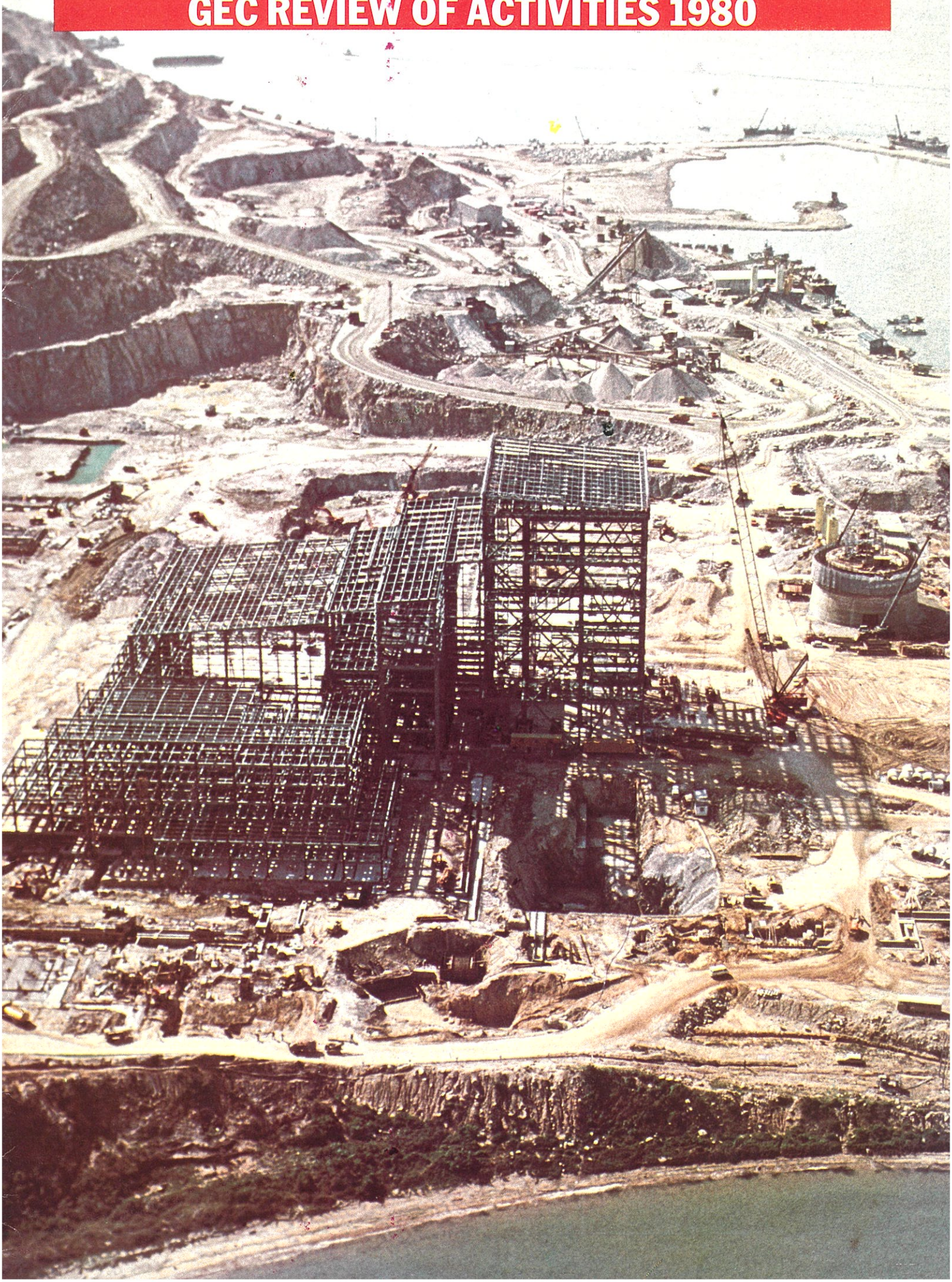
GEC REVIEW OF ACTIVITIES 1980



CHAIRMAN'S STATEMENT

We in GEC had many problems to face last year but one cannot help feeling that the national cult of laying blame for one's own troubles elsewhere while lecturing others on how to run their affairs is rather too widespread and by and large less than helpful. Certainly exhortations delivered by Chairmen are unlikely to change the world in which we have to conduct our businesses. In the real world it is our task to do the best we can in the conditions which actually exist. If everyone concentrated on doing his own job properly instead of spending so much time telling others how to do theirs, the UK economy might well prosper beyond expectations. I shall refrain therefore from offering homilies on the sins and omission of government, the more so as we now have a government which appears to have its priorities better ordered than some of its predecessors. It does seem to me necessary however to say a few words about the dangerous manoeuvres of some small elements in our society, mainly or almost beyond the fringe of democratic politics who seek by spurious argument to invoke the public interest as a façade for the pursuit of their own ambitions. Throughout British Industry it behoves shareholders and employees to be constantly on their guard against these machinations whose success would impoverish every one of us.

In this connection, the recent Special Conference of the Labour Party adopted as part of the policy of a future Labour Government a commitment to nationalise certain private concerns without compensation. It is astonishing that there has been no public outcry against such a blatant threat of confiscation. Even today, the principle of fair treatment at the hands of the State is being seriously eroded, as illustrated by the acquiescence of the present Government in the grossly unfair compensation terms of the Aircraft and Shipbuilding Industries Act, 1977, terms which, in opposition, they vehemently and explicity condemned as palpably unjust. It is a plain fact that this basis of compensation in respect of the Company's shareholding in the British Aircraft Corporation (Holdings) Limited, which was sequestrated on 29th April, 1977, is not in accordance with the international standards to which the Government professes to subscribe. Further there is no intention to make good the fall in the purchasing power of money since that time; the interest carried by the compensation stock is, even before corporation tax, much less than the inflation rate.

Since the resources of GEC, AEI and English Electric were amalgamated, we have tried to contribute towards the establishment of rational structures in the industries in which our Group participates. As a result, the Company is in a better position to face the predicted recession than a good many others. The complete justification for the harsh decisions we had to make following the mergers twelve years ago is that there is not today any doubt that your Company can withstand the challenges of the next difficult years. To have evaded or postponed those decisions would have brought retribution now, for we would certainly have found ourselves facing possibly insoluble problems. This is not to say that we will not have problems in GEC in the future which will have to be dealt with as they arise; it is only to say that when we said in the past that things were necessary, they were. During the years since the mergers, we have in fact disposed of more businesses in the UK than we have acquired, the disposals usually occurring because we were satisfied that others could make better use of the resources involved than we could, and the acquisitions because we thought they would function better in GEC than left as they were. It was the application of these principles which led to bringing into our Group the activities of A B Dick and of Averys. The record clearly shows this course to have been right; in general we have managed more effectively and productively the businesses we have acquired; and so too, have those who bought businesses from us.

Lord Nelson (centre) Chairman of GEC, with Mr W F Stones (right), Director and Deputy General Manager of China Light and Power Company in the turbine hall of the power station on Tsing Yi island, Hong Kong, for which GEC has supplied turbine generators.

