ENERGYDOCK

INTRODUCTION TO THE

ENERGY POD RANGE

PRE-MANUFACTURED & ASSEMBLED ENERGY SYSTEMS

Different System Configurations Available

Manufactured by SPECIALIZED SOLAR SYSTEMS
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ENERGYDOCK ENERGY POD

INTRODUCTION

In times of increasing pressure on the reduction of carbon emissions and increasing energy prices with penalties due to coal fired energy plants, the sales price of conventional energy has significantly exceeded the price of supplying renewable energy via generation from solar, with energy storage. The Energydock Energy Pod is a modular decentralized method of energy generation using the very latest technology in energy generation, energy storage methods and energy management control.

Using a combination of photovoltaic energy generation, prime lithium iron phosphate storage cells, the Energy Pod is quick to deploy and does not need large areas for establishment. The Energy Pod could be installed as a stand-alone energy service, a grid-supported service or even as a grid-assisted service. Each Energy Pod has different programming methods and with full remote management, can be designed and programmed to fulfil specific requirements. The Energy Pod can be equipped with a main central meter together with up to ten additional sub-meters, supplying customers with energy through standard means of distribution and controlling this distribution according to the energy supply and service promised to the customer.

This micro-grid method has been developed, designed and manufactured in South Africa, and is known as the Energy Pod method. This could consist of individual Energy Pods working separately or several units connected to each other. The Energy Pod receives it generation from various sources, be it from solar generation in close vicinity, higher voltage DC distribution line, generators or limited grid supply. It will utilize all forms of incoming energy and store it or distribute it accordingly to the priorities set in its programming.

Housed in a high-end steel enclosure, this unit has been designed with security of equipment in mind. Two levels of access into the unit are supplied, one for local technicians while the side covers can only be accessed by specialist engineers. The configuration of the equipment is pre-determined and can be formatted as single phase or three phase supply.

The Energy Pod is a versatile but complex product that will allow various functions of implementation; be it to increase a mini-substation's capacity, perform as a simple UPS unit or as an integrated off-grid decentralized utility energy system.

This modular configuration will allow you to develop your energy needs, as the need arises.

The Energy Pod has the functionality to "understand" the individual supply agreements with different customers and manage these customers' expectations in relation to the contracted energy requirements, versus the potential energy supplied in real time, and to adapt its performance proportionally to ensure constant supply.

The Energy Pod can be pre-manufactured in different sizes. Each Energy Pod is modular in its design and utilizes low frequency inverter format, in conjunction with lithium iron phosphate storage. Each Energy Pod is designed proportionally to the needs of each specific project and therefore a clear client mandate would need to be supplied.

2. FUNCTIONALITY

The Energy Pod has the ability to function in several different formats:

- **Off-grid Energy Pod.**
  When the Energy Pod is connected to a client's generator only (and not to the grid) it functions as an off-grid energy system. Extra energy generated by the solar panels during the daytime will be stored in lithium iron phosphate ($LiFePO_4$) batteries for use during the night-time. With a shortfall of contracted energy, the unit has the ability to automatically start the generator, supplement the shortfall and again switch off the generator.

