



10 DOWNING STREET

From the Private Secretary

29 October 1985

I have now received further briefing material from BNFL for the visit on Friday.

MARK ADDISON

Sir Robin Nicholson,
Cabinet Office.

British Nuclear Fuels plc

Head Office: Risley Warrington Cheshire WA3 6AS
Telephone: Padgate (0925) 832000 Telex: 627581
Direct Dial (0925) 83 5004

Your ref:

Our ref:

Ext: 5004

Mr M Addison
Private Secretary
10 Downing Street
LONDON SW1

28 October 1985

Dear *Mr Addison*

Please find enclosed further briefing material for the coming visit to BNFL sites. This brief relates closely to the visit programme and provides an outline of the work carried out in each of the plants to be visited. I trust it will be of some interest and, perhaps, useful on the day.

The enclosed information has also been sent to Mr E Huke of the Department of Energy.

Yours sincerely

R L Pilling

R L PILLING
Production Director

Copy: Mr E Huke



BNFL

British Nuclear Fuels plc

**BRIEFING
NOTES FOR
VISIT TO
BNFL SITES ON
1st NOVEMBER
1985**

CONTENTS

Summary

CAPENHURST

Map

Aerial photograph

Centrifuge Assembly Plant

Enrichment Plant – E22

SPRINGFIELDS

Map

Aerial photograph

AGR Fuel Canning and Assembly Plant

Magnox Fuel Canning and Assembly Plant

Apprentice Training Centre

SELLAFIELD

Map

Aerial photograph

Exhibition and Training Centres

Fuel Handling Plant

Site Ion Exchange Effluent Plant

SUMMARY

The Company was formed in 1971, when it was created out of the former Production Group of the UKAEA. It became a public limited company in 1984.

Company turnover has shown a steady growth since 1971 to reach a total of almost £550M in 1985, with sales per employee increasing by a factor of about 5 over this period. Before-tax profits over the period have increased by a factor of 11 to a level of £68M in 1985. Export sales have shown good growth during the 1980s and now represent some 23% of all sales.

Capital expenditure in 1985 reached some £360M and the total projected spend over the next ten years is some £3700M.

The Company's main areas of business are in the provision of nuclear fuel cycle services. In addition it generates electricity from its Calder Hall and Chapelcross nuclear power stations. It also carries out work for the MOD.

The Company is structured into four main Divisions, reflecting the main nuclear fuel cycle processes:

Fuel Division

Processes uranium ore through to the production of fuel elements, excluding the enrichment step.

Enrichment Division

Provides uranium enrichment capability plus manufacture of equipment for the enrichment process.

Reprocessing Operations Division

Processes irradiated fuel to extract the unused uranium and the plutonium formed. Provides waste handling facilities. Operates the Calder Hall and Chapelcross reactors.

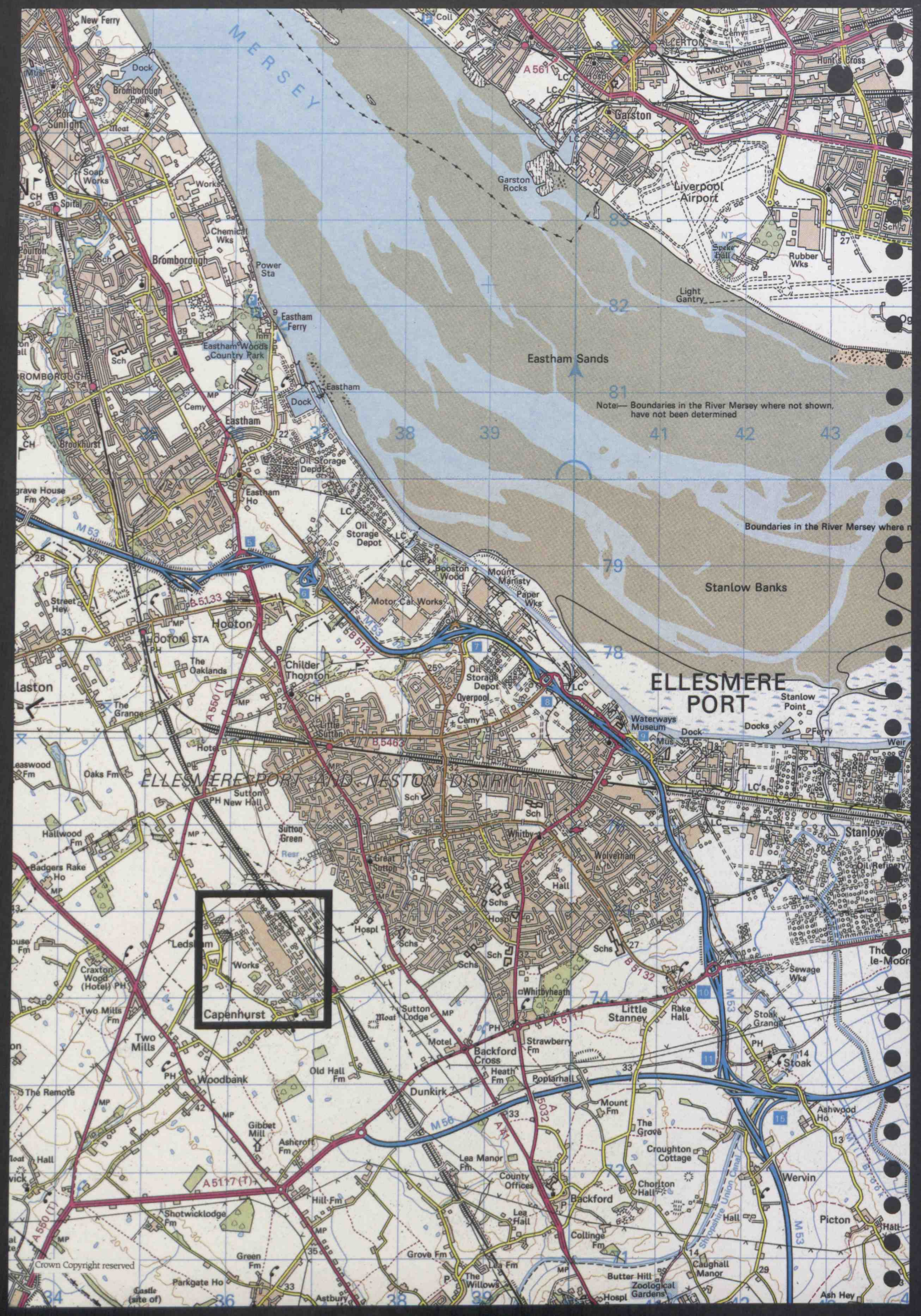
Reprocessing Engineering Division

Provides design and engineering facilities associated with the Company's new reprocessing and waste handling plants.

In addition to the Divisional structure there are central directorates located at the Head Office at Risley and the Company maintains a London office.

The Company employs some 15,000 people of which some 10% are graduates, mainly engineers.

