This green and pleasant land

FROM early days the industry had recognised that the environment mattered. It showed in the care the CEB took over the design of the original grid transmission towers. On nationalisation, the BEA had decided that the architectural design of new stations would be submitted to the Royal Fine Art Commission. But when the CEGB was created, it was put under a statutory duty to "preserve amenity" and Hinton was under no illusion concerning the way people felt about lines — or stations.

"It is no use talking about knights in shining armour striding across the countryside. Knights in shining armour are a damned nuisance in the wrong place. The same is true of power stations, however well designed."

He made full use of Lord Holford, an eminent architect who had been appointed a Part-Time Member. As a later Chairman said: "He encouraged and developed an appreciation among Board staff of the importance of looking at all our projects — power stations, transmission lines and substations — with the eye of an artist."

The "Holford Rules" were drawn up for the guidance of wayleave officers who had to route the new 400 kV lines. Their job had never been easy. They'd always had to get permissions (wayleaves) for lines to cross every bit of property along the route, and they knew the problems of choosing routes that would have the least effect on the countryside or built-up areas.

But since 1947, planning permission was needed as well, with district and county planning officers often having very different views about where the line should go. As one wayleave officer said when he was discussing a line route near Hadrian's Wall: "It's a good job Hadrian wasn't around now ... he'd never had got planning permission for all that lot!"

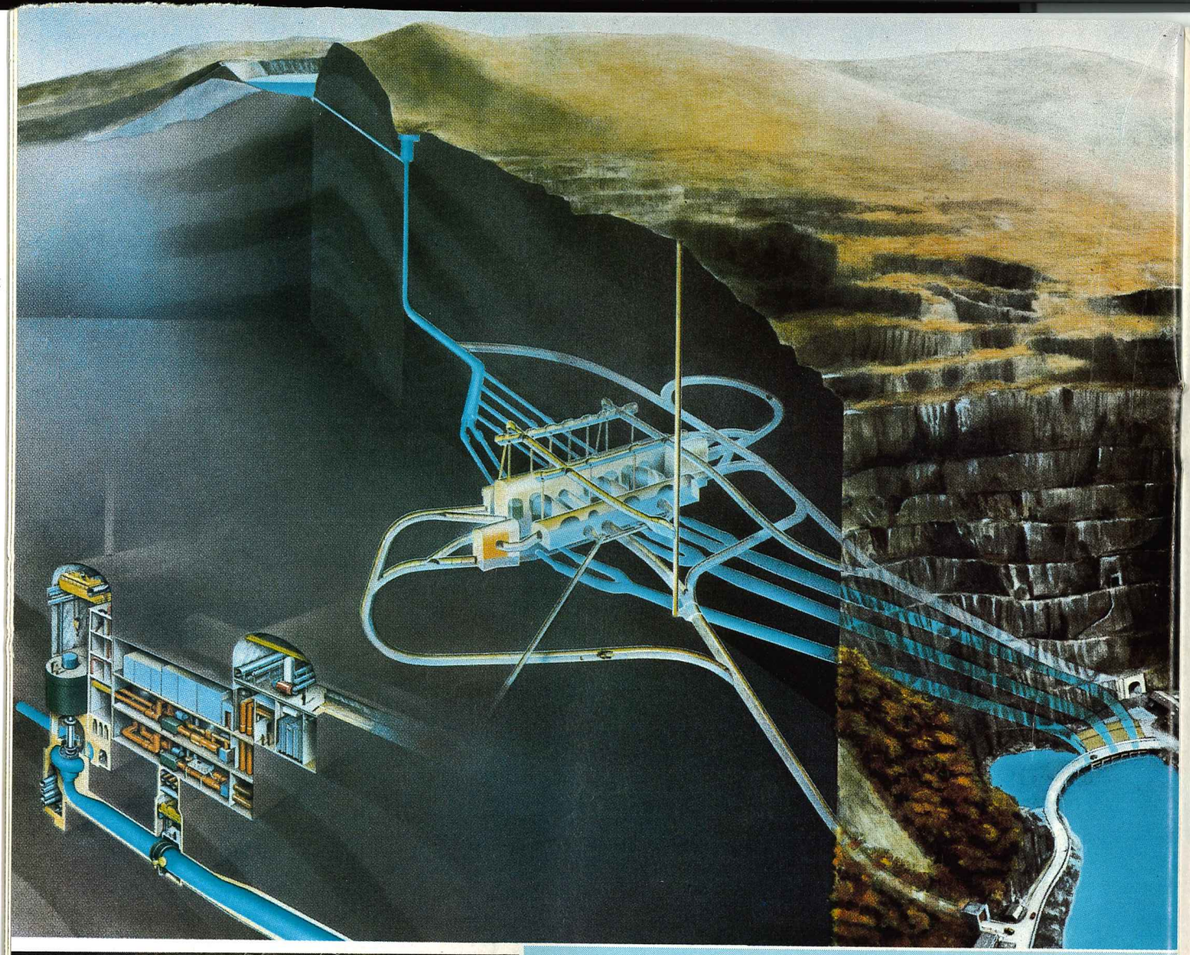
There was one inevitable question: "Why can't the line be put underground?" This was considered whenever lines were being routed through sensitive areas like beauty spots. What ruled it out other than in exceptional cases was the heavy extra expense.