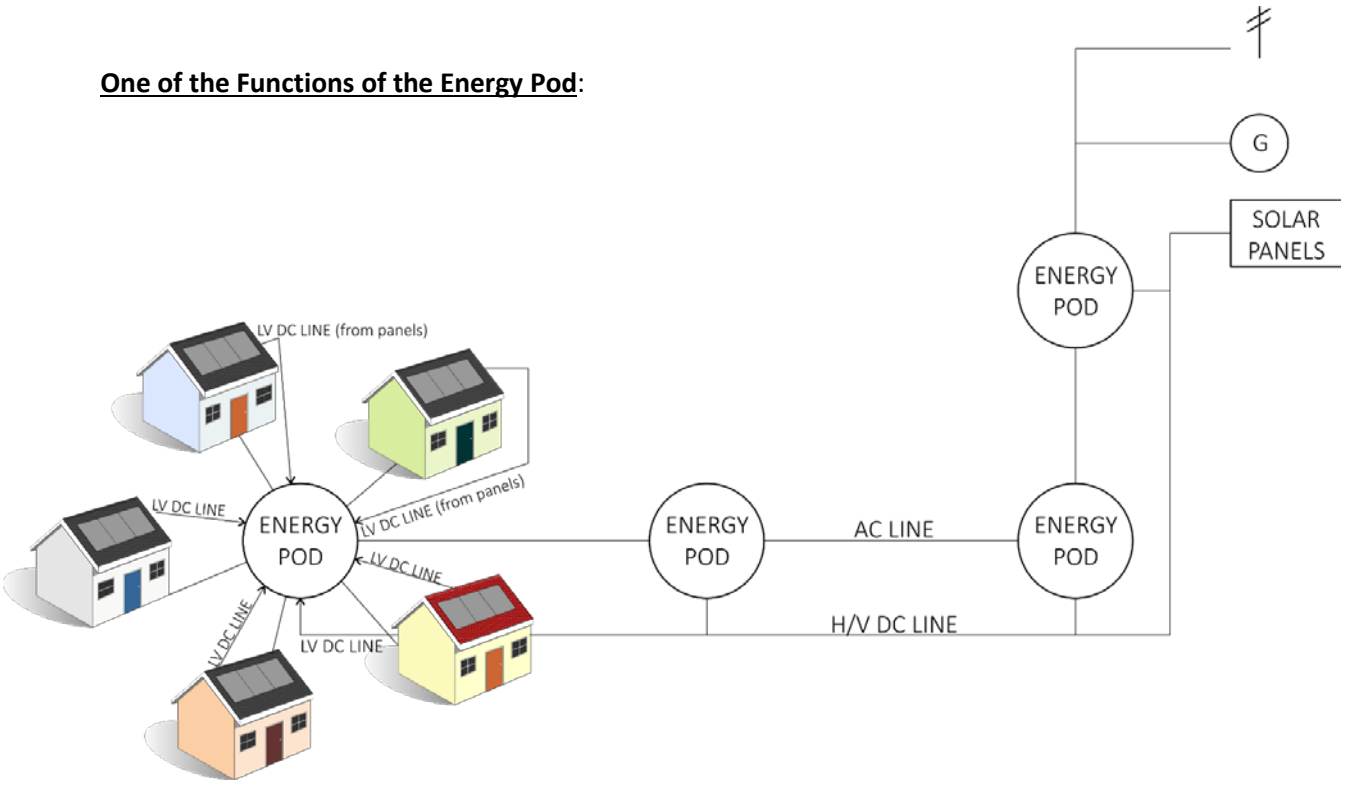
- **Hybrid Energy Pod with Grid-Tie Functionality**
  If the Energy Pod is connected to a main grid supply, the Energy Pod becomes a hybrid energy system. The hybrid system allows you to add renewable energy to your network, creating a priority for this supply. It could therefore function in a grid-tie format with the support of the grid. The NERSA approved inverters could supply the complete day-time load and, in the absence of this load, could be programmed to feed energy back to the grid, if so allowed. The power assist function will allow the Energy Pod to be connected to a limited grid capacity point and use this available power while adding its additional capacity to this limited point of supply. By selecting the schedule charging function of the Energy Pod, one could program the unit to accept the grid supply at a specific time, charging the batteries during off-peak periods and discharging these batteries during peak or standard periods. In the hybrid functionality, all these programs could be managed and controlled remotely.

- **Unlimited Power Supply (UPS) Functionality**
  The Energy Pod can function to support loads (critical or non-critical) in times of grid failure. Each Energy Pod can be configured to be single or three phase. Selecting the correct Energy Pod for your load will deliver the required Amps proportional to the size of the Energy Pod. The Energy Pod comes standard with two load outputs, AC1 and AC2. AC1 will always stay on irrespective of the grid condition, and AC2 will stay on when the grid or generator is active. This function will allow you to have greater capacity when the grid is connected but

when the grid fails, only the capacity of the Energy Pod will be available (AC1). AC1 should not exceed the capacity of the inverter size.

- **Decentralised Distribution of Energy**
  Please see the schematic below indicating the basic principle on how the Energy Pod is the first step to a decentralised utility.

