Student sheets

A changing model of Power Generation

The way we supply our homes, schools, hospitals and workplaces with energy is changing. Rather than relying upon large power stations operated by utility companies it is now possible to make use of new technologies so that people can manage their energy better.

It used to be that a common model of power generation and consumption was:

Electricity generation, transmission, and distribution

Power plant generates electricity

Transmission lines carry electricity long distances

Transformers on poles step down electricity before it enters houses

Distribution lines carry electricity to houses

Transformer steps up voltage for transmission

Neighbourhood transformer steps down voltage
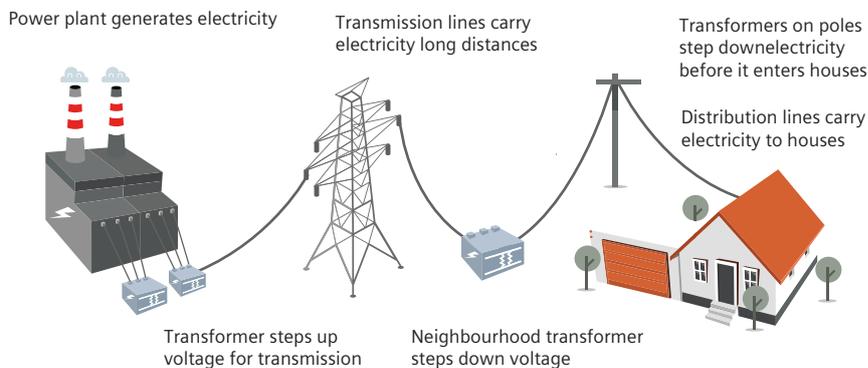
Source: Adapted from National Energy Education Development Project (public domain)

- Power generation is done on a large scale by utility companies
- Power is distributed from the large generators to the consumers
- Consumers use the energy and pay the utility company for providing it

This model is now, in some places, being changed in a number of ways:

Alternative power distrubution system

Generates electricity, e.g. from solar cells

Sells electricity to the Grid when they have a surplus

Uses electricity, e.g. for lighting

Buys electricity from the Grid when they need extra

Stores electricity for later use, e.g. in storage batteries
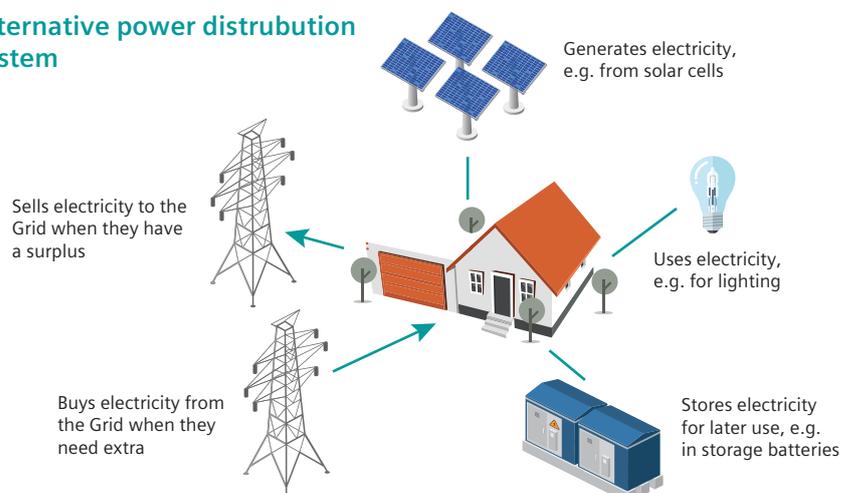
- Power can now be generated using smaller generators, with a variety of energy sources, and distributed over a wide area.
- These generators may be owned or controlled by the consumer, who can produce at least some of the energy they need themselves.
- They may even sell excess energy to the distribution system.

Your task

- Your task is to organise the energy technology for a farm. This should provide the farm with energy to carry out various functions, such as keeping the lights on (when it's dark), powering the equipment (such as the milking parlour) and keeping the house warm.

- You have a budget of 20 tokens to set the system up. Each piece of equipment has a price, so you will need to make decisions about what to spend the tokens on.

- Once you've set the system up, you then run it for a (simulated) week. At the end of the week you can then see how well it has worked.

Assessing your success

There are three sets of criteria you will be judged against:

1. Did you get through the week without the lights going out?

2. What were your running costs?

3. Did you manage to minimise the negative impact on the environment?

Your teacher will brief you on the use of the interactive resource, explaining the decisions you need to make and showing you the feedback you will get on how well the system has performed. You can then modify the system to try and improve its performance.

From your best performance:

- Did you manage to keep the lights on all week? _____

- What did the system cost to run? _____

- What was the environmental impact of the system? _____

- Now think about how you managed to set up an effective system: _____

- What hints would you give to someone trying to set up an effective system and get a good score?

_____

_____

_____

_____

- What would you say about whether (and, if appropriate, how many) to use of:

Solar cells _____

Wind turbines _____

Biogas generators _____

Batteries _____

National Grid link _____

Petrol generators _____

Your teacher will then show you the feedback screens from some other people's attempts at setting up a system. Have a look at them and comment on how good a job they've done.

The interactive simulation uses the context of a farm. Some of the solutions available for the farm might not work so well in other situations. However, some other contexts might not need to produce as much energy. How would the simulation need to be altered if, instead of a farm, the situation was:

• A detached family home with a large garden?

• A terraced town house with a small garden?

• A corner shop with a yard in a town?