OLDBURY · ON

SEVERN

NUCLEAR · POWER · STATION

VISITORS · GUIDE

·CONTENTS·

·WELCOME·

We are delighted to welcome you to our station. Each year we receive visiting groups from many different parts of the country, and from many different walks of life. Amongst others we welcome schools, universities, interest groups, scientific associations and individual members of the public. We hope that you enjoy your visit to Oldbury-on-Severn Nuclear Power Station, and through viewing every stage of the generating process, we trust that you will gain an appreciation of the role of Oldbury Power Station in the co-ordinated provision of the electrical energy that is fundamental to our national well being.

·ELECTRICITY·

There is a steadily increasing demand for electricity, due not only to modern industrial methods which use more electrical processes and machinery, but also to rising standards of living reflected in the domestic consumer's increasing use of electrical power. It is estimated that this increasing demand will require up to 8 or 9 new power stations to be built by the turn of the century.

As electricity cannot be stored in large quantities and there is the expectation that power will be available at the instant an appliance is switched on, sufficient generating capacity must be available to meet the whole of the possible demand at any given time. This presents the supply industry with particular planning problems and requires great flexibility to respond to the changing patterns of demand – both on a daily and seasonal scale. A further important consideration is that nuclear power stations are among the most economic to run.

Nuclear energy provides a means of conserving our finite stocks of fossil fuels. Oldbury-on-Severn therefore operates for 24 hours a day at full load producing about 435 megawatts which is enough to keep 1½ cities the size of Bristol supplied during peak load hours.

Hydro-electric power: The Turbine hall of the tiny Mary Tavy power station.

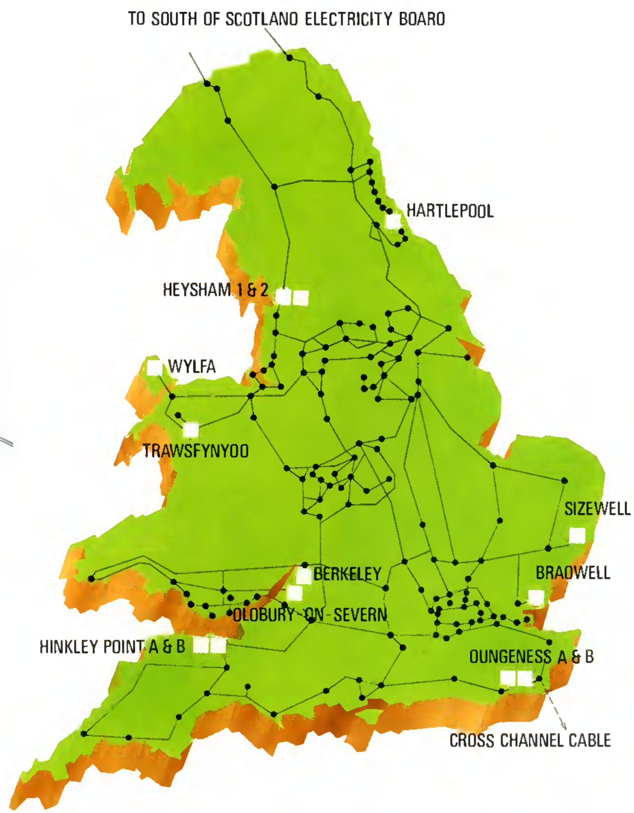
View from the coal stockyard of one of the two bucket-wheel machines at Drax power station. Each machine can handle 3000 tonnes of coal an hour.

·NATIONAL·GRID·

Electrical energy is generated in over 70 stations, and is transmitted through the National Grid to the main centres of local distribution.

Europe's first airborne power-line repairs: A 275kV line spanning the river Usk at Newport, South Wales was repaired through the use of a cradle suspended from a powerful helicopter. £250,000 was saved over conventional repairs – and the work was completed in 45 minutes rather than several weeks.

THE NATIONAL SUPERGRID AND NUCLEAR POWER STATIONS IN ENGLAND AND WALES



·NUCLEAR·FISSION·

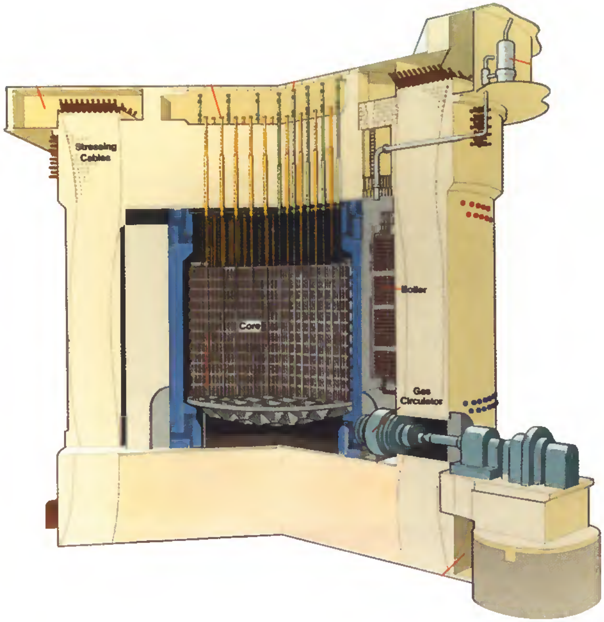
Atoms are very small — in fact so small that 10 million might just stretch across a full stop on this page. Small though they are, atoms are composed of three smaller fundamental particles — PROTONS and NEUTRONS (which together form the NUCLEUS) and ELECTRONS which orbit the nucleus. The number of electrons in the atom determines the chemical behaviour, and defines the element. There are 92 different naturally occurring atoms such as hydrogen, carbon, iron, uranium. They form the chemical elements of which an atom is the smallest identifiable part. Elements combine to form compounds. For example hydrogen and oxygen combine to form water, sodium and chlorine produce salt, and the burning of coal combines carbon with oxygen. Such chemical reactions sometimes produce energy in the form of heat as in the burning of coal in a conventional power station. Alternatively, if the nucleus itself is broken up, then some of the energy of the forces binding the protons and neutrons together in the nucleus is released. This process is known as NUCLEAR FISSION (commonly called splitting the atom). At Oldbury Power Station, for each unit of fuel used, the amount of energy released by nuclear fission is 10,000 times greater than the amount that would be released by a chemical reaction.

To achieve fission, a neutron is made to collide with the nucleus of an atom which causes it to break up and release some free neutrons. These neutrons are then made to collide with more nuclei so producing more free neutrons.

The energy so released appears as the high speed of the particles, and as the free neutrons collide with the neuclei of other atoms, they are slowed down and the energy of motion is converted into heat energy.

This CHAIN REACTION provides the basis of a power producing system. But a fission chain reaction will only occur under certain conditions, the most important of which is that the neutrons will not cause fission unless they are slowed down — or MODERATED. At Oldbury the neutrons are slowed down by using graphite, and this is known as the MODERATOR.

URANIUM is one of the few natural elements whose atoms will sustain a fission chain reaction easily and uranium metal is used as the fuel to produce the nuclear energy. There are two main forms of natural uranium atoms (called isotopes) which are known as Uranium 235 and Uranium 238. These forms are chemically identical, having the same number of electrons and protons but U238 has three additional neutrons in the nucleus. Over 99% of natural uranium is U238 and less than one per cent U235. Only the Uranium 235 is capable of undergoing fission and sustaining the chain reaction. This process takes place inside the two REACTORS which are housed at either end of the reactor building.