The improvement in the 1980 results over the previous year, in a period of a flat economy, constitutes a considerable achievement by the Company's employees. But it would have been still better, and we would face the future with that much more confidence, if we had not suffered from the engineering strike and from other home-grown disputes. Things still happen which cause us to labour under handicaps we could have avoided. Some of these are management's fault, some are not. Our industrial relations record in the last year has not been too bad. But it is ridiculous, when we are facing a world recession likely to be felt particularly sharply in Britain, that industrial disputes should lead to any interruption at all of production. We still find ourselves sometimes delivering goods late. Foreign competitors come up with new ideas which we should have had. Many of our people know of things which could be done better in their own areas of responsibility, where only lack of commitment, or habit, prevents their being put right. In the tougher times into which we are moving, those are the very things which will lose orders and jobs.

The steady strengthening of the Company over the years is to a large extent the reflection of the importance we attach to research and development. Advances in technology change the products we make and how we make them, and innovation remains a major priority in the 1980s. It is the sectors where the most rapid technological changes are taking place, electronics and telecommunications, which are providing the growing sales and profits to offset the slackness in some of the heavy engineering and industrial divisions. These technologies penetrate deeply into many of the fields in which we operate; our managers are alive to the changes taking place, to the opportunities they present and to the dangers they entail. The course we steer is, in our view, in the best long-term interests of our businesses, but this does not mean that what is the best course of action today will necessarily be the best tomorrow. So we remain vigilant and ready to modify our plans if the need to do so arises.

There is some doubt whether there is a full realisation of the importance of public purchasing policy to the country's trading, or of the ways in which our competitor countries turn their public purchasing and government R & D funding to the advantage of their industries and their exports. The impact on our export business is direct and immediate and we commend this subject to H M Goverment as worthy of study. UK firms cannot be expected to win their battles at home and abroad against powerful and heavily backed foreign rivals if they are obliged to compete with one, and sometimes two, hands tied behind their backs.

Although the future is unlikely to be easy, it is for the shareholders and employees of GEC by no means terrifying. If we all do our own particular jobs as best we can, there is no reason to think that our Company's satisfactory progress will not continue over the ensuing months and years.

Our Managing Director was created a life peer in this year's Birthday Honours. To everyone who knows how much he has done for our Company, for our industry and in the national interest, this recognition will have given great pleasure. He has dedicated himself to discharging his responsibilities in an impeccable manner and it is very fitting that his leadership, immense courage and untiring efforts should be so rewarded.

Nelson of Stafford.

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COVER STORY

The new Castle Peak power station being built in Hong Kong for the Kowloon Electricity Supply Company. Hong Kong is small and has a large population so land is scarce. Over half the land to be used by the new station has been reclaimed from the sea. When fully developed, Castle Peak will be amongst the largest generating complexes in the world, with a potential capacity of 4280MW. GEC is the main contractor responsible for the provision of the first four 350MW turbine generators, all associated auxilliary plant and the management of the contracts. The first generating set will be commissioned in 1982.

POWER ENGINEERING

	1980	1979
TURNOVER	£427m	£401m
EXPORT SALES	£216m	£187m
EXPORT ORDERS	£323m	£269m
PROFITS	£46m	£56m

Turnover in 1980 increased only modestly over 1979, and profits were lower. Sales of turbine generators were maintained at about the same level, at slightly lower margins, but deliveries of switchgear were markedly lower and the trading results were unsatisfactory.

GEC Turbine Generators Ltd Profits were lower than in the previous year but were not unsatisfactory in the circumstances. Good progress was made towards fulfilling export contracts for South Africa, Hong Kong and Korea. The first sets of GEC's new design of 660MW four-flow exhaust turbine generators were successfully commissioned at the Duvha Power Station of the Electricity Supply Commission of South Africa (ESCOM) and the Peterhead Power Station of the North of Scotland Hydro Board. Since the end of the year, ESCOM has issued a letter of intent for six 600MW units for its new Tutuka Power Station which, at a value in excess of £200 million, will constitute the biggest single order ever placed with GEC for power plant. Another new order calls for completion of the second phase of the Castle Peak Power Station, Hong Kong, incorporating two 350MW turbine generators. A design contract for two 660MW units for Torness was received from the SSEB, and a production order for the plant is expected during 1980.

The company won the Queen's Award for Exports again.

GEC Gas Turbines Ltd's export orders included a further four 60MW heavy duty machines for Hong Kong and repeats from Abu Dhabi, Saudi Arabia and Iraq. At home, its position as a leading supplier of gas turbines for major offshore production platforms was maintained, with orders for both generator and mechanical drive units.

Development activity is being intensified to meet the challenges arising from the changing economics of fuel supply, and a new range of lightweight gas turbines specifically designed for maximum fuel economy is being marketed.

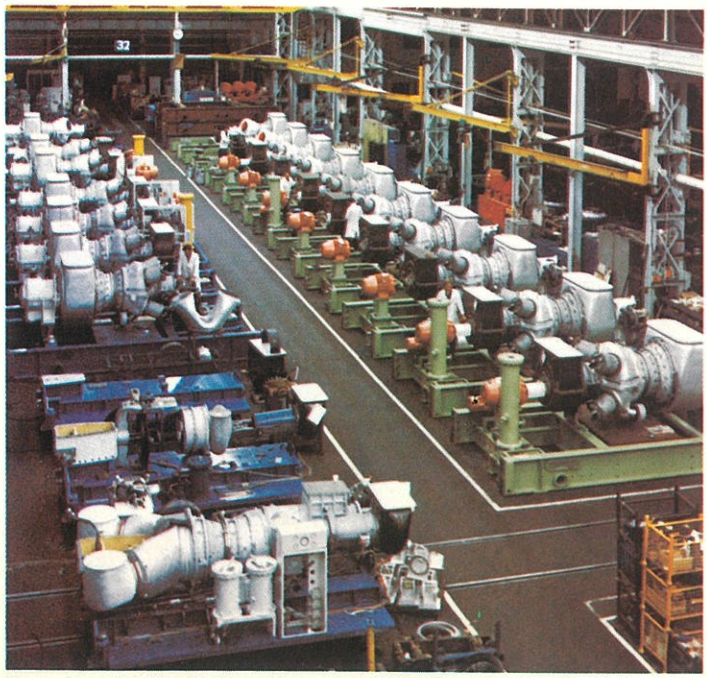
Ruston Gas Turbines Ltd again increased sales and profits over the previous year with notable improvements in cost control and productivity. Shipments were at a record level, all for export or North Sea oil operations. More than fifty machines were for oilfields of Mexico, where Ruston has established a company with local participation to provide rapid and effective after-sales service. Major shipments were also made to fourteen other territories. The year-end order book was at a satisfactory level and prospects are good.

Napier Turbochargers Ltd Output continued at the same level as last year, but profitability rose slightly as a result of investment in new processes and machine tools. Trials of new turbochargers in Europe continued with encouraging results.

GEC Reactor Equipment Ltd improved on the previous year's performance as a result of its continuing heavy involvement in the construction of the Advanced Gas Cooled Reactors at Hartlepool and Heysham. The opportunities provided by the recently announced UK nuclear power station building programme and the increasing potential business overseas are being actively pursued.

GEC High Voltage Switchgear Ltd progressed with the development of its SF6 switchgear and other new products, and won important orders. Overall, the results were very much worse than the previous year's, partly because of a fall in demand for some products, but much more due to the failure to achieve the planned level of production.

Power Transmission Division undertook further design study and engineering work in preparation for the projected cross channel link with France.



The assembly line for the production of the Ruston type TB gas turbine at the Lincoln works.