Just one kilometre of heavy-duty 400 kV line could cost several millions of pounds — 20 times as much as putting it overhead. But trying to convince planning officers or local people that they hadn't got a special case was just one more headache for the wayleave officers.

The same care has been given to planning power stations and substations. They couldn't be hidden, but a lot could be done to soften the outlines by tree-planting and using artificial mounds as well as by making the best use of the surrounding features.

Even more positive steps include nature trails and schemes to improve the breeding grounds for local wildlife - "creative conservation." Since 1959 the CEGB has won more than 40 awards for its care of the environment.

Modern power stations are among the biggest things created by man so they can never be completely hidden. But their outlines can be softened by judicious planting (top left). Nature trails (above) and reserves have also been established at many stations.



Power station in a mountain

IMAGINE excavating a cavern big enough to take St Paul's Cathedral, linked to the surface by tunnels you could drive a bus down. That is the measure of Dinorwig, the CEGB's "power station in a mountain" that lies hidden beneath the beauty of Snowdonia.

Dinorwig is a pumped storage station. At night when generating costs are low, it takes electricity from the grid to pump water from its lower lake, Llyn Peris, to Marchlyn Mawr, its upper reservoir. During the day the water can flow back, providing power for the grid. The station is the National Grid's pacemaker, helping to ensure that the electricity supply is both regular and steady.

Almost every aspect of its construction deserves a place in the record books. The scheme was the largest of its type in Europe. At £425 million it was the largest civil engineering contract ever announced in the UK. In all some two million cubic metres of concrete was poured — enough to fill Wembley Stadium to a depth of 100 feet.

Why was it built inside the mountain? To minimise the impact of the station on one of Britain's most beautiful areas.

Enter new men with new ideas

AS the CEGB went into the 1970s the future looked bright. Demand was still growing steadily. More 2,000MW stations were coming into service and so were gas turbine stations using aero-type engines which could be brought into operation very speedily to help cope with daily peaks and unexpected surges in demand.

Some 1,300 miles of 400kV line had already been built. Within the next few years much of the 1,500 miles of 275kV supergrid would be modified for operation at 400kV.