**CAPENHURST
ENRICHMENT
DIVISION**



MERSEY

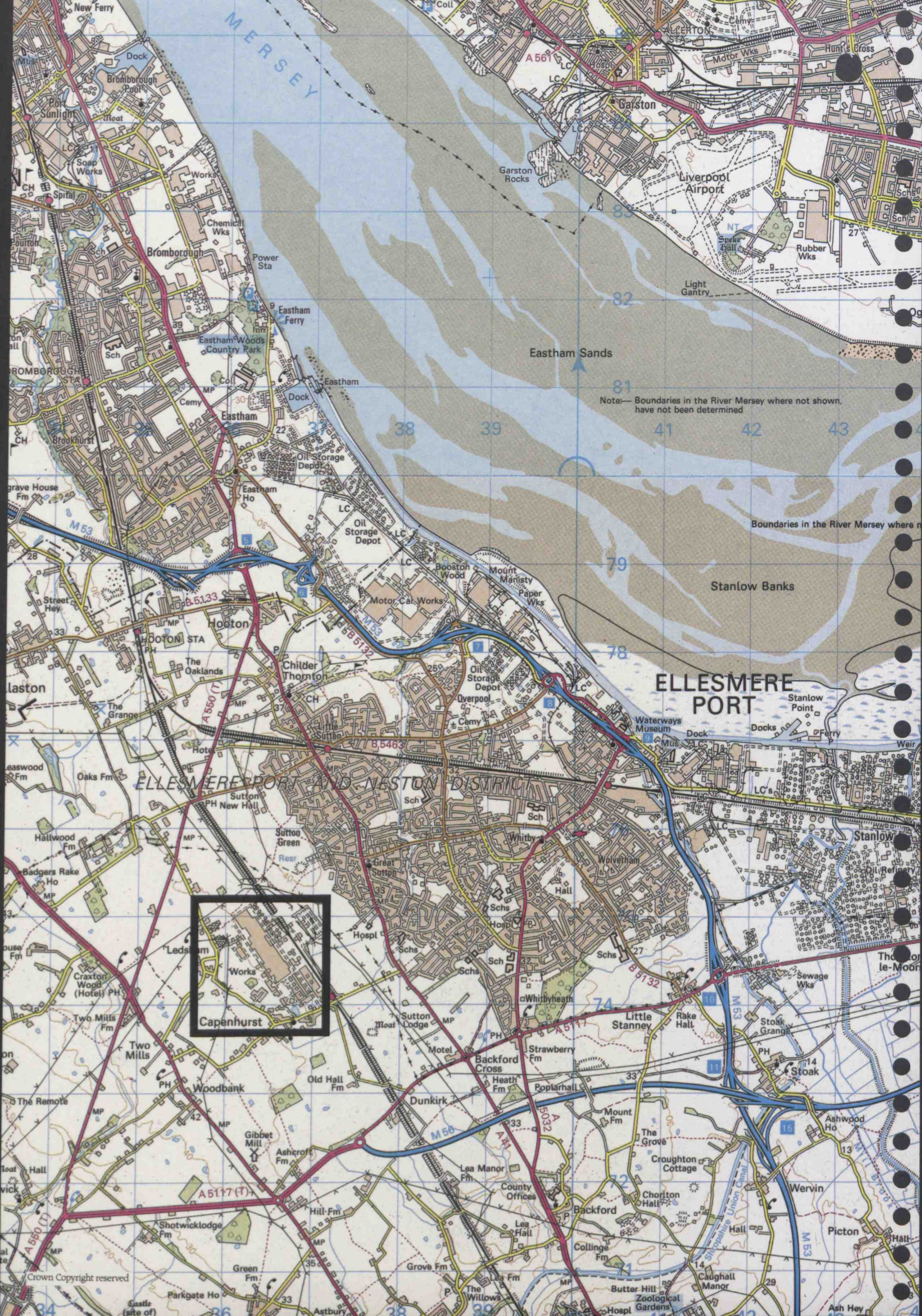
Note— Boundaries in the River Mersey where not shown, have not been determined

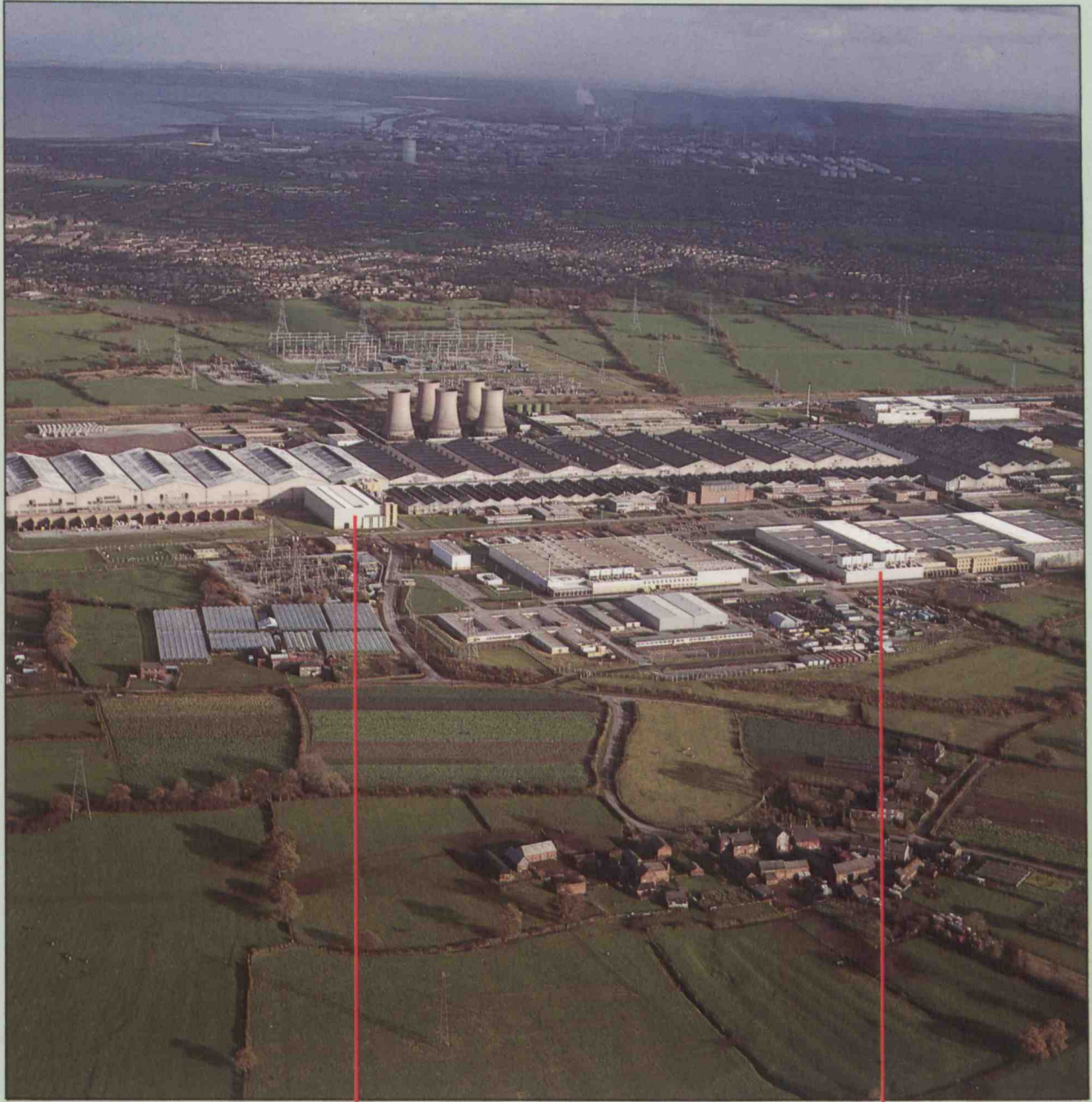
Boundaries in the River Mersey where not shown, have not been determined