At **GEC Distribution Switchgear Ltd** results for the year were unsatisfactory due to a combination of reduced demand and interruptions of production. Innovations were achieved in the field of vacuum switchgear including the first 36KV vacuum circuit breakers in Europe. The company's 12KV vacuum switchgear is now winning a larger share of the market.

GEC Power Transformers Ltd completed a major reorganisation of its facilities, which are now more closely aligned with forecast demand for its products. Nearly half the total output is exported.

A fuel element transfer machine supplied by GEC Reactor Equipment Ltd to Wylfa nuclear power station. The machine holds 64 fuel elements.

GEC Distribution Transformers Ltd was affected by depressed demand. But the introduction of new products, notably cast-in resin dry-type distribution transformers and a range of factory assembled package substations backed by innovative production methods, has improved its competitive position so that new orders and orders in hand are above last year's levels.

GEC Rectifiers Ltd was unable to maintain the sales and profit achieved in the previous year. Rectifier equipment was successfully commissioned in railway installations in Belgium, North America, and some months ahead of programme in Hong Kong. Major orders were won for the second stage of the Hong Kong Mass Transit system and for power supplies for the JET nuclear fusion project. Development continues of advanced forms of transistorised power conditioning units, predominantly for traction drives and auxiliary power generation for which prototype orders came from Canada and South Africa. The outlook for future business is promising with the recent emergence of several mass transit and light railway projects overseas.

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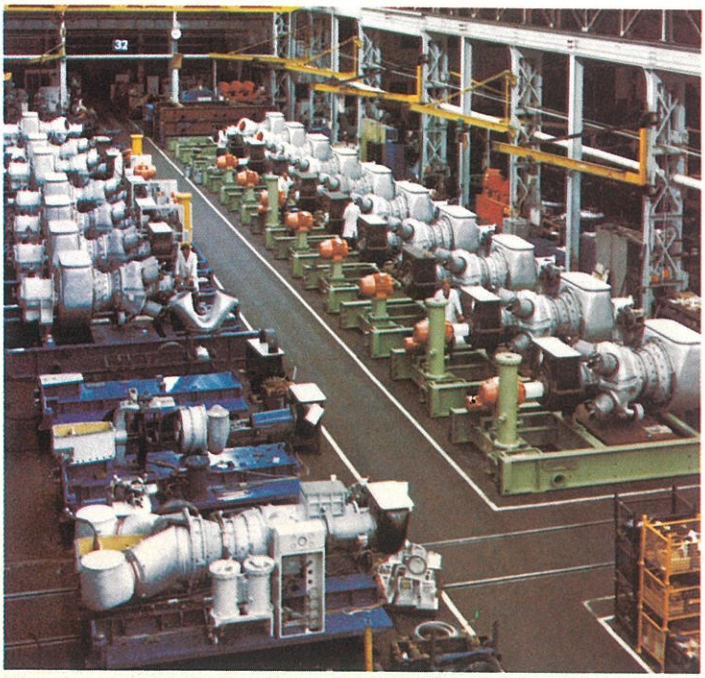

The assembly line for the production of the Ruston type TB gas turbine at the Lincoln works.

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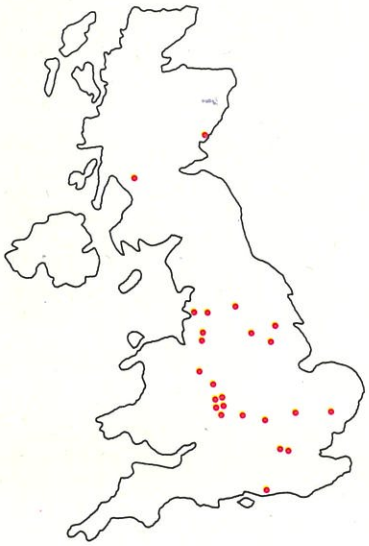
Micanite and Insulators Company Ltd's profits were down in the year due to reduced sales. To rejuvenate demand, effort was intensified in such new developments as high voltage insulation systems, and in new products for the reduction of environmental pollution, particularly non-toxic biodegradable and fire-resistant fluids for use in transformers and switchgear. Further legislation to protect the environment will enhance the sales of these products.

INDUSTRIAL



	1980	1979
TURNOVER	£334m	£327m
EXPORT SALES	£123m	£131m
EXPORT ORDERS	£133m	£134m
PROFITS	£48m	£55m

Generally, turnover remained fairly static and a good recovery in the profit from Paxman Diesels was more than offset by lower profits from smaller diesels and traction.

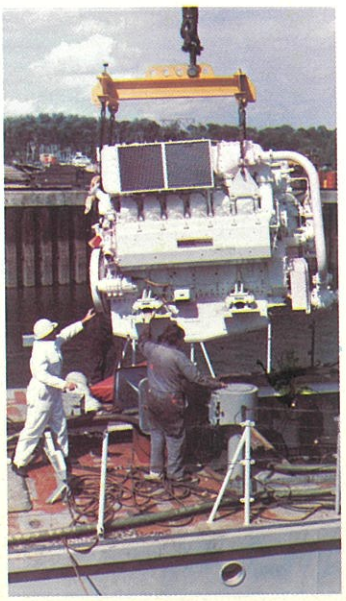
GEC Diesels Ltd Throughout the world the level of demand for diesel engines remains well below capacity. All the same, GEC Diesels finished the year with order books as a whole higher than the year before, and is pressing ahead with investment in new and improved products and plant.

Dorman Diesels Ltd experienced another difficult year, with turnover and profits down. The manufacturing facilities and manning levels at both Stafford and Lincoln are in the process of being streamlined. At the same time, a full-scale technical appraisal of the product range will lead to improvements in engine performances and market competitiveness.

The company managed to increase its direct exports, with notable successes in Egypt, Saudi Arabia, Iran and Bangladesh. However, the home market remains depressed for small engines, particularly for use in diesel generating sets. This, together with the uncertain political situation in the Middle East, is a continuing cause for concern. There are under active negotiation several overseas licensing projects which, if they can be brought to fruition, will increase the export of components from the factories.

Kelvin Diesels Ltd also suffered from reduced sales, affected by the continued uncertainty in the fishing industry and changes in exchange rates which turned in favour of American manufacturers in some traditional markets. Nevertheless, at home, Kelvin increased its market share; and overseas there are now definite signs of improvement. Subsequent to the year end, the company won a record-sized order for the supply of engines to the Inland Water Transport Authorities of Burma for the first stage of fleet re-engining worth over £7 million.

