

# BBC Bitesize – Physics

## Episode 6 – The National Grid

**ELLIE:** Hello and welcome to the BBC Bitesize Physics podcast.

**JAMES:** The series designed to help you tackle your GCSE in physics and combined science. I'm James Stewart and I'm a climate science expert and TV presenter.

**ELLIE:** And I'm Ellie Hurer, a bioscience PhD researcher.

**JAMES:** Let's get stuck in.

Let's start with pylons. They carry electricity cables high above the ground and they belong to something called the National Grid.

**ELLIE:** The National Grid is a system of cables and transformers that link power stations where electricity is generated to buildings, homes and consumers across the country.

**JAMES:** The electricity we use in our daily lives is generated at power stations around the UK. But it's transferred in different ways using transformers.

**ELLIE:** Not the type of transformer that turns from a car into a crime fighting robot though. It's an electric transformer. A transformer is a device that changes the potential difference or voltage of an electrical supply. And there are two types to know about.

**JAMES:** The first one is a step-up transformer and it's used to increase or 'step up' the voltage or potential difference of an electric current. As we increase the voltage, the current decreases. Whereas a step-down transformer is used to decrease, or 'step down', the voltage or potential difference of an electric current. As we decrease the voltage, the current increases.

**ELLIE:** So what's that got to do with the National Grid?

**JAMES:** Well, electric current is transferred straight from a power station to your home in one smooth go. Before electrical power leaves a power station, it goes through a step-up transformer to transfer the power at a very high voltage, we're talking about 400,000-ish volts. This makes the current much lower.

**ELLIE:** The current travels through the wires until it reaches a local area and goes through another kind of transformer, a step-down transformer. There, the voltage is decreased to around 230 volts for domestic use. This means the current increases.

**JAMES:** So can you explain why a potential difference is increased if it's then going to be decreased later?

**ELLIE:** It's to make the transfer more efficient. When the electric current in a cable is higher, more of the energy is lost as it's transferred into heat, so high currents waste energy and money.

**JAMES:** By using step-up and step-down transformers, the National Grid is able to transport the same amount of electric power at a higher voltage and lower current to save money and save energy.

**ELLIE:** But the National Grid does even more than that. At what time of the day do you think that people in the UK use the most electricity?

**JAMES:** Like 6, 7 o'clock when people get home from work, or having dinner, watching telly.

**ELLIE:** Yeah, so in the UK we usually use the most electricity between 7am to 11am in the morning, when lots of people are getting ready for work and school. And then again, from 5pm to 9pm, when some people are making dinner, relaxing and getting ready for bed.

**JAMES:** And we use more electricity during the winter months too. When there's a big event happening like the Football World Cup or during the school holidays when people are at home a little bit more.

**ELLIE:** Yeah, the National Grid is designed to manage the demand for electricity during those busy hours. The people who work there predict when more electricity will be needed and produce it based on this. So usually, power stations run well below their maximum capacity to enable them to ramp up power output when needed.

**JAMES:** So the next time you see a pylon in the middle of the countryside, remember it's connected to the National Grid and it's actually responsible for getting electricity into your home so you can switch your plug on in your bedroom.

**ELLIE:** Right, I think it's time to recap some of the lessons we've learned in this episode. Firstly, the National Grid is a system of cables and transformers linking power stations to consumers. Secondly, the National Grid uses transformers to make energy transfer more efficient. And thirdly, the National Grid uses step-up transformers to increase the voltage, or potential difference, decreasing the current as it leaves the power station. Then it uses step-down transformers to decrease the voltage, or potential difference, which in turn increases the current before it can be used in homes, factories and buildings.

**JAMES:** Thank you for listening to Bitesize Physics. If you found this helpful, go back and listen again, and make some notes on your way. Feel free to come back here any time to help you revise.

**ELLIE:** In the next episode of Bitesize Physics, we're going to be talking all about static, so be sure to listen to the next episode. So I'll see you then.

**BOTH:** Bye!