SECTION THROUGH REACTOR CORE

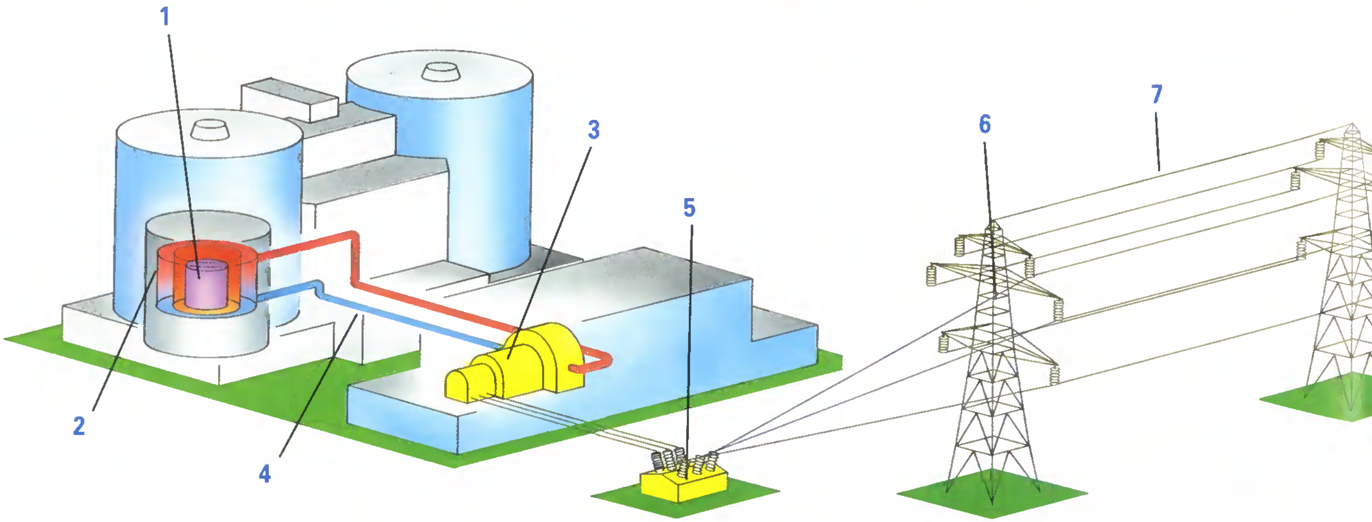
The actual rate of nuclear fission is controlled by increasing or decreasing the number of free neutrons. If the chain reaction is to be reduced or stopped, it can be done rapidly by lowering boron steel rods into the reactor. These rods, known as CONTROL RODS, absorb some of the free neutrons so reducing the fission process. When the control rods are raised, there is less neutron absorption, and so fission increases. Even at full power, there are always some control rods partially in the reactor, thus ensuring that there is always complete control of the fission process.

· HOW · ELECTRICITY · IS · PRODUCED ·
· A T · O L D B U R Y ·

All power stations produce electrical energy in a similar way. Electricity is generated by spinning a long shaft — the rotor — which is an enormous magnet. Thick copper bars in the form of coils are placed all around the outside of the rotor to form the stator, and as the shaft is made to rotate, electricity is generated in the copper bars of the stator.

The energy used to make the generator rotor spin is obtained from superheated, high pressure steam which is directed against rows of rotating blades inside a turbine causing the rotor to spin at high speed. Coal or oil can be burned to boil water into steam. But at Oldbury, use is made of the heat energy that the process of nuclear fission generates.

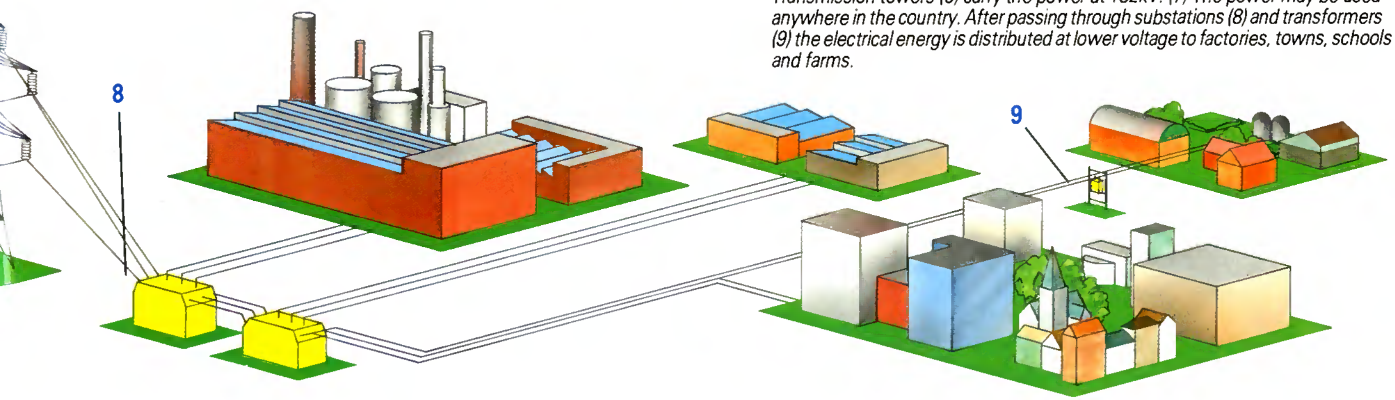
The fission produced heat is harnessed by pumping carbon dioxide gas through the reactor. In absorbing the



heat, the temperature of the gas increases and it then comes into contact with the water pipes in the boilers. The pure demineralised water is then carried in pipes from the boiler under the road and into the Turbine Hall. In the turbine, it strikes the blades making the shaft spin at 1;500 revolutions per minute, thus driving the generator which produces electricity. The steam is condensed back to water in order to be continuously re-used. The voltage produced in the generator is stepped up by a transformer, and the power is fed into the National Grid. Transmission towers carry the power at 132kV. After passing through substations and transformers, the electrical energy is distributed to the consumer.

One of the two 313mw turbo/generators.

The fission-produced heat raises the temperature of the gas pumped through the core (1). The gas passes to the boilers (2). where its heat is transferred to the water, turning it into steam which drives the turbo/generators. (3) The steam now condensed back to water is recycled. (4) The voltage produced in the generator is stepped up by a transformer (5) and the power is fed into the national grid. Transmission towers (6) carry the power at 132kV. (7) The power may be used anywhere in the country. After passing through substations (8) and transformers (9) the electrical energy is distributed at lower voltage to factories, towns, schools and farms.



·THE·RIVER·SEVERN·

The River Severn is essential to the power station, because up to 75,000,000 litres of water an hour are used for condensing steam back into water in the Turbine Hall.

In order to ensure a constant supply of water in sufficient quantities and yet not disrupt the flow of the river, a reservoir with a wall 1.7 metres in height was built. As the tide comes in, it flows over the wall and refills the reservoir. Due to the sand bank between the station and the Severn Bridge, considerable quantities of sand and silt are washed in with the tide. This requires the reservoir to be dredged for up to eight hours a day.

The water is filtered for debris, seaweed and fish before being used. It is carried by underground tunnels into the Turbine Hall where it passes through the condensers of the turbine. This process raises the temperature of the river water by up to 10 degrees Celsius. The water is pumped about 1½ miles before it is returned back into the river upstream of the station.

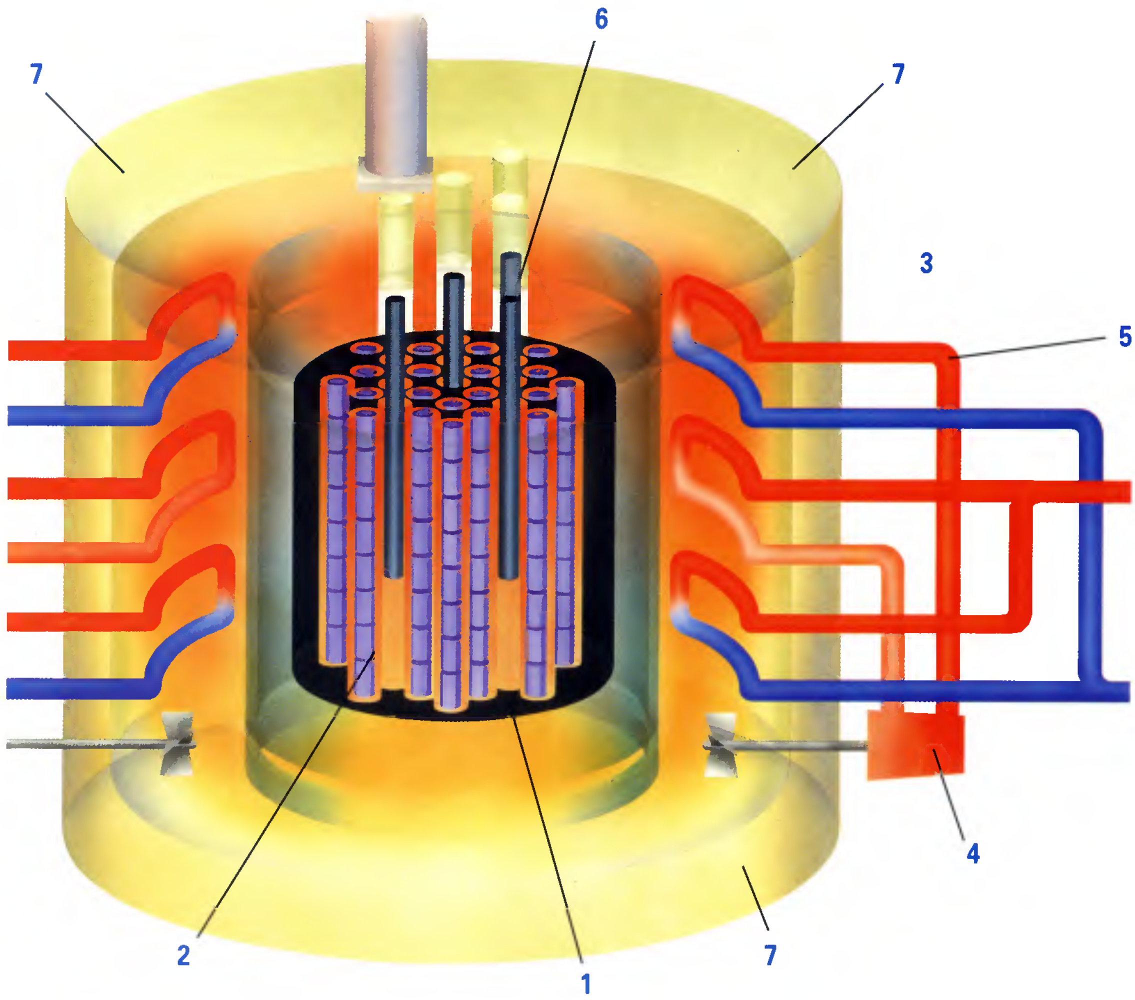
The Severn has the world's 2nd largest tidal range.

