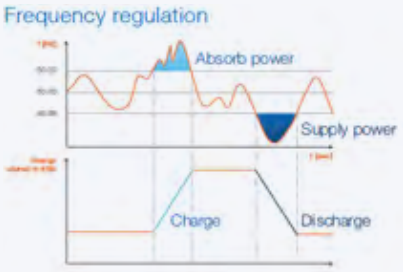
controlled by a Power Plant Controller or SCADA.

PEAK SHAVING

With peak shaving, the energy is stored during periods of low demand (overnight, troughs in the day) and discharged during periods of high demand when the monthly peak consumption could be set. Given the anticipated cycling, duration and power needs of peak shaving, energy storage is very effective. The higher the peak related to the duration of the peak, the better the energy storage economics.

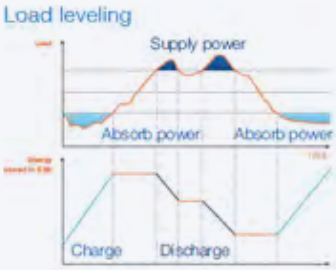
FREQUENCY REGULATION

DRM Demand Response Module provides ability to regulate grid frequency in both directions. When there is a grid overfrequency (generation > demand) inverter power output is curtailed and this energy is stored. When there is a grid under-frequency (generation < demand) inverter power output is increased by discharging the batteries and injecting more power to the grid.



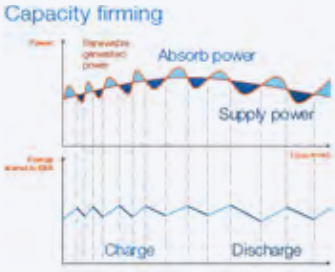
LOAD LEVELLING

Load levelling is similar to peak shaving but is focused on reducing the kWh costs on a utility bill, and effectively captures the difference between buying energy at low prices and discharging at higher prices. Load levelling typically provides incremental value to a system that is providing other functionality like peak shaving.



RENEWABLES CAPACITY FIRMING / RAMPING

Capacity firming is the conversion of available uncontrolled random power from renewable sources, into "dispatchable power" with an agreed level and duration which can be committed as part of the utility's generating assets.
UPSS DRM System attenuates the intermittent nature of renewable energy sources, to provide a smoother power output. DRM controls the ramp rate at which power is injected into the grid, and thus reduces the impact of rapid power fluctuations due to sudden or transient conditions experienced by the PV array.



POWER QUALITY

Facility load power factor can cause power quality issues. Often demand charges are related to facility loads with low power factor, when a higher cost is paid for lower power factor. An energy storage system can improve the facility power factor, improve power quality and save money on utility bills

DRM SYSTEM
DEMAND RESPONSE MODULE
440-1000 KVA

THREE LEVEL 3 UPS

98% Efficiency at half load

OUTDOOR

HIGHLIGHTS

- Ultra high efficiency
- Smart Energy management
- Multi grid support functions (Peak shaving, frequency and voltage stabilization..etc)
- Modular, flexible and scalable
- Compatible with different battery technologies

AN INNOVATIVE ENERGY STORAGE SYSTEM FOR THE SMART MANAGEMENT OF ELECTRICAL GRIDS

Makelsan DRM Energy Storage and Power Conversion System enables fast response times to variations in demand and supply, helping to maintain grid stability and ensuring reliable and high-quality energy supplies through a range of applications.

BI-DIRECTIONAL CONVERSION

Dual-function storage capability of DRM enables the energy available during the day to be stored in cyclic batteries, then converted and fed back into the network as usable AC current that is injected into the grid.

