

## Formula Sun - Solar power systems

### Task:

To find out how much power you need for your boat  
To test how to connect and use your solar panels  
To find out how to store the energy from your solar panels.

### Introduction

Your boat will be powered by the energy from the sun, which has to be converted from light into electricity using photovoltaic material. The efficiency of your system will depend on many variables. To start to make sense of it all you will need to make plans of how to set up your systems and take careful measurements in different conditions.

### Research Section

How much power do you need?

Motor

Look at the motor specification; test it using a power-supply on the bench.  
Use an ammeter and voltmeter to quantify your results  
Put your motor under load and see what difference it makes

Solar Cells

Measure the voltage given out by the panels under different light conditions. Connect them together in series and in parallel, then compare the results.

Storing the electrical energy

If we directly link the motor to the solar panels they only work in good daylight or better still, sunny conditions. There is a way of storing the electricity for use later on, the most common being a battery, however we only need a small amount of electricity for a pretty short period of time.

A capacitor is much simpler than a battery, and is much quicker and simpler for us to charge up from our solar cells.

A battery works in a completely different way to a capacitor, it produces a flow of electrons from a chemical reaction, a capacitor does not produce new electrons it only stores them.

### Design Section

Collect the information you need to design the circuit to test your solar power plant. Record the results and then decide upon the number of solar cells you will use and how they will be connected together.

Remember your boat must carry its own solar cells so more is not always the best way to make a fast boat!

If you build a capacitor into your circuit you must be able to switch it on and off. This can be done very simply using connectors or you may like to design a switch system into your boat. Remember this will need to be done at the start of the race, a capacitor will not discharge for very long and you do not want to waste racing power!!

### Manufacturing Section

Accurately measure some sample components using a Vernier calliper or Micrometer and check your findings against others.

Using the correct machine, produce one sample of the housings for the Laser or LDR.

Etch your PCB

Use soldering equipment to manufacture your design.

### Target Areas

#### KS 3 or 4

#### Key skills

Working with Number

Skills framework

Communication, Number, IT

#### Diploma

Unit 2 Engineering Design

Unit 4 Producing Engineering

Solutions

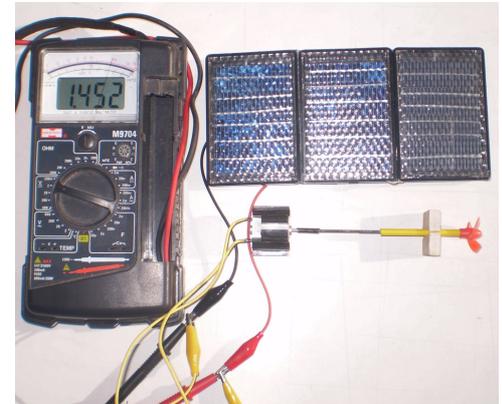
Unit 5 Electronic Circuit systems

#### GCSE Engineering

Units 1 & 2

#### BTEC 1st Diploma

Several units depending on course structure



### Specifications

#### Motor

Voltage range	0.5 – 3
No-load current	800mA
No-load rpm	1950
Torque	10 g/cm @ 3v
Size	25 dia X 20 mm

#### Solar Panel

Voltage	0.45
Max current	800mA
Size	95 X 65mm

#### Capacitor

Voltage	2.5
Capacitance	10F
Size	18dia X 35mm