

Sustainable Energy

Affordable Sustainable Energy for
your business

CSIR cost study shows new solar, wind to be 40% cheaper than new coal



Costs in Context

The model shows that, in combining the **62c/kWh** from wind and solar PV, with flexible solutions such as gas, which are “pessimistically” assumed to carry a cost of 200c/kWh, the outcome is a “blended cost” of just 90c/kWh. Such an outcome is cheaper than both base load coal of **103c/kWh** and the 117c/kWh to 130c/kWh currently assumed for nuclear.

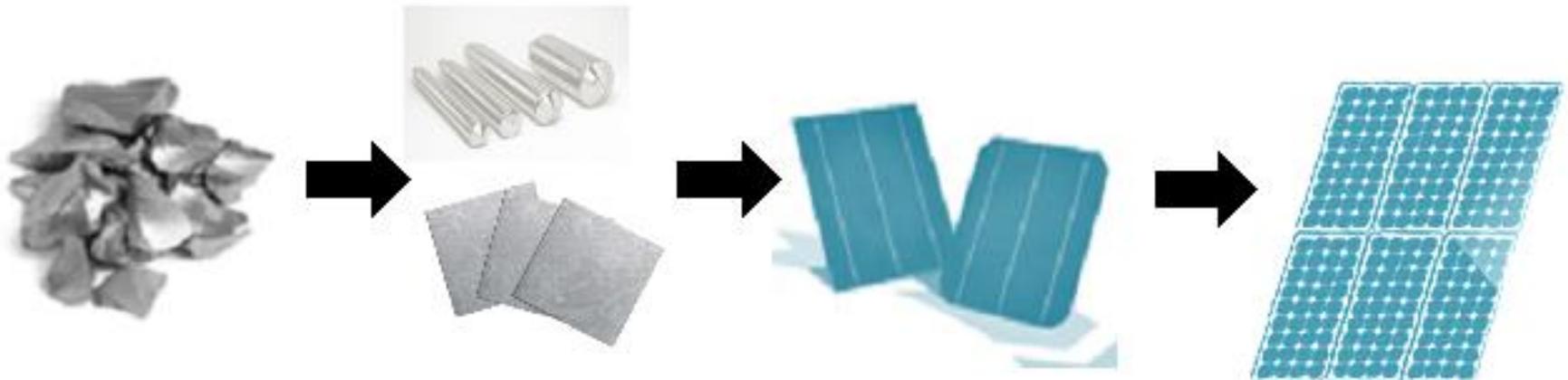
What does PV panels consist off

Polysilicon

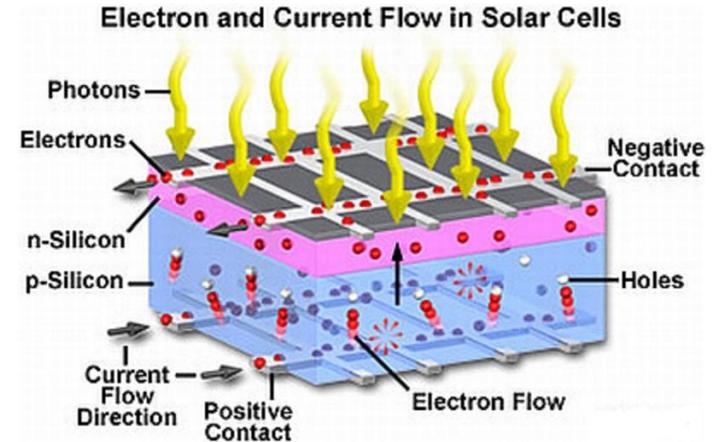
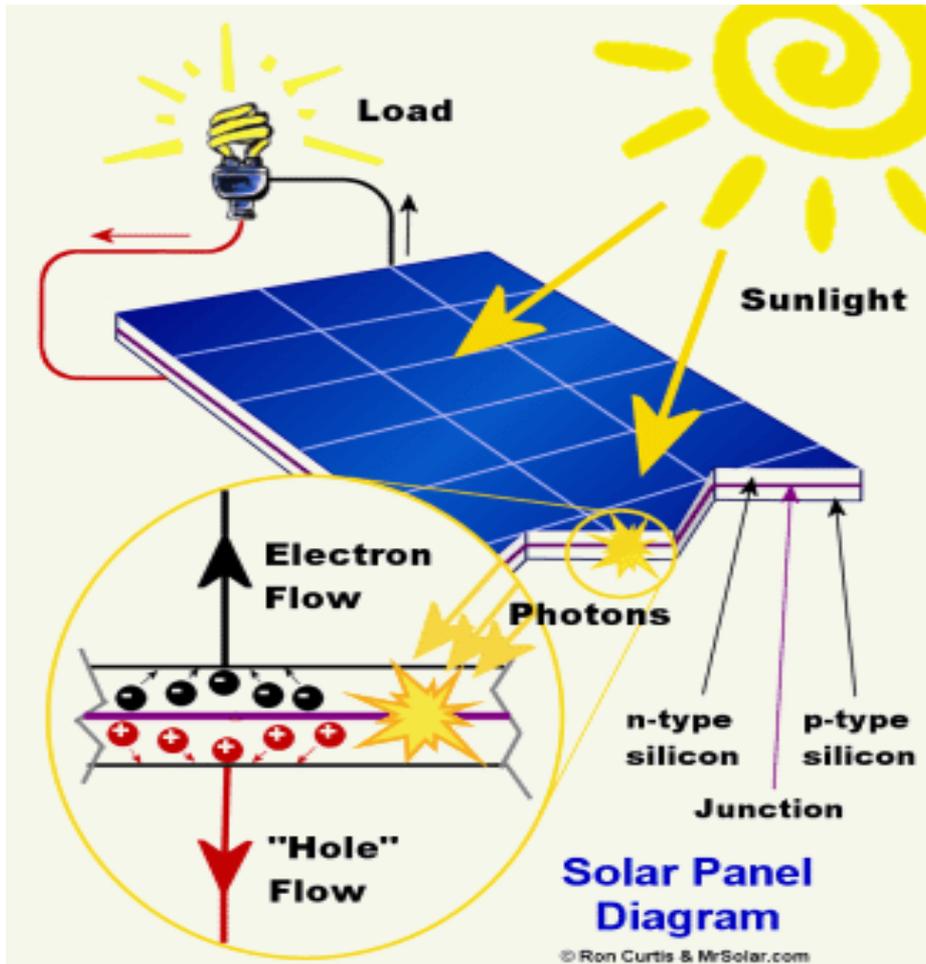
Ingots & Wafers

