Fact Sheet 1

The Electricity Network

Electricity is everywhere. Electricity runs across Northern Ireland on a network of pylons, substations, poles, overhead lines and underground cables. In every community there are substations breaking the electricity down into safe voltages so that you can use electricity to run your TV, computer and lights!

The electricity distribution network is designed and maintained so that normally, all dangerous parts are well out of reach of members of the public. However, during some activities, either at work or at play, people can find themselves at risk of injury or worse from the thousands of kilometres of overhead wires and underground cables that deliver power to homes, offices, shops, hospitals, farms, and factories across Northern Ireland.

Every year, people are injured or killed by coming into contact with live overhead electricity lines, underground cables or equipment. At work or at play, everyone should know what the dangers are and how to avoid them.

Dangers on the Electricity Network

- The overhead powerlines that carry electricity into your home are very dangerous. If you touch them, the electricity will pass through your body and can kill you.
- Do not climb trees that have powerlines going through them, or trees growing close to powerlines
- Do not use fishing lines or fly kites near powerlines – always **Look Up** and **Look Out** for overhead lines before you assemble fishing rods.
- Do not allow metallic helium balloons near powerlines
- Never retrieve items that are stuck in powerlines. Contact Northern Ireland Electricity on 08457 643 643 for help.
- Never climb a pylon or electricity pole, you could fall or come too close to the electricity lines and be killed.
- Remember that telephone wires and electricity powerlines look the same. All wires may be dangerous so stay away from them.

So what is electricity and why is it so dangerous?

The movement of electricity through a circuit can be defined by two terms, voltage and current. If you compare the flow of electricity in a circuit to the flow of water in a pipe, current is very much like the rate at which water moves through the pipe and the voltage can be likened to the pressure at the end of the pipe from which the water is flowing. Voltage is measured in volts, and current is measured in amps, and there is a relationship that links the two values:

Voltage (volts) = Current (amps) x Resistance (ohms)

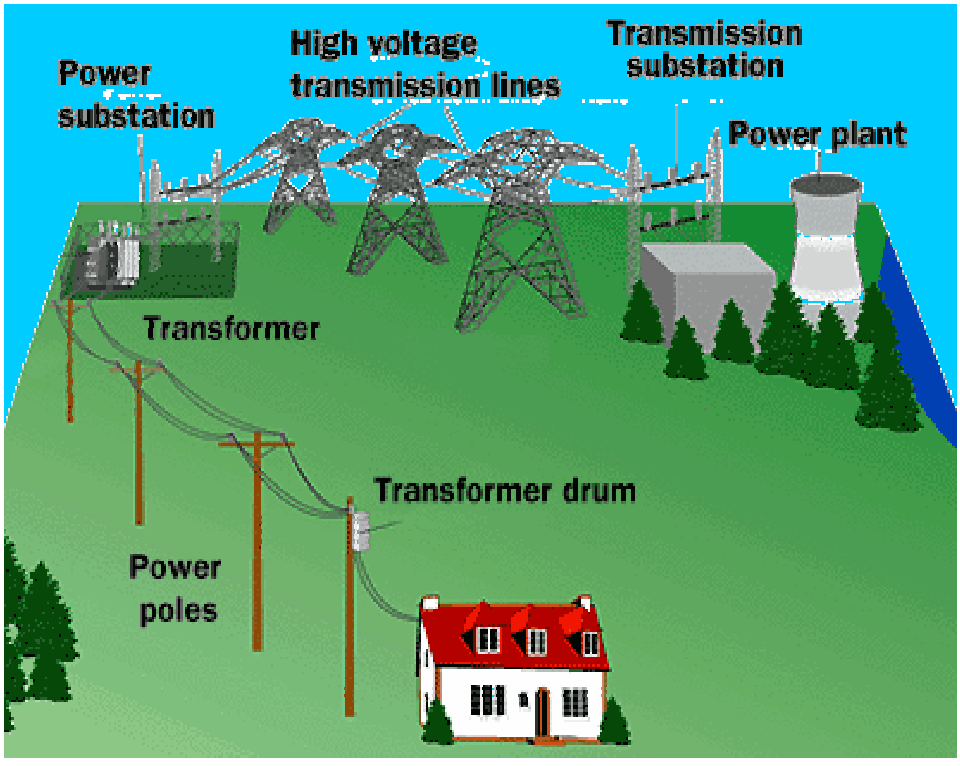
Resistance is a measure of how an object restricts the flow of current. A piece of metal will have a low resistance and therefore will conduct a high current, whereas a piece of plastic will have a very high resistance and will conduct very little current. Resistance is measured in Ohms. However, even plastic and wood can conduct electricity when subjected to high voltages, such as that found on poles and pylons.

A 12 Volt car battery would typically be connected to a circuit with a resistance value of approximately 1.2 ohms, using the above equation this tells us that approximately 10 amps will flow through the circuit. The value of resistance between a person's hands is closer to 1 Mega-Ohm (1 Million Ohms), and therefore using the same equation a current of approximately 12 micro-amps (0.000012 amps) will flow. This is very low and would have no effect on the person.

However, the resistance value of the human body is not constant and in fact decreases significantly at voltage levels over 50 Volts. This means that much larger currents can flow through a person putting them at greater risk. A current of less than 100 milli-amps (0.1 amps) is sufficient to stop a person's heart from beating, which is why people can be killed from the 230 volt supply in our houses.

Powerlines on the NIE network start at 230 volts on wooden poles and increase up to 275,000 volts carried by larger towers. If a person were to come into contact with a powerline the current that would flow would be so large that the person would have no chance of surviving.

The Journey of Electricity



Electricity travels in a circuit that begins at a power station. A thick coil of wire spins inside giant magnets at the station, moving the electrons in the wire and making electricity flow. The electricity then travels from the power station through a grid of power lines. Large transmission wires on tall pylons carry electricity to substations in different parts of Northern Ireland. These substations contain equipment that reduces electricity's voltage so it can travel on smaller power lines that branch out down streets, either on overhead power lines or underground cables.

Overhead power lines and underground cables carry electricity to transformers on poles or under the ground where the voltage of electricity is reduced again so people in homes and businesses can use it safely. Transformers and substations contain equipment that is very dangerous to touch, that is why they have yellow **Danger of Death** warning signs on them.

From transformers, electricity travels into homes, schools and hospitals through wires called service cables. These connect to a meter box, which measures how much electricity is being used and electricity is distributed throughout the building, powering lights, computers and appliances.

Fact Sheet 2

Electricity and the Human Body

Electricity is a form of energy, which is easily changed into other forms of energy, such as heat and light, and flows along wires to wherever it is needed. Electricity flowing along wires is called "current electricity" and is made up of a stream of particles called 'electrons'.

The dangers of electricity

- Electricity always tries to find the easiest path to the ground.
- Human bodies contain 70% water and electricity flows more easily through water than through air.
- This means that if you touch an electric current it will pass through the water content in your body as it seeks to find the easiest path to the ground, giving you an electric shock which could kill you.

Electrical injuries can be caused by a wide range of voltages but the risk of injury is greater with higher voltages such as those found on the electricity network.

Coming into contact with electricity equipment can cause:

- **Death**
- **Electric shock**
- **Electrical burns**
- **Loss of muscle control**
- **Thermal burns**

Electric shock

An electric shock can happen at voltages as low as 50 volts, even on equipment such as low voltage drills. This can block the electrical signals between the brain and the muscles and may

- Stop the heart beating
- Prevent the person from breathing
- Cause muscle spasms

The exact effect is also dependent on the size of the voltage, which parts of the body come into contact with the electricity equipment, if it is raining and the length of time the current flows. An electric shock from 50 volts can be fatal.

