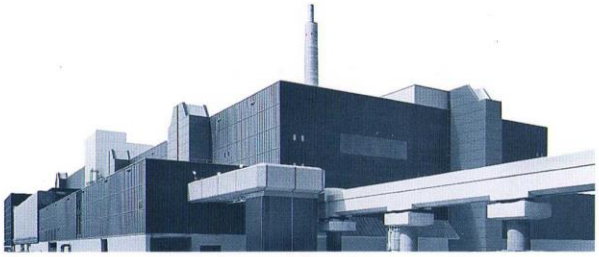
THORP

THE FACTS



THE FACTS ON THE WORLD'S MOST ADVANCED NUCLEAR RECYCLING FACILITY

THORP, the new Thermal Oxide Reprocessing Plant which has been built by British Nuclear Fuels at Sellafield in West Cumbria, is a unique facility for recycling used nuclear fuel into new nuclear fuel.

To understand why THORP is necessary, THORP itself must first be understood – what it is, what it will do and what it will mean for us all.

This information pack has been produced to give you the facts about THORP. If, however, you have any questions which are not answered here, please refer to the back of this folder.

THORP. WHAT IT IS AND WHAT IT WILL DO.

THORP
THE FACTS

FACT THORP will recycle used nuclear fuel into new nuclear fuel. In fact 97% of all the used fuel sent to THORP can be reclaimed and sent back to power stations to contribute to the sustained generation of clean electricity.

FACT Only 3% of the used fuel sent to THORP is waste, and all contracts signed with overseas utilities since 1976 give BNFL the right to return the waste arising from recycling operations to its country of origin.

FACT Without THORP the UK would have no proven long-term means for disposing of used fuel from either Advanced Gas-cooled Reactors or Water-cooled Reactors.

FACT The plutonium which THORP reclaims from used fuel can now be utilised in the making of highly efficient Mixed Oxide (MOX) fuel. BNFL is a leader in MOX technology and already has an order from Switzerland for MOX fuel.

THORP. WHAT IT IS AND WHAT IT WILL DO.

THORP THE FACTS

The Thermal Oxide Reprocessing Plant, or THORP for short, is a nuclear fuel recycling facility which has been constructed by British Nuclear Fuels plc (BNFL) at its Sellafield site in West Cumbria.

The recycling of used nuclear fuel from the older Magnox type of reactors has been taking place at Sellafield for more than 30 years. This has ensured that rather than being wasted, the fuel has been re-used to generate more electricity.

And now, with the completion of THORP, it is possible to do precisely the same with fuel from the modern Advanced Gas-cooled Reactors and Water-cooled Reactors in Britain and overseas.

All of the processes necessary for the recycling of such fuel have been combined within THORP's 500 metres-long structure. This means that used fuel can be received at one end of the building and separated uranium and plutonium can be supplied at the other.

Inside, THORP is divided into three distinct areas of operation, known as Receipt and Storage, Head End and Chemical Separation. The first of these, Receipt and Storage, is where used fuel is taken once it has arrived at Sellafield. Here the fuel, contained in special flasks, is cooled in water for between 3 and 5 years to allow short-lived radioactivity to naturally decay.

After this period the fuel is transferred to the Head End section of the plant, where it is chopped into small pieces. The chopped fuel then travels down a chute and into a basket suspended in nitric acid. This acid dissolves the fuel but leaves behind the undissolved residues, consisting mainly of fuel cladding, which are then removed and stored as waste.

The dissolved fuel is transferred to Chemical Separation, where a series of physical and chemical processes separate the uranium and plutonium from the remaining waste. The uranium and plutonium can then be purified and converted to solid form, ready for re-use as recycled fuel.

From the total amount of used nuclear fuel which enters THORP, 96% can be reclaimed in this way as re-usable uranium, 1% can be reclaimed as re-usable plutonium and 3% is waste.

As THORP has been designed to be fully integrated with Sellafield's waste management facilities, such waste can then be transferred to the appropriate plants for safe treatment and storage, after which waste from most foreign fuel can finally be returned to the country from which it originally came.