ELLESMERE PORT AND NESTON DISTRICT

Capenhurst

ELLESMERE PORT



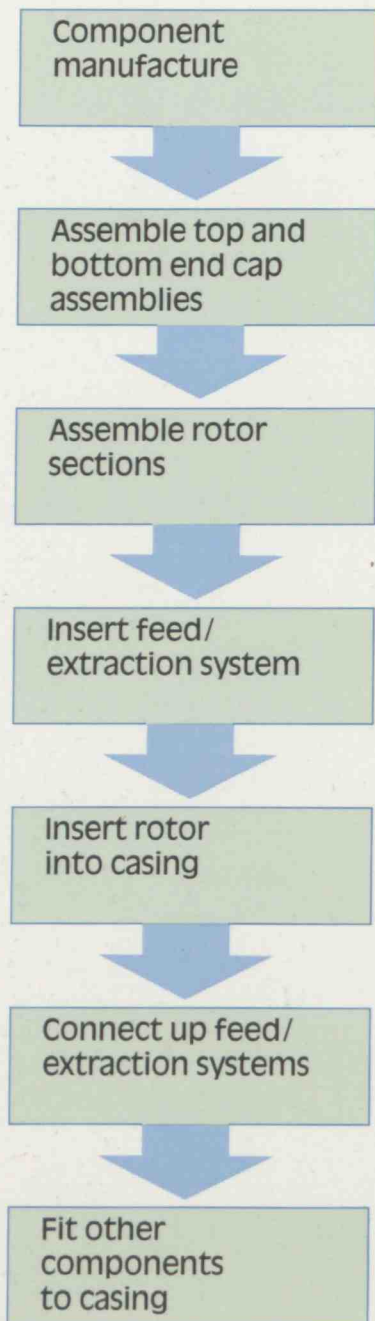


Centrifuge Assembly Plant

Enrichment Plant E22

CENTRIFUGE ASSEMBLY PLANT

PROCESS



TECHNICAL NOTES

Most manufactured at Capenhurst. Of particular note are the rotor sections which utilise special materials necessary to withstand the large forces associated with high rotational speed.

To form completed centrifuge rotor.

Delivers feed into, and extracts product and tails from, centrifuge rotor.

Motor, bearing and other components.

ENRICHMENT PLANT—E22

PROCESS

Connect feed container



Vapourise feed



Pass vapour to centrifuge cascade



Feed to centre of cascade



Extract product and tails



Condense product and tails

TECHNICAL NOTES

Feed is natural uranium hexafluoride in solid form.

Container placed in heating chest and heated by steam.

Via pressure reducing valves.

Enrichment levels rise above the feed point and fall below it.

Product and tails flows pumped to services building. Pressure increased to facilitate condensation.

Product condensed back to solid form in container chilled by cold air. Tails condensed back to solid in container chilled by cold water.

ENRICHMENT PLANT—E22



Enrichment plant—E22.

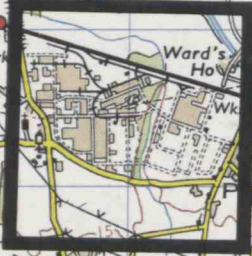
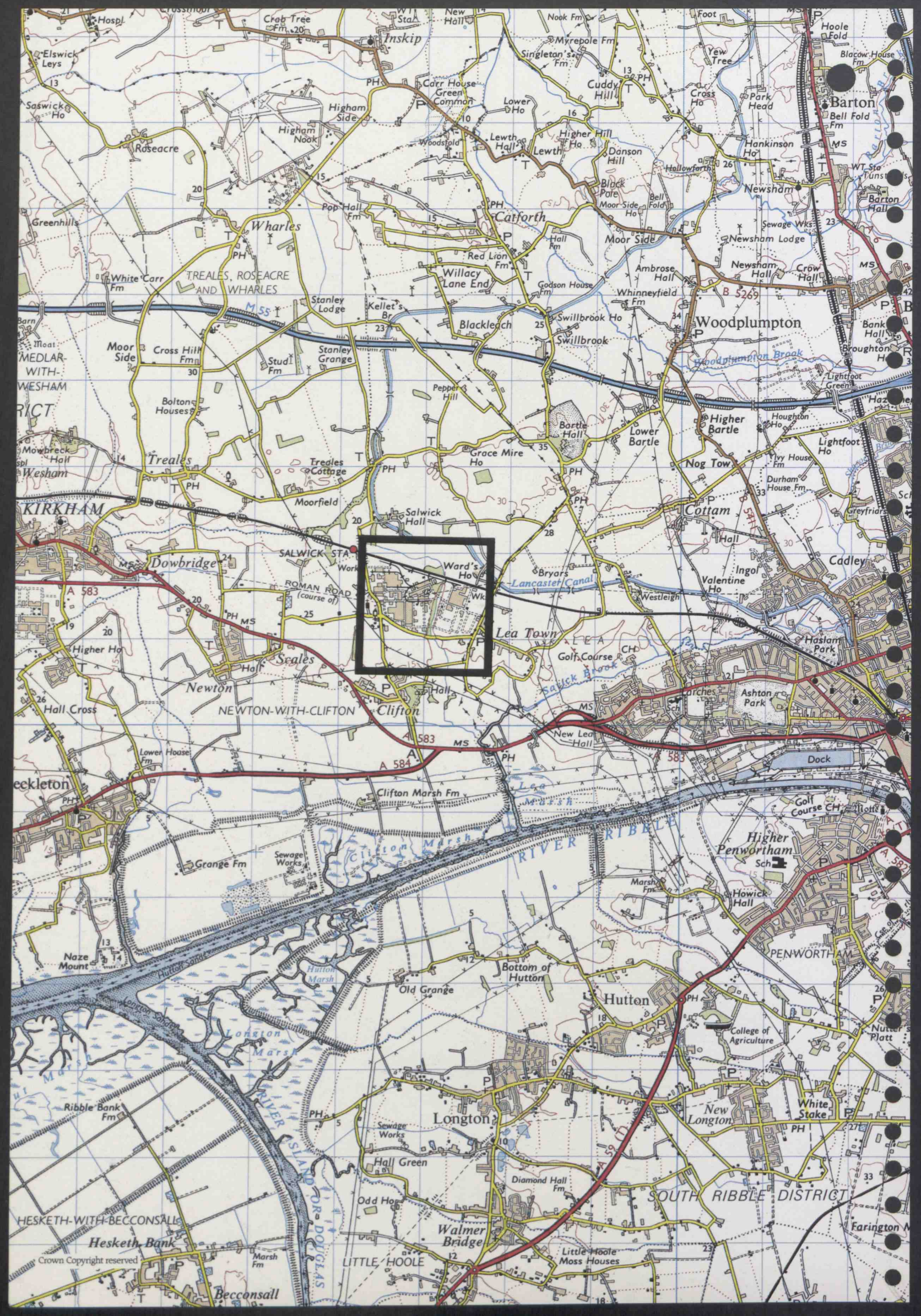


View across the top of a centrifuge cascade.