Solar Cell

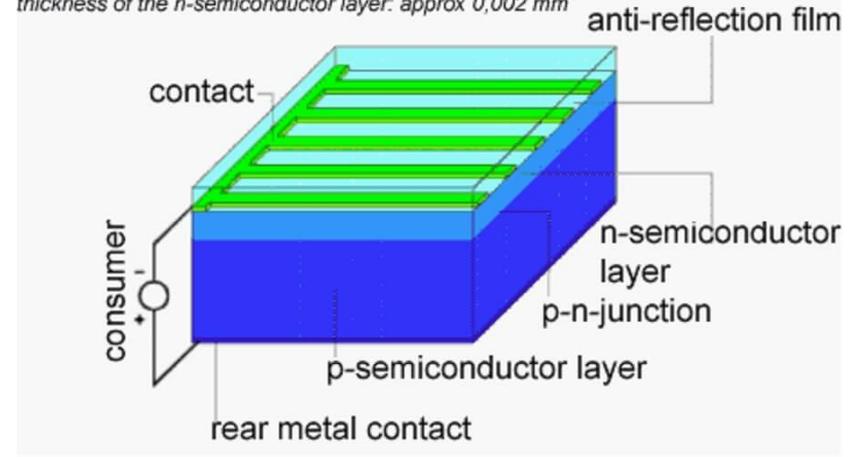
Solar Modules



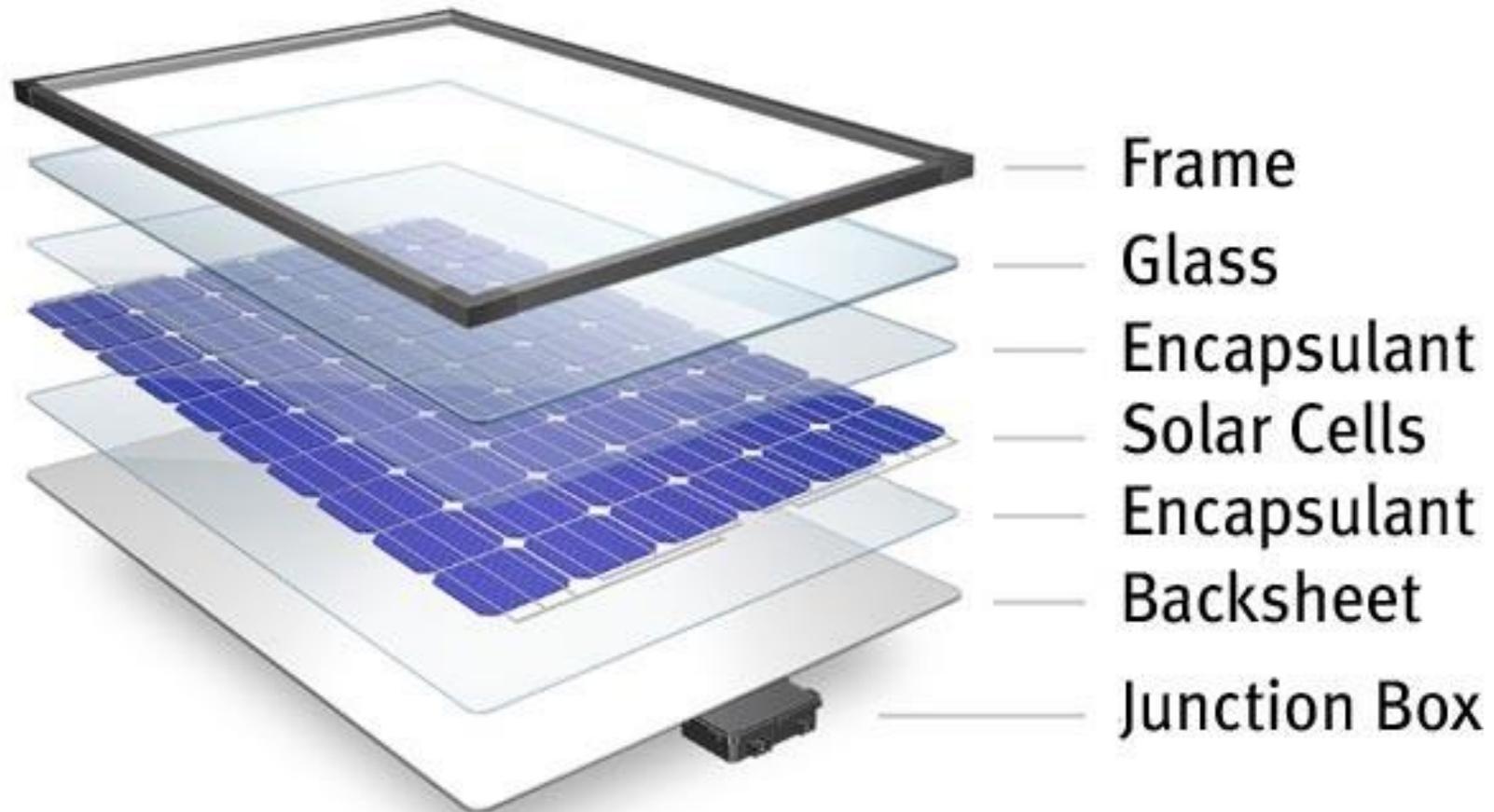
How does a PV panel generate electricity ?



thickness of the solar cell: approx 0,3 mm
thickness of the n-semiconductor layer: approx 0,002 mm



PV Panel Components



Typical PV panel specifications

25
years

insurance-backed warranty
non-cancelable, immediate warranty insurance
linear power output warranty

10
years

product warranty on materials
and workmanship



Excellent module efficiency
up to 16.47%

ELECTRICAL DATA | STC*

Electrical Data CS6P	260P
Nominal Max. Power (Pmax)	260 W

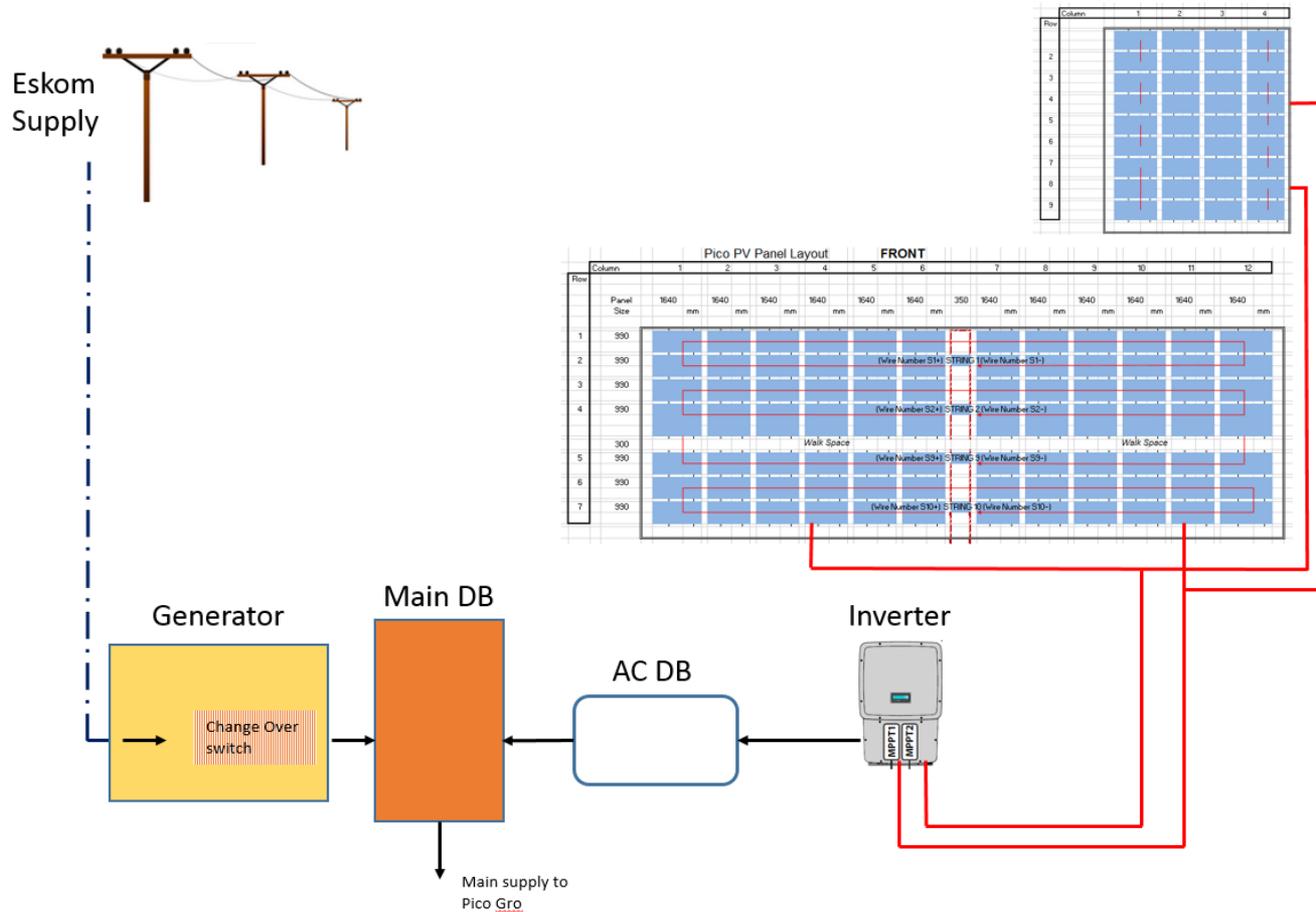
ELECTRICAL DATA | NOCT*

Electrical Data CS6P	260P
Nominal Max. Power (Pmax)	189 W

TEMPERATURE CHARACTERISTICS

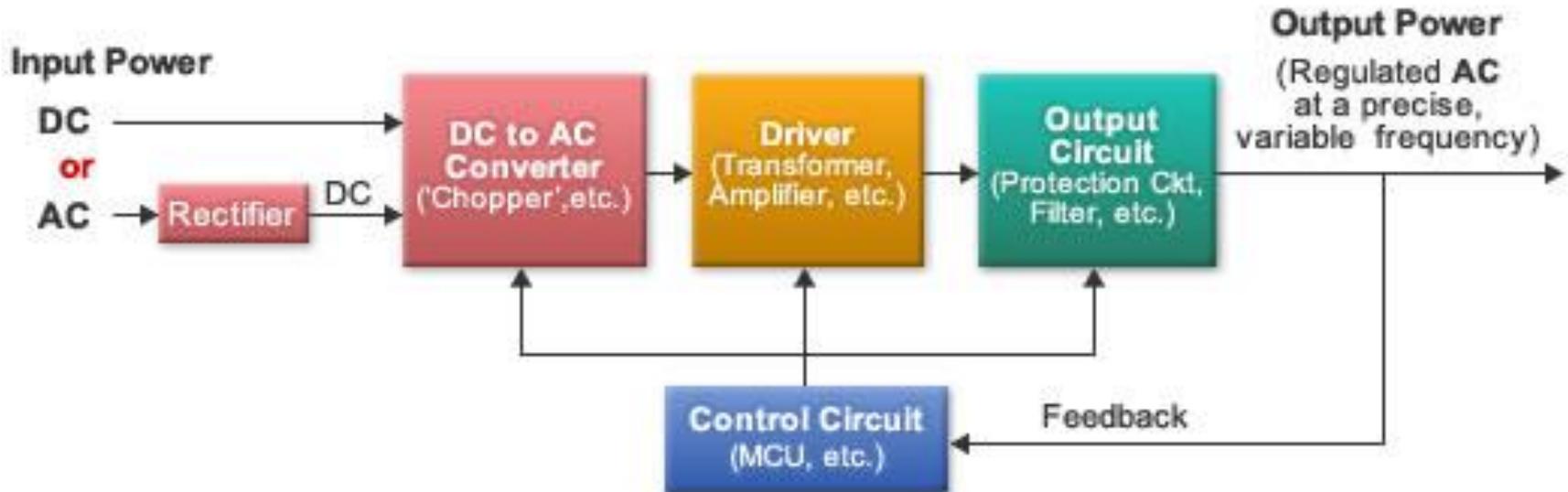
Specification	Data
Temperature Coefficient (Pmax)	-0.41% / °C

Typical PV Grid Tie System (No - Batteries)