<u>One of the Functions of the Energy Pod</u>:



As each project and site have different criteria, detailed discussions would need to be held to achieve a customised design applicable to a specific site. Please contact SSS to discuss further. The pictures below are of an Energy Pod being installed in Thembalethu in George. This Pod supplies 13 houses as an off-grid energy system.

3. ADDITIONAL COMPONENTS AND FEATURES

- Security alarm for unauthorized entry into Energy Pod.
- Temperature control with automatic fan management.
- Easy AC IN and AC OUT connections.
- All required DC cabling, fusing and surge protection.
- AC circuit breaker for incoming and outgoing AC with earth leakage.
- Automatic shutdown on AC and DC.
- Single phase or three phase bypass switch.
- Full colour display touch screen on AC line with motorized DC circuit breaker control.
- Internal modem for wifi communication (excluding SIM card).
- A Certificate of Compliance will be supplied for the internal installations within the Energy Pod.

4. APPROVED EQUIPMENT USED WITHIN ENERGY PODS

- Victron inverters
- Fronius Eco inverters
- Storagedock LV lithium iron phosphate ($LiFePO_4$) batteries
- Victron Cerbo GX device for remote monitoring and management
- Victron SmartSolar RS 450/100 or 450/200 MPPT's

4.1 Warranties

The following warranties will be applicable to the equipment listed above:

- Victron equipment - 5 year warranty. An additional 5 year warranty can be purchased at an additional cost.

- Fronius inverters - Initial 3 year warranty. Upon registration of inverter an additional 2 year warranty (5 year warranty in total). An additional 5, 10 or 15 year warranty can be purchased for an additional cost.

- Storagedock batteries - 10 years or 6000 cycles at 80% depth of discharge, whichever occurs first.

5. MODULAR COMPONENT CONFIGURATIONS

A standard range of Energy Pods has been developed by Specialized Solar Systems and are available in different configurations.

- Single or three phase.
- AC configuration only (UPS).
- DC-coupled configuration.
- AC/DC-coupled configuration.

The standard Energydock Energy Pod Range (available in stock, pre-built and pre-assembled) consists of the following units:

- AC configuration
  - 15 kVA Single phase and three phase
  - 20 kVA Single phase only
  - 24 kVA Three phase only
  - 30 kVA Single phase and three phase
  - 45 kVA Three phase only

5.1 Custom Made Energy Pods

DC-coupled Energy Pod configuration, as per the AC configuration above, would be designed in the same Energy Pod as mandated.

Based on the specific requirements needed, the following Energy Pods will be available on request:

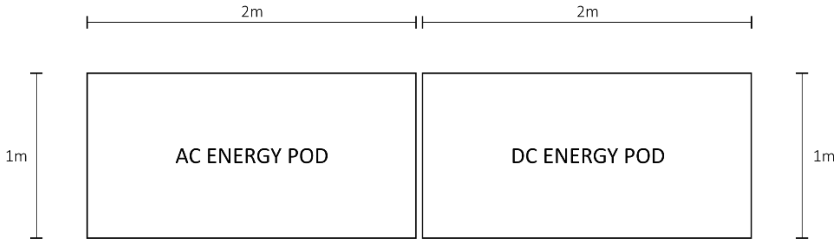
AC kVA CAPACITY		MINIMUM BATTERY SIZE	PV INPUT
• 60 kVA	Three phase	60 kWh	as requested
• 90 kVA	Three phase	120 kWh	as requested
• 135 kVA	Three phase	150 kWh	as requested

*Single 2m x 1m Energy Pod enclosure is limited to 4 x 15 kWh (60 kWh total) battery units.

