

## A5.1 Solar cells – Tracking down technology

### 1 Photovoltaic system

The photo shows a photovoltaic system mounted on the roof of a house. The system consists of several hundred solar cells.

(The word “photovoltaic” is derived from the Greek word for “light” and the physical unit for electric voltage, the volt.)



#### **What a photovoltaic system does:**

The solar cells you worked with in the experiment convert the energy from the sunlight to current (electrical energy). Solar cells are therefore used to generate current in places where the sun shines a lot. For instance, a south-facing roof of a house is a good location for a photovoltaic system, as is a field or a sunny desert.

#### **How a photovoltaic system works:**

A photovoltaic system consists of individual solar modules, and these modules consist of a multitude of individual solar cells. Since one solar cell by itself produces only a very small current, many solar cells are connected together here – in series and in parallel. The series connection achieves higher voltage. The parallel connection achieves higher currents. The sum of the voltages and currents achieves much higher power and thus much more electrical energy.

The solar cells in such systems are usually manufactured from silicon. We obtain silicon from completely normal silica sand, which is abundant in nature. The solar cells are protected from the weather by a glass plate.

There are two problems with such a system: Current is generated only as long as there is light, and the generated current does not correspond to the alternating current that is normal in a household. For this reason, every photovoltaic system includes what’s called a power inverter. This device allows the solar electricity to be used in a household and to be fed into the public power supply grid.

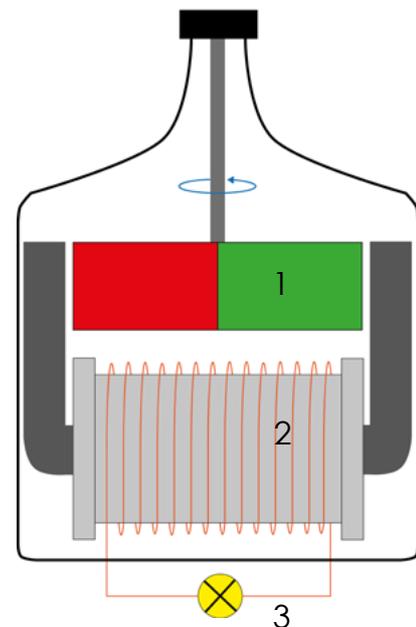
## 2 Bicycle dynamo

Like the solar cell, a bicycle dynamo also generates current. However, it does so according to a different principle: The dynamo converts the mechanical energy contained in the rotary motion of the wheel to current (electrical energy).



### How a dynamo works:

The dynamo has two essential components in a housing: a magnet and a coil (a copper wire that is wound in a circular pattern). The magnet is connected to the small wheel at the top of the dynamo. The coil is below the magnet. If the small wheel at the top of the dynamo rotates, the magnet in the dynamo also rotates. The rotation constantly changes the magnetic field that penetrates the coil. As a result, the charges (electrons) found in the coil's copper wire are moved against each other. This produces a voltage at the coil's terminals (like you are familiar with from a battery) and current can flow via the lamp.



1: Magnet; 2: Coil; 3: Lamp.

Incidentally, in a large power plant, the electricity is produced according to the same principle as in a bicycle dynamo. In this case, though, the magnets are much stronger and it's not the magnet that rotates, but the coil. However, the result is the same. This kind of device in a power plant is called a "generator."