



RRR SOLAR

offers comprehensive design, implementation, supply, and installation and commissioning of various types of solar equipment such as:

- Solar Rooftop
- Solar Power Plant
- Solar Water Heating
- Solar Dryer
- Solar Pump
- Power Monitoring
- Building Automation
- Solar Streetlights

We also provide Solar Components and equipment:



Solar PV panels

Solar Photovoltaic (PV) panels convert sunlight directly into electricity (DC).



Battery Bank

Batteries store power so that it is available when neither the PV panels nor the grid are supplying power.



Power Converter (Inverter)

Modern Inverters regulate Grid connection, Battery Charging, and Maximum Power Point Tracking (MPPT)

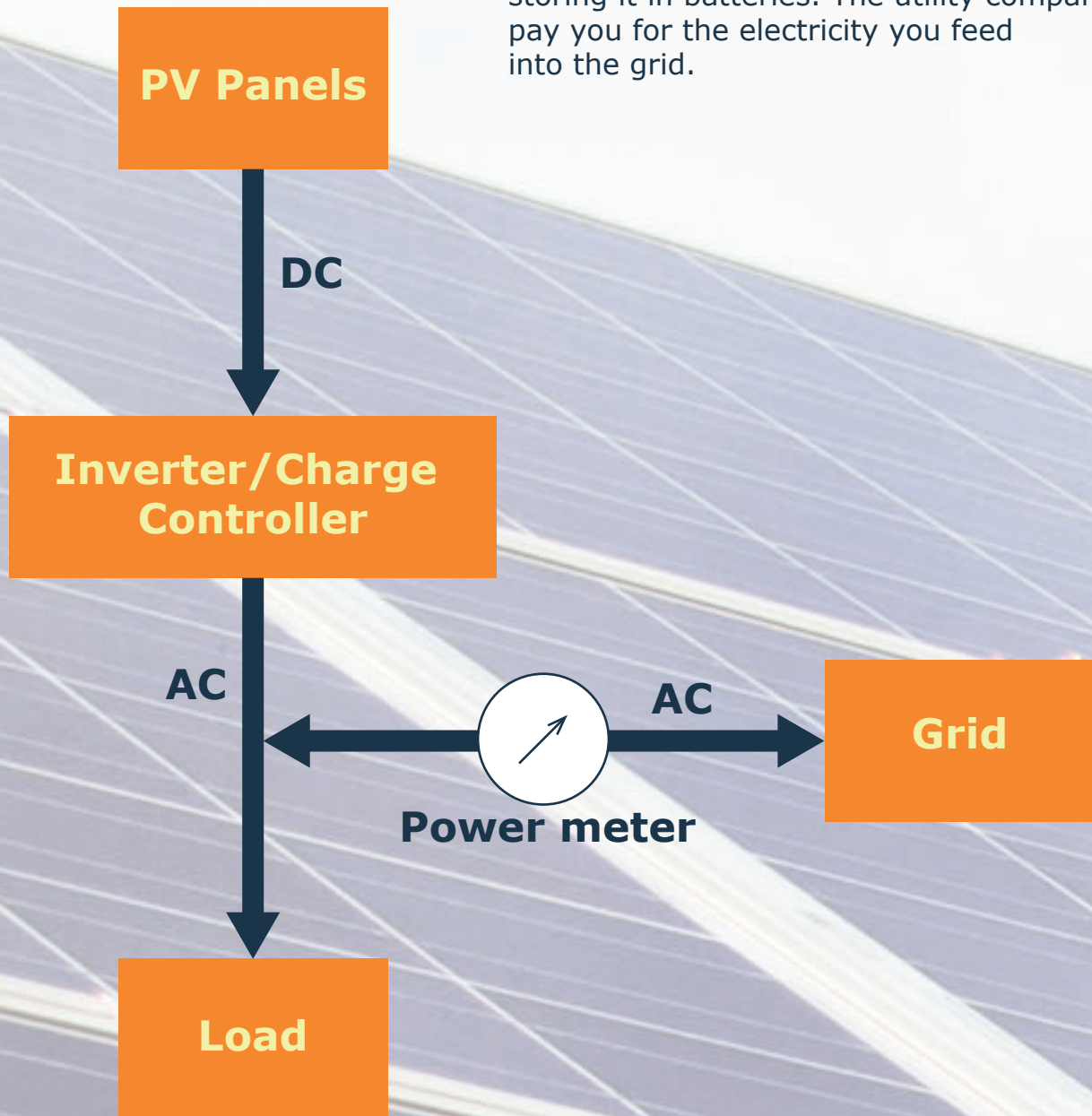


Interface Protection

provides different monitoring functions in accordance with DRRG standard of DEWA to detect overvoltage and undervoltage.