Higher Level of Efficiency than the EU CoC

CE

CONTAINERISED DESIGN, COMPLETE SOLUTION FROM SINGLE SOURCE

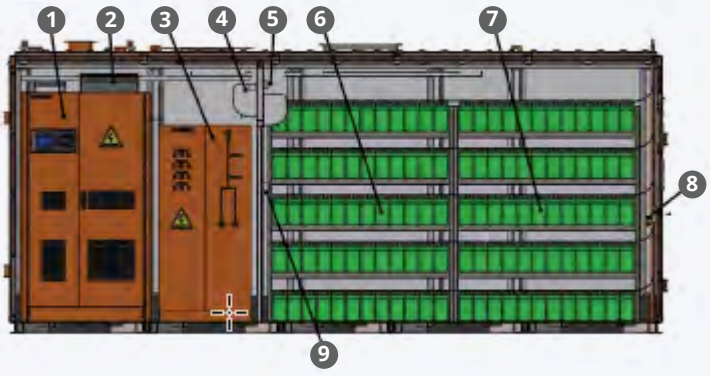
The fully integrated DRM system comprises

Power Converter/Freq. Converter etc., Genset, Main AC In/Out Electrical Panel , Internal AC Distribution Electrical Panel, Battery Breaker Panel, AC Aircon, Battery, Environment Control system, Fire detection and protection, Digital Power and Switchgear Controls.

Fully bunded ISO Container is designed with personnel and maintenance access doors and has air conditioned seperate converter and battery compartments.

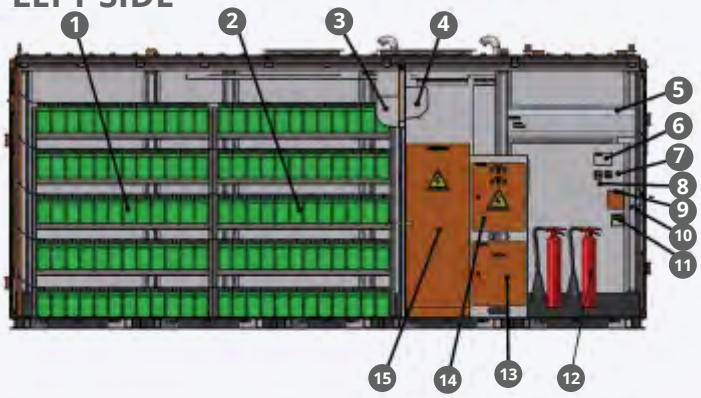
PROVEN HARDWARE AND ROBUST OUTDOOR DESIGN FEATURED WITH THE LATEST CONTROL IS READY FOR THE MOST DEMANDING CONDITIONS.

RIGHT SIDE



1 Power converter
2 Power converter hot air evacuation channel
3 Main AC panel
4 Alam card AC-2
5 Alarm card AC-3
6 Battery group -2
7 Battery group -1
8 Battery room door panic bar
9 Power outlet (220VAC/16A)

LEFT SIDE



1 Battery group -3
2 Battery group -4
3 Aircond-3 (Daikin FTXS25)
4 Aircond-2 (Daikin FTXS35)
5 Aircond-1 (Daikin FAQ100C)
6 Alarm card A/C-1
7 Lighting buttons
8 Power outlet (220VAC/16A)
9 Emergency stop button case
10 System room door panic bar
11 Aircon 1-RC
12 Fire extinguisher (CO_2)
13 PLC panel
14 Int. AC distribution panel
15 Battery breakers panel