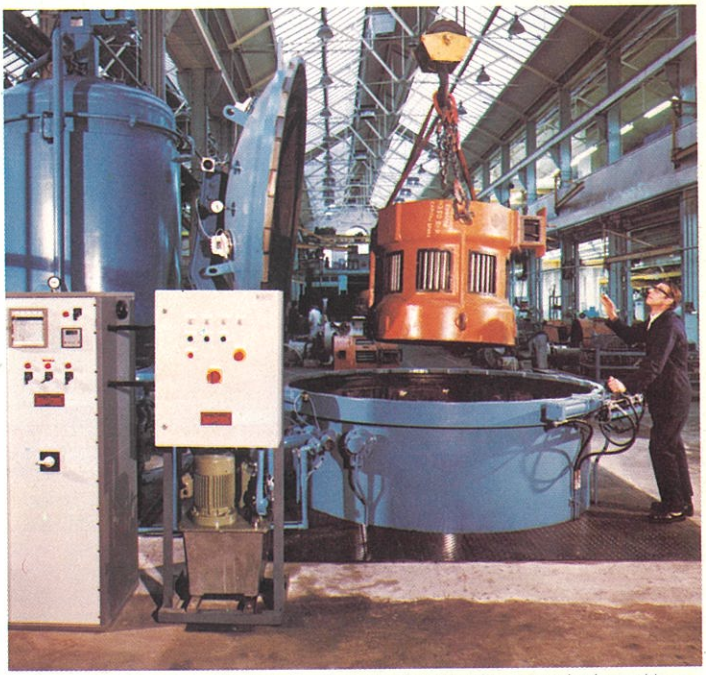
Paxman Diesels Ltd benefited in both sales and profitability from better productivity and calmer labour relations, though the industrial and marine markets remained weak. Important new orders received in the year included engines for the Australian equivalent of the successful British Rail High Speed Train, for naval type engines for Malaysia and additional orders for Naval Defence. The successful Valenta range of engines is being developed and extended in the specialised field of naval applications, and presentations have been given to several navies.



Paxman Diesels Ltd has broken into new overseas naval markets with its Valenta engine. In the UK it is installed in the Royal Navy's most modern aircraft carriers and many high-speed craft.

Ruston Diesels Ltd The severe recession in the shipbuilding and industrial generating set markets reduced sales of Ruston's large and medium diesel engines. Industrial business overseas continued universally difficult but in the UK marine field orders were well up on the previous year.

GEC Machines Ltd had a reasonably satisfactory year. Although the markets for most products were declining, sufficient orders were obtained to enable production to be maintained. The prospects are less good for the current year. Large Machines Division completed the components of the six



A vacuum pressure impregnation plant recently commissioned by Magnet Electrical Repairs Ltd at Bradford. It can be used for re-winding motors or treating existing windings particularly in machines which face onerous mechanical and electrical requirements or severe environmental conditions.

Substantial investment in improved manufacturing facilities has been maintained and will be continued, together with the development of new designs, two of which are currently at the prototype stage and will be available for sale in 1981. All engines within the Ruston range have been adapted to meet the current demand for heavy fuel. Simultaneously, the dual-fuel RK range of engines is being developed to operate fully on natural gas.

GEC Traction Ltd was held back by technical problems with some new products and industrial unrest in its factories which affected sales and profitability. The order book is currently satisfactory and new business prospects look promising despite keen competition in overseas markets. The home market for GEC Industrial Locomotives was affected adversely by the cut-back in UK steel production, and overseas by the reduction of Government Aid to developing countries.

GEC Engineering (Accrington) Ltd continued to show improvement in both sales and profitability, principally through more aircraft and automotive work; prospects in these areas continue to be good.

330 MVA generator/motors for the CEGB Dinorwic Pumped Storage Station, and site erection of the machines will follow. Work also continued on the machines for the JET project for the European Atomic Energy Community. Among major orders received was one for thirty-five 4000 HP induction motors for Saudi Arabia, believed to be the largest single order for machines of this size ever placed in the UK. Medium Industrial Machines Division and Small Industrial Motor Division introduced new ranges of motors with cast iron frames, and also put on the market their Thermalife Class "F" insulation system. Magnet Electrical Repairs Ltd started trading on 1st April 1979 and had a satisfactory first year as a repair and service company for GEC Machines.

Birlec Ltd continued to be adversely affected by the recession in the UK and in its traditional markets in Eastern Europe for furnace plant. The fall-off in orders has necessitated a reduction in the workforce and the outlook is obscure.

GEC Marine & Industrial Gears Ltd made reasonable sales but lower profits. The postponement of

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some business at home and abroad adversely affected order intake.

Woods of Colchester Ltd suffered a fall in profits, but prospects improved with a record order intake and improvement in output and productivity in the second half of the year. Exports were maintained at around 45 per cent of total sales, and included a contract to provide ventilation for the Suez Canal Tunnel.

Keith Blackman Ltd underwent a major reorganisation to enable production in future to be carried out at Arbroath and Rugby. New advanced production machinery has been installed. The planned expansion of activities in centrifugal fans and dust control equipment is expected to raise the levels of sales and restore profitability.

lishment of service companies in three Middle East countries. The National Westminster Tower installation was completed. A start was made on the Cairo Plaza project in Egypt, which will have twenty-four high speed lifts and four escalators when finished in 1982.

The new ETP microprocessor system, launched in March 1979, has created considerable interest and 61 units have been sold. A further major development, using microprocessors for speed control, has now been launched and a new test facility, the first of its kind in the UK, is being built in support of the development programme.

Claudgen Ltd's results were similar to the previous year. In spite of the mild winter, the major sales growth was derived from the expanding range of heating products. A major sign installation in Piccadilly Circus was completed,

A new, fast turret punch installed in Keith Blackman Ltd's new factory at Rugby. The punch produces components for Keith Blackman's new ranges of centrifugal fans and dust filters.

Greenwood Airvac Ventilation Ltd improved sales and profits. More orders in the commercial and industrial sectors are helping to counteract the decline in the building and construction industry.

The Express Lift Co Ltd Profits rose, and order input in the year was satisfactory although opportunities have declined recently at home and abroad. The export content of sales of new equipment is rising and accounted for 34 per cent of turnover in the year. Benefit is being gained from the establishment of service companies in three Middle East countries. The National Westminster Tower installation was completed. A start was made on the Cairo Plaza project in Egypt, which will have twenty-four high speed lifts and four escalators when finished in 1982.

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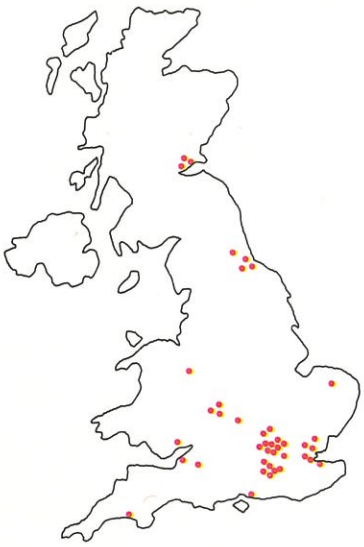
GEC Foundries Ltd did less well than in the previous year but increased its market share in depressed trading conditions by seeking out new customers. The Plastics Division achieved record sales and profit, and continues with its re-equipment programme.

Simplex of Cambridge Ltd enjoyed a good first half, but the export market weakened in the remainder of the year. High interest rates and uncertainty concerning the Common Agricultural Policy continue to deter farmers from purchasing new capital equipment. The Milking Division was strengthened by the purchase of Hosier, a company specialising in milking equipment.

ELECTRONICS, AUTOMATION & TELECOMMUNICATIONS



	1980	1979
TURNOVER	£1042m	£862m
EXPORT SALES	£330m	£305m
EXPORT ORDERS	£337m	£340m
PROFITS	£135m	£101m

The turnover of nearly all of the separate businesses showed a marked increase, and the year finished with order books in total nearly 40 per cent higher than at the beginning. In exports, avionics and electrical projects did exceptionally well in winning new orders, but most of the other businesses were unable to match the high level of intake of the previous year. In terms of profits, electronics continued to advance and telecommunications moved well ahead after the slow-down of recent years.