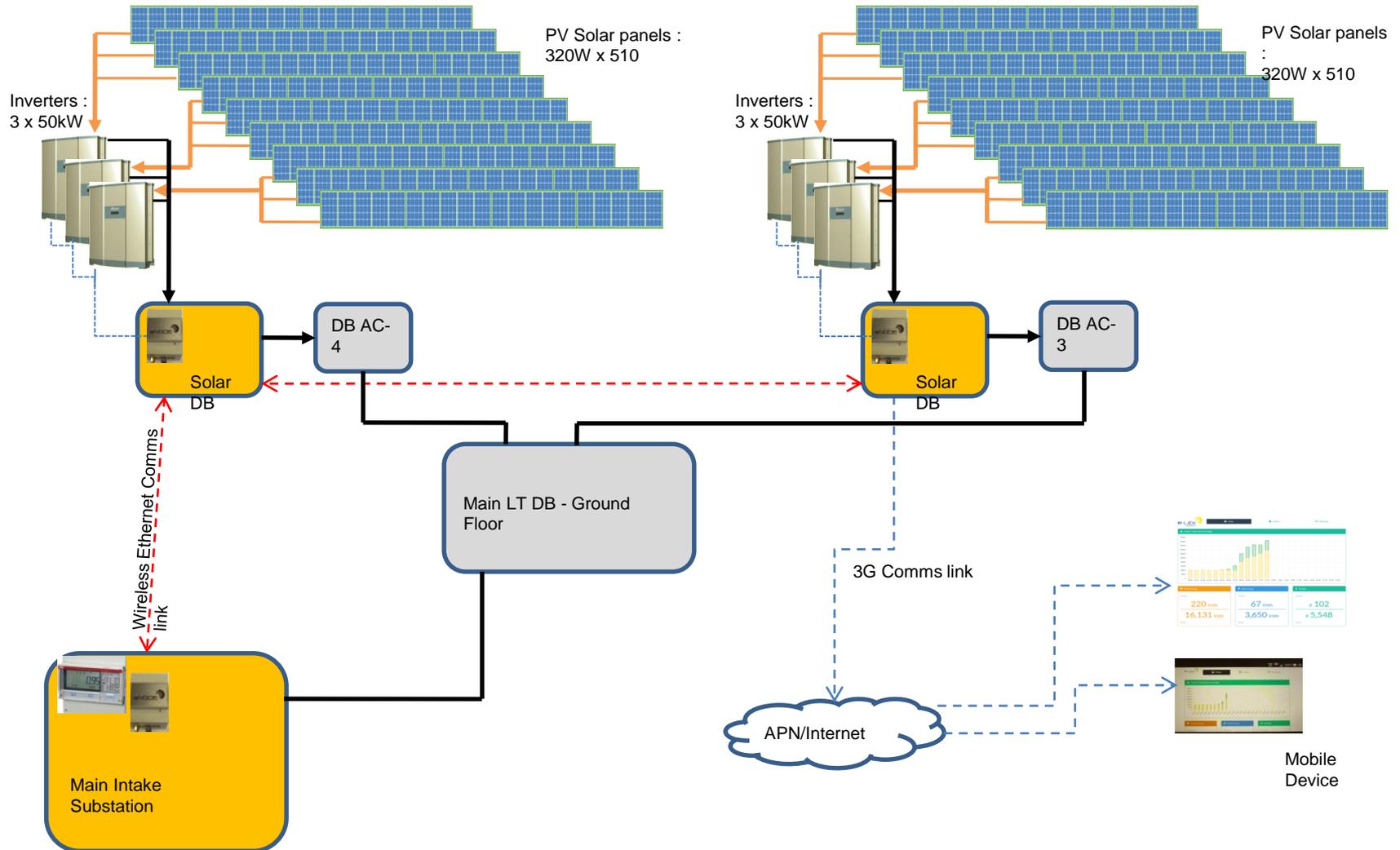


How does the Grid Tie Inverter work ?

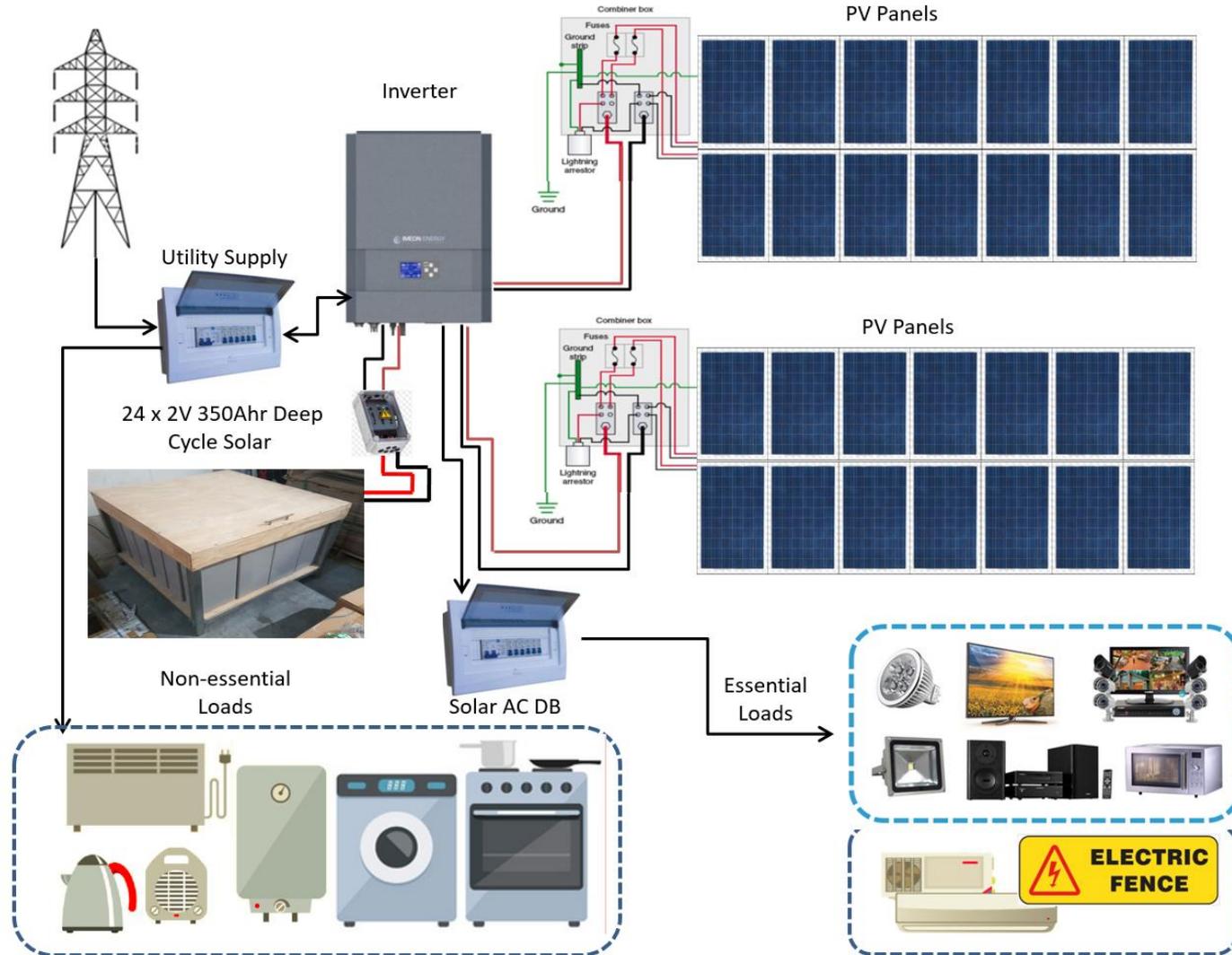
The inverter's output is an AC voltage that is precisely controlled in both amplitude and frequency



Larger PV Grid-Tie System (no batteries)



PV Hybrid System (with batteries)