THORP has been created to optimise the energy potential of uranium and to reclaim plutonium, which can be converted into highly efficient Mixed Oxide (MOX) fuel by mixing it with uranium. Ultimately, therefore, it will help to ensure the generation of clean electricity for decades to come.

THORP. THE BENEFITS.

THORP
THE FACTS

FACT **Even assuming the worst possible commercial scenario THORP will make a profit of at least £500 million during its first 10 years of operation.**

FACT **THORP has secured advance orders worth £9,000 million, over half of which are from overseas customers and is expected to attract at least a further £2,500 million in foreign earnings.**

FACT **THORP has already made BNFL one of Britain's biggest earners of Japanese yen.**

FACT **THORP currently employs 2,500 people and will provide long-term jobs for 1,200 workers for between 10 and 25 years.**

THORP will deliver major benefits on two different fronts – the economy and employment.

THE ECONOMY

The construction of THORP has cost £1,850 million, around 90% of which was spent in the United Kingdom, securing business and employment for a great many British companies and their employees.

And now that THORP is completed, Britain has a world technological lead in what is a key area of future energy use, a fact reflected in the £9 billion of advance orders that have already been placed for its services and which cover the first 15 years of the plant's capacity.

Especially in today's economic climate, it is encouraging to know that with 68% of these orders coming from overseas customers, THORP will be making a substantial contribution to the nation's balance of payments in the same way as the export of banking or financial services.

Indeed, THORP's largest exports will be to countries where the UK has balance of trade deficits, namely Germany and Japan, and the plant has already made BNFL one of Britain's biggest earners of Japanese yen.

At worst, THORP is expected to make a profit of £500 million in the first 10 years of its operations, benefiting West Cumbria, all the companies which service the plant and Britain as a whole.

EMPLOYMENT

BNFL is currently West Cumbria's largest single employer, with more than 7,900 people directly employed by the Company at its Sellafield site. At the peak of construction, THORP alone was responsible for the direct employment of 5,000 workers and sustained 10,000 jobs throughout the UK.

Today THORP employs 2,500 people and will keep over 1,200 local workers in jobs for at least 10 years, and possibly up to 25 years.

Over that same period THORP will also require the services of a great many suppliers, both local and from across Britain.

The region of West Cumbria in which THORP is situated is currently seeking Assisted Area Status because of concerns over employment. Clearly, therefore, the plant is vital to the future of the local community.

THORP. WHAT IT WILL MEAN FOR THE ENVIRONMENT.

THORP
THE FACTS

FACT New authorisations proposed by the Department of the Environment for Sellafield will be more restrictive, not less.

FACT The new authorisations will mean that after THORP comes into operation the radiation dose limit for those living near Sellafield will be lower, not higher than before.

FACT Doses to the public from Krypton 85 gas from THORP will be 30 times lower than those originally considered at the 1977 Public Inquiry, equivalent each year to one thousandth of the dose received from natural background radiation.

FACT The annual effect of Krypton 85 on those people living closest to Sellafield will be the same as eating a small pack of Brazil nuts once a year, or spending one hour a year in Cornwall, or drinking a glass of mineral water every day for a year.

FACT Leading independent scientists have confirmed that Krypton 85 does not enter the food chain or affect the climate.

FACT Two parliamentary debates and a full 100-day Public Inquiry have all concluded that THORP should go ahead.

FACT Recycling by THORP is the safest possible long-term means of dealing with used nuclear fuel, the only other option being dry storage which is only a temporary measure before either reprocessing or direct disposal are required.

FACT As well as THORP, BNFL is also commissioning major new plant which will greatly enhance the overall environmental performance of the entire Sellafield site.

THORP. WHAT IT WILL MEAN FOR THE ENVIRONMENT.

THORP THE FACTS

Since plans for THORP were first announced in 1974, two parliamentary debates and a full 100-day Public Inquiry have been held to determine whether the plant would be safe for BNFL employees, local people and the environment. All concluded that it would be safe and therefore gave approval for its construction and operation.

In the meantime, technology has been developed which will ensure that THORP's environmental performance will be even better than was anticipated 15 years ago.

For example, estimated doses to the public of Krypton 85, a gas which THORP will release into the air, are expected to be 30 times less than those originally considered in 1977.