Cooling water is screened to remove debris.

The reservoir was dug before any of the construction work on the site began, and the spoil was used to raise the level of the ground by 4 metres before building commenced. This ensures that the station is above the flood level of the river.

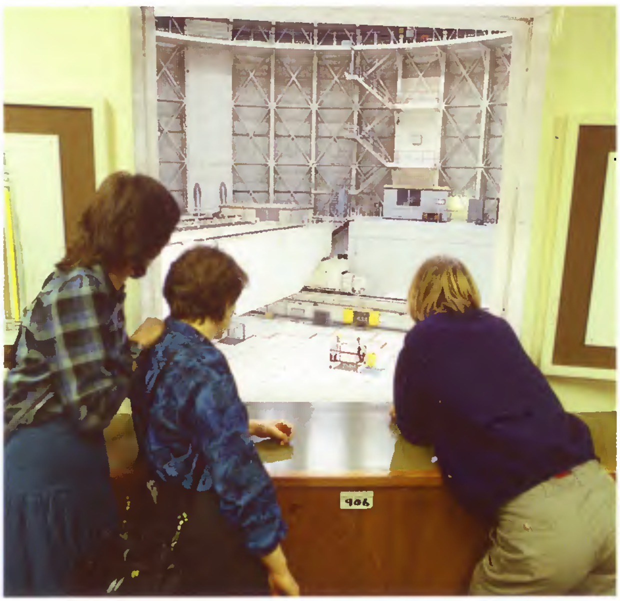
The river is over one mile wide at this point.

OLDBURY-ON-SEVERN REACTOR



These are two seperate reactors, one at each end of the reactor building. The core (1) of the reactor is made up of thousands of graphite blocks built up to form a solid cylinder. In each reactor, there are 3,308 channels running down through the graphite, into each of which is placed 8 uranium fuel elements (2) stacked on top of each other. With the graphite acting as a moderator to slow down the neutrons, nuclear fission occurs and the elements generate large amounts of heat. This heat is transferred to the boilers (3) by blowing carbon dioxide gas up through the channels and then passing it over the boiler tubes thus converting the water into steam. The pumps (4) that circulate the gas are powered by high pressure steam (5) that is taken from the boiler system.

The chain reaction is controlled by the movement of control rods (6) in 101 additional channels. Made of boron

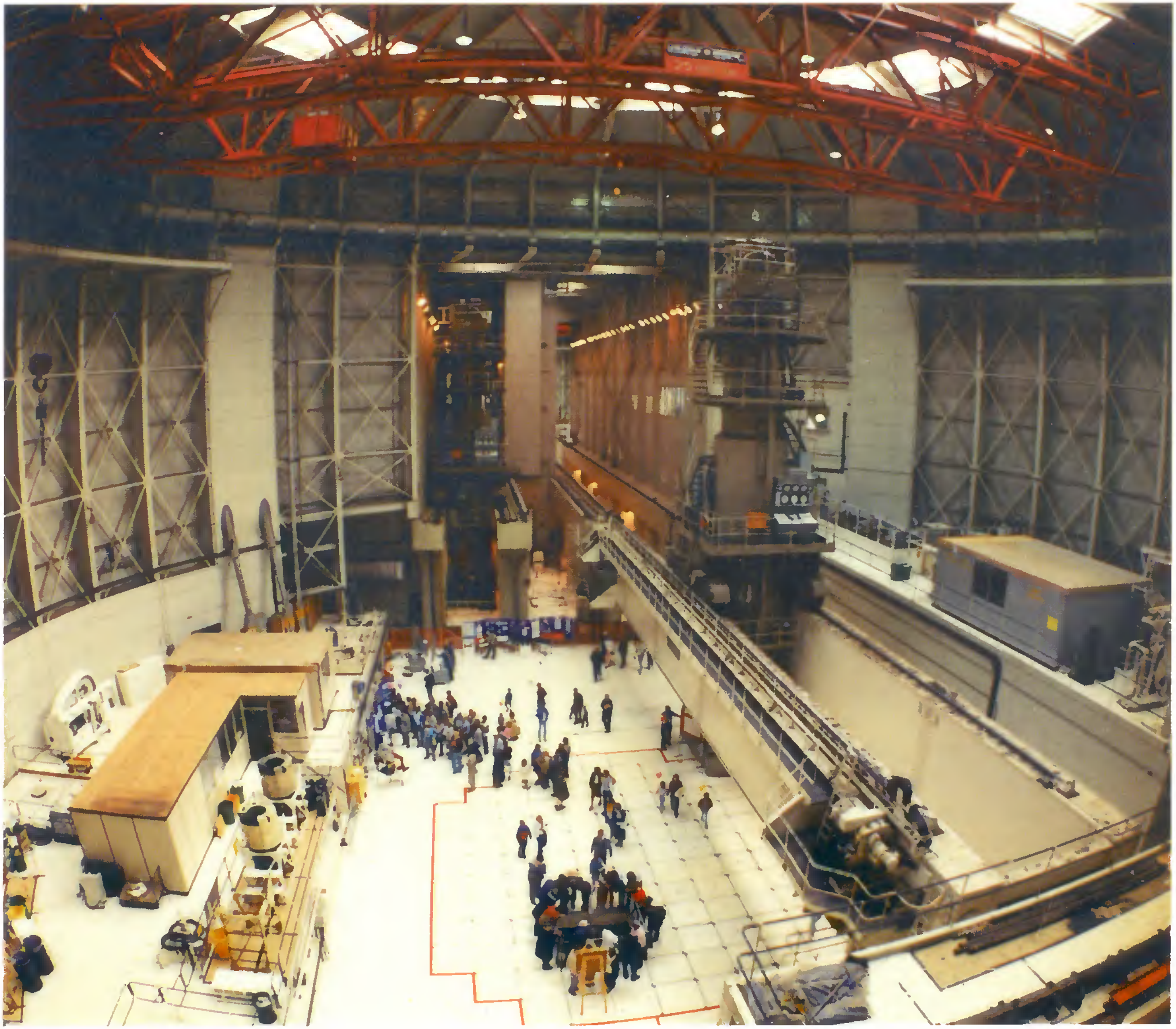


steel, when lowered into the core they absorb some of the free neutrons, so limiting fission and reducing heat output.

The reactor is contained within a concrete pressure vessel (7) which is 6.7 metres thick above and below the reactor, and 4.6 metres thick at the sides. There is also a steel lining that is 1.2 cm thick. The pressure vessel which is reinforced by 116 miles of steel cable serves two purposes. Firstly, it acts as a barrier against radiation, and secondly it acts as a container for the carbon dioxide. In order to prevent any possible damage to the concrete, the pressure vessel has a cooling system which keeps the pre-stressed concrete at an even temperature. Demineralised water is fed through pipes buried in the concrete to remove heat, and ensure that the concrete does not become excessively hot on the inside surface.

The boilers surround the reactor core inside the concrete pressure vessel. They are separated from the core by a second shield in the form of a carbon and steel wall that is 1.1 metres thick and which protects the boilers from radiation. This shield wall allows personnel to safely enter the boiler sections to undertake any necessary work when the reactor is shut down.

The floor that can be seen when looking down onto the reactor is called the pile cap, and is 14 metres above the core. It consists of a number of concrete floor slabs that are 45 cm thick and each weighing 1½ tonnes. The motors that drive the control rods are situated underneath the pile cap floor.