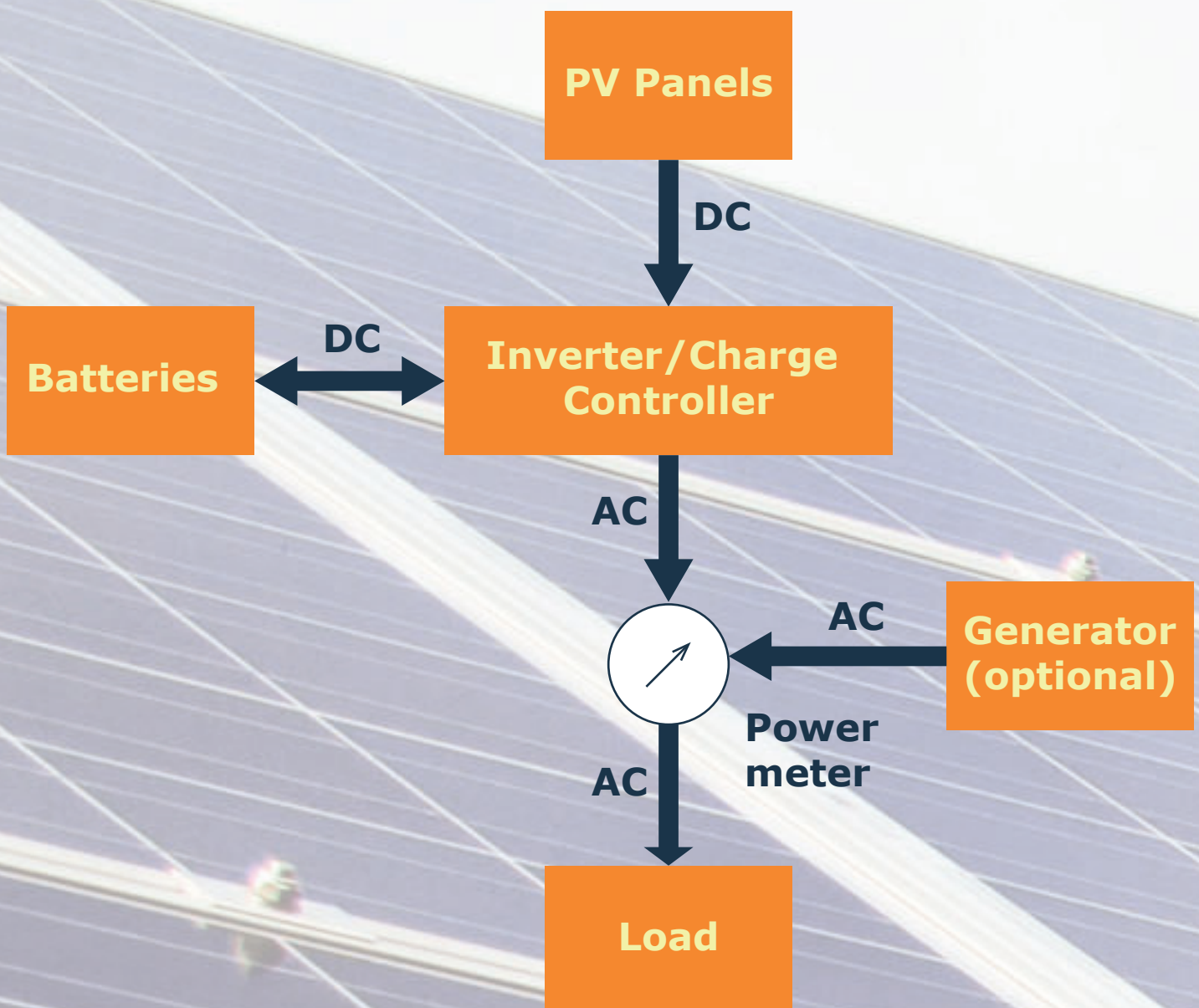
On -Grid Systems

An **on-grid system** allows you to save money with solar panels through better efficiency rates. Your solar panels will often generate more electricity than you need. With net metering, you can put this excess electricity into the utility grid instead of storing it in batteries. The utility company will pay you for the electricity you feed into the grid.



Off -Grid Systems

An **off-grid system** is a stand-alone system that is not connected to the grid; it is generally more expensive and less efficient than an on-grid system, but is useful in remote areas, far from any distribution grid. It stores power in batteries, and can also be connected to a generator.



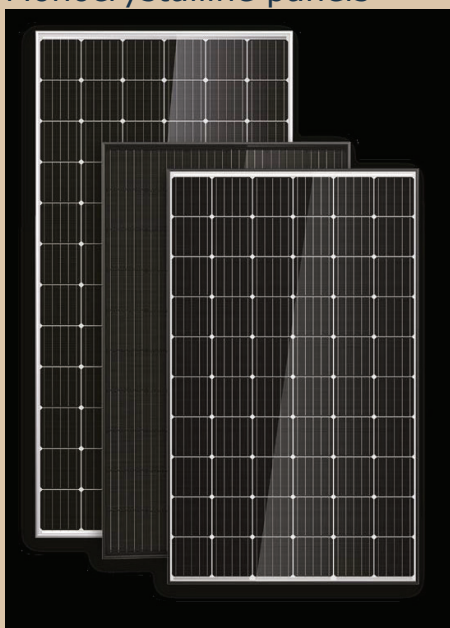
PV panels

Photovoltaic panels or PV panels are made up of PV cells which are connected together. These cells are mostly made of silicon, an element that creates electricity when exposed to sunlight (because of its semiconductor characteristics and the photoelectric effect). The cell may be monocrystalline or made of a single crystal of silicon; it can also be polycrystalline, which means many crystals of silicon were melted to make the cell. Monocrystalline panels are of higher quality. As a result, they are also more expensive, and more efficient—during