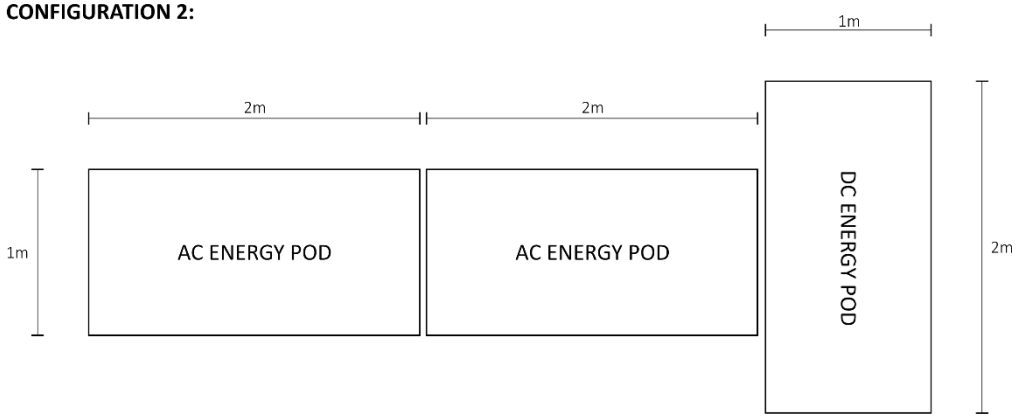
5.2 Energy Pod Configuration

To accommodate the individual Energy Pods as requested and subject to the amount of solar production required, Energy Pod housing will be confirmed accordingly.

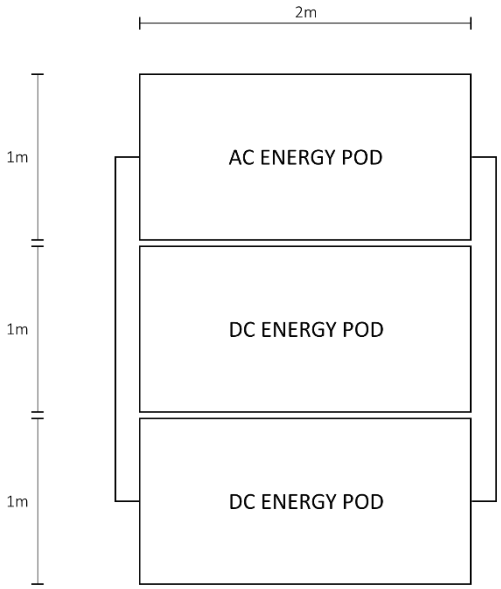
CONFIGURATION 1:



CONFIGURATION 2:



CONFIGURATION 3:

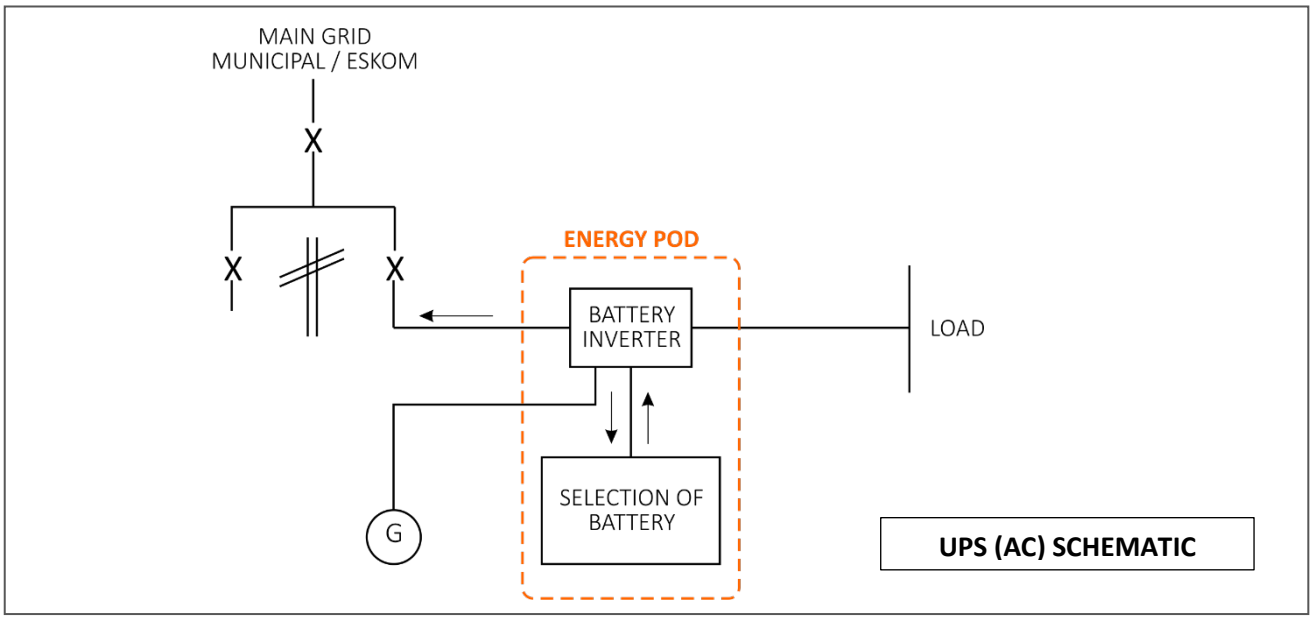


The configuration of each Energy Pod is directly proportional to the requirements mandated. Please note that any Energy Pod larger than 45 kVA will automatically require an air-conditioning unit which will be mounted on the outside of the unit. Air-conditioners will be optional on smaller units.

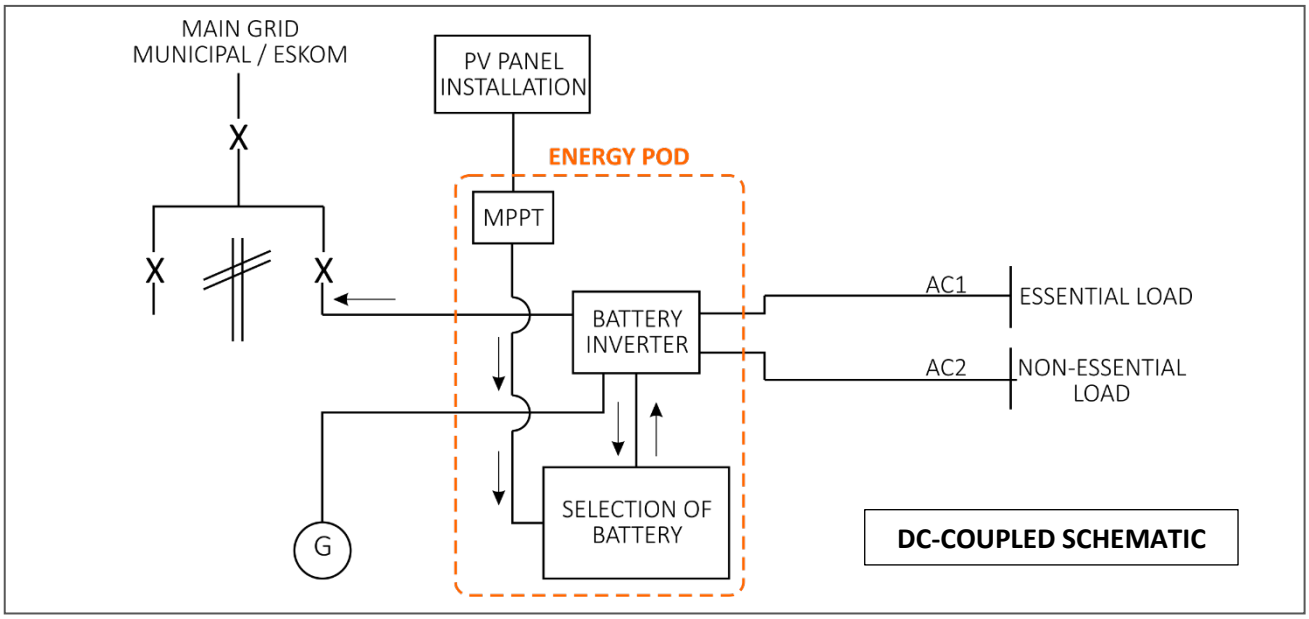
6. BASIC SCHEMATIC DIFFERENCES BETWEEN DIFFENT CONFIGURATIONS

Please see the schematics of the differences between the UPS configuration, DC-coupled configuration and the AC/DC-coupled configuration:

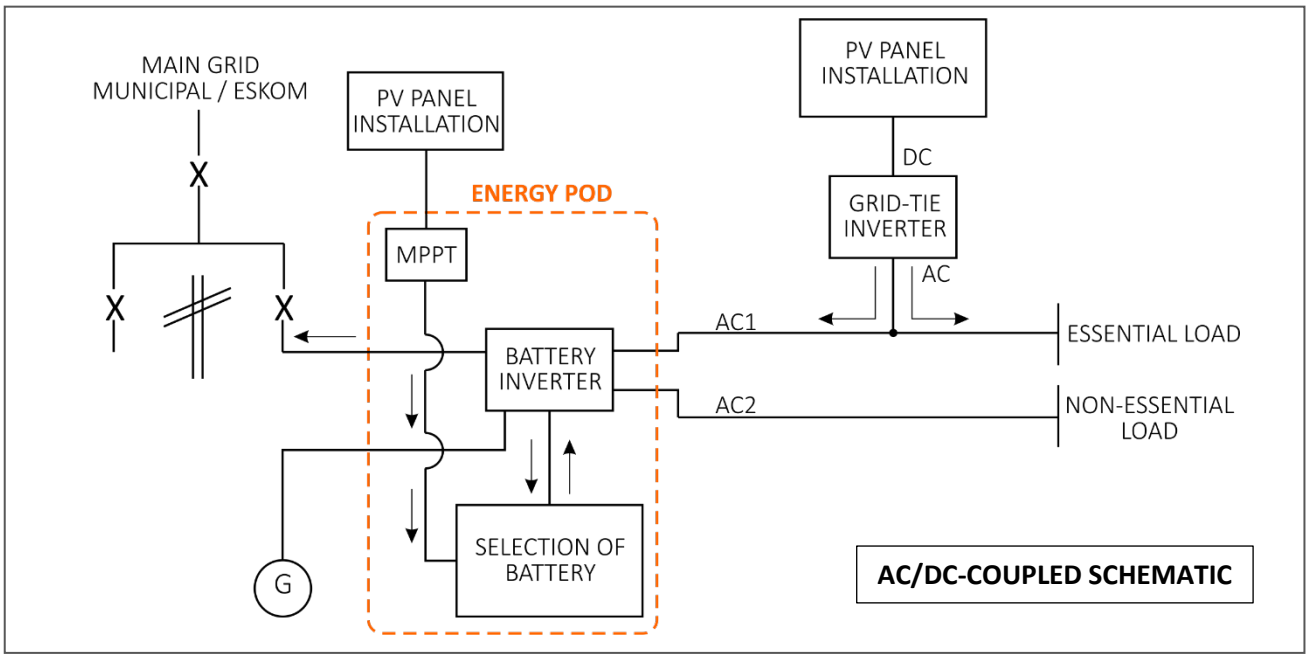
1.


MAIN GRID
MUNICIPAL / ESKOM
ENERGY POD
BATTERY
INVERTER
LOAD
SELECTION OF
BATTERY
G
UPS (AC) SCHEMATIC

2.


MAIN GRID
MUNICIPAL / ESKOM
PV PANEL
INSTALLATION
ENERGY POD
MPPT
AC1
ESSENTIAL LOAD
BATTERY
INVERTER
AC2
NON-ESSENTIAL
LOAD
SELECTION OF
BATTERY
G
DC-COUPLED SCHEMATIC

3.


MAIN GRID
MUNICIPAL / ESKOM
PV PANEL
INSTALLATION
PV PANEL
INSTALLATION
DC
ENERGY POD
GRID-TIE
INVERTER
MPPT
AC
AC1
ESSENTIAL LOAD
BATTERY
INVERTER
AC2
NON-ESSENTIAL
LOAD
SELECTION OF
BATTERY
G
AC/DC-COUPLED SCHEMATIC

7. IMAGES

Above: The Energy Pod enclosure.

Above: Internal configuration of a custom built 24kVA Energy Pod with MPPT's installed.
Please note that these pictures are indicative only & inverter and battery sizes may differ.

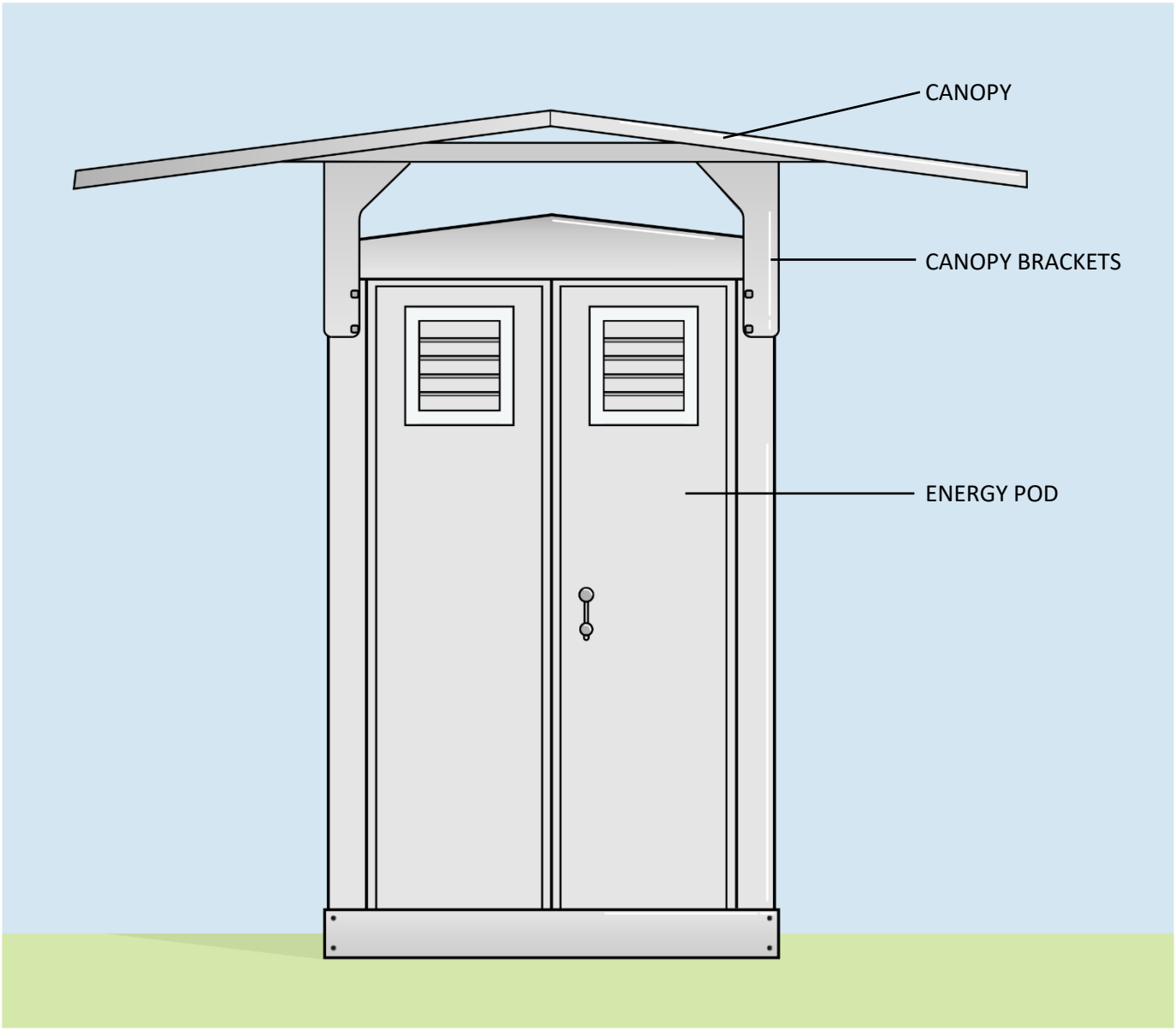
Above: DC wiring side of unit / AC wiring side of three phase unit

8. OPTIONAL ENERGY POD CANOPY

If the Energy Pod is not to be installed in a sheltered position, such as adjacent to an existing building, under trees, inside a warehouse or under a covered parking area etc, then it is recommended that a canopy be purchased along with the Energy Pod to provide extra protection against the elements (especially rain).

The four lifting brackets on each of the top corners of the Energy Pod should be removed and then the canopy can be installed over the Energy Pod using the existing bolts and holes of the lifting brackets (please ensure that the lifting brackets are stored in a safe place once they have been removed, just in case the Energy Pod needs to be relocated in the future).

Below is an illustration of the optional canopy.



9. SINGLE LINE DIAGRAM