The pace of advance had been remarkable, but the rapid plant expansion was bringing its own problems. Methods of working which had been adequate in 1948 no longer met the new needs. As Gil Blackman explains:

"Station maintenance staff were doing a good job. But it seemed silly to me that often they were sitting on their hands from Monday to Friday when the plant was running, then having to come in at weekends to carry out the maintenance work . . . in effect condemned to a seven-day week. There were similar problems on the transmission side. The answer was to bring in work-stagger arrangements together with an incentives scheme which would give them a third extra pay and a reduction of overtime to as near zero as we could make it"

The idea was sound. It enabled the CEGB to take on the massive amount of new plant without a massive increase in numbers. Manpower productivity shot up. But the job of implementing the scheme at each location and selling it to the workforce was yet one more headache for managers.

The job of running the newer stations was getting more and more demanding. And often station managers were finding they hadn't enough hours in the day or adequate resources to cope with that while also giving enough attention to technical problems.

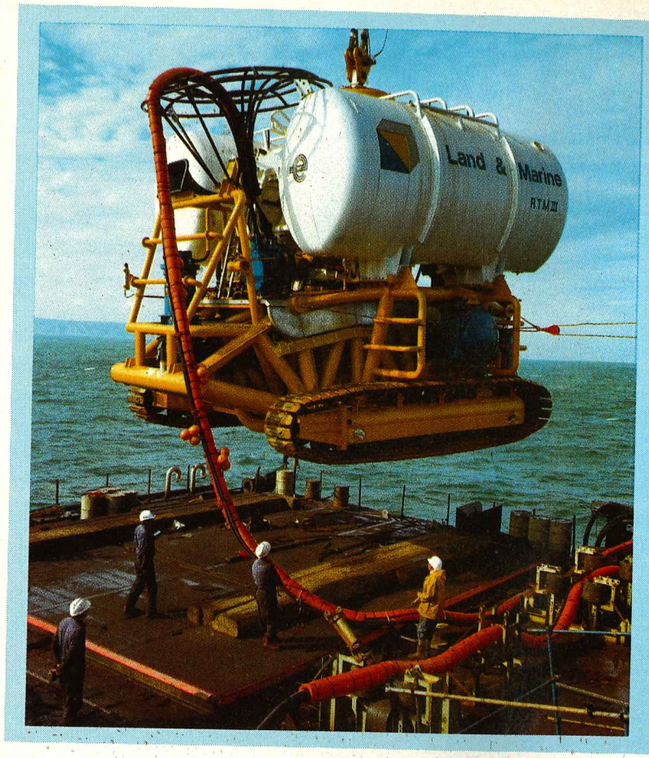
The nature of the job had developed since the CEGB was set up, but the organisation hadn't changed with it. That came in the early seventies.

Stations had always been able to call on Regional Scientific Services Departments where corrosion and similar problems were beyond the scope of station staff. Investigations leading to improved methods of operation had reduced failures of boiler tubes and other plant. Welds had caused problems, and non-destructive techniques were developed for testing them. Now Regional Engineering Departments were formed to help stations cope with problems of an engineering nature, and to provide teams to assist in the commissioning of new plant.

There were other changes. Transmission Sections were merged into larger Districts, while generation and transmission were brought together under a Director of Production. Soon other functions such as co-ordination of station and transmission overhauls and various management services like computing come together in a Resource Planning Department.

New men with new ideas were taking over, and the effects were being

Overhead line working is no job for the fainthearted as the photograph below demonstrates. Picture: Balfour Beatty



Le Link . . .

CONSTRUCTION of the 2000MW link between Britain and France involved robot machines with more than a touch of science fiction about them. Each country was responsible for installing two of the four pairs of cables in what was nicknamed "Le Link" by *Power News*. To protect them from damage, the cables had to be buried in trenches beneath the seabed.

To instal their cables, the British developed two robot machines that would have looked at home in a science fiction magazine.

The first was the trench cutter (left), a 175-tonne underwater tractor which crawled along the seabed. It was controlled by an umbilical cord from a barge on the surface above. In some 12 weeks it twice cut its way along the seabed the 31 miles from Folkestone to Calais, removing more than 200,000 tonnes of chalk, rock, and clay and laying a steel guiding hawser in each trench.