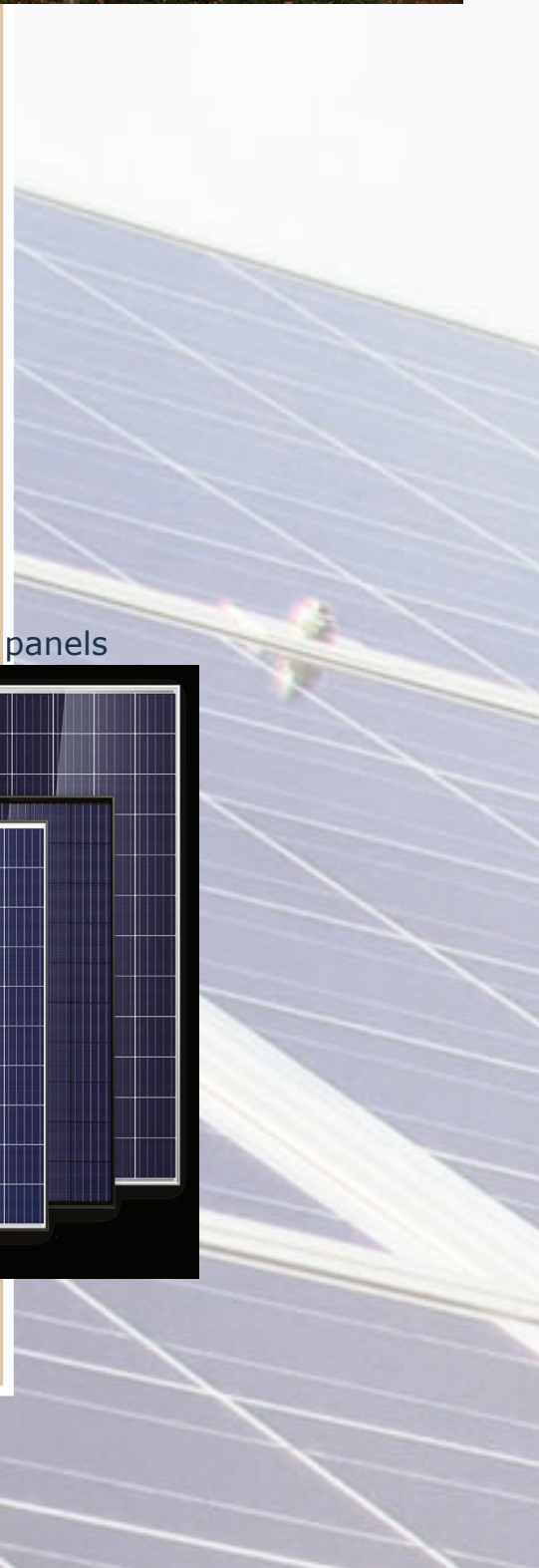
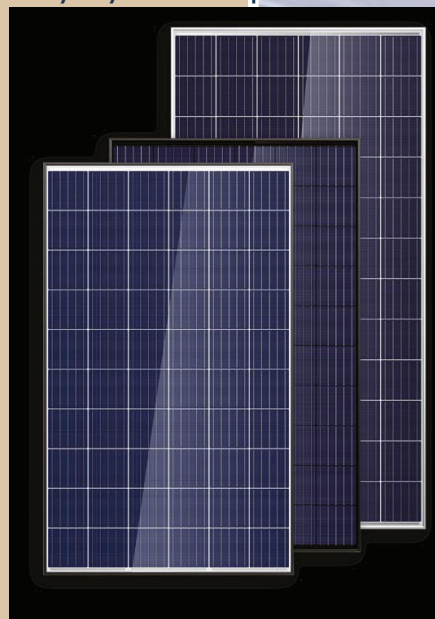
peak sunlight hours. Polycrystalline panels have lower efficiency compared to mono, but they compensate by their ability to generate power even in low sunlight conditions. Their operational hours are therefore longer.



Monocrystalline panels



Polycrystalline panels



Charge Controller



Why you need a charge controller

The charge controller is used in off-grid systems for