Typical Roof Installation



Typical Roof Installation



eSEMS Smart Energy Monitoring System

Utility
Supply



Inverters



Data Screen



Web Browser

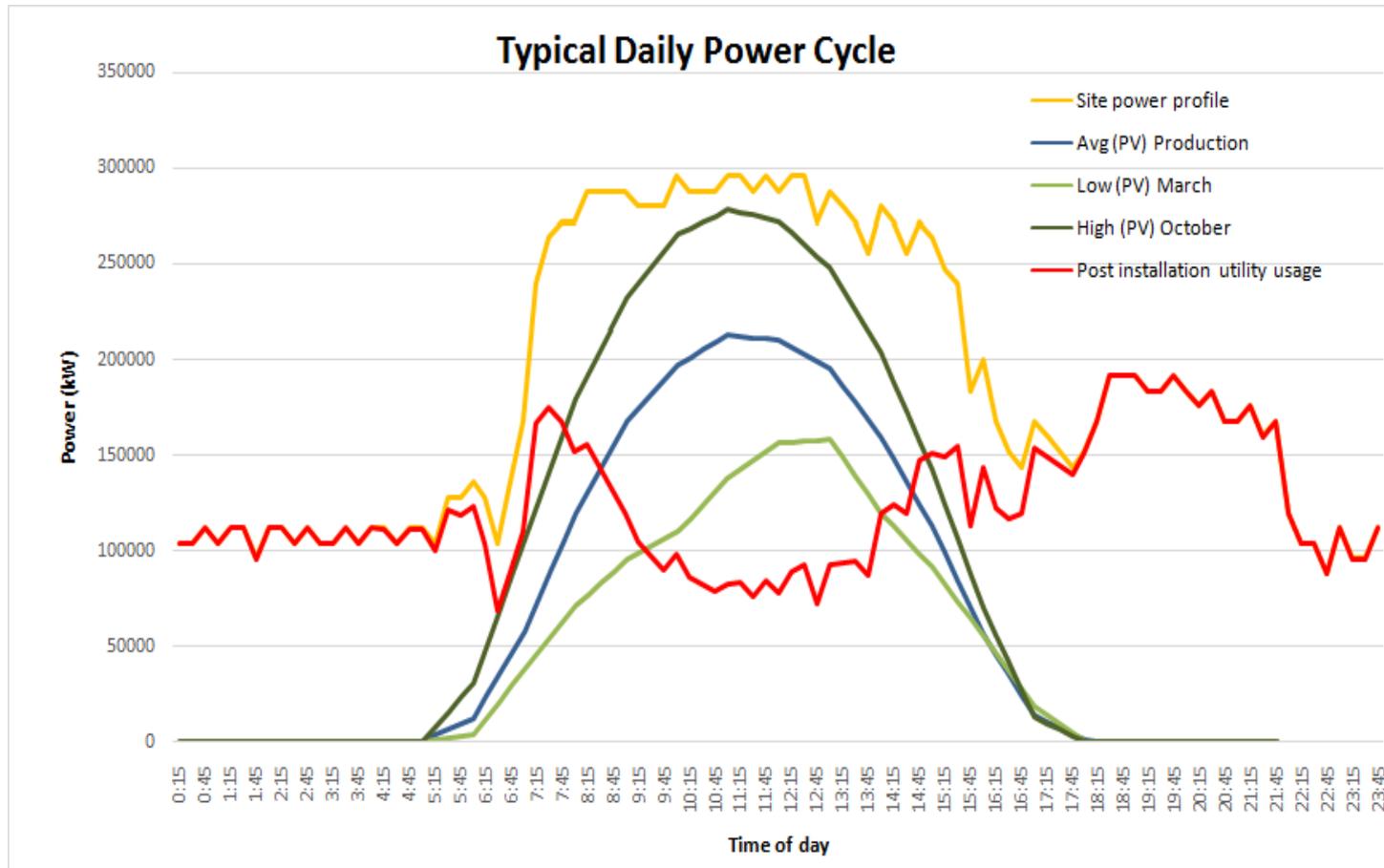


Mobile
Device



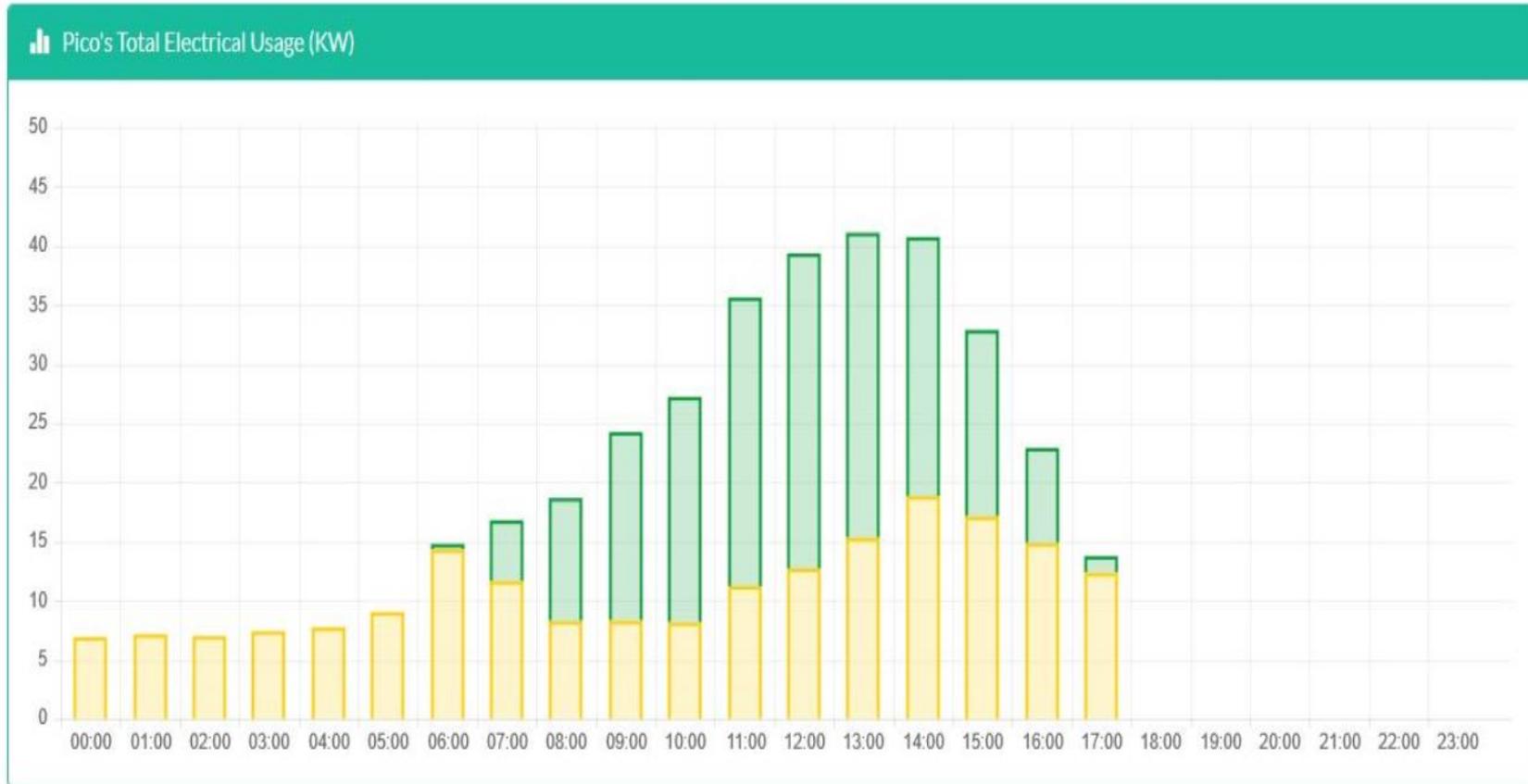
- Web based and include energy limiting algorithm

Energy Profile



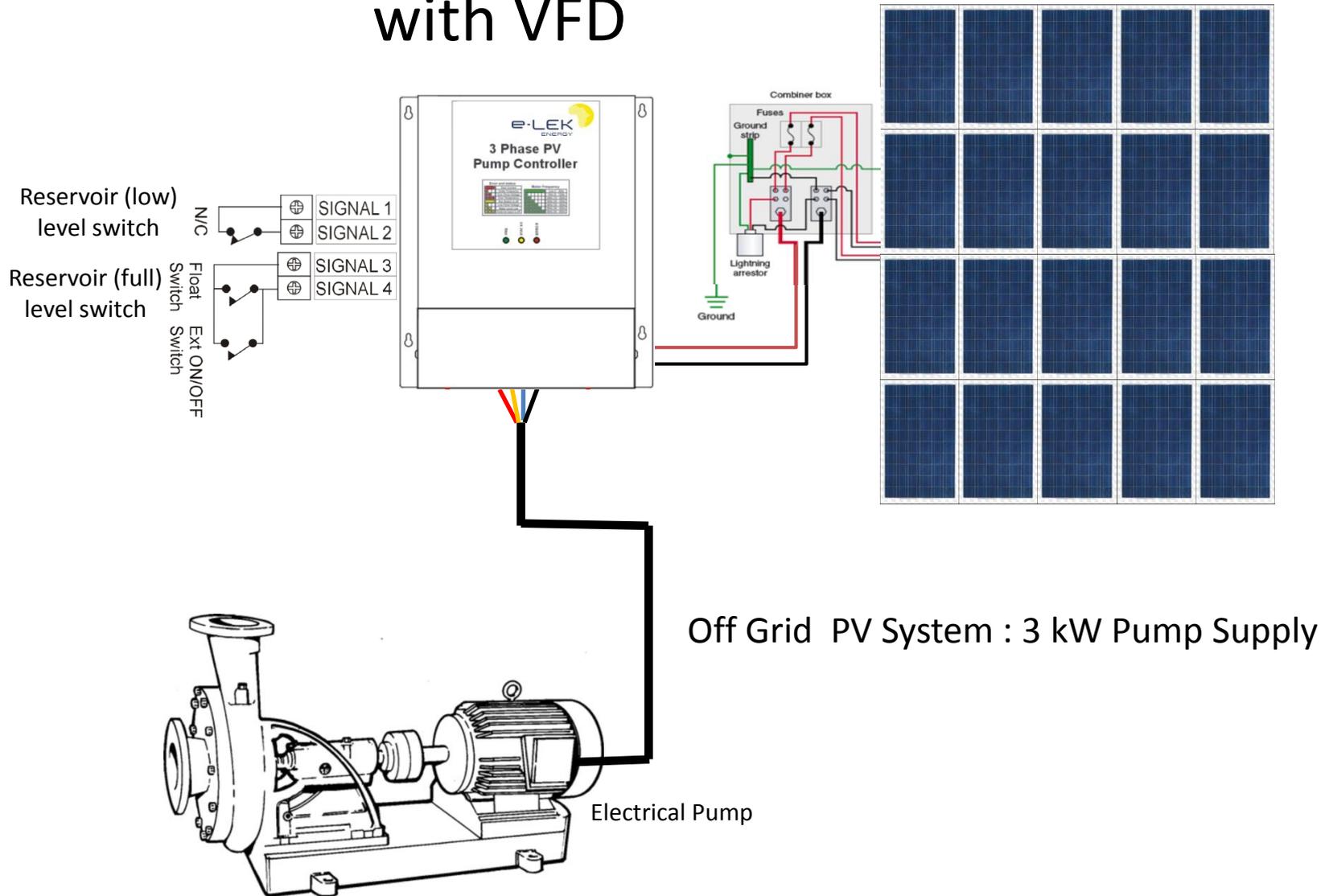
- Measurements for daily and weekly usage profiles