Marconi Avionics Ltd achieved a further substantial growth in sales, with exports still accounting for 40 per cent of the total, mainly to the USA. To satisfy a growing order book, several new establishments have been opened, including facilities in Bristol and at Milton Keynes. The drive to attract more graduate engineers met with marked success. Export sales were made to General Dynamics, Bell Helicopter, Textron and the Boeing Commercial Airplane Company. Boeing placed the first orders for a new groundspeed measurement system for airlines, one of three new airborne radio products launched during the year. Substantial home orders have been received for the initial production of the RAF's new airborne interception radar and for the Mission System Avionics for the United Kingdom's Airborne Early Warning Nimrod project. Considerable sales were made of avionics for anti-submarine defence and progress was made in the application of avionics based technology to sub-sea controls for the North Sea oil wells and in electro-optical and battlefield surveillance equipments, all of which hold promise for the future.

Marconi Communication Systems Ltd Profits were down on last year. After a slow start, sales and the order book improved in the latter half. The Mark IX colour television camera continued to sell well, and during the year a major contract to convert to colour the existing television studios in Yemen was successfully completed in the very short time-scale of six months. The recently introduced fifth generation of television transmitters achieved its first major success with the order from the Independent Broadcasting Authority for transmitters for the Fourth Television channel. The Madley II Satellite Ground Station for the Post Office was brought into service ahead of schedule, and so was the Ground Communication equipment for the Cable and Wireless second earth station in Bahrain. The naval communication system, ICS3, has been ordered for a further twenty Royal Navy ships.

Marconi Radar Systems Ltd achieved record results. Increased sales derived largely from major shipments of equipment to Saudi Arabia for the improvement of Civil Air Traffic Control and Air Defence systems. Substantial resources continue to be devoted to the manufacture and development for the Royal Navy of shipboard systems for SEAWOLF and SEA DART, and to the development of a new naval surveillance radar. Marconi Radar Systems received the Queen's Award for Exports.

Marconi Space and Defence Systems Ltd achieved sales and profits 30 per cent higher than the year before. Outstanding orders now stand at a record high level, with substantial production orders due to follow current development contracts. The Sting Ray contract, valued at more than £200 million, is one of the largest single development orders ever received by GEC; production over the next decade is expected to be worth £800 million, plus exports. Several major production contracts are just beginning in missile guidance and counter measures. Tank and

REVIEW OF ACTIVITIES

artillery fire control systems offer an expanding export potential, and the company-funded 'frequency hopping' radio "Scimitar" is expected to secure good overseas business in the manpack and vehicle radio field in those areas of the world where the company is already well established with the Clansman vehicle radio.

Marconi Instruments Ltd Orders and sales were at a similar level to the previous year, with home orders increasing to balance a decline in exports. The strong pound and increased costs caused profit margins to decline. Two new Automatic Test Equipments were launched during the year and have received excellent customer reaction.

The Marconi International Marine Company Ltd There is no indication of an early end to the depression in the shipbuilding and shipping industry. With exports accounting for over 60 per cent of sales, Marconi Marine did well to maintain its turnover, but was not able to maintain its profits.

Easams Ltd increased sales, profits and new orders. Exports are running at a high level. The continuing shortage of suitable professionally qualified engineers for the type of project work undertaken by this company imposes limitations on its growth.

GEC-General Signal Ltd's performance deteriorated in comparison with last year because of some suppliers' delivery delays, a contractual hold-up on a major export contract, and some technical problems. Actions have been taken to overcome these shortcomings and there are signs of an improving situation in the current year.

Further stages have been completed of major re-signalling contracts for British Rail on the Edinburgh and East of Scotland and London Victoria re-signalling schemes, and work on train describers for British Rail at Liverpool Street and for Euston/Rugby has recently begun. Development has commenced on replacing relay-type vital safe systems with microprocessor-based technology. The first microprocessor-based Remote Control System has been commissioned.

GEC Traffic Automation Ltd continues as a major supplier for Urban Traffic Control Systems at home, and is trying to increase its business in overseas markets. Whilst sales and orders in hand were higher than in the previous year, profits were affected by the failure to obtain compensation for increased costs. The first Compact Urban Traffic Control system using a microprocessor-based Highwayman Traffic Signal Co-ordinator was completed in Hull, and shipments commenced of microprocessor-based Traffic Signal Controllers for the major Singapore Area Traffic Control contract. Among new products being developed is the Vehicle Location system now undergoing preliminary trials for the Metropolitan Police in London, and sales to Police Authorities at home and overseas are expected to follow.

Lorries travelling on a flush floor slat conveyor system supplied by GEC Mechanical Handling Ltd in use at Vauxhall Motors, Dunstable.

GEC Computers Ltd extended its manufacturing capacity by the addition of a further factory at Dunstable. Profits did not advance at the same rate as output, which was 50 per cent higher than in the previous year although it did not increase as much as planned. The company has a healthy order book, and new orders for the GEC 4000 series computer systems included project "Wavell", the British Army's command and control project, equipment for a new viewdata installation in Hong Kong, and substantial extensions to the German and Dutch Viewdata services. New sales and service centres were established in Germany and the Netherlands to support expanding exports.

McMichael Ltd enjoyed a fast rate of growth and, with new developments in advanced digital equipment ranging from the Autopilot for the Sting Ray Torpedo to visual telecommunications equipment for the Post Office, prospects are good.

GEC Medical Equipment Ltd As a result of increased efficiency in manufacturing and administration, this unit improved its margins after absorbing a heavy increase in research and development expenditure, even though the level of sales was somewhat reduced because of reduced expenditure by the DHSS in the UK and lower capital spending on medical equipment by overseas customers.

However, order intake showed some improvement over the previous year, and for the first time included substantial orders from the USA which helped to raise the export content to nearly 50 per cent of orders for major equipment.

GEC Electrical Projects Ltd increased substantially its order intake, sales and profit. Export orders increased to over 50 per cent of total bookings, and included a major drives and automation system for a cold steel mill complex in Yugoslavia. A new microprocessor-based industrial control system launched early in the year won very high customer acceptance at home and abroad. With the increase in demand and prices for minerals, good potential exists for the company's mining division.

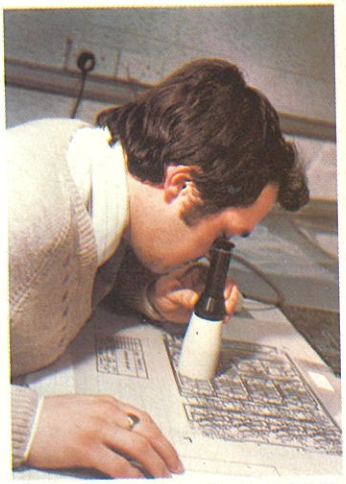
GEC Industrial Controls Ltd had a reasonably good year, with higher sales and profits. A satisfactory level of orders was achieved for High Voltage Motor Control using Vacuum Switches. The new GEM 80 microprocessor-based industrial control system launched in May 1979 has proved to be successful, with orders taken across a wide spectrum of industry at home and abroad. Good progress has been made in developing a new range of AC Variable Speed Drives to be introduced progressively during the ensuing months using advanced microelectronic components.

GEC Mechanical Handling Ltd made good progress in clearing some unremunerative overseas contracts against which provisions had been made in the previous year. Output and sales improved, and order input reached a new record level. Prospects are for further improvement in profitability, but with slower growth.

GEC Transportation Projects Ltd successfully completed the Taiwan Railway electrification scheme, and is now proceeding with work on the £150 million Railway Electrification project in Brazil. Business prospects in Latin America, Zimbabwe and Greece are being pursued.