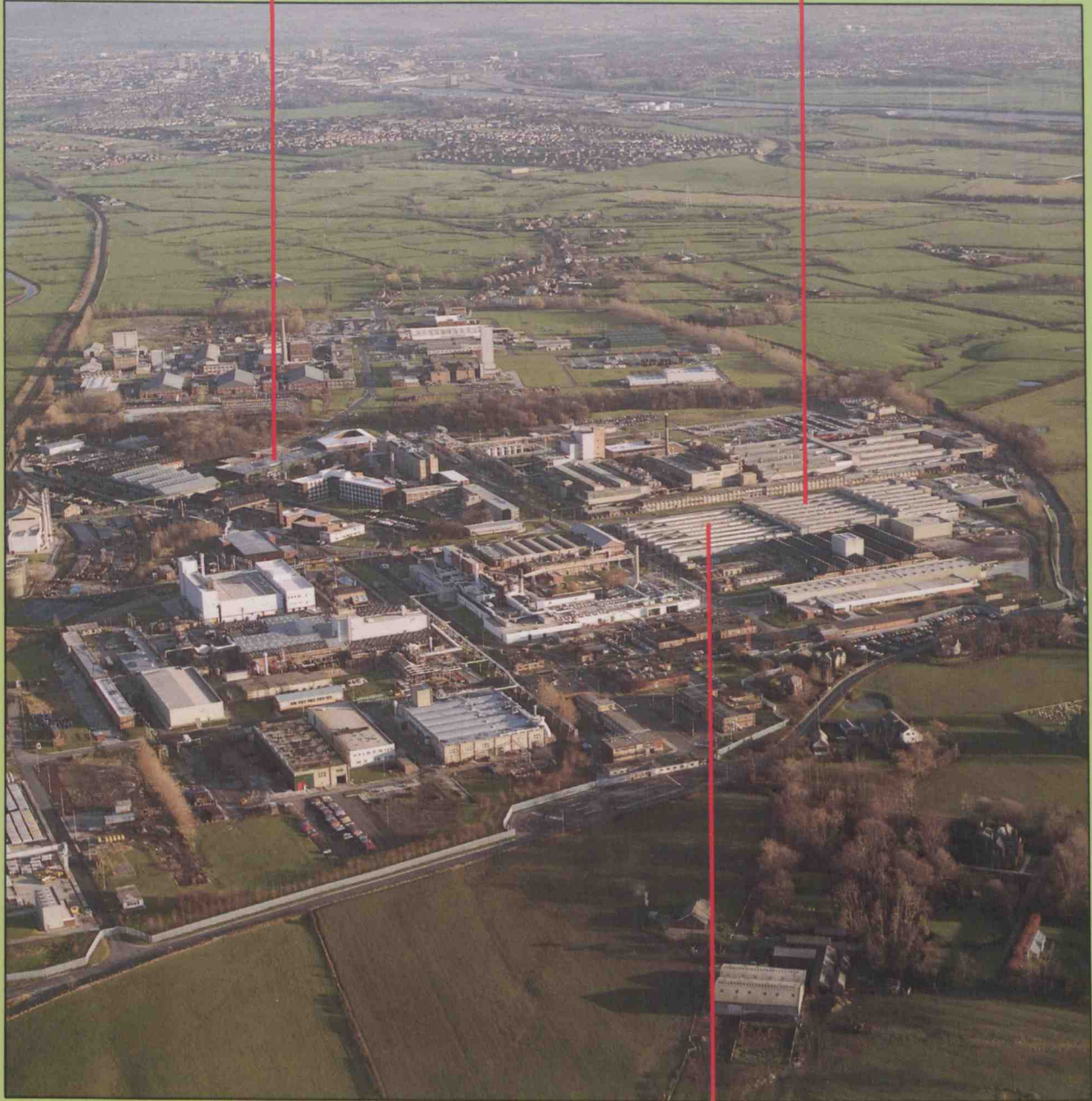
Control room.

**SPRINGFIELDS
FUEL
DIVISION**



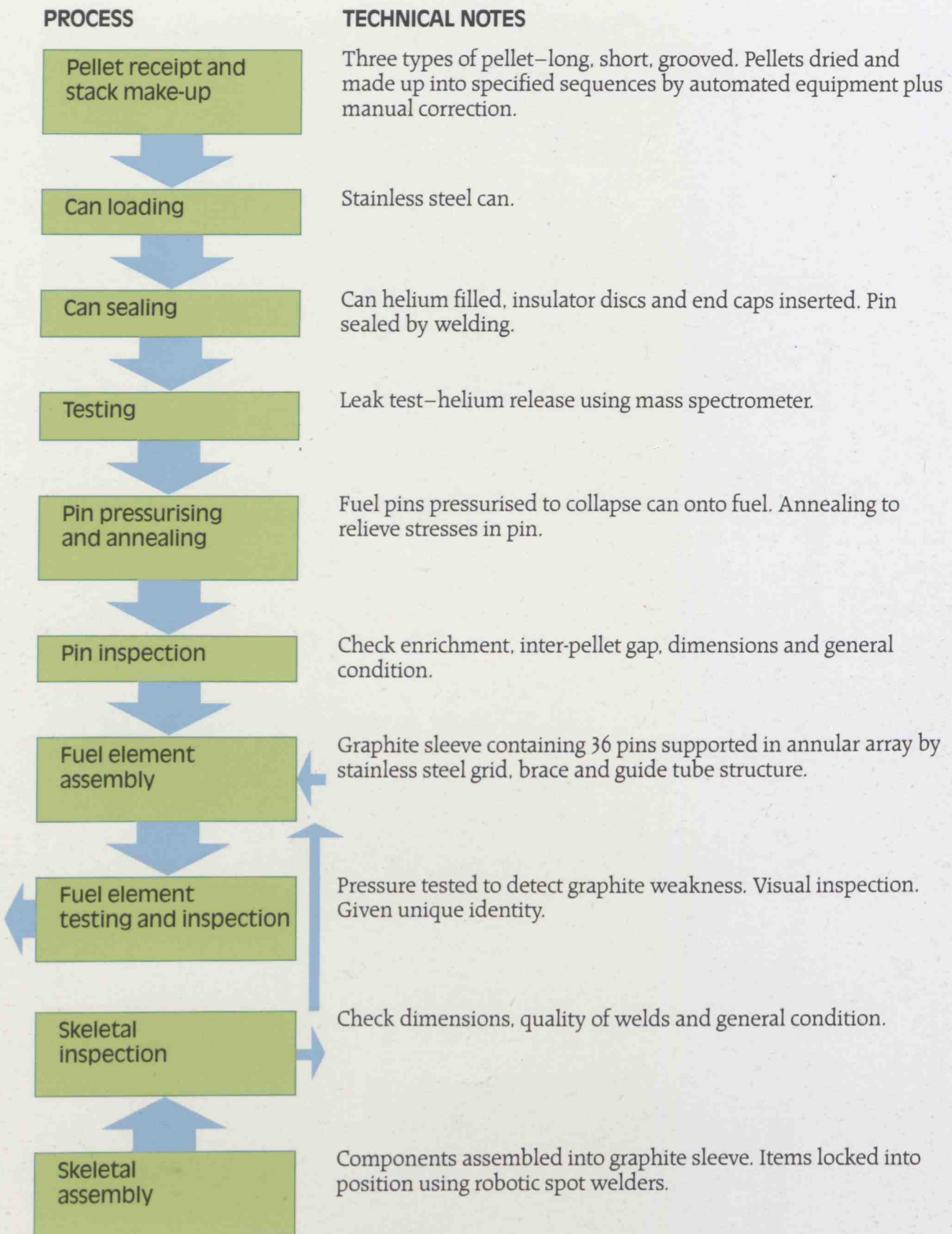
Apprentice
Training Centre.

Magnox
Canning Plant.



AGR.Canning
and Assembly Plant.

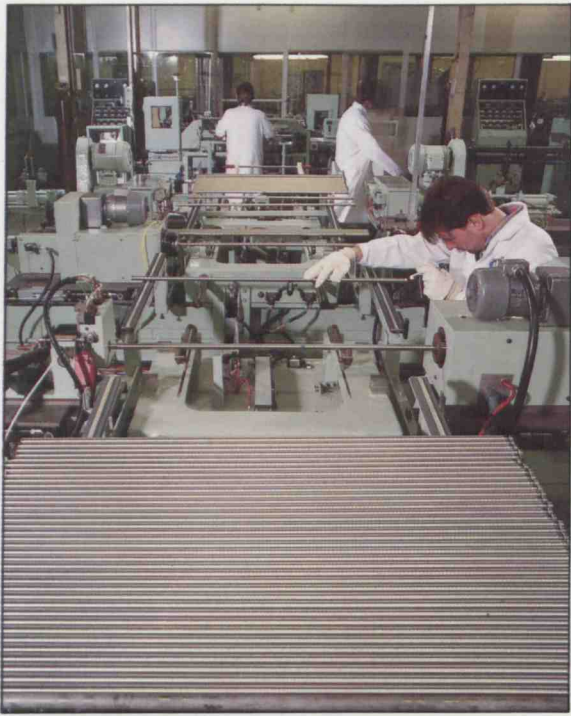
AGR FUEL CANNING AND ASSEMBLY PLANT



FEATURES

An area of the plant is dedicated to construction/modification of fuel elements to carry instrumentation for reactor control and research.