Energy Profile

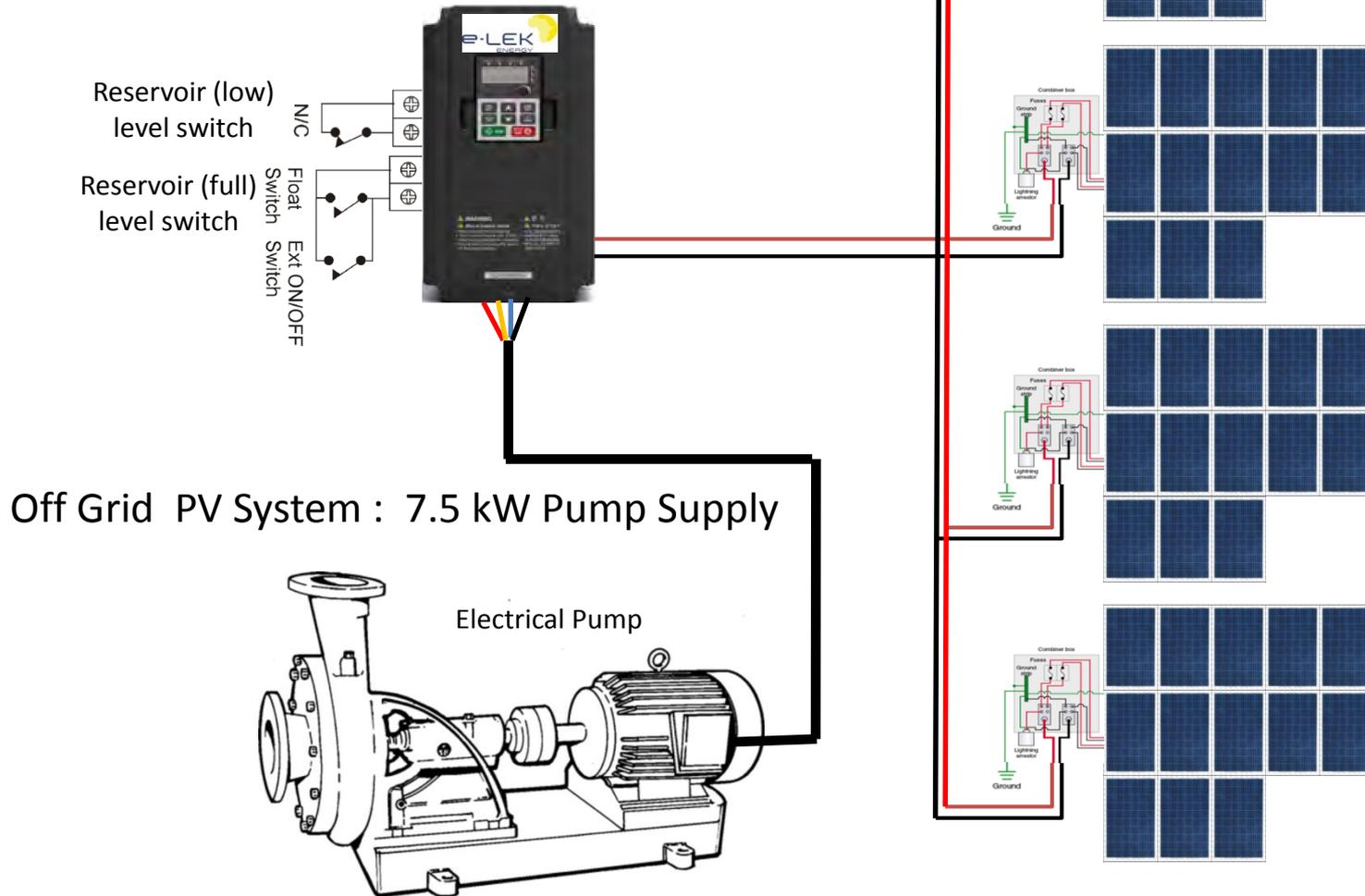


- Agri - tunnel energy profile perfect for PV solar application

VFD – PV Solar MPPT combined with VFD



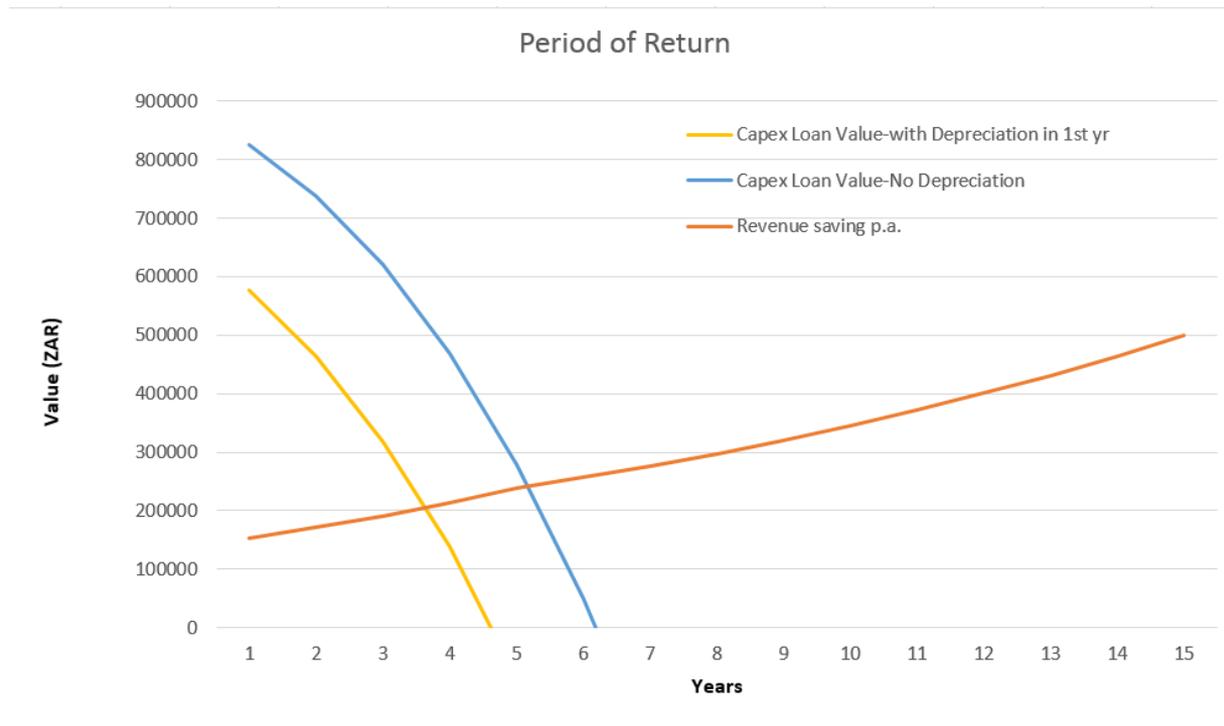
VFD – PV Solar MPPT combined with VFD



Financial Model

- Straight buy
 - Typical payback period - 5 to 7 years
 - System guaranteed output – 25 to 30 years
- Buy only renewable energy
 - Electrical energy cost available for less than the utility
 - Long term agreement
 - T&C s apply
 - Stay property of e-LEK

Return on Investment

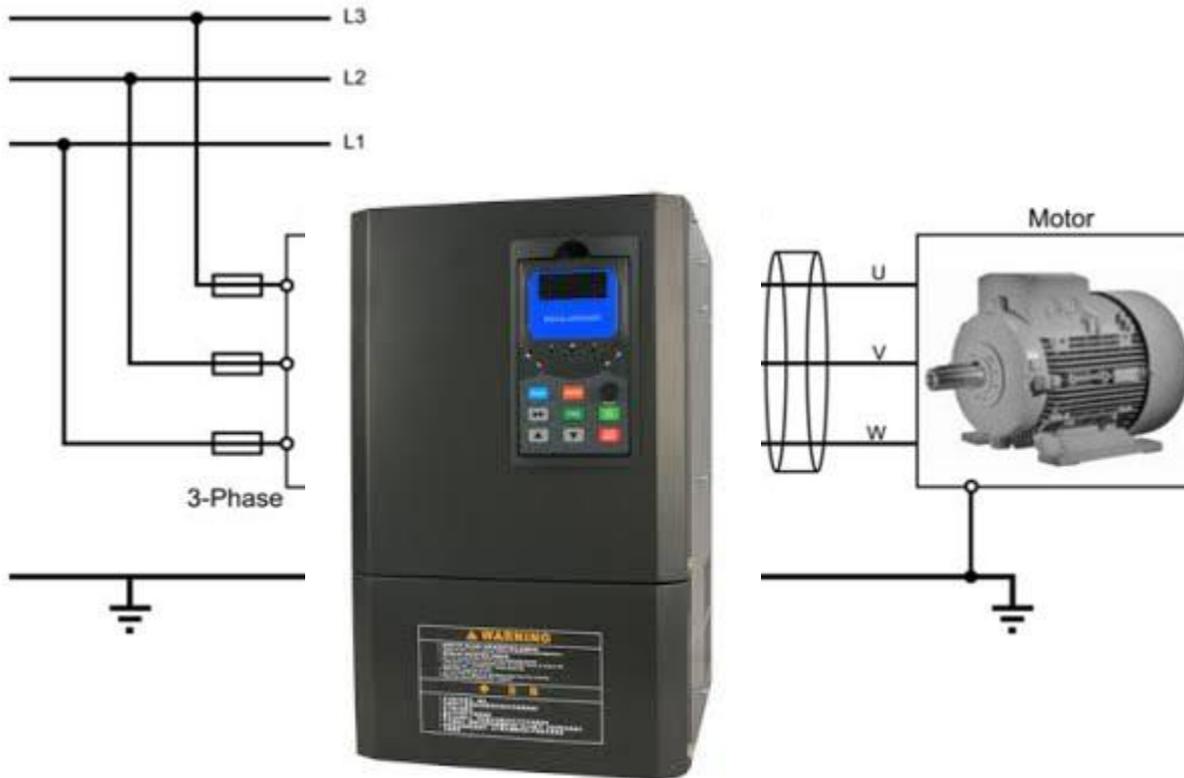


- Agri – tunnels application leads PV energy system high production yield

Q & A

Thank you !