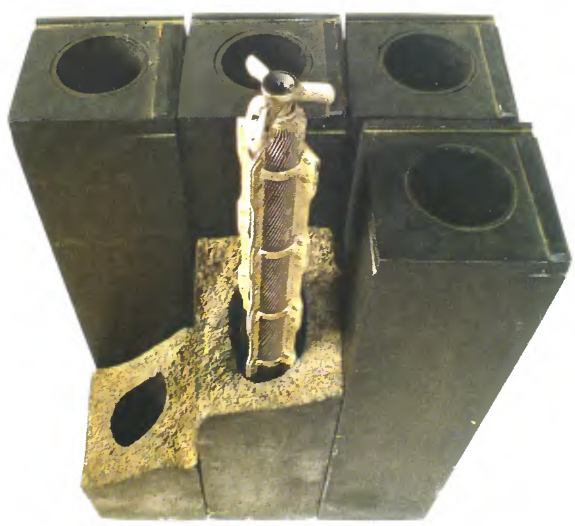
·FUEL·ELEMENTS·

Oldbury-on-Severn is known as a MAGNOX NUCLEAR POWER STATION, and the title *magnox* comes from the canister that containes the uranium metal. This is made from MAGnesium alloy that will Not OXidise in carbon dioxide, hence the name. The canister allows the heat generated to pass through it, but it keeps the uranium and fission products sealed inside, and also it prevents the gas from coming into contact with the uranium. As the elements are only very slightly radioactive before they are used, they can be handled safely. However, when each element is inspected to ensure that it is in perfect condition, gloves have to be worn as even a small amount of dust or perspiration could lead to some corrosion of the canister.

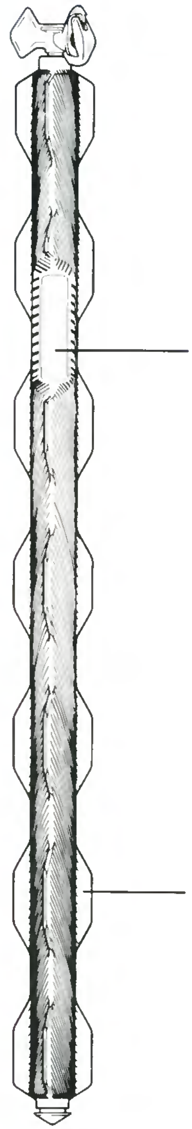
·DID·YOU·KNOW·?·

— Elements are sometimes called fuel rods.
— Each reactor contains 26,464 magnox fuel elements.
— The elements near the centre last for 4 or 5 years.
— Those near the outside last for about 11 years.
— Each element costs over £1,500 to purchase.
— The Uranium used is called "Natural Uranium" and is a mixture of Uranium 235 and Uranium 238.
— Each element contains 0.7% of Uranium 235 and 99.3% of Uranium 238.
— Uranium 235 is a very unstable atom and can be split using neutrons.
— Uranium 238 is not an unstable atom, and will not 'fission' in a nuclear reactor.
— Each element weighs 11 kilos.
— One fuel element is equivalent to 135 tonnes of coal!
— The fuel elements are finned to allow for better heat transfer.
— Each element is individually numbered when it is made.
— When the Uranium 235 has been used, it is called "spent".
— Only 0.4% of the total amount of the uranium metal is used.
— Two types of elements are used — the newer ones are slightly cheaper and a little stronger.
— the spring clip at the end of the element stops if from being spun round by the force of the pumped gas.

Graphite core section



Each fuel element is equivalent to 135 tonnes or 4 wagon loads of coal.

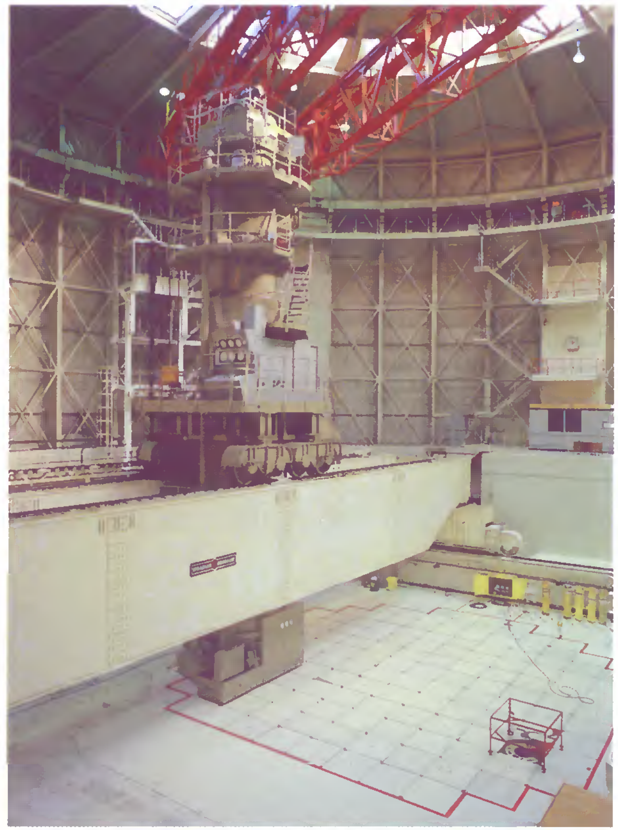


·CHARGE·MACHINE·

Uranium 235, the fissile part of uranium fuel, is slowly used up and has to be replaced with fresh fuel, this operation is carried out by using one of the two charge machines. These machines allow elements to be taken in and out of the core whilst the reactor is working at full power. The operation is carried out by making use of stand pipes which provide access through the concrete pressure vessel.

The refuelling process requires two of the pile cap floor slabs to be removed using the overhead crane. A chute head box, which is a joining section, is placed into position in order to couple the charge machine with one of the stand-pipes above the reactor. The charge machine weighs 465 tonnes as it is shielded with concrete and steel to provide protection against the radiation emitted by the spent fuel elements.

A cable with a grab on the end goes down through the standpipe and into a fuel channel. Each of the 8 elements in the channel is taken out one at a time, before 8 new ones



The charge machine permits refuelling whilst the reactor is at full power.

Two of the 1½ tonne floor slabs are lifted away.

are put in. The charge machine is designed to allow replacement of elements from 32 different channels without needing to constantly re-adjust its position. After replacing 40 elements, the machine travels back along the gantry into the centre of the reactor building where the elements are discharged into a water filled chute which carries them to the cooling ponds.

The Chute head box is lowered into place.

After the charge machine is positioned, refuelling begins.

·COOLING·PONDS·

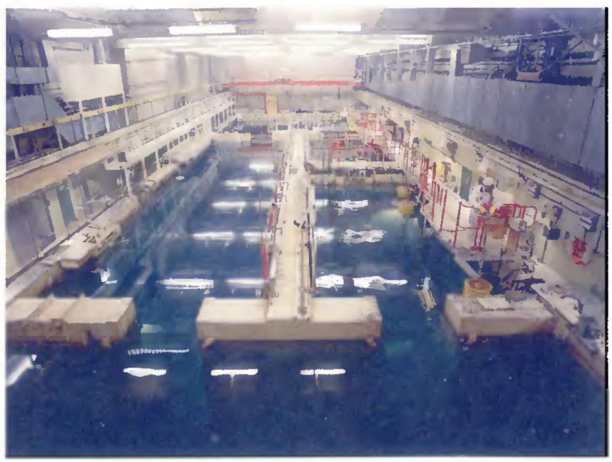
The spent elements enter the cooling pond individually from the chute, and are transferred to a skip by the use of long handled manipulating tongs. Each skip is loaded with 120 elements before being moved to a storage section.