Even for those who live closest to Sellafield, the annual radiological effect of THORP Krypton 85 will be approximately the same as that from eating a small pack of Brazil nuts once a year, or spending one hour a year in Cornwall, or drinking a glass of mineral water every day for a year. It will, in other words, be equivalent to one thousandth of the average annual dose which each of us receives from natural background radiation.

Furthermore, because Krypton 85 is an inert gas it cannot enter the food chain nor, as independent scientific opinion supports, will it have any effect on the climate.

With the commissioning of THORP and related clean-up plant, some discharges from the Sellafield site will increase while others will decrease. This requires BNFL to seek a change in the annual Sellafield discharge authorisations from the Department of the Environment. The average overall radiation dose limit to the general public will actually be lower, not higher than before and the discharge authorisations more restrictive.

This will be due to facilities like the Enhanced Actinide Removal Plant (EARP) and the Site Ion Exchange Effluent Plant (SIXEP), which have been designed to improve the environmental performance of Sellafield as a whole by reducing discharges of radiation into the Irish Sea.

But perhaps the most important environmental aspect of THORP will be its ability to conserve the Earth's natural uranium deposits, extending their energy potential from around 200 to as much as 1,000 years.

This will have the effect of reducing environmental pollution caused by uranium mining and milling, as well as ensuring that nuclear power stations, which generate electricity far more cleanly than most other types, have the capability to continue producing energy for centuries to come.

Recycling by THORP is also environmentally preferable to the only alternative means of managing used fuel. This, the storing of all used nuclear fuel as waste, would result in its reclaimable uranium and plutonium going unused and the need for either direct disposal or reprocessing 50 years later. In either case it is possible that by then the fuel may have deteriorated and become difficult to handle.

The original 1977 Public Inquiry which approved the building of THORP did consider the possibility of storage, but concluded that it was 'not in the best interests of ourselves or future generations.'

So whilst creating new fuel from old, THORP will enable the safe management of high-level radioactive waste. This it does by separating the waste from the re-usable materials, after which the waste can then be concentrated to a third of its original volume and converted into solid form for safe storage.

Far from being a threat to the public or the environment, the safe and highly efficient recycling of used nuclear fuel by THORP will have many major benefits.

THORP. WHAT HAPPENS TO THE PLUTONIUM IT RECLAIMS.

THORP THE FACTS

FACT **The plutonium which THORP reclaims during recycling can be put to peaceful, civil uses and cannot be converted into weapons-grade material without substantial expertise and equipment.**

FACT **Plutonium is ten times less toxic than many ingredients found in herbicides and pesticides.**

FACT **The plutonium which THORP reclaims from used fuel can be utilised in the making of highly efficient Mixed Oxide (MOX) fuel.**

FACT **BNFL has 30 years experience of handling plutonium and is a world leader in MOX technology. A new plant at Sellafield will soon produce MOX fuel and orders have already been placed by a utility in Switzerland.**

As part of its recycling process, THORP will reclaim relatively small amounts of plutonium from used nuclear fuel.

This it will do in a form suitable for peaceful, civil commercial uses. The plutonium from THORP cannot be converted to weapons-grade material without substantial technical expertise and equipment. Plutonium is not highly radioactive and is in fact ten times less toxic than, for instance, lead arsenate, which is widely used as an ingredient in herbicides and pesticides.

In fact the technology now exists to take plutonium not only from THORP but also from dismantled nuclear weapons, and mix it with uranium to make highly efficient Mixed Oxide (MOX) fuel.

BNFL, which has 30 years experience of handling plutonium, is currently a world leader in MOX technology. It has recently established a new joint venture company, called Intermox, which will produce MOX fuel at Sellafield and already has an order for the fuel from Switzerland.

With the development of MOX fuel, BNFL will be able to offer a long-term solution to used fuel management by recycling the uranium and greatly reducing the high-level waste to be disposed of, whilst also recycling the plutonium in a form suitable only for civil use.

Plutonium from THORP, therefore, poses no threat to world peace, it cannot be extracted from MOX fuel without complete reprocessing and it actually provides additional possibilities of export sales which would be of further benefit to Britain's balance of payments.

BNFL

For answers to any
questions you may have on
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