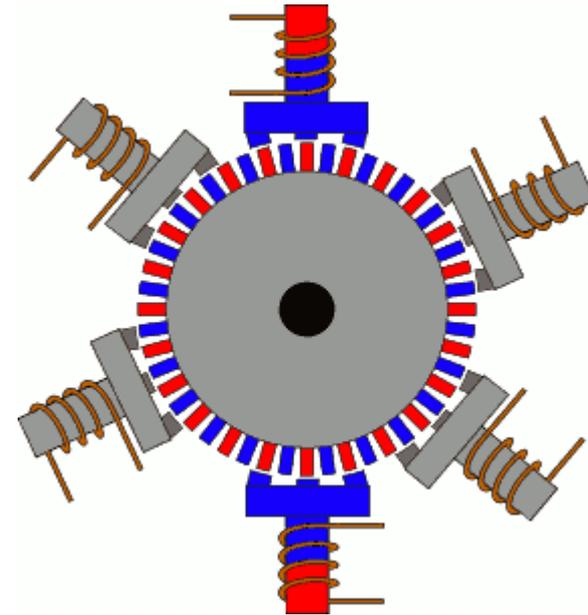
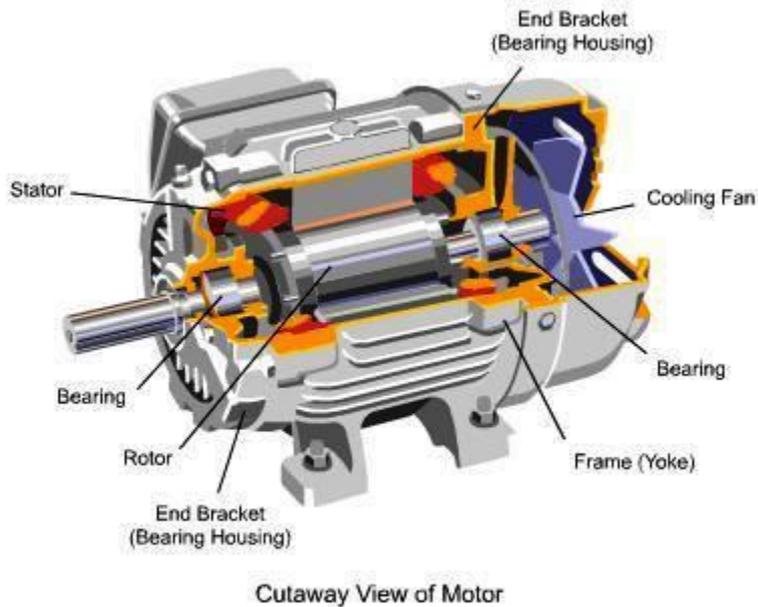
VFD – Variable Frequency Drive



Example of VFD

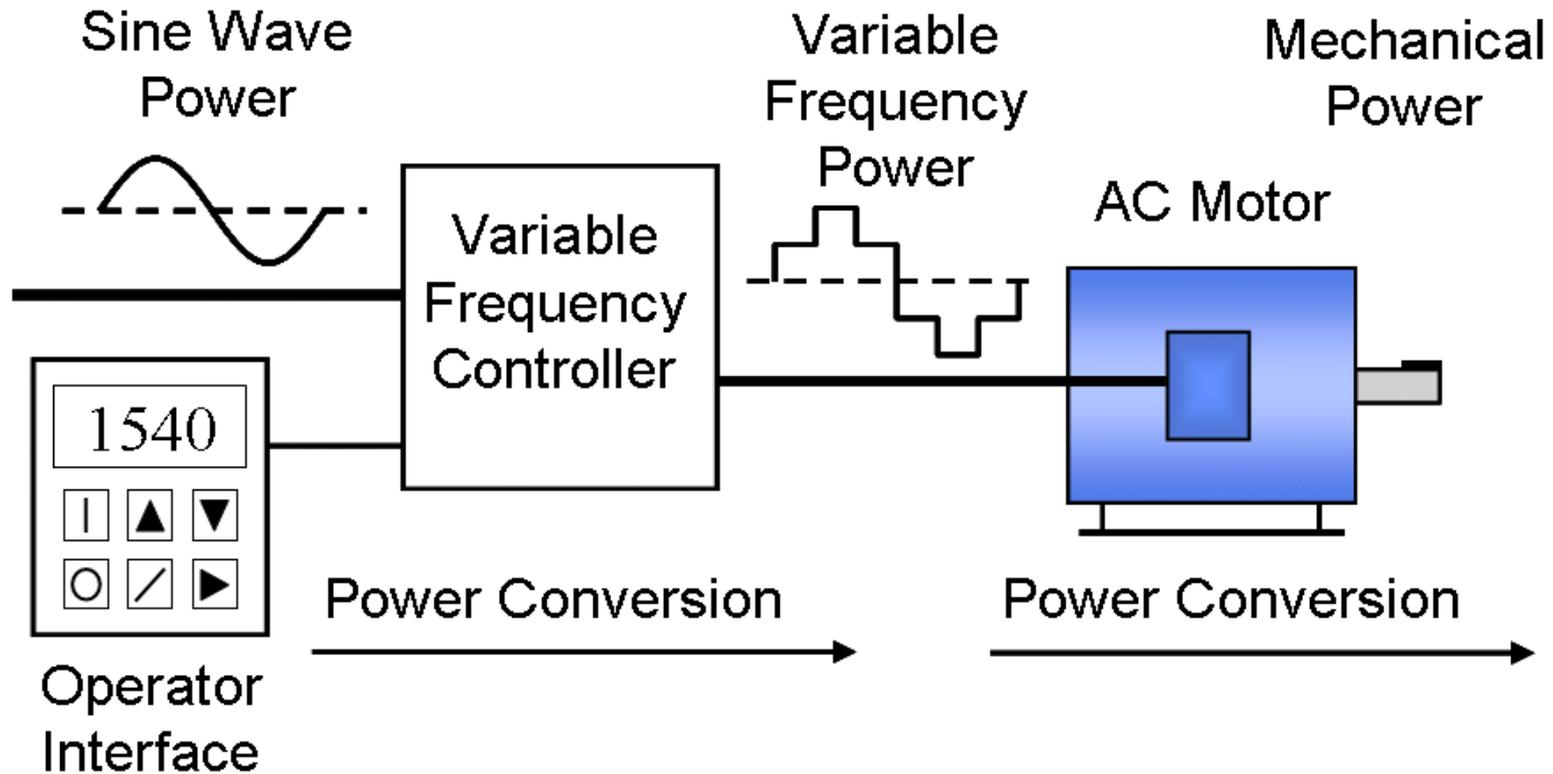
VFD – Variable Frequency Drive

3 phase AC motor construction



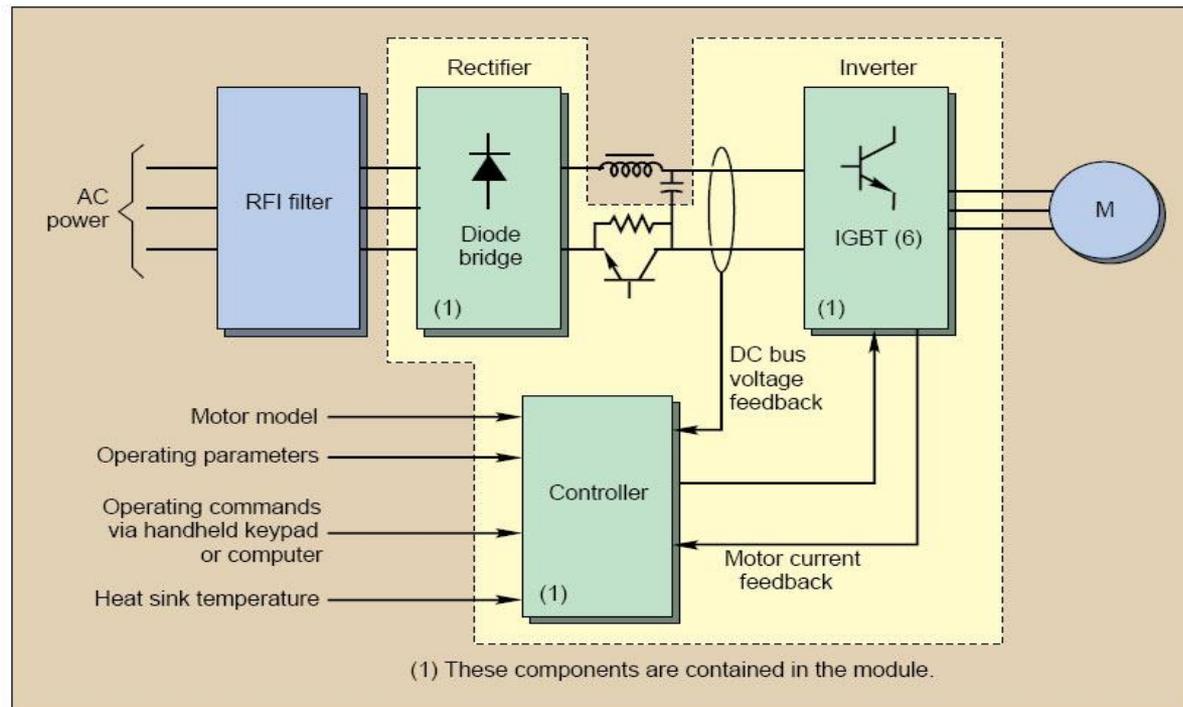
- The speed of a 3 phase AC motor is determined by the number of poles and the frequency of the AC power supply