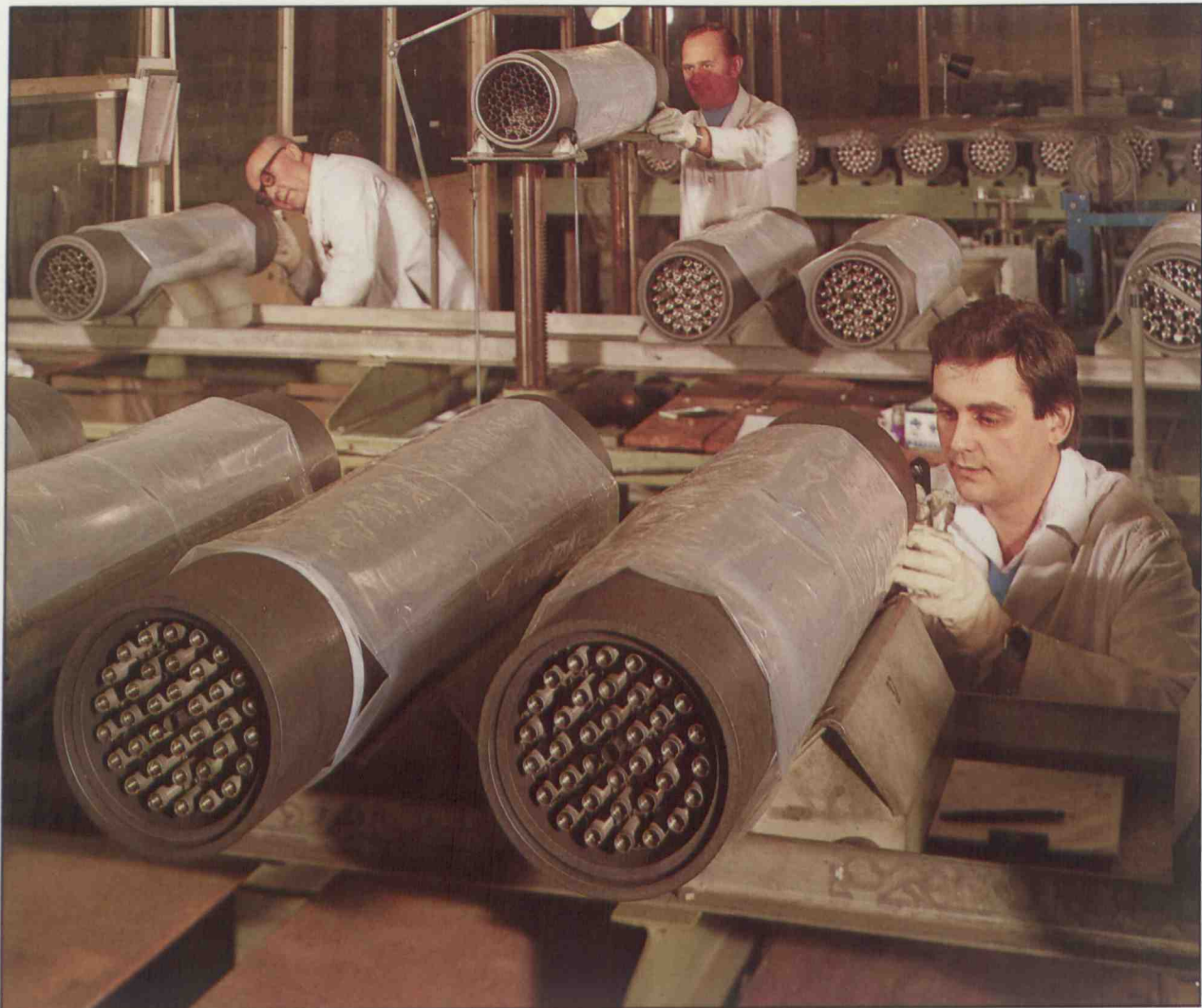
AGR FUEL CANNING AND ASSEMBLY PLANT



Inspecting end caps of AGR cans.



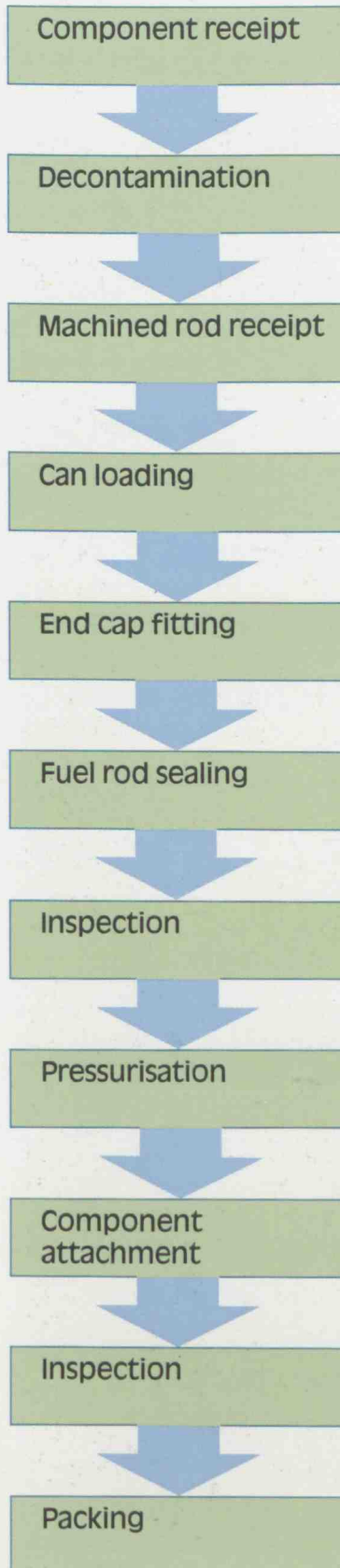
Robotic spot welding.



Final assembly of AGR fuel.

MAGNOX FUEL CANNING AND ASSEMBLY PLANT

PROCESS



TECHNICAL NOTES

Components are Magnox cans, end caps, fins and end fittings. Graphite sleeves in some cases.

Components cleaned and degreased prior to use.

From machining plant.

Rods degreased before loading. Ceramic discs added and can charged with helium.

End caps screwed in.

By argon-arc welding.

Weld checked by X-radiography. Leak testing by helium sampling in mass spectrometer.

By hydraulic or gas pressure to compress can into grooves machined on rod. Type of pressurisation depends on final position in reactor.

Additional components required for specific fuel designs added—e.g. fins.

For physical dimensions, pin defects and uranic contamination.

FEATURES

Twelve different designs of Magnox fuel are manufactured.