- 1) Regulation of DC output from the PV array
- 2) MPPT—Maximum Power Point Tracking of the PV panel output
- 3) Giving DC output for battery charging, DC loads, and for inverters at high efficiency.

Battery Bank

Why is a battery bank needed?

A battery is the only device that can store electrical power. As such it is indispensable in off-grid and hybrid solar power systems.

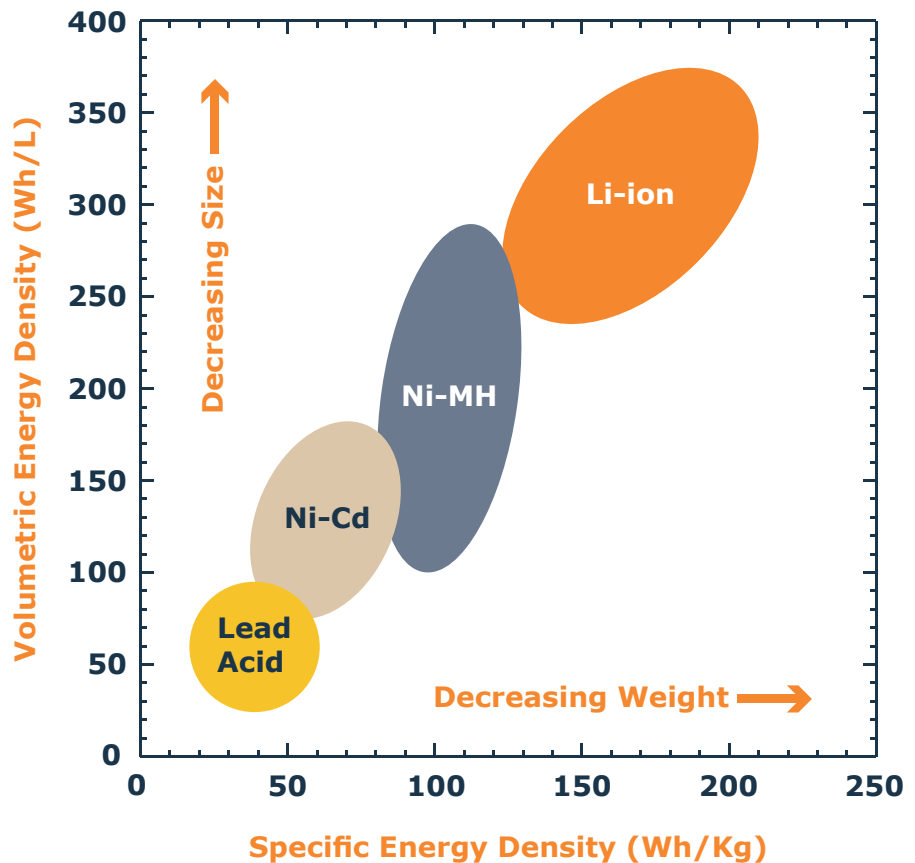
What is a battery bank made of?