VFD – Variable Frequency Drive



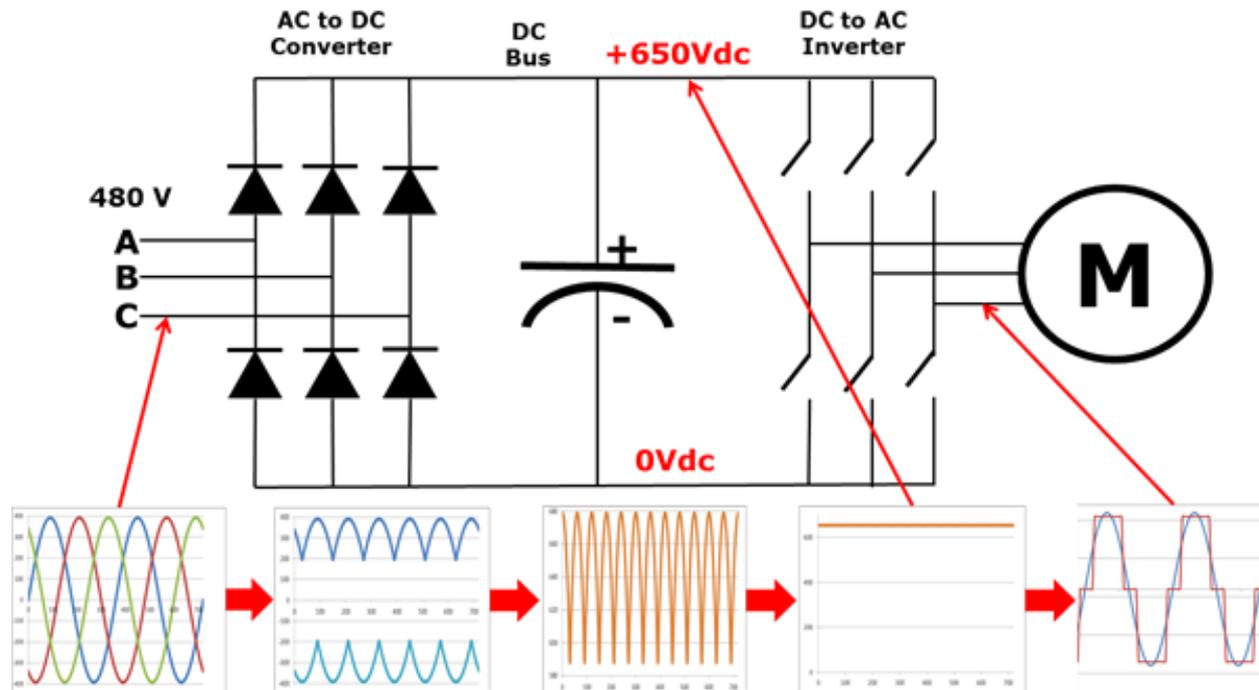
- The VFD control the speed of a 3 phase AC induction motor by changing the frequency (and Voltage) of the AC power supplied to the motor.

VFD – Variable Frequency Drive



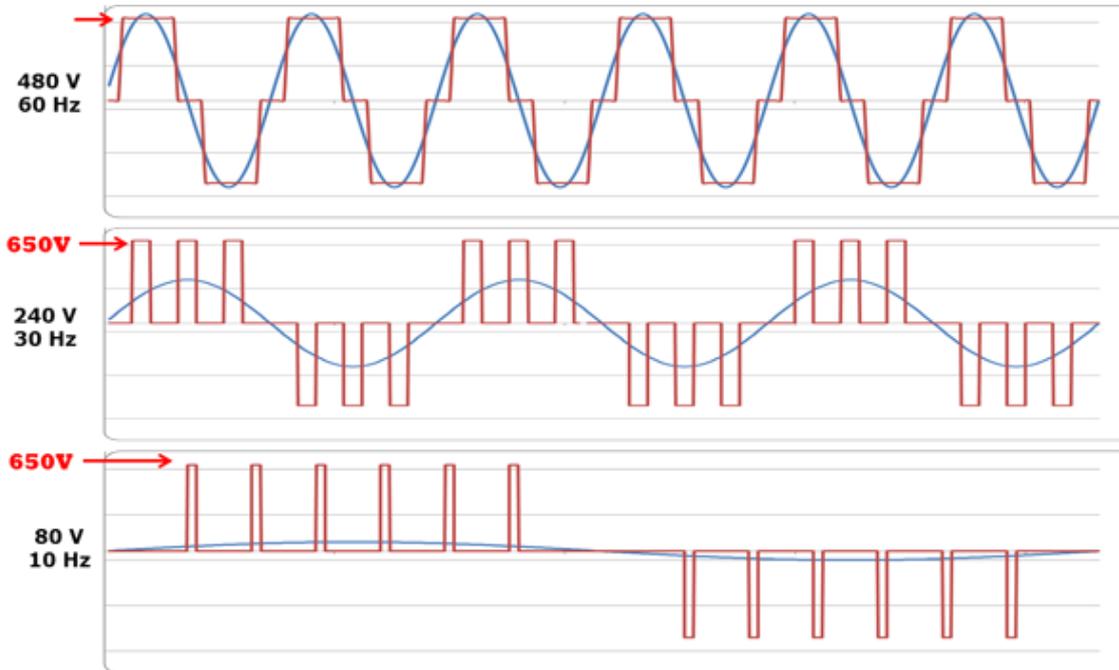
The VFD Block diagram – Major functions and feedback loops

VFD – Variable Frequency Drive



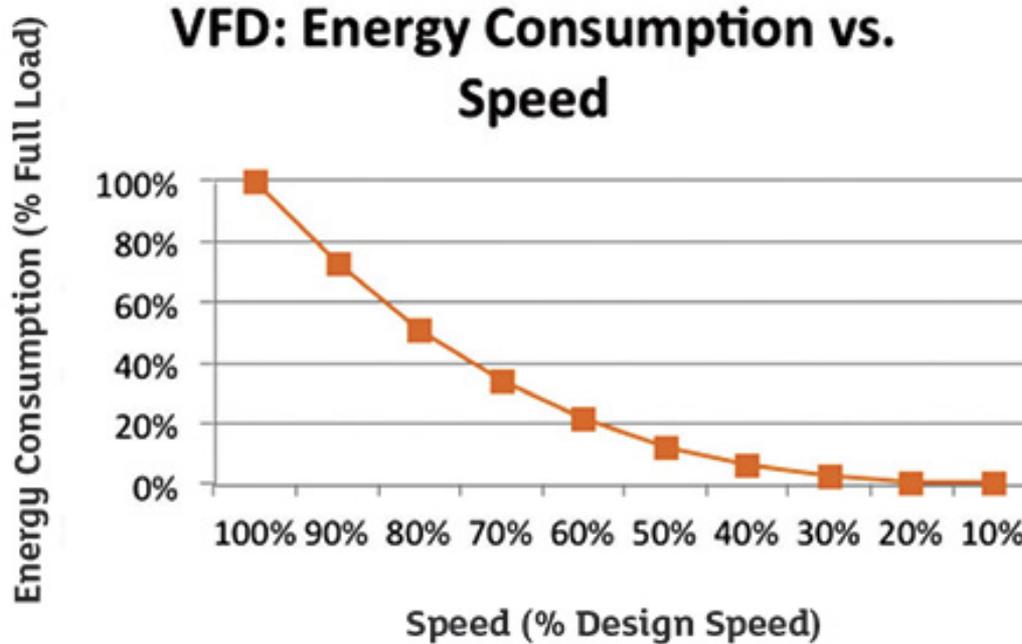
The VFD Block diagram – waveforms

VFD – Variable Frequency Drive



The output from the VFD is a “rectangular” wave form. VFD’s do not produce a sinusoidal output. This rectangular waveform would not be a good choice for a general purpose distribution system, but is perfectly adequate for a motor

VFD – Main Advantages



Flow is proportional to speed directly.

Power is proportional to the cube of speed.

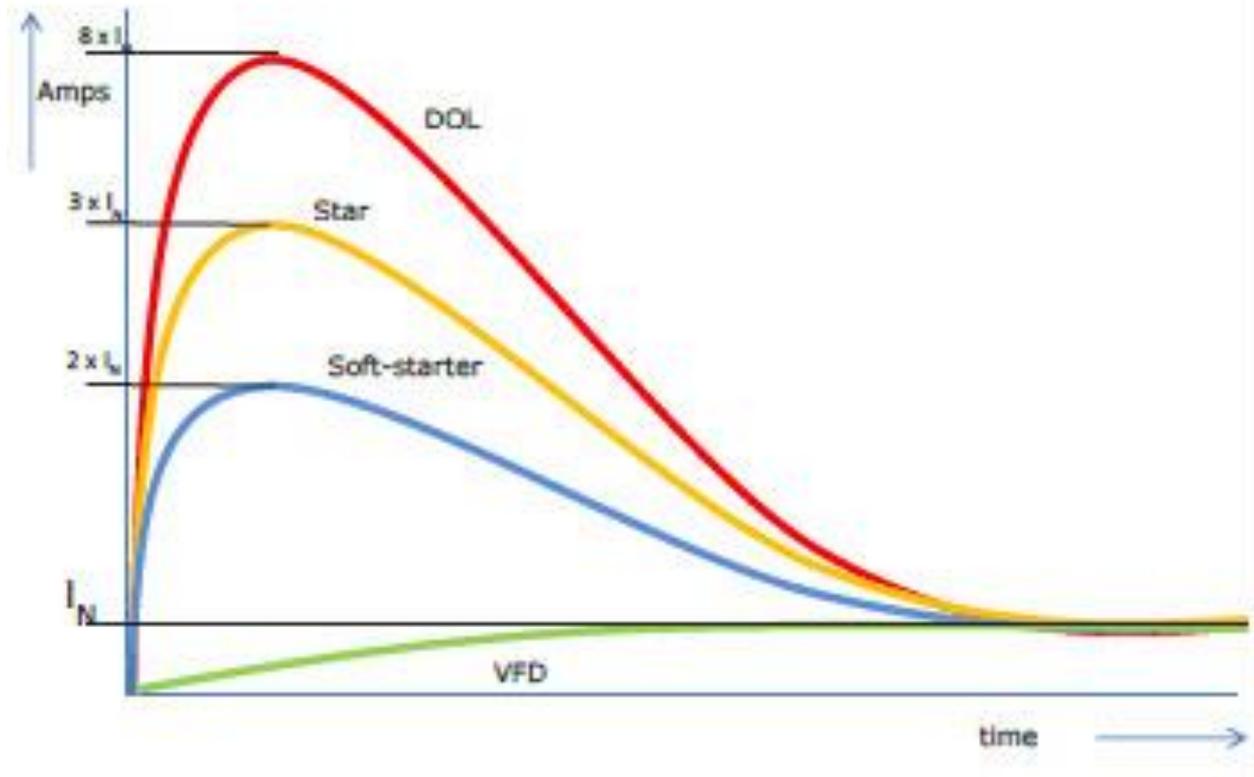
$$\frac{P1}{P2} = \left(\frac{N1}{N2} \right)^3$$