Electrical burns

Electricity can cause severe burns, at the point it enters and leaves your body on its way to the ground. When an electrical current passes through the human body it heats the tissue along the length of the current flow. This can result in deep burns that often require major surgery and are permanently disabling. Burns are more common with higher voltages but may occur from domestic electricity supplies if the current flows for more than a few fractions of a second. Coming into contact with or vandalising electrical equipment can also cause an explosion, which can lead to injury, blindness and burns.

Loss of muscle control

People who receive an electric shock often get painful muscle spasms that can be strong enough to break bones or dislocate joints. This loss of muscle control often means the person cannot let go of the equipment sending electricity through their body. The person may fall if they are working at height or be thrown into nearby machinery and structures.

Thermal Burns

People can receive thermal burns if they get too near an electrical explosion. A single low voltage torch battery can generate a spark powerful enough to cause a fire or explosion in an explosive atmosphere such as in a paint spray booth, near fuel tanks or in any places where aerosols, vapours, mists, gases or dusts exist.

IN CASE OF EMERGENCY

Electric shock victims often hold onto the appliance that is passing the electric current through their body because the electricity causes their muscles to contract.

Never attempt to rescue a person in contact with the electricity network. Call for help on **999** or **112** and tell the Emergency Services it is an electrical accident

Do not touch the person or anything he or she is touching as electricity can jump gaps and you might receive an electric shock.

Fact Sheet 3

Vandalism and the electricity network

Northern Ireland Electricity takes many steps to protect the public from danger by designing its equipment to be safe. Electricity equipment is enclosed behind secure doors and fences and overhead electricity equipment is put well out of reach. Yellow **Danger of Death** warning signs are displayed on substation fences, poles and other equipment.

However, every year thousands of homes and businesses lose electricity supplies because of vandalism to the electricity network, and every year innocent members of the public are put at risk. When you mix vandalism with electricity equipment, the result can be death.

The following acts of vandalism show how damaging electricity equipment can lead to injury or death, for those directly involved and other members of the public.

Vandalism case studies

1. The doors of a kiosk substation (large grey metal substation which you might find near a group of houses) were forced open with a crowbar and vandals used the substation as a den. A younger child found the substation with the doors open and, as he was exploring the substation, touched live electricity equipment, receiving an electric shock and burns to his chest and face. He is now permanently disfigured and is blind in one eye.

Never attempt to gain entry to substations – the equipment contained within the substation is live and can kill you.

2. A group of young people tried to prise open the door of a mini pillar with a metal bar. The bar came into contact with the live electricity equipment in the mini pillar and the girl received an electric shock and burns to her hands and arms. Three fingers on her right hand had to be amputated and she is still receiving hospital treatment for burns.

Never sit on or kick a mini pillar. Never poke anything into a mini pillar or try to open the door – the equipment contained within the mini pillar is live and if you touch it you could be injured or electrocuted.

3. Vandals threw stones and bricks at glass insulators and electricity lines on the rural overhead network one evening. This brought the overhead line down, cutting off electricity supplies to all the homes in the local village for over three hours and leaving the electricity network in a very hazardous state. As a result of the power cut an elderly lady living on her own fell while trying to find candles, breaking her hip. She was hospitalised for three months.

Never throw anything at the overhead electricity network. You could bring down live overhead lines, which could electrocute you and your friends. Damaging electricity equipment is a criminal offence and you will be prosecuted. Vandals' actions can have far reaching consequences for the community and they can put innocent lives at risk.

4. A group of young people tied shoes and boots together and threw them at overhead lines. A younger boy climbed a tree near the overhead line to try to reach the shoes. He came into contact with the overhead electricity lines and was electrocuted.

Throwing items at the electricity lines can damage equipment, causing power cuts. In this incident an innocent boy was killed as he tried to reach trainers tangled in the overhead lines. Stay safe by staying away from electricity equipment.

Think Safe, Act Safe, Be Safe