GEC Telecommunications Ltd achieved a marked increase in sales and order input. Margins were better, particularly in telephone exchanges.

Deliveries of all exchange systems rose, especially TXE4. Installation began of the first System X exchanges for the Post Office network. The company's long term investment in stored-programme control techniques continues to bear fruit; orders for processors now exceed £30 million, including a contract for India.



A development engineer at GEC Telecommunications Ltd checks artwork against a computer-aided design for a printed circuit board which will be used in a private telephone exchange.

In transmission equipment, sales were similar in volume to last year, and the company's leading position in digital systems was maintained. The first 120 Mbit/s line transmission systems and 140 Mbit/s 11 GHz microwave radio system were installed, and first orders were received for 140 Mbit/s line systems. All of this con-

REVIEW OF ACTIVITIES

tributes to creating an up-to-date digital transmission network for the United Kingdom over the next decade.

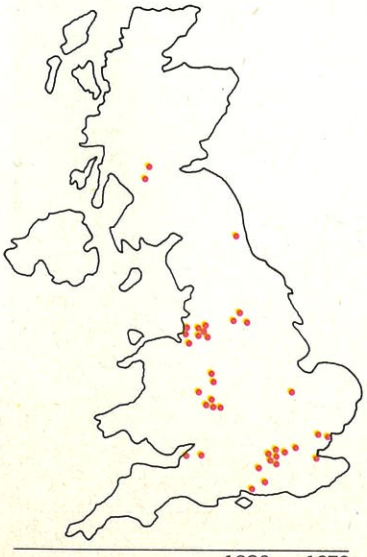
The increasing output of the Telephone Division included first deliveries of new designs of push-button telephones.

In private systems, further heavy investment was made in modern manufacturing and testing facilities for CDSS1 and SL-1, the new range of SPC digital Business Communication Systems for which a substantial order book has been built up.

Reliance Systems Ltd again had a successful year, increasing its turnover and profit in difficult trading conditions. The SL-1 private telephone systems have been well received by the first customers to use them, particularly because of the wide range of time saving facilities they offer; one installation includes the largest digital PABX operating in the UK. The company is continuing to do well with its room call system in hotels, and its new range of time control equipment is securing good orders. Looking further ahead, the proposed plans in the Post Office monopoly to introduce extra competition infer both opportunities and drawbacks to the company which has been active in advancing technology and providing facilities to meet customers' changing needs.

Associated Automation Ltd continued the steady improvement of the previous year with an extension in sales of coin-operated telephones and relays. Profits were better.

COMPONENTS CABLES AND WIRE



	1980	1979
TURNOVER	£397m	£328m
EXPORT SALES	£108m	£93m
EXPORT ORDERS	£85m	£132m
PROFITS	£35m	£35m

The rise in the price of copper influenced turnover in wire and cables, but generally all the businesses achieved higher sales. The decline in export orders was also materially affected by the lack of repetition of a large order taken in the previous year for telephone cables in Nigeria. The results of the other units were affected by the exclusion of the control valves business as from January 1979 and the inclusion of Averys from December 1979.

English Electric Valve Co Ltd achieved a modest increase in sales despite the scarcity of work in the first part of the year.

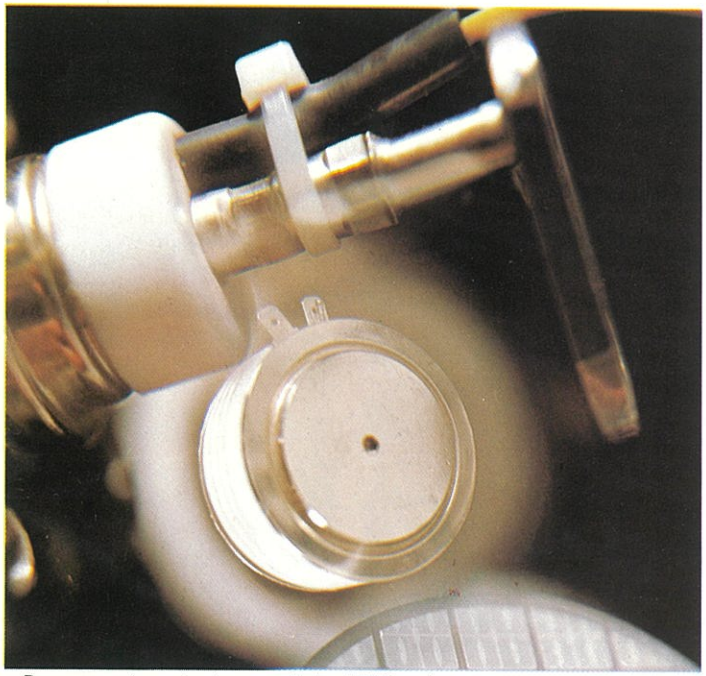
The pattern of new orders is changing significantly. Solid state devices are reaching higher power levels and are replacing triodes and tetrodes at the lower end of the power range. But the requirement for higher power levels for transmitters and industrial heating is maintaining the overall demand for these types. New business is developing for travelling wave tubes, image intensifiers, frequency agile magnetrons and character display tubes.

The move to larger premises for the manufacture of travelling wave tubes was started during the year and will be completed by the autumn of 1980. There is a growing demand for these devices for advanced radar and electronic warfare applications.

The M-O Valve Co Ltd had a satisfactory order intake, particularly for surge arresters. The production of reed relays again increased, and is still rising. Orders and sales of magnetrons for defence projects at home and overseas have been high and are expected to remain so during 1980.

GEC Semiconductors Ltd continued to grow, with sales increasing by one-third during the year. New products for the defence and television markets were introduced, and orders for these, together with new integrated circuits developed for telephone applications, represent a major contribution to growth in the year to come.

AEI Semiconductors Ltd Although sales increased only modestly, there was a substantial increase in orders. A new factory has been completed in Lincoln for the development and manufacture of microwave sub-assemblies mainly for use in military systems.



Power semiconductors made by AEI Semiconductors Ltd at Lincoln and used in advanced industrial drives.

GEC-Avery Ltd is a new company formed to manage the majority of the companies in the former Averys Group and the units which comprise the GEC Energy Conservation sector. It is active in five major business areas – Weighing and Testing, Liquid Metering, Electrical Measurements, Thermal Controls and Electrical Components.

Averys Ltd became a GEC subsidiary on 30th November 1979, and audited accounts for the Averys Group were made up for the fifteen months to 31st March 1980. Partly due to the more stringent accounting principles applied in GEC than in Averys Ltd and partly to the need to bring production more into line with falling demand, profits available to bring into the GEC Group Accounts were at a lower rate than those published for the year 1978. Steps have already been taken to strengthen the management of the Avery businesses, to improve productivity and efficiency, to introduce better accounting procedures, and to give technical support.

W & T Avery Ltd constitutes by far the largest activity of the Averys Group and manufactures weighing and counting machines, weighing control systems, strain gauge load cells and aircraft weighers. Its extensive sales and service field organisations operate from 219 branches in the United Kingdom and the Republic of Ireland. There are also 20 mobile workshops to service British Rail.

Avery-Denison Ltd manufactures physical testing machines and distributes dynamic balancing machines through an extensive sales and service network.

Driver Southall Ltd manufactures automatic weighing, filling, and checkweighing machines, and vibratory conveyors for packaging and processing, automatic batching plants, weigh-feeds and belt-weighers with sales and service coverage throughout the United Kingdom and overseas.