Example: 80% flow

$$(0.8)^3 = 0.512 \text{ or } 51\% \text{ HP}$$

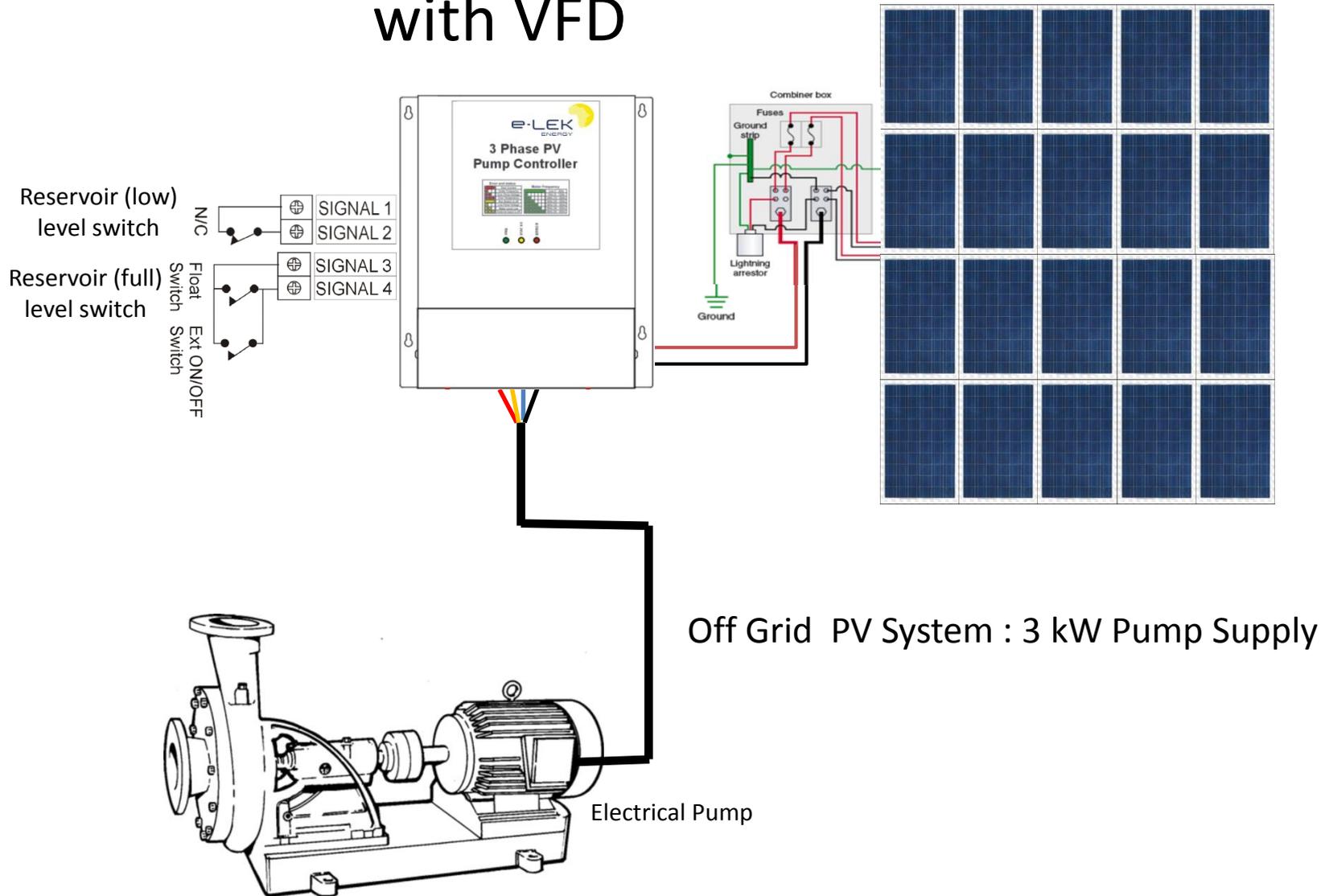
- Energy Saving 20% drop in speed yield 50% in energy saving
 - applications that does not need to be run at full speed continuously such as the fans of agricultural tunnels

VFD – Main Advantages

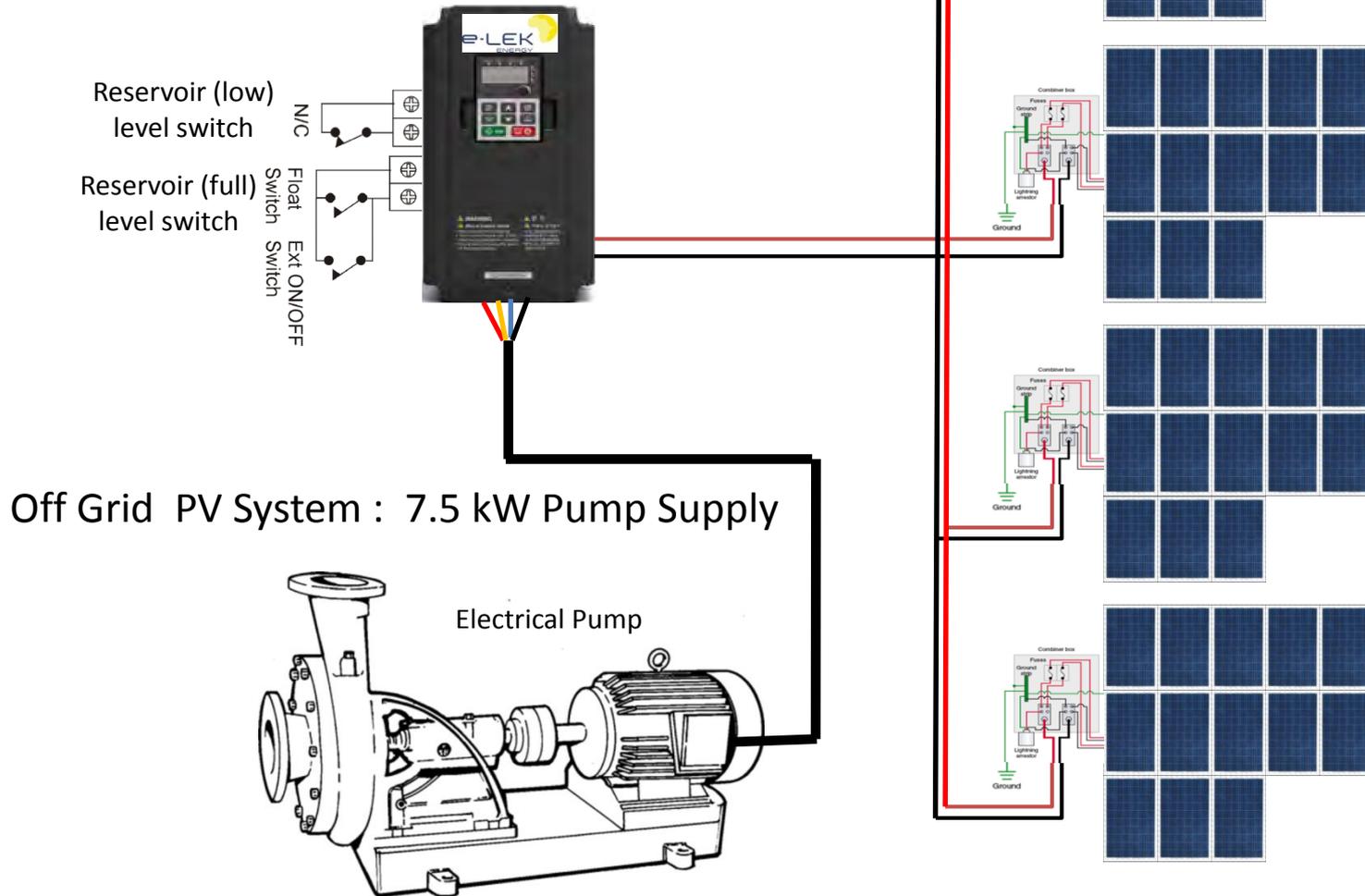


- Reducing the startup current of 3 phase AC motors
 - Reduced requirement in the capacity of power supply and generators

VFD – PV Solar MPPT combined with VFD



VFD – PV Solar MPPT combined with VFD



Q & A

Thank you !