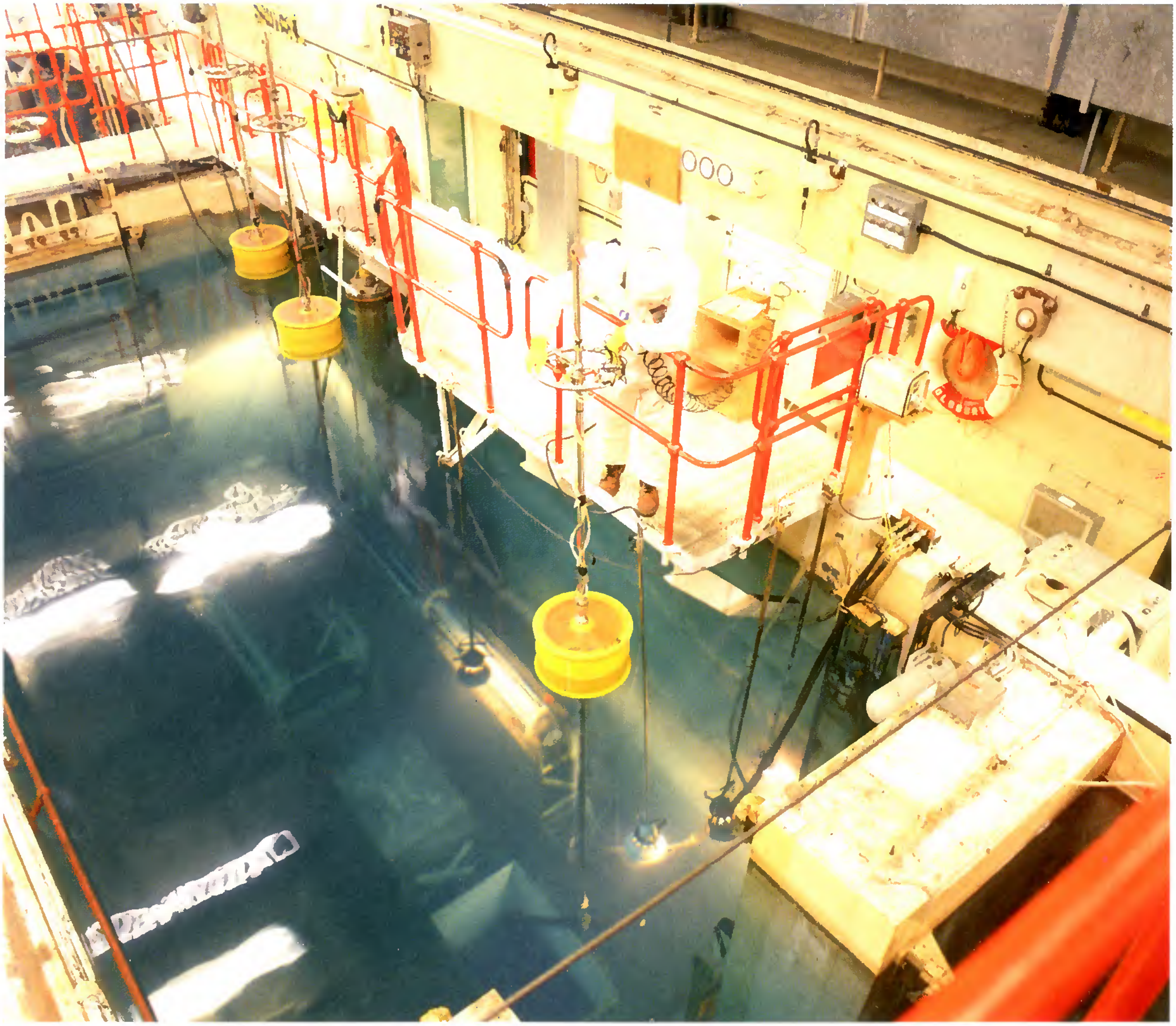
The fuel elements are very hot and also highly radioactive when they are removed from the reactor core, and they are therefore stored for a minimum of 90 days which allows the heat to dissipate and some of the radioactivity to decay away.

The pond water is about 7 metres deep which provides a wide safety margin over the 3 metres required to act as a barrier to this level of radiation. The water is filtered and cooled to about 10 degrees Celsius to limit the build up of dirt and contamination.

The water is 7 m deep.

Tongs are used to place the elements into a skip.





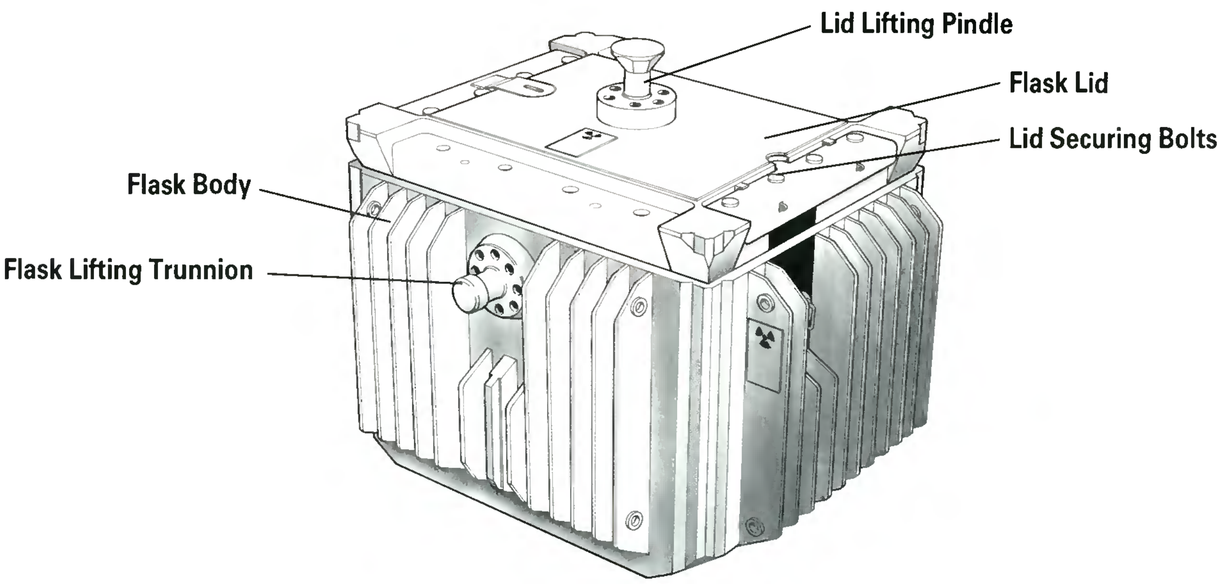
·FLASK·

Despite 90 days cooling, the spent fuel elements are still highly radioactive. They are therefore transported to Sellafield in thick walled steel containers weighing over 49 tonnes which are manufactured from a single piece of forged steel. The flask is designed to withstand tests involving a 9 metre drop onto solid concrete, and exposure to a 30 minute fire burning at 800 degrees Celsius.

The flask, which is loaded underwater, transports a single skip containing 225 elements. The lid is fixed on, retaining 1,000 litres of the pond water inside, thus keeping the skip fully immersed in water. The flask is next slowly lifted out of the pond whilst being constantly checked for radiation. When it is fully raised, the flask is sprayed to wash off residual pond water. Next, it is transferred into the decontamination bay where it is scrubbed clean, and the lid is fully tightened down. Finally, the flask is checked thoroughly once more to ensure that it is completely clean and safe to be transported.

The flask is placed onto a low loader lorry, and is transported to Berkeley Railhead where after further monitoring, it is loaded onto a special train for transport to Sellafield.

FUEL TRANSPORT FLASK



In a demonstration to show the strength of the fuel flask, a television audience of millions saw a diesel train travelling at 100 m.p.h. crash into a flask. The diesel locomotive was destroyed, but the flask was unscathed.

·MANAGEMENT·OF·RADIOACTIVE·WASTE·

The spent fuel elements are taken to the Sellafield reprocessing factory in Cumbria, where the unused uranium and plutonium metal (which is a by-product of fission) are recovered for future use. During this process, the waste products of fission are separated out producing highly radioactive waste. The process involves opening the magnox cannisters, dissolving the uranium bar in acid and chemically treating the resulting solution. Three different categories of waste arise from the reprocessing operations. These are low level, intermediate level, and high level. A specific method of treatment has been devised for each.

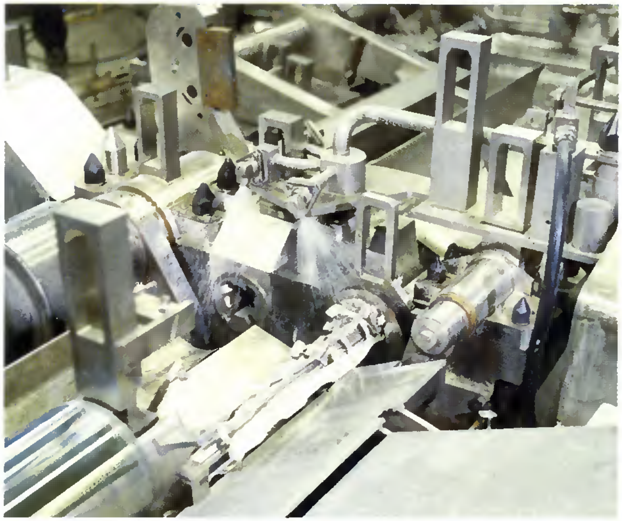
·LOW·LEVEL·

A government licence has been granted to allow the controlled discharge of low level liquid wastes to the sea after treatment. Solids which are made up mainly of laboratory equipment, protective clothing and miscellaneous rubbish, are disposed of at a specially selected fenced site at Drigg near Sellafield. The waste is put into drums, placed in trenches, and covered by at least one metre of soil. The site is constantly monitored which has confirmed that the radiological significance of the disposal is insignificant. Monitoring will continue until the regulatory authorities deem the site to be safe for unrestricted use.

·INTERMEDIATE·LEVEL·

This waste includes part of the dismantled fuel elements and other radioactive materials. At present this material is stored in special silos at Sellafield and all nuclear stations,

Spent elements are taken to Sellafield by rail.