MAGNOX FUEL CANNING AND ASSEMBLY PLANT



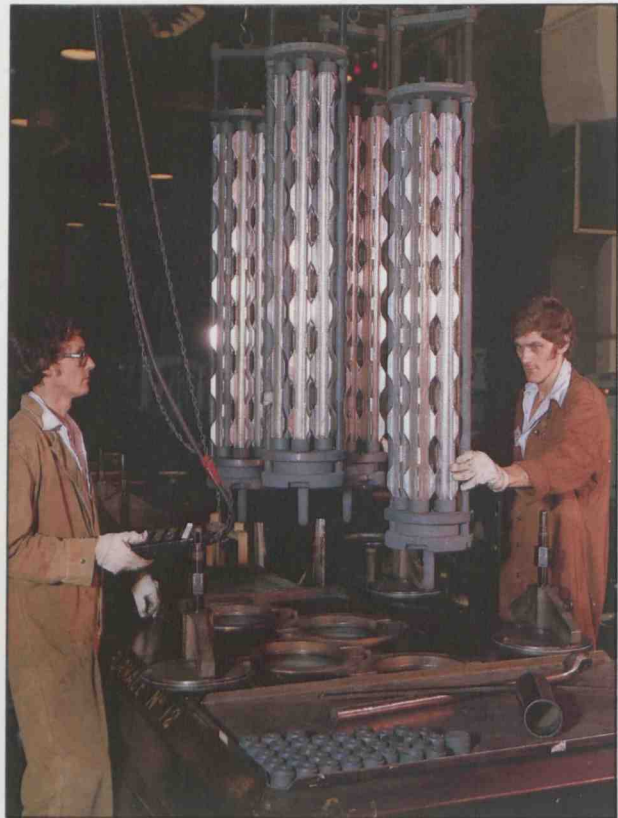
Selection of Magnox fuel elements.



Welding the ends of Magnox fuel elements.



X-raying welds.



Magnox fuel elements being loaded into gas pressurising pots.

APPRENTICE TRAINING CENTRE

An apprentice training centre has been established at Springfields since 1950.

The new apprentice training centre—part of a major investment programme at the site—was officially opened in 1982.

It has 3500 square metres of floor space comprising main workshops, lecture rooms, reception area, tea bar, interview rooms, adult training facilities and changerooms. The facilities provide for approximately 200 apprentices undertaking a four-year apprenticeship. The bulk of apprentices are instructed in traditional engineering trades, as fitters, turners, instrument mechanics and electricians but the centre also provides training for: joiners, painters, platers, welders, plumbers, bricklayers and motor mechanics as well as advanced training for other craftsmen.

First-year engineering apprentices are taught basic skills, including an appreciation of other trades as well as their own. They have to make their own tools and tool-boxes to strict specifications.

In the second year, they do more specialised training within the centre before they go out on the plant in the final two years.

They work alongside skilled craftsmen and are also assigned to professional engineers who co-ordinate their training.

One day per week is allocated to formal academic training at local Technical Colleges at which Springfields Apprentices have won several top awards.

During the apprenticeship there is close co-operation with trade union representatives and parents are encouraged to discuss progress with training staff.

As well as technical ability BNFL believe strongly in developing the whole character.

Virtually every apprentice is sent on a "character-building course" of some kind. Many do Outward Bound and some take part in City Challenge—a three-week course of work for charities and the under-privileged.

The programmes of training for apprentices are based on those recommended by Training Boards and are devised to meet site requirements. The overall supervision is the responsibility of the Apprentice Training Manager. An Apprentice Training Board chaired by the Chief Engineer and assisted by management and trade union representatives gives general guidance on practical and related theory.

When possible the requirements of the training programme are achieved by carrying out a variety of useful projects associated with works activities and often assistance is given to local community groups.

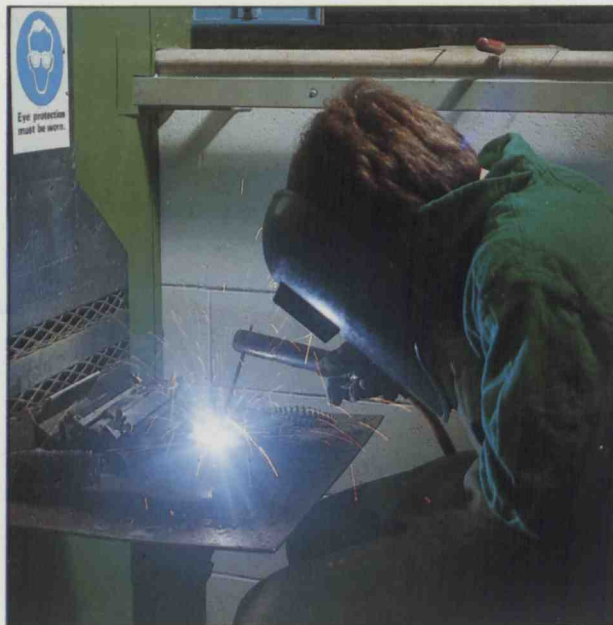
The company encourages apprentices to organise their own activities. They run their own Association of Springfields' Apprentices which organises trips, social activities and charity efforts.



Advanced machining areas and fitting benches.

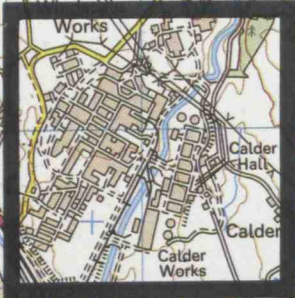
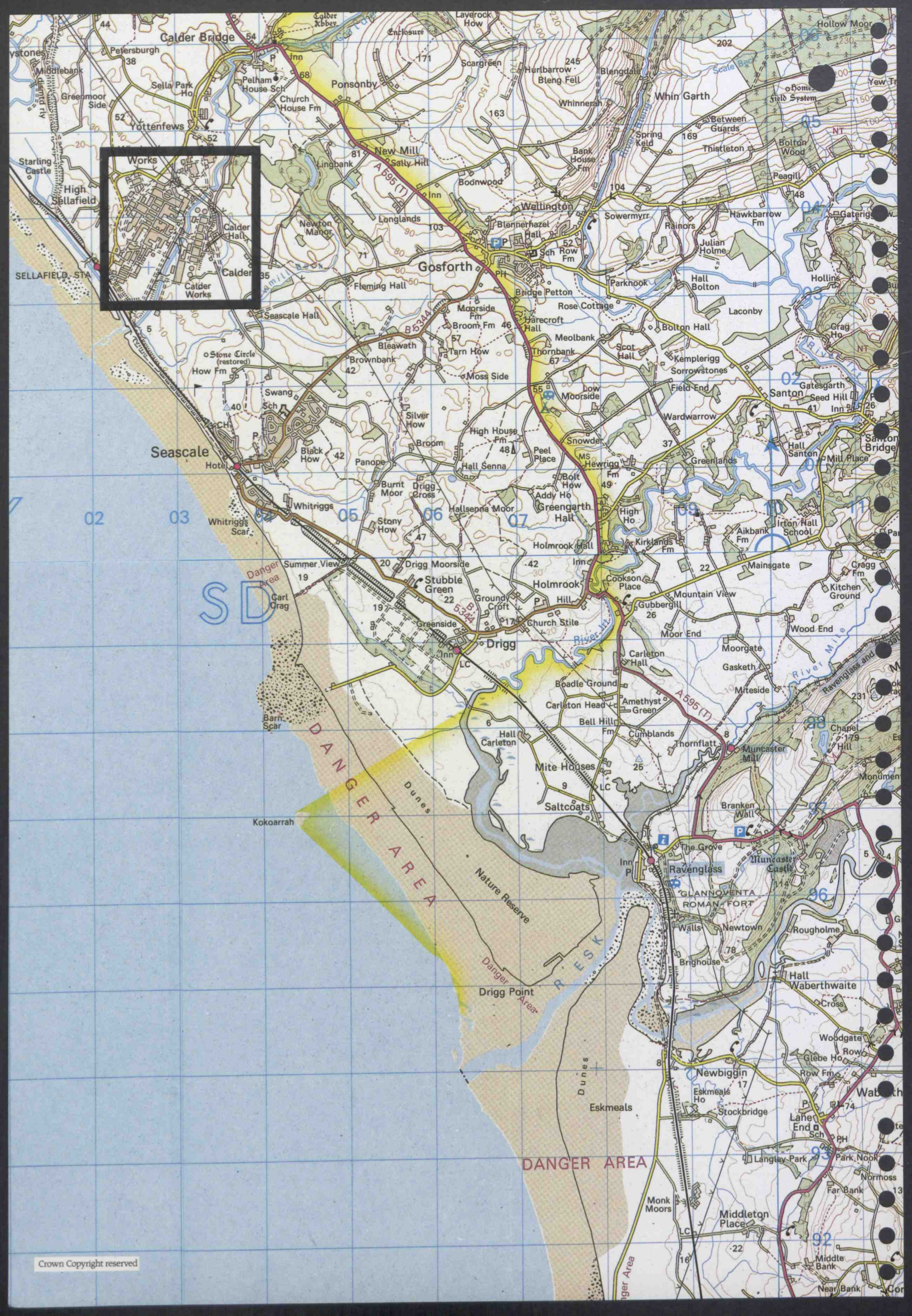


Two fitter apprentices working on a Kinney Pump used in vacuum work.