It might be just a single battery, or many batteries connected together to act as a single battery working at the required voltage and ampere-hour rating.

Types of Batteries

There are two main types of batteries that are currently in use:

1. VRLA (Valve Regulated Lead Acid) batteries. These are advanced lead-acid batteries. There are three types: wet cell, absorbent glass mat (AGM) and gel cell.
2. Lithium-Ion. Lithium-ion batteries are costlier, but they also last longer.



Comparison of battery types



Power Converter (Inverter)

A power converter is used for inverting or regulating the variable power DC output from a PV panel to the required form:

- DC to AC (micro-inverter)
- DC to DC (power optimizer)

Solar inverters have functions dedicated for PV panels such as MPPT (Maximum Power Point Tracking) and circuitry for anti-islanding.

Solar PV power converting operations

Three main options are available:

- string inverters
- microinverters
- power optimizers

String inverters

Advantages:

1. Economical
2. Conventional—easily available
3. Suitable for large scale (higher efficiency at

large scale)

Disadvantages

1. Difficult to maintain
2. A defect in a single panel affects the whole system, and efficiency is reduced.
3. Difficult to monitor performance and identify defects in individual PV panels.

Microinverter

Advantages

1. Suitable for small and microgeneration projects such as a single home
2. Easy monitoring—makes it possible to monitor the array panel-wise, measure performance, and identify defects.

Disadvantages

1. Expensive compared to String Inverters (20% to 30% higher project cost).
4. More suitable for on-grid installations: battery charging not efficient.

Power Optimizer

Advantages

1. Easy monitoring
2. Can identify and monitor the array panel-wise, measuring performance and detecting defects in each individual panel

Disadvantages

1. Only suitable for off-grid and hybrid systems



RR SOLAR

can supply equipment and components specially designed for solar related projects. These include:

- **Solar PV Panels (KOSOL brand approved by DEWA)**
- **Solar Off/On grid invertors**
- **Solar Batteries (CIEL, LEOCH)**
- **Solar Charge Controllers**
- **Solar Interface Protection Systems**
- **Solar LED Streetlights**
- **Solar Water Heaters (FPC Solar System Device)**
- **Solar Home Power Systems**
- **Solar Water Pumping Systems**
- **Solar Dryers (Solar Air Heating System)**
- **Solar DC Analog Meters**
- **Solar Trackers (dual axis)**
- **Solar PV Control Box Accessories:**
 - 1) **Solar Fuse Carrier**
 - 2) **Solar PV Fuse Link (1A, 2A, 3A... 32A)**

- 3) **Solar PV Panel Connectors (CF4 & CM4)**
- 4) **Solar Crimping Tools**
- 5) **Solar Spanner**
- 6) **Solar PV Panel Inline Fuse Connectors**

Our Engineering, Procurement and Construction (EPC) team can provide advanced solar energy solutions.

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