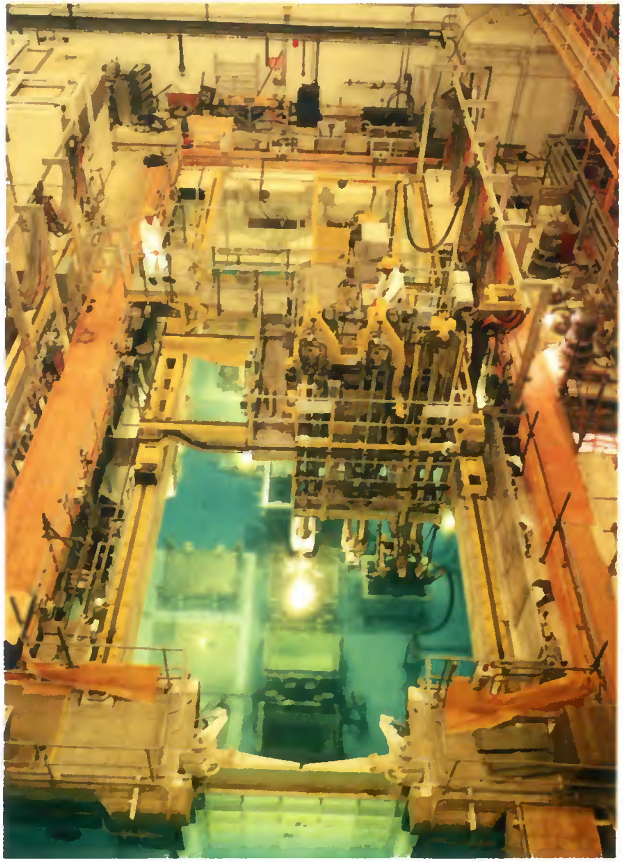
Decanning of the Magnox fuel at Sellafield.

although ultimately it will be encapsulated into solid blocks of cement which can be safely stored until permanent deep burial repositories are developed.

·HIGH·LEVEL·

This waste is at present stored in liquid form in high integrity stainless steel tanks at Sellafield. The fission produced decay heat is removed by a system of cooling coils. Although this method has been used safely at Sellafield for the past thirty years, it is clear that there are advantages in storing this waste as a solid. Therefore, a vitrification plant which will incorporate the waste into glass blocks is currently under construction at Sellafield. It is envisaged that the glass blocks will be contained within stainless steel canisters and encased in concrete. These will be held in an air-cooled store for 50 years, by which time its heat generation will have reduced, therefore simplifying disposal.

A skip wash bay in the Sellafield fuel Handling Plant.



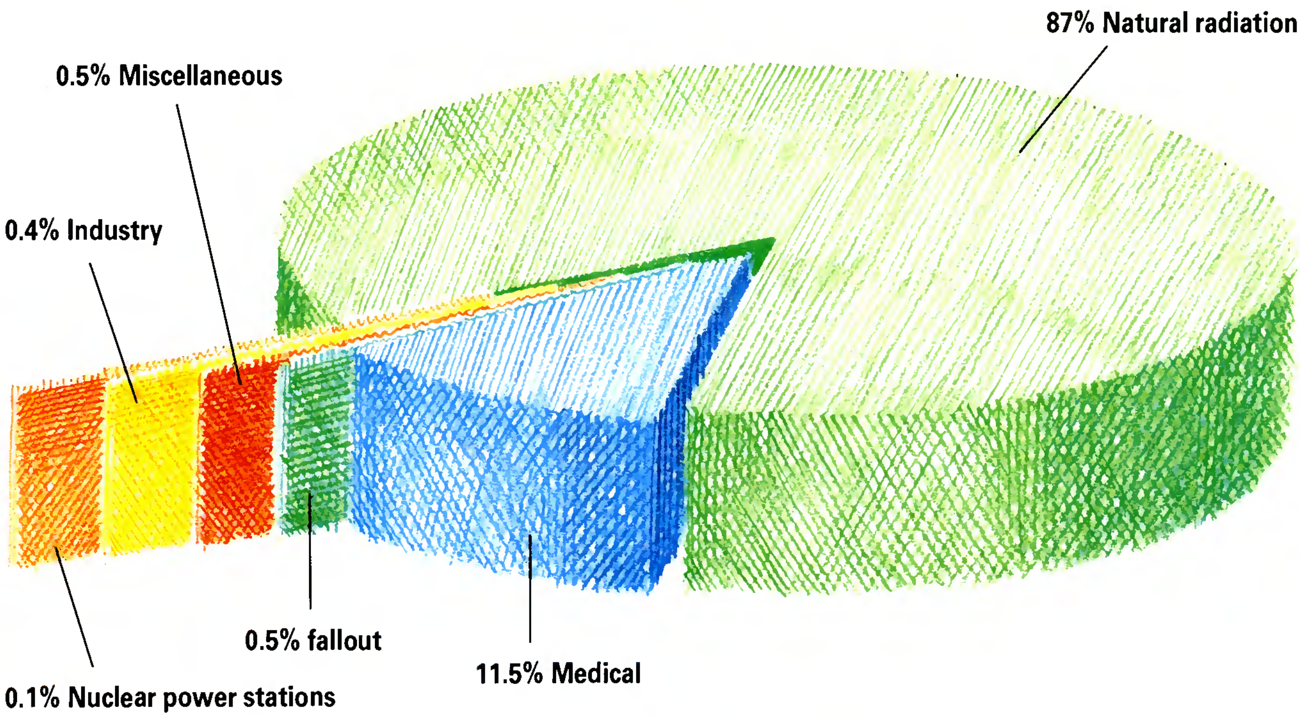
·RADIATION·

At Oldbury, the process of nuclear fission changes the atoms in the uranium metal, and as this happens both heat and radiation energy are produced. However, people living near the power station receive little or no radiation exposure from this process.

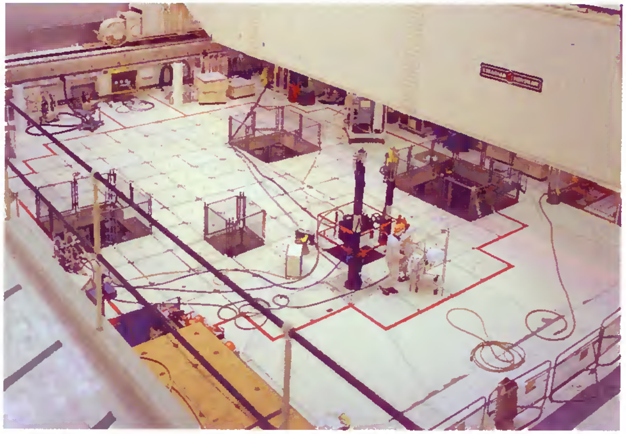
The public's main source of radiation exposure is from natural radioactivity which has always been present. This natural radiation is present in a number of forms. Firstly, many rocks — notably granite — are slightly radioactive, and there is also a tiny amount of uranium in some soils. Secondly, we receive some natural radiation from outer space, and from the thermo-nuclear reaction of the sun.

A lesser form of public radiation exposure is artificial radiation, which is produced in many ways other than by nuclear fission. In fact only one part in one thousand of the total radiation present in the United Kingdom is derived from the nuclear power industry. The best kown source of artificial radiation is x-ray equipment used in hospitals.

AVERAGE RADIATION EXPOSURE TO A PERSON IN THE U.K.



·NUCLEAR·SAFETY·



Every two years the reactor is shut down and an internal examination is carried out.

Safety standards within the nuclear industry are rigourously maintained through stringent laws and regulations. These are determined by central government and enforced through the Nuclear Installations Inspectorate of the Health and Safety Executive.

Nuclear power stations are designed and operated to the highest possible safety standards. Thus, since the first UK commercial nuclear power stations began generating electricity in 1962, there have been no accidents involving any UK reactors that have given rise to any danger to the public.

The main safety criterion is achieved at the design stage. Oldbury, like all other nuclear power stations, was constructed only after the most detailed consideration was given to its design by many safety authorities. All suppliers of nuclear plant have their working practices assessed by specialists before contracts are placed. At each stage of development and construction, all aspects of the building of the station remain under the scrutiny of the Nuclear Installations Inspectorate (NII), who carry out their own inspections as well as witnessing installation tests. No changes of any sort are allowed to be made to the reactors, nor can any of the equipment to do with safety be altered in any way without the approval of the NII.