Oertling Ltd manufactures balances and other high precision weighing equipment.

Stanton Redcroft Ltd manufactures thermal analysis and flammability test equipment.

Avery Hardoll Ltd manufactures petrol pumps, bulkmeters and couplings for petrol and fuelling equipment.

Pump Maintenance Ltd installs and maintains petroleum storage and dispensing equipment throughout the United Kingdom.

Parnall & Sons Ltd and its subsidiaries are engaged in store fitting, security installations for banks, and manufacture of office chairs and furniture. The shopfitting and security sides of the business look promising for the future and new designs for the office furniture range will be introduced in 1981.

GEC Measurements Ltd sold over 50 per cent of its production in overseas markets and so was adversely affected by the increased value of the pound. To safeguard its competitive position, the company has invested heavily in new product development and manufacturing plant.

Satchwell Control Systems Ltd increased sales by nearly one quarter despite difficulties caused by national labour disputes and

REVIEW OF ACTIVITIES

long deliveries of the microelectronic components which form the basis of a new generation of controls.

Satchwell Control Systems Ltd's Keyboard 700 CMT controller uses a microprocessor to provide digital control of temperature or humidity in heating, ventilating and air-conditioning installations. Accurate control means minimum use of energy to maintain a comfortable environment.

Satchwell Sunvic Ltd had a poor year with sales and profits below the previous year due to the effects of industrial disputes on its major suppliers and customers. Several new products are now being launched to raise the tempo of business.

Salford Electrical Instruments Ltd made good progress with sales and profits well up on last year. The order book stands at a record level and investment is being directed towards improving productivity and increasing sales in overseas markets.

Londex Ltd continued to make progress. Sales were slightly higher than in the year before and a small profit was earned.

Telephone Cables Ltd had a much better year with profits recovering from the recent low levels. This was due mainly to a good export performance, but the home market also improved. The first lengths of optical fibre cable for a major network for the Post Office have been installed and show excellent operating characteristics.

AEI Cables Ltd's results improved after the reorganisation of the power cable factory last year. Exporting power cables is increasingly unremunerative, but overseas sales of general wiring cable were good and included a major contract for Russia. The range of fire retardant cables has been augmented, and extruded dielectric cables have now been developed up to 132kV.

GEC-Henley Ltd encountered intense price competition in export markets and made less profit as a consequence. However, prospects improved with several good orders received towards the end of the year.

The London Electric Wire Company & Smiths Ltd is undertaking a major reorganisation of the Leyton site and has announced a major modernisation programme for Trafford Park. The manufacture of optical fibre for communication purposes is expanding rapidly.

Vactite Ltd achieved a slightly improved performance in difficult market conditions. Lengths of overhead line conductor incorporating optical fibres are in course of manufacture under a development contract from the CEGB.

Kent Electric Wire Ltd maintained its performance in the enamelled wire sector of the business but was adversely affected by the declining demand for insulated conductors for the transformer industry.

F D Sims Ltd held its profits at the same level as last year despite increased price competition.

GEC Fusegear Ltd was severely affected by a strike which lasted for three months during the summer. However, good progress has been made in repairing the damage suffered by the business, and sales are currently at a high level.

GEC Distribution Equipment Ltd was also severely affected by the strike at Liverpool, but in this case the long order cycle time and the weak international demand for switchgear made its effects even more damaging and to some extent impossible to counteract. In consequence, the size of the business is being reduced and some 200 fewer people will be employed in future. As part of the drive to restore the company's fortunes, the product range is being improved with the introduction of modular designs of switchboards.

Redring Electric Ltd again increased turnover and profits. The company's spread of products mitigated the worst effects of the strikes in the engineering and steel industries. The product range has been widened further with the successful automatic electric kettle 'Autoboil'.

Walsall Conduits Ltd and **GEC Walsall Ltd** again produced record sales and profits in persistently difficult markets as a result of improvements in the efficiency of both the distribution and manufacturing divisions.

A G Hackney & Co Ltd continued to grow in sales and profits, but home orders showed a tendency to decline in the last quarter.

The results for the year were marred by the increasing pressure on margins and by the need to make substantial provisions at the year-end to cover some of the costs now being sustained in carrying through programmes of retrenchment necessitated by the fall in demand for many of the Group's products, especially furniture.

CONSUMER PRODUCTS

	1980	1979
TURNOVER	£303m	£278m
EXPORT SALES	£26m	£29m
EXPORT ORDERS	£27m	£26m
PROFITS	£21m	£24m

Osram (GEC) Ltd profits were well down, with home trade showing little growth. The CSEU action in mid-year created manufacturing problems resulting in loss of sales, an imbalance of stock, and higher manufacturing costs. Through concentrated and energetic management effort, a substantial recovery was seen in the last quarter, but this recovery has not followed through into the current financial year.

In export markets, the company was severely affected by the strength of sterling and low prices offered by foreign competition.

By continuing capital investment, stepped-up new product development programmes and further measures to raise efficiency, Osram hopes for better prospects.

GEC (Radio & Television) Ltd earned a small profit in spite of weak market conditions. New products and higher market penetration should lead to further improvement in results.

One of GEC's new range of colour television sets, produced at the GEC-Hitachi Ltd factory in South Wales.

REVIEW OF ACTIVITIES

Cannon Industries Ltd sales were higher, and profits improved. The introduction of a new range of built-in ovens coincided in the last quarter with the beginning of a fall-off in consumer demand.

GEC-Xpelair Ltd achieved a 25 per cent increase in exports and maintained steady growth at home despite more competition in the range of extractor fans. The Middle East continued to be a particularly good market with business in Saudi Arabia expanding rapidly. Two new fans and a wall heater will be introduced in 1980/81.

Hotpoint Ltd increased turnover by 22 per cent on the previous year although profits were lower. The company brought into full operation its new refrigeration manufacturing facility at Peterborough and a start was made on the extension of the Home Laundry Division in North Wales. But the current year has opened with a severely depressed market, and the level of activity is unlikely to be as high as planned. Firm action is being taken to adjust capacity to available demand. The fulfilment of the company's ambitions depends critically on its ability to replace foreign suppliers in the home market with Hotpoint products.

Schreiber Industries Ltd began with a reasonable improvement over the previous period, but demand dropped during the second half. Turnover for the year as a whole was higher, but profits lower.

The current year has started badly, and action has been taken to adjust capacity to the market level.

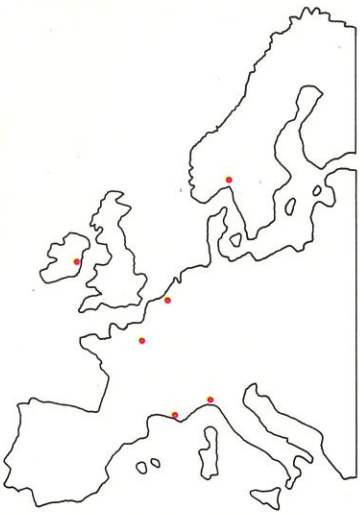
The company's new factory in Runcorn, Cheshire, is amongst the best equipped in Europe for fitted kitchen and bedroom furniture, and will manufacture newly introduced ranges of fitted kitchen and bedroom furniture.