DRM VS BATTERY STORAGE

Features	DRM & Battery Storage
AVAILABILITY	Constant availability to charge and recharge batteries during request from grid. With battery storage you can discharge but when depleted there is no more power available. No problem with the DRM unit. The system can recharge while the unit is also discharging due to the technology employed.
SPACE REQUIRED	Space on site is significantly reduced. We estimate at least 5-7 times the floor volume is required for battery storage requirements.
BATTERY QUANTITY	Cost of batteries - 30 Mins as opposed to typical 3-4 hours of discharge required. Therefore there are less batteries on site.
CARBON FOOTPRINT	Carbon footprint is significantly reduced on DRM modules.
BACK UP POWER	DRM is not Limited to how much power and energy is available. With GRM system, power can be supplied as long as there is source of fuel. Addtional Fuel storage on site can enable weeks or months of runtime if required.
COST OF BATTERY TECHNOLOGY	DRM uses batteries which are easy to recycle using known SLA based technology. There is no cost of recycling. You actually get paid for the used batteries under current UK recycling schemes.
LIFE TIME	A DRM unit has a typical life span of 15-25 years. Battery storage has a limited life span depending on replacement cells.
INSTALLATION TIME AND COST	Installation time and price is significantly reduced in the modular DRM format.
RUNNING COST	Running costs are significantly lower compared to battery storage considering the constant charge required on Battery storage and potential air conditioning costs.
IMPORT AND EXPORT CAPABILITY	DRM is constantly charging and recharging using import and export connections. It is not limited to how much energy is able to be imported or exported.
MAINTENANCE	Maintenance costs are significantly reduced on the DRM system due to remote monitoring and reduced strings of batteries. Battery Impedence Testing is significantly reduced. Time on site is reduced. Problem solving time is reduced.
CUSTOMISATION	Each DRM can be militarised and super silent.
FLEXIBILITY	DRM has its own enclosed portable cabinet compared to typical battery storage solutions. This flexibility is unique. Can be used with Datacentres, Hospitals, and in sites where space is at a premium.
MOBILITY	DRM can be used as an immediate portable power station to any site. If site conditions change of planning on a site changes. No problem. The DRM can move as and when required.
CONNECTIVITY	Proven technology for the UK.

THE MOST COMPETITIVE SOLUTION
FOR ENERGY STORAGE

DISCOVER ADVANTAGES OF DRM

MAXIMUM FLEXIBILITY

SCALABLE SYSTEM FROM 416 KW TO 1 MW

HIGHEST LEVEL OF POWER IN ONE MODULE

FULLY INTEGRATED TURN KEY SOLUTION

COVERS A POWER RANGE OF HUNDREDS OF MEGAWATTS

BATTERY TECHNOLOGY INDEPENDENCE - COMPATIBLE WITH DIFFERENT STORAGE TECHNOLOGIES

MODULAR ARCHITECTURE TO PROVIDE FUTURE GROWTH OR PARALLEL REDUNDANCY

READY FOR CONNECTION TO MEDIUM - OR HIGH-VOLTAGE GRIDS

DELIVERS THE HIGHEST LEVELS OF AVAILABILITY AND EASY MAINTENANCE

THE SIZE OF THE SYSTEM IS MATCHED TO THE CUSTOMER-SPECIFIC LOAD PROFILE AND APPLICATION REQUIREMENTS.

AVAILABLE TO RUN ON DIESEL AND B100 BIO FUEL (100%). GAS IS OPTION

EXCELLENT PERFORMANCE

HIGH EFFIENCY UP TO %99

HIGH PERFORMANCE IN ANY CLIMATE

MINIMIZED RISK DUE TO PROVEN TECHNOLOGY

INNOVATIVE DEMAND RESPONSE SOFTWARE

EASILY FUNDABLE

DELIVERS EXCEPTIONAL RETURNS ON INVESTMENT OUTPERFORMORMİNG

THE PRE-DETERMINED CRITERIA BY GRID OPERATORS.

REPUTABLE, BANKABLE TRUSTED PARTNER DELIVERİNG OVERALL SYSTEM

EXTENSIVE EXPERIENCE MANAGING COMPLEX PROJECTS

2 YEAR ON SITE WARRANTY WITH 10 YEARS EXTENDED WARRANTY WITH O&M CONTRACT AVAILABLE

LONG TERM SERVICE MANAGEMENT DURING LIFE CYCLE

LOWEST CARBON FOOTPRINT

CARBON EXCHANGE COMPLIANT

ASSET FINANCE AVAILABLE

INCOME AGAINST COST POSITIVE YEAR IN YEAR OUT

2 HOUR MAINTENANCE RESPONSE

EASY TO INSTALL

FULLY INTEGRATED

FRONT ACCESS OPERATIONS

SUITABLE FOR INSTALLATIONS IN HARSH ENVIRONMENTS AND EXTREME WEATHER CONDITIONS

QUICK MAINTENANCE

GRAPHIC DISPLAY FOR ERGONOMIC OPERATION AND MONITORING

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