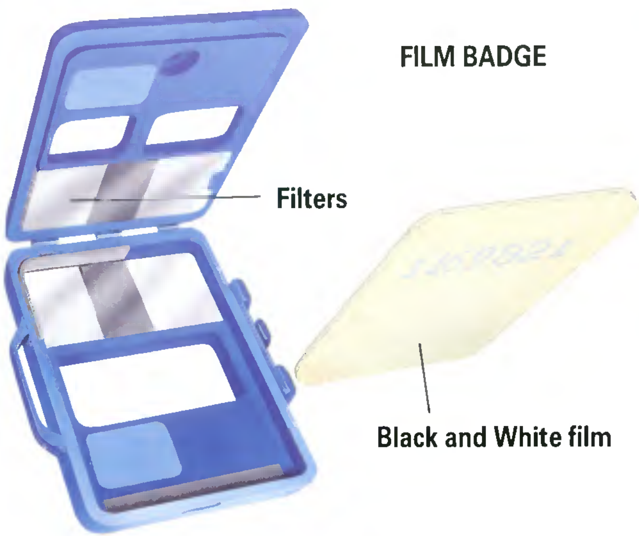
Operating standards are such that all senior technical staff go through a rigorous training schedule before being permitted to operate the reactor. The Nuclear Installations Inspectorate vet the qualifications, experience and training of key personnel in the station. The Nuclear Training Centre which is sited immediately next to the power station, provides regular courses in such subjects as nuclear safety, operations, maintenance, chemistry, health and reactor physics.

Furthermore, a reactor is licensed to operate only for a period of two years. After that it has to be shut down completely and meticulous internal inspections and maintenance checks carried out. This takes about 10 weeks, and only when it is completed to the satisfaction of the NII will a licence to operate be given for a period of a further two years.

·PERSONAL·PROTECTION·

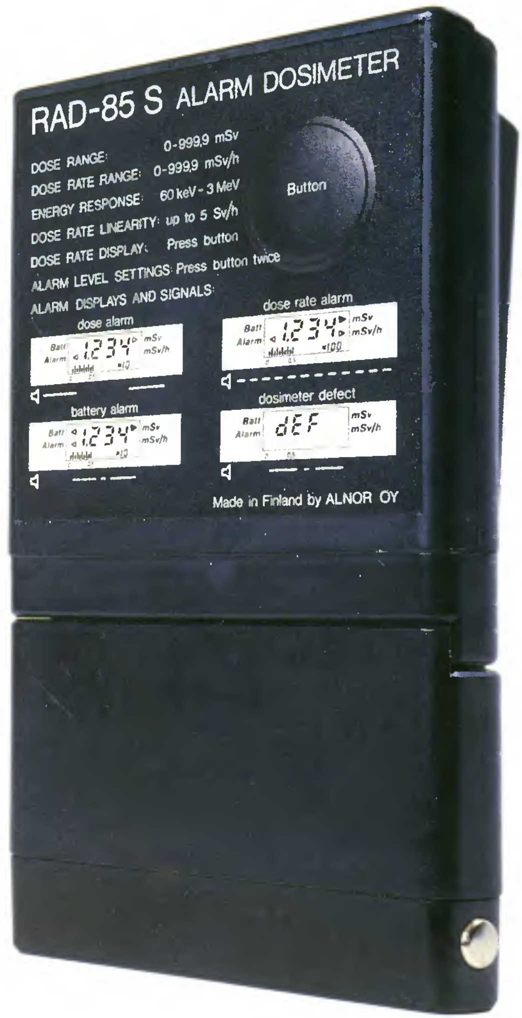
People who work regularly with radiation have to wear a personal radiation dosemeter, usually a film badge. These include radiologists, gas pipe welding inspectors, civil aircraft engine checkers and many others. At Oldbury, each person who works in the reactor buildings has their own badge. Inside, there is a small piece of black and white film which is developed each month. The shade of the film determines any radiation that may have been received by the wearer.

More sophisticated electronic battery driven personal dosemeters are now available. One of the latest is known as the Rad 85 which shows radiation levels at a glance and will automatically emit an alarm if a preset limit is exceeded. The entire working environment is constantly monitored and when workers leave the plant they must monitor themselves and their clothing.



Every person must pass through a whole body monitor before leaving the reactor building.

THE RAD 85



Equipment and plant is regularly checked for contamination.

·ENVIRONMENTAL·MONITORING·

Systematic radiation surveys up to a radius of 20 miles from the station are maintained through the collection of over 3,000 measurements and samples per year. Information is collected by station Health Physics staff who monitor any possible changes in radiation within the survey region. Samples taken from the river include fish, seaweed, silt and water; other samples are gathered from grasses, soil, milk and a variety of produce from a number of local farms. Finally, by using a Deposition Collector (Tacky Shade) which can pick up impurities in the air, any airborne radioactivity can be detected.

The samples are analysed at a nearby laboratory and the results are sent to a number of Government departments including the Ministry of Agriculture, Fisheries and Food and the Department of the Environment. These organisations carry out independent monitoring to confirm the results which demonstrate that readings taken close to the station are no higher than those taken from further away.

Discussing a map showing the environmental monitoring posts.

This tacky shade is in the Oldbury station car park.

...of grass, soil and vegetation from nearby...

Different samples are taken of mud and seaweed from the river;...

...they are analysed in the laboratory.

·CONTROL·ROOM·

The Central Control Room contains all the controls, indicators and displays that are required to enable the operators to start up, run, and shut down the whole power station.

The room is divided into two identical halves, each associated with its own reactor/turbine unit.

The reactor operator monitors and controls all the essential parameters of the station plant from the reactor control desk. He is assisted in this task by powerful computer systems that check the condition of all the machinery and equipment on the station. If an abnormal condition arises, it is detected by a computer which informs the operator on one of the displays located immediately in front of him. A chime also sounds to alert the operator to the situation so that remedial action can be taken in order to restore the plant to normal as soon as possible.

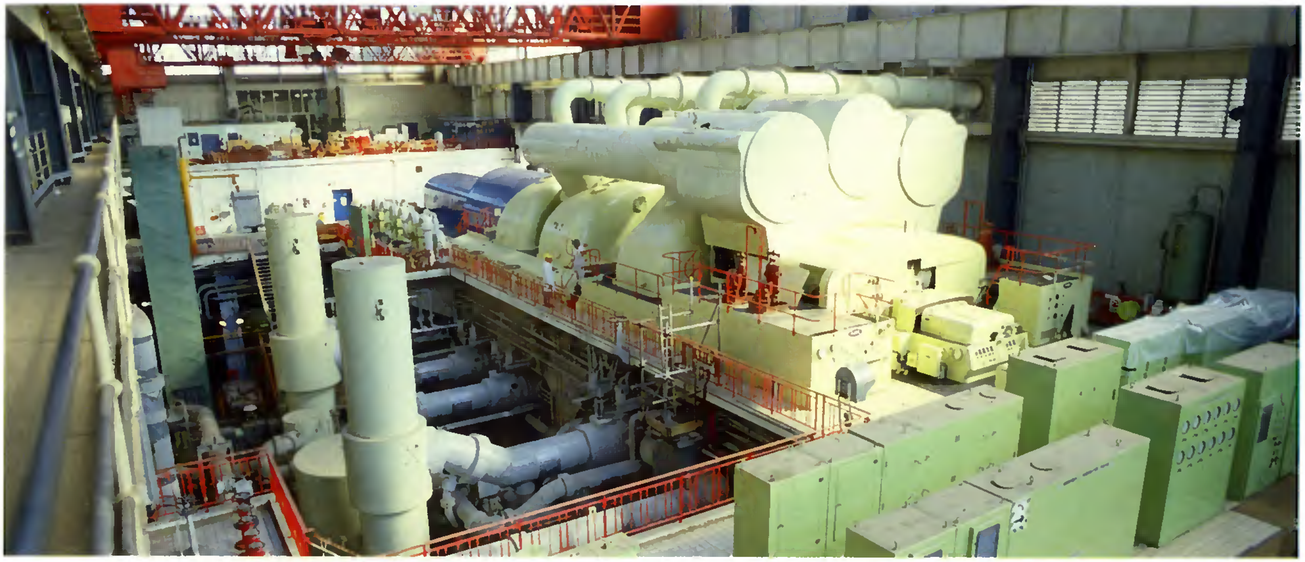
Most of the station's operational systems are controlled automatically in order to ensure maximum efficiency whilst maintaining stringent safety standards. The only event that is fully automatic, and therefore beyond the control of any operator, is for the reactor to shut down if any of the safety devices detect an abnormal condition. Should the reactor be required to shut down under these circumstances, this will be achieved in six seconds by releasing the control rods to fall under gravity into the reactor core thereby absorbing the free neutrons and stopping the chain reaction. However, it can take as long as 48 hours to return to full power following a shut down, as extensive safety checks are implemented during progress back to the desired output.

·TURBINE·HALL·

There are two turbines, one working with each reactor. They are powered by the superheated steam which is carried into the Turbine Hall under the road from the reactor building.

Inside the main turbine, the steam strikes blades up to 2 metres long which spin the shaft at 1,500 revolutions per minute to drive the generator which produces the electricity at 16,500 volts. The electricity is transformed up to 132,000 volts for transmission down the grid lines. Once the steam has driven the turbines, it passes down underneath to condensers where it is condensed using river water for subsequent re-use in the reactor boilers.