The second robot CLEM (right) — the cable laying and embedding machine — used the hawsers as a guide when laying the power cables. This robot, too, was controlled by a mother ship on the surface.

felt all down the line, especially as more and more "Directives and Procedures" descended from Board Headquarters covering everything from changes in management concepts to new and detailed procedures like those governing contract and purchasing requirements.

Conferences were held to put the changes across — sometimes with unexpected contributions from the floor.

"One station manager showed a slide of the Director of Production upside down — then on its side (both ways round) before standing him back on his feet and commenting: 'That's how all this has got us feeling. We can score the goals — but not if you keep moving the goalposts!' There were grins all round, but of course it didn't make a blind bit of difference."

It was a good job that people in the industry could manage to keep a sense of humour. Although the seventies had started well, crises were ahead. First came the miners' strikes of 1972 and 1973 when electricity supplies to homes were cut on a rota basis and industry was forced into a shorter working week. Frank Ledger (later Board Member for Production) was then the System Operations Engineer, and he has vivid memories of that time:

"We lived life at an unreal pace, with hardly any time to sleep. Coal stocks were running down; but to make things worse, miners were picketing outside power station gates so other vital supplies weren't getting through. To cap it all, I remember coming back to a deserted and very cold Board headquarters late on New Year's Eve, 1973,after the Chairman and I had been to see the Secretary of State for Energy. He had been asking us to advise him about replying to an MP's letter claiming that we were only turning out the lights for political reasons — to put pressure on the miners! Of course, it was that 1973 strike which toppled the Heath Government. But what we learnt then helped us keep the lights on the next time."

As he recalls, those weren't the only emergencies that year. A dispute involving engineering staff affected output from all stations. Industrial action by ASLEF railway drivers and a seaman's strike hit coal deliveries. And to make matters worse, oil was in very short supply, with prices soaring because of the Middle East war.

The industrial relations problems were only temporary setbacks, but the oil-price increase had a major effect. New oil-burning stations were coming into service at a time when oil was being priced out for base load (24-hour a day) generation. But that wasn't the only problem. The whole construction programme had been based on the expectation that electricity demand would continue to rise at the same pace. Instead it had slackened and for the first time the CEGB found it had far more plant than it needed. It was the start of another very difficult period — for managers and for many staff.

The CEGB could see just one way to turn the plant surplus situation to advantage. A lot of older uneconomic plant could be closed down. But that wouldn't be possible without affecting a large number of station staff. Rod Lewin — later Head of Employee Relations — was in the South Eastern Region and he remembers how it was the start of a massive industrial relations exercise:

"The Region's staff surplus was getting on for six or seven thousand and we needed a whole new system to deal with that kind of situation. So we dealt with employees as individuals, interviewing everybody concerned to see what their needs and expectations were. Some were happy to be paid off, but others wanted to be retrained and relocated. Then we created a huge computer data base so particular job vacancy notices could be sent to those who would be interested. We wanted to establish a personal touch so there would also be some pressure on the individual to take responsibility for his or her future. The system spread to other Regions and ended up being used over the next 10 years — with a lot of staff in new positions of their own choosing and no problems from the unions."

On October 25, 1975, the Board was able to shut down 23 stations, with another 18 partial closures . . . in all some 3,000MW of plant. It made economic sense. But in the meantime the CEGB and consumers were getting other economic benefits in a way never envisaged by early planners.

Ever since the thirties, engineers in grid control centres had been forecasting likely demand and selecting the most economic plant to meet requirements. In some ways the job had become easier. Computers in National Control could give up-to-the-minute information on the running costs of every generating unit in the country. But engineers still had to decide how much plant was needed to meet a demand that changes day by day and minute by minute. Insufficient plant would mean power cuts. Too much would waste fuel.

Gas turbine stations had made a big difference. They weren't cheap to run, but they could be brought into operation at the flick of a switch. Soon there