First year apprentice practicing arc welding.

**SELLAFIELD
REPROCESSING
OPERATIONS
DIVISION**



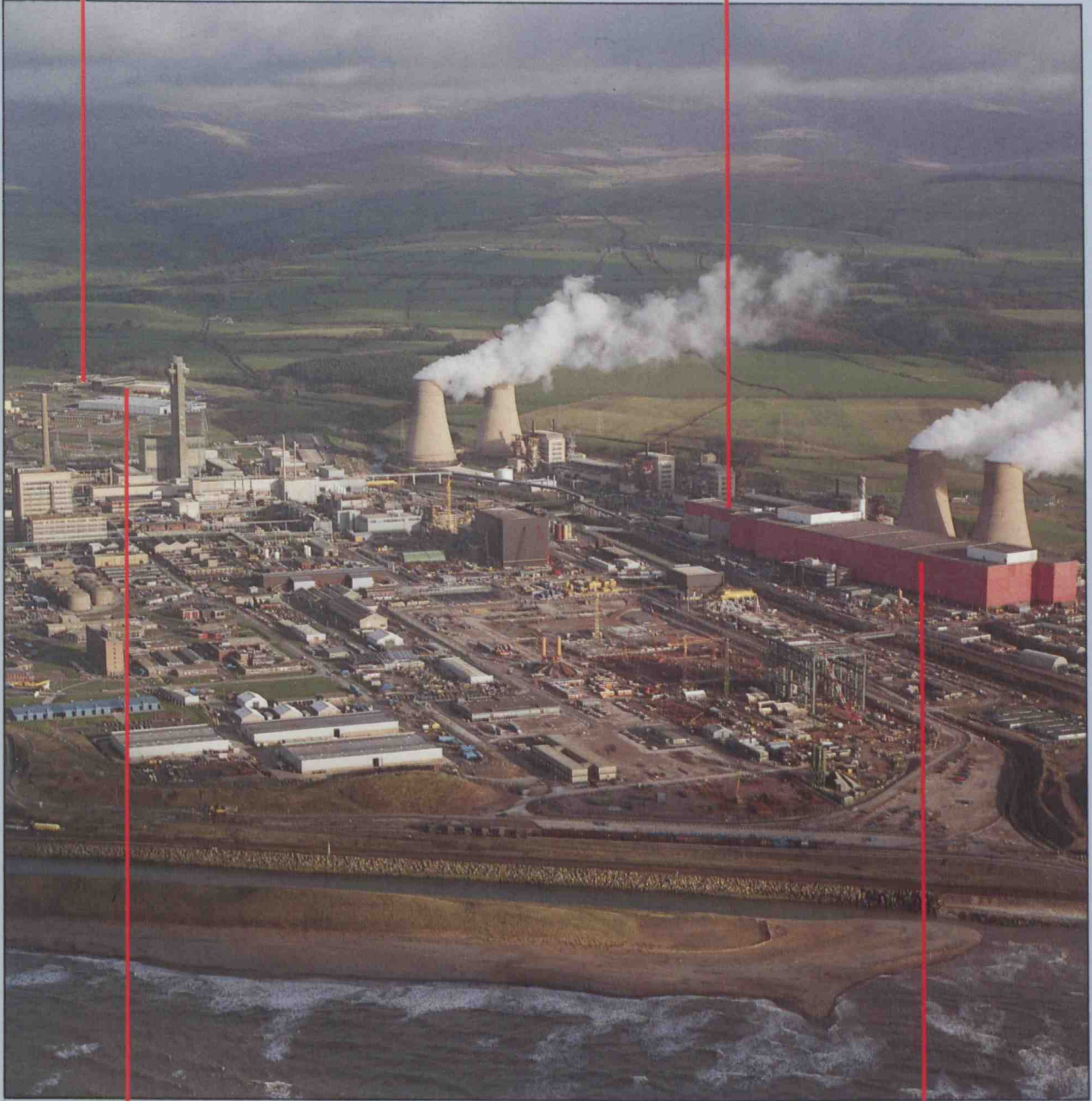
SD

DANGER AREA

DANGER AREA

Exhibition Centre

Site Ion Exchange
Effluent Plant (SIXEP)



Apprentice and General Worker
Training facilities

Fuel Handling Plant



Exhibition centre.



General view of the machine shop in the Apprentice Training Centre.

FUEL HANDLING PLANT

PROCESS

Flasks arrive

Flask to monitoring station

Flask to inlet cell

Fuel skip out and moved to pond container. Container lid fitted. Container to main pond

Pond storage

Container transferred to sub-pond

Skip washed

Skip to decanning cave

Fuel rods out and to decanner

Cladding stripped

Uranium bar to magazine

To chemical reprocessing

TECHNICAL NOTES

By rail except for fuel from Chapelcross which is transported by road.

Receipt inspection. Equipped for venting, pressure testing, monitoring and decontaminating flasks.

Flask lid removed—remote handling operation.

Sequence monitored by computer—operator watches on closed circuit television and initiates and controls operations.

For at least 175 days from reactor discharge. Water chemistry and temperature controlled.

By computer-controlled skip handler machine. Container gas seal vented off. Container flushed through with clean water.

By rotary skip washer—to clear corrosion products and accumulated debris before decanning.

Heavily shielded compartment in which highly radioactive material can be remotely handled. There are two caves for Magnox decanning.

Designed for ease of maintenance. All hydraulic seals and connections and most limit switches outside biological shielding.

Rod pushed through a die to give bare uranium bar.

Magazine holds 38 bars. Transported in shielded flask to reprocessing plant.

FUEL HANDLING PLANT

FEATURES

The pond itself is constructed on stilts such that all external surfaces (ie. sides and base) can be monitored for leakage.

The fuel skips are held in sealed pond containers in alkaline conditions to reduce and contain corrosion products.

The plant has several specialised decontamination facilities and remote maintenance cells.

The plant's three inlet cells, three storage ponds and two decanners can be used in any combination for flexibility.

In addition to Magnox fuel the plant will also be used to store oxide fuel from AGRs. The universal inlet cells can handle both Magnox and AGR flasks, while the position equivalent to the third decanner will be used for dismantling AGR fuel to allow for more compact storage.



Flask being lowered into an inlet cell.



An operator outside one of the inlet cells.