The inlet for station cooling water supply.



·LOCAL·LIAISON·

A liaison group was established as long ago as the late 1950's in order to keep people living in local communities fully informed of the activities of the three nuclear sites of Berkeley Power Station, Oldbury Power Station and the Berkeley Nuclear Laboratories. Regular meetings occur in turn at each of the sites to consider nuclear issues and other matters relating to the running of the three establishments.

Members and officers representing all the local District Councils and the County Councils of Avon, Gloucester and Gwent attend the meetings along with representatives from Health Districts, Fire Service, Police, Water Authorities, Nuclear Installations Inspectorate, Department of the Environment, Ministry of Agriculture Fisheries and Food, the Welsh Office and senior power station staff.

At the meetings, the managers of the three sites provide a detailed report on the operation of their plant since the last meeting, and results of environmental monitoring are reported. The managers answer questions which could cover any aspect of the operation of their respective

All nuclear power station's Emergency Plans and Station Handbooks are available to the public.

establishments and their relationship with the local community. In order to keep the public fully informed, minutes are distributed to local libraries and representatives of the press attend the meeting.

An important aspect of this work is the provision of information regarding the operation of the station's emergency plan, which in accordance with statutory requirements specifies the precise action to be followed by station staff and other organisations in the event of an emergency. Power station staff receive regular training in emergency procedures, and the emergency plan routines are tested annually by a full exercise. This is scrutinised and monitored by the Nuclear Installations Inspectorate, and the results of this exercise are reported to the meeting at which copies of the emergency plan and handbook are distributed.

All nuclear power stations co-operate with local authorities and emergency services in the preparation of their own emergency procedures, and joint training exercises are carried out.

·GLOSSARY·

Atom
The smallest unit of an **element** that retains the characteristics of that element, and cannot be decomposed by chemical means.

Canister
The magnesium alloy container in which **uranium** fuel is sealed to prevent contact with coolant gas or the escape of radioactive fission products. The canister is finned to increase the rate of heat transfer.

Chain reaction
A self sustaining process in which, in the chain reaction of nuclear **fission, neutrons** cause nuclear fission in uranium atoms producing more neutrons, which cause further fission and so on.

Control rod
A neutron-absorbing boron steel rod which is moved in or out of the **reactor core** to control the number of neutrons available for fission, and hence the power level of the reactor.

Core
The central region of a nuclear reactor containing the fuel elements where the chain reaction of nuclear fission is carried on.

Electron
One of the fundamental constituent particles (see **proton, neutron**) of an atom, around whose **nucle**i they revolve in orbits. It carries a single unit of negative electric charge.

Energy, radiation
Energy in the process of transmission as electromagnetic waves or particles: all the ways in which an atom gives off energy.

Fission
The process in which an atomic nucleus is split into two approximately equal fragments, accompanied by the emission of a number of neutrons and the release of a large amount of energy.

Moderator
The material used in the **reactor** core to reduce the speed and thus energy of the **neutrons** produced as a result of **fission**. In the case of Oldbury, the moderator is graphite.

Nucleus
The core of an **atom**, composed of **protons** and **neutrons**, occupying little of the volume, containing most of the mass, and bearing positive electric charge.

Plutonium
A metallic element, produced by the absorption of neutrons by the Uranium 238 component of the natural uranium fuel. Some forms of plutonium will undergo fission themselves and may therefore be used as fuel in a nuclear reactor.

Proton
One of the fundamental constituent particles (see **electron, neutron**) of an atom, having the same mass as a **neutron**, having positive electric charge.

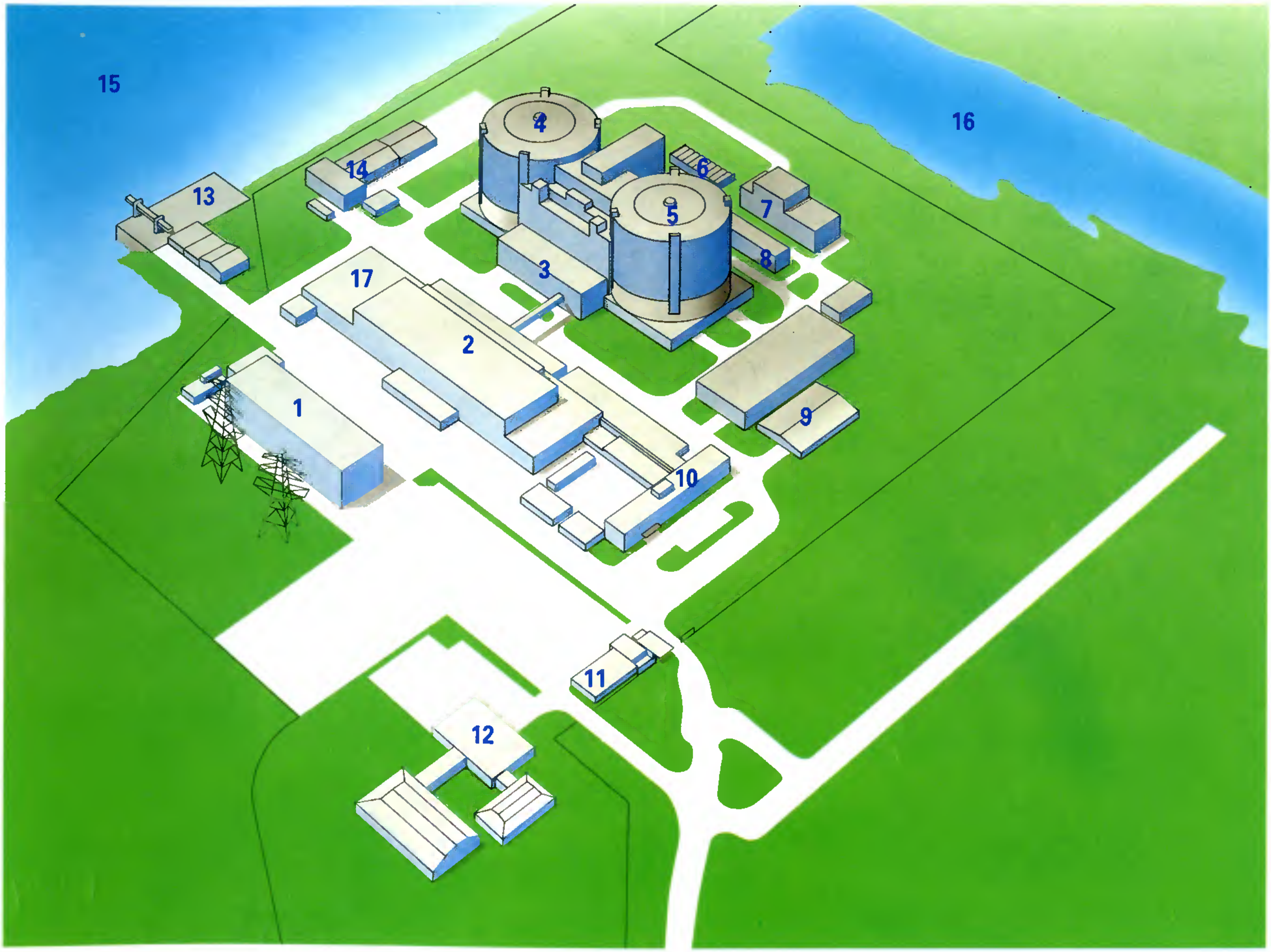
Reactor
A structure, or part of a plant in which a neutron-induced chain reaction of nuclear fission can be maintained, controlled, and used.

Stand pipe
A pipe which provides access through the concrete pressure vessel to the reactor core for **control rods** and the refuelling process.

Uranium, natural
A metallic element (symbol U) malleable and white in colour, and mined as an ore. One of the few natural elements whose atoms will sustain a fission chain reaction easily, and is therefore used as the fuel to produce nuclear energy.

·SITE·PLAN·

1. 132 kV Switchgear
2. Turbine Hall
3. Control Block
4. Reactor 1
5. Reactor 2
6. Carbon Dioxide Storage Tanks
7. Pond Water Treatment Plant
8. Active Waste Store
9. Workshops
10. Administration Block
11. Visitors Reception
12. The Nuclear Power Training Centre
13. Cooling Water Inlet
14. Stores and Workshops
15. River Severn
16. Silt Lagoons
17. Water Treatment Plant



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Joined CEGB at BNL on 3 January 1972, Retired 7 May 2007
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The responsibility for generation and transmission of power for England and Wales rests at present with the Central Electricity Generating Board, a public utility. If legislation going through Parliament at the time this publication was printed is approved, the CEGB will move into the private sector as two competing generating companies and a transmission company. The two generating companies will be called National Power Company and The Power Generation Company (PowerGen) and the transmission company will be called The National Grid Company.

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