OVERSEAS

	1980	1979
TURNOVER	£688m	£487m
PROFITS	£61m	£47m

The comparisons between 1979 and 1980 in this section not only reflect the trading performance of the overseas subsidiaries, but also the inclusion of the overseas businesses of A B Dick as from April 1979, the exclusion as from January 1979 of the control valves and instruments businesses incorporated into the associate company, Fisher Controls International, and the changes in the exchange rate between sterling and the overseas currencies. The commentaries that follow on the individual overseas subsidiaries are based on their results in their local currencies.

EUROPE



	1980	1979
TURNOVER	£155m	£156m
PROFITS	£17m	£18m

Vynckier N V of Belgium, with subsidiaries in Germany, France and Holland, achieved a notable increase in sales and profits in its business of installation equipment in a dull year for the construction industry in Europe.

GEC Composants S A in France also achieved satisfactory growth, which more than compensated for the disposal of its resistors activity during the previous year.

Société des Moteurs Baudouin S A of Marseilles experienced a further year of depression in its traditional markets in the fishing industry and the francophone countries of Africa. The weak dollar increased the effectiveness of competition for the available business from American diesel engine manufacturers. Profits suffered, but the growing acceptance of the company's high speed 'F' range of engines for new markets and applications, including fuel-efficient propulsion packages, will broaden its base and prospects.

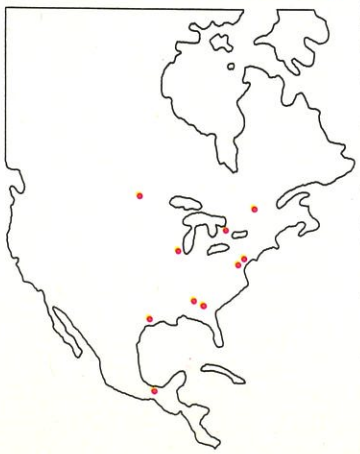
GEC Distributors (Ireland) Ltd expanded its sales and increased its profit in a market which had begun to show signs of recession by the end of the year.

Marconi Italiana SpA continued the progress of record breaking years for sales, profits and orders. Exports now account for a quarter of the company's business and included orders for telecommunications and avionics products for Denmark, Sweden and Algeria. Exports are also expected to benefit from a recently launched new range of military and civil equipment.

Norsk Marconi A/S benefited substantially in sales from the implementation of its major North Sea communications projects for the oil industry, but the overall results were depressed in generally poor domestic conditions. Intensive development of new products and markets is already meeting with success, particularly in avionics products and overseas.

San Onofre nuclear power station in California to which GEC supplied two 1100 M W turbine generators.

THE AMERICAS



	1980	1979
TURNOVER	£306m	£109m
PROFITS	£25m	£12m

A B Dick Company of Chicago, which was acquired at the beginning of the financial year, made record sales, and an improving trend of profits was developing by the year end. Continued growth was evident in the company's traditional product lines, offset printing presses, mimeograph machines and office machines. A new professional model offset machine received very favourable acceptance in the printing industry. In August 1979, a new and inexpensive plain paper copier was introduced, and over 5,000 units were sold in the first ensuing six months.

The company continued to broaden its market approach with automated office systems. Sales of the Magna line of word-processing systems increased notably and were enhanced by the acquisition of a shared-logic word processing system now being manufactured at a new factory located in Manchester, New Hampshire. Development and marketing were also intensified on A B Dick's Systems 200 record processor, which remains the only updateable microfiche record management system commercially available.

The recession in the United States and elsewhere has affected the company in the current year, and business has become more difficult in recent months.

Alco Power Inc's diesel engine business enjoyed a year of growth. Orders, particularly in the traction field, were won in Brazil, Mexico, Pakistan and Japan. A new capital investment programme is under way to improve manufacturing facilities and reduce costs. Two new engine models of UK design are to be manufactured in the Alco factory to widen the application base of the company, and to serve customers in the natural gas market.

Electrical Machinery Industrial Controls Corporation occupied its new factory in Macon, Georgia, in August 1979 and has made progress in establishing products using vacuum switching technology for medium voltage motor starting. The company has also

REVIEW OF ACTIVITIES

introduced variable speed AC drives which have already brought in orders from major customers.

EEV Inc achieved a substantial increase in sales of products manufactured in the UK by the English Electric Valve Company Ltd, mostly camera tubes and magnetrons.

The English Electric Corporation continued to assist other UK units not represented by the specialist companies in the American market; the most noteworthy order was for 25kV vacuum trackside sub-station equipment for the North East Corridor Railway Improvement Project.

Marconi Avionics Inc achieved further sales growth, particularly with head-up displays and air data systems, whilst developing new applications for other high technology products.

Marconi Electronics Inc had a successful year in which the Instruments Division obtained several important military contracts and the Broadcasting division expanded sales of videotape recorders and Mark IX cameras.

Ruston Gas Turbines Inc had an outstanding year. The expansion of the packaging facility in Texas was completed and is being used to service the growing demand in the western hemisphere, particularly Mexico.

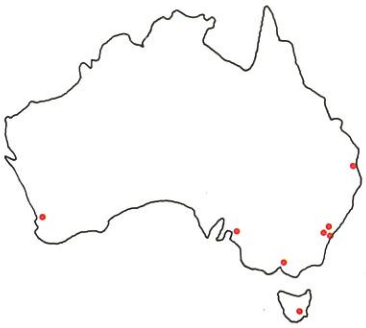
AEI Telecommunications (Canada) Ltd results are still being adversely affected by the reduction of business in imported equipment. Its own products, developed and manufactured in Canada, are selling reasonably well in Canada and elsewhere, and the company will expand this side of its activities.

Canadian Marconi Company reported strong growth in sales and profits, with deliveries of tactical radio relay equipment to the United States and other countries. An international telex transit exchange was commissioned in Canada and, in association with GEC Telecommunications Ltd, orders were received from the British Post Office for nine telex exchanges. Further growth is to be expected from the considerable product development programme and growing penetration of international markets.

GEC Canada Ltd with less power engineering business available, succeeded in expanding its other activities and was able to increase sales and profits.

Eastern Electric Company Ltd's margins in its staple trading activities in electric motors and fusegear were eroded by the strength of sterling and the weakness of the Canadian dollar. The extended strike at the Liverpool fusegear factory delayed deliveries and thus lost sales. The company's overall results were further influenced by unsatisfactory stock control, a deficiency which is being corrected.

AUSTRALASIA

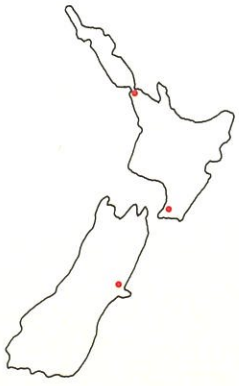


	1980	1979
TURNOVER	£99m	£102m
PROFITS	£6m	£5m

GEC Australia Ltd's performance showed a sharp improvement, primarily due to the elimination of losses in the Electrical Wholesale Division after an extended period of unsatisfactory trading. Easier market conditions have helped, but the major influences were better marketing management and stock control.

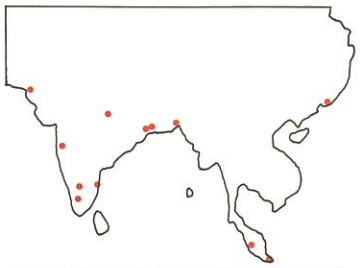
The Heavy Engineering, Projects and Automation & Controls Divisions improved their results and finished the year with excellent order books. The Lamp & Lighting Division suffered the effects of price cutