

# Home Energy Storage System Integration

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Low Energy Designs Limited

Unit 9a Sunrise Business Park, Higher Shaftesbury Road, Dorset, DT11 8ST UK

Tel: +44 (0)1258 858 171 Fax: +44 (0)1258 858170 UK Registration Number: 6451580 VAT Reg. No: GB 931 9513 21

email: [info@lowenergydesigns.com](mailto:info@lowenergydesigns.com) [www.lowenergydesigns.com](http://www.lowenergydesigns.com)

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## Executive Summary

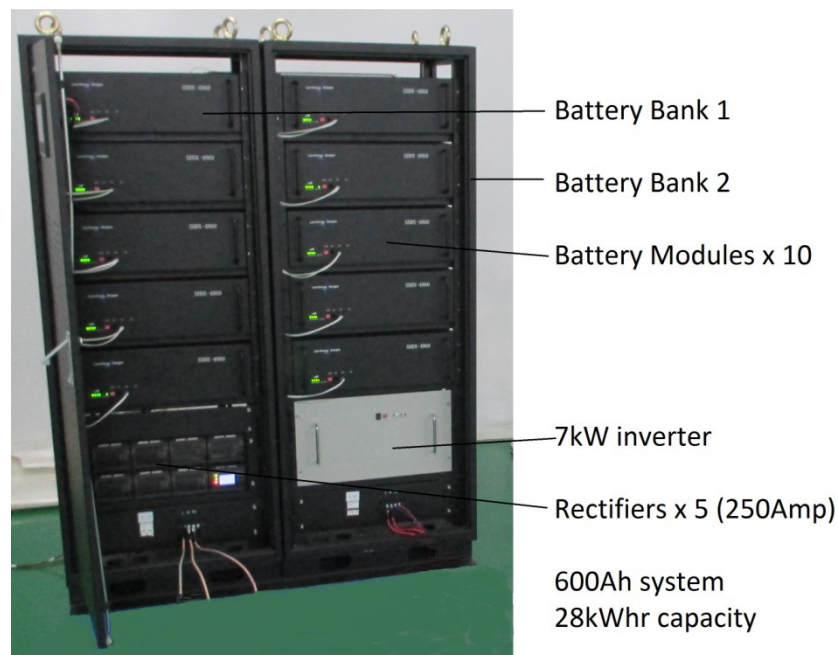
The following document details the proposal from Low Energy Designs Ltd for the provision of an uninterruptable power supply system capable of powering an average home or small business premises. The system is simply called the Home Energy Storage System (HESS)

The system is intended for deployment in a domestic environment. The complete system is smartly housed in two ventilated racks. It comprises all of the elements required to maintain an electricity supply to domestic appliances when a mains power outage occurs or it can be used as the prime power source at chosen times. The system is almost silent in operation with little more than a hum being heard from the cabinets in standby mode and some fan noise during the short recharge cycle.

The system will integrate with exiting single phase generators (minimum 15kW recommended) , shore power supply or renewable sources. The system sits between the regular power supply / generator input and the mains distribution board of the premises. When the main shore power fails, the HESS inverter switches in to preserve the power supply to the home in less than 20 milliseconds and continues to supply power without interruption from the battery modules. When shore power is returned, the inverter switches out of circuit and the HESS commences the battery recharge cycle.

## Features

The image below shows the main components of the HESS. The model shown is a 600Ah system capable of supplying almost 30kWhrs of power, with a peak power of 7kW into a domestic distribution panel.



- There are 10 battery modules, each module with 60Ah capacity
- Bus bar distribution at the rear of the rack for simple battery insertion and removal
- Integrated Battery Management System displaying system health and regulating recharge
- Battery temperature monitoring at 5 points per module.. Battery operation to 55 degrees C
- Double rectifier shelf housing up to six rectifiers modules at 50A DC each
- 7kW inverter with auto switching for uninterrupted power supply
- Isolation switches for AC input and AC output
- Ventilated doors and side panels for excellent air flow
- Possible expansion via further cabinets, battery modules and rectifiers to extend operation

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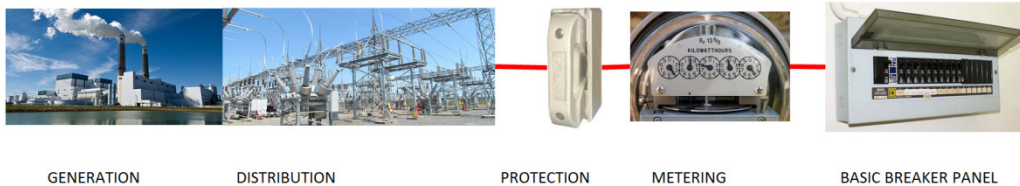
## Connectivity

The following information is indicative of the preferred method of utilisation of the equipment. In the majority of cases, the domestic service will be provided from a central provider.

### Basic Service

The transmission service to the property will be protected by a fuse device that is typically the property of the service provider, followed by a metering device, again owned by the service provider. Power distribution throughout the property is achieved via a single phase, domestic breaker panel equipped with a selection of MCCBs of varying sizes to protect the domestic wiring.

#### EXISTING NETWORK ARCHITECTURE



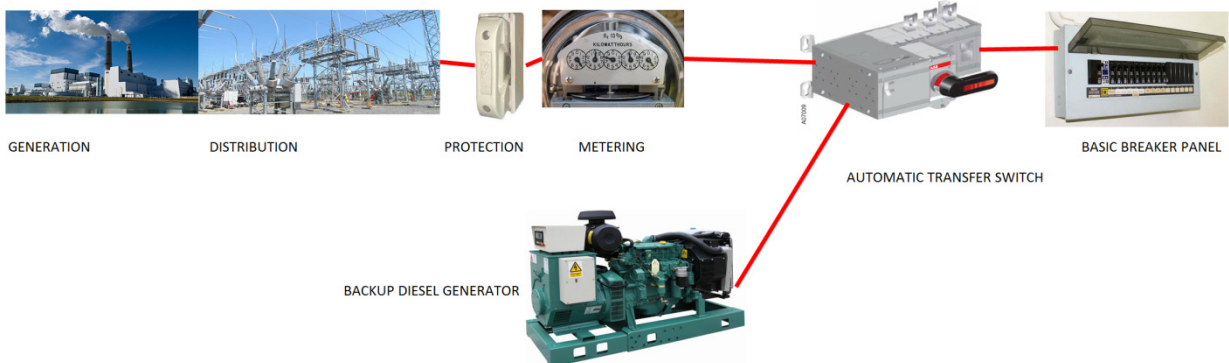
### Domestic Generator Backup

In areas that are subject to frequent outages of the main shore supply, the home owner may supplement the power provision to the property with the use of a domestic generator system that can provide power while the mains service is out of operation. The use of an automated transfer switch will detect the failure of the incoming mains service and automatically start the generator system. When the shore power returns, the generator will automatically be switched off.

The main drawbacks to this mode of operation are as follows:-

- Potentially short and frequent run times of the generator which lead to inefficient fuel use, coking of the generator and reduced service intervals.
- Noisy generators may run during the night disturbing sleep.

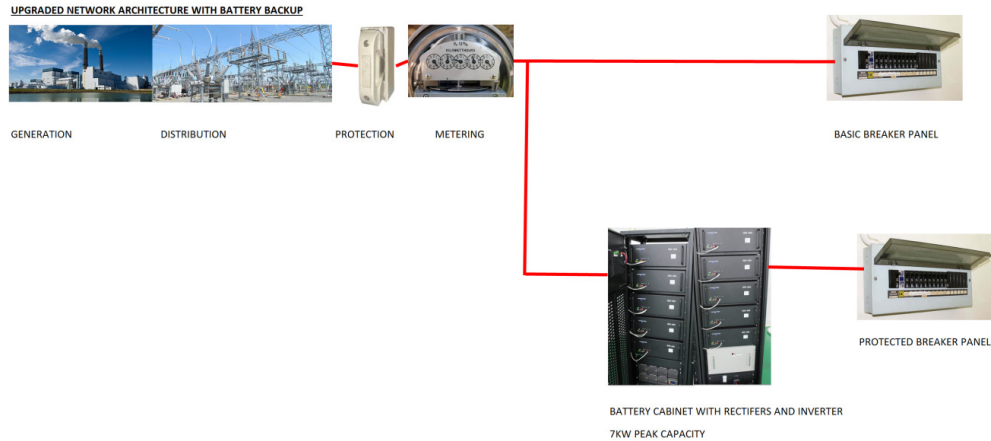
#### UPGRADED NETWORK ARCHITECTURE WITH GENERATOR BACKUP



## Domestic UPS

As an alternative solution to failing mains supplies and where a generator is not an option for backup power, the HESS may be deployed as an Uninterruptable Power System (UPS).

Since the basic HESS has a limited power output capability of 7kW, the use of two breaker boxes in the house is recommended. This will ensure only the critical services such as lighting and refrigerator systems are maintained during a power outage and will prevent the HESS from overload conditions that could occur for example if multiple air conditioning units were running.

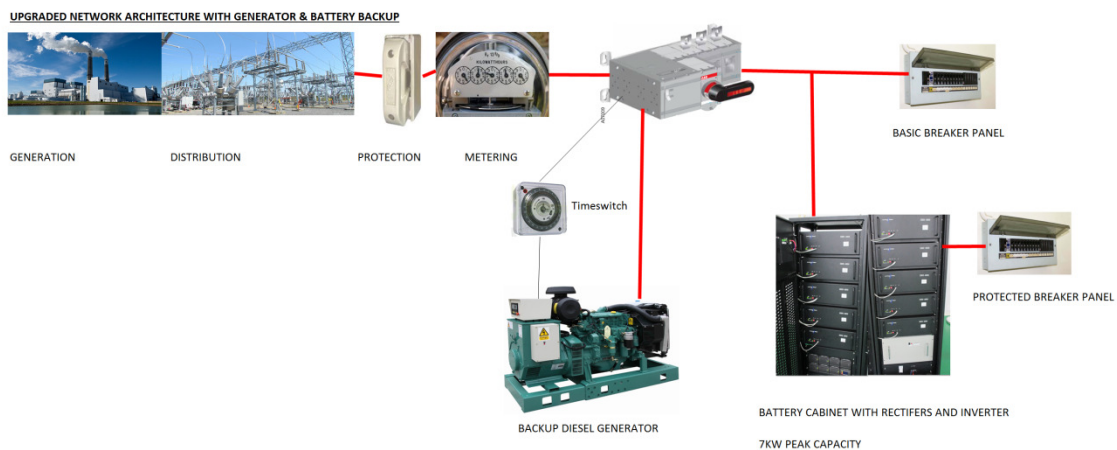


Under mains power operation, the HESS will sit in a quiescent mode, only using a small amount of power to ensure the batteries remain at maximum capacity. The inverter will be switched out of service, so all power is derived from the grid. When the grid fails, the inverter will be switched into service and the critical services in the house will be maintained from the HESS.

The critical services will be maintained until the grid is restored or until the batteries are depleted.

## Domestic UPS and backup generator

If a backup generator and Auto Transfer Switch (ATS) is already installed at the premises, the HESS may be integrated into the system as shown in the diagram below.



In this case, a time clock is also installed into the communications link between the ATS and the generator. This clock can be set such that if the shore power fails during the night time period, the control signal from the ATS to the generator is blocked. The critical services will continue to run in this case from the HESS.