FUEL HANDLING PLANT

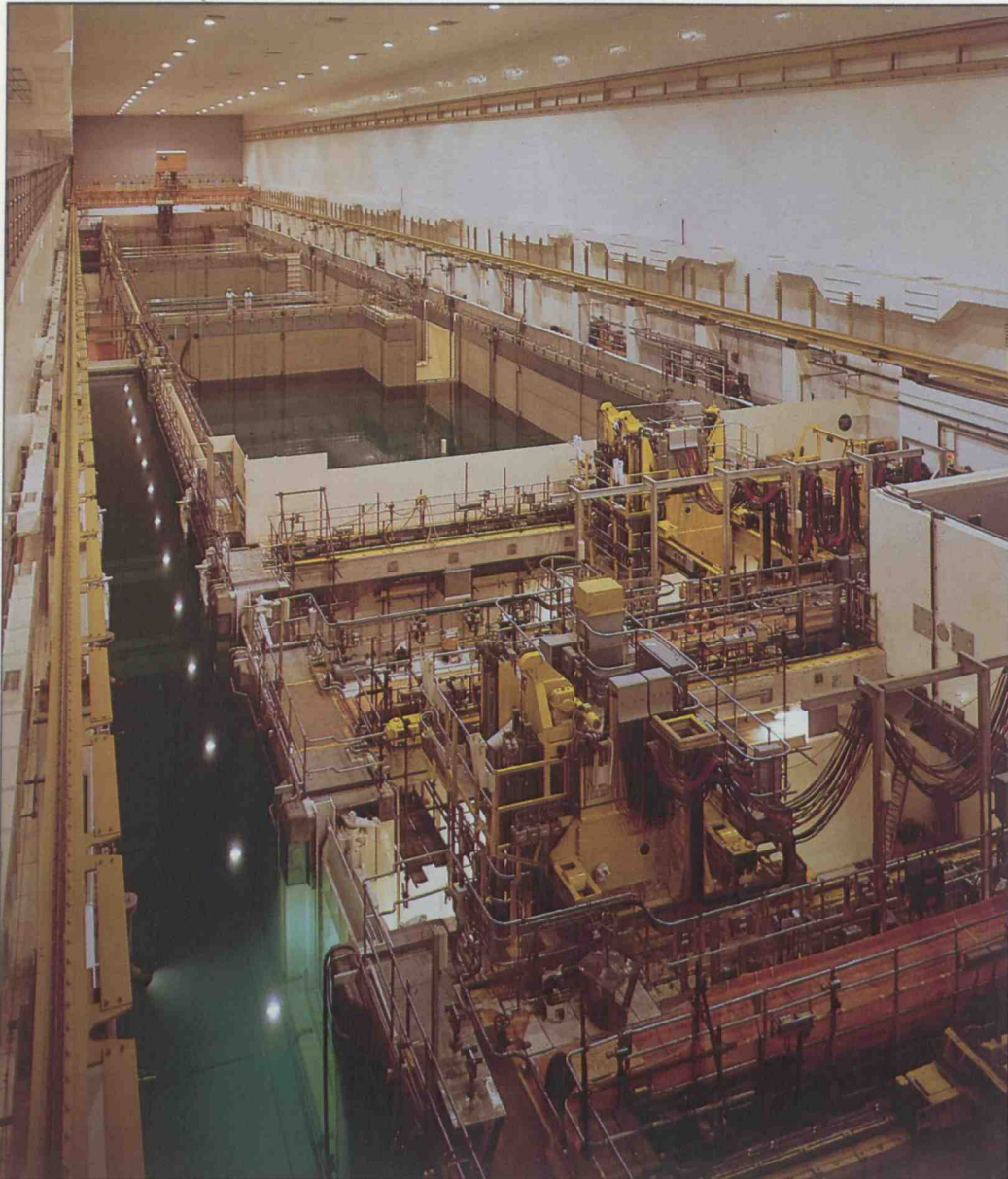


View of main storage pond hall.



Decanning of Magnox fuel.

FUEL HANDLING PLANT



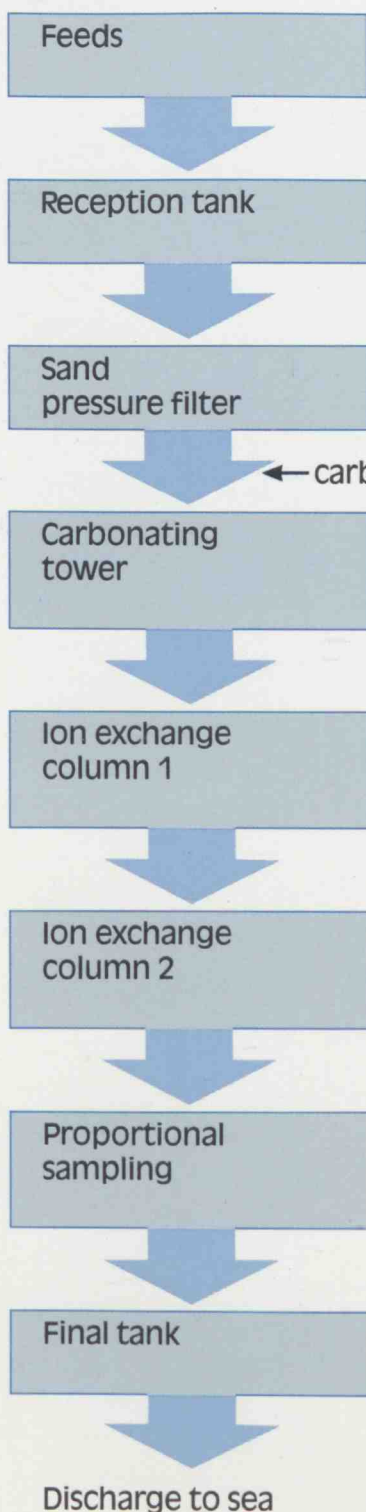
View of main storage pond hall.



Decanning of Magnox fuel.

SITE ION EXCHANGE EFFLUENT PLANT (SIXEP)

PROCESS



TECHNICAL NOTES

Contaminated water from various irradiated fuel storage ponds and other facilities pumped to SIXEP via overhead concrete-shielded pipebridges.

Sand bed filters remove particulate matter from feed which would otherwise block ion exchanger beds. Filters backwashed at intervals and resultant sludge stored in tanks.

Water in Magnox ponds is alkaline to reduce corrosion of the cladding material. Carbon dioxide bubbled through feed stream to neutralise it as alkaline conditions would result in deterioration of ion exchange material.

Ion exchange medium is clinoptilolite, a naturally occurring aluminosilicate. Clinoptilolite in a granular form is loaded into vessels in chemical preparation area where it is washed and skimmed to remove fine particles before being transferred hydraulically to main treatment part of plant. Lead column saturates after about 3 months (80 million gallons throughput) and the column order is reversed. Saturated bed discharged to store and replaced by fresh clinoptilolite.

Results of analyses of levels of activity discharged reported routinely to Government authorising Ministries.

SITE ION EXCHANGE EFFLUENT PLANT (SIXEP)

FEATURES

There are some 1800 instrument monitoring or control circuits plus a number of process computers to assist in handling the instrument signals. The computers also check plant status before starting certain operations.

The plant includes facilities to sample the process stream at various points, both to confirm satisfactory operation and to monitor discharge levels.

Specially designed pumps and valves are used. The functioning part of each item is located in a stainless steel body beneath thick concrete shielding. The drive shafts extend through sealing arrangements into the Lower or Upper Maintenance areas and hence are accessible for maintenance. When a pump or a valve fails it can be withdrawn into a shielded container, positioned by overhead crane. SIXEP incorporates a decontamination and remotely-operated strip-down facility for pumps and valves.

Solid wastes from this plant are stored pending encapsulation and disposal.

SITE ION EXCHANGE EFFLUENT PLANT (SIXEP)



Control room.



Lower maintenance corridor.

© British Nuclear Fuels plc 1985

British Nuclear Fuels plc
Risley Warrington
Cheshire WA3 6AS

All maps reproduced from the Ordnance Survey 1 to 50,000 maps.
With the permission of the Controller of
Her Majesty's Stationery Office.
Crown Copyright reserved.

Kynoch Graphic Design. Printed in England by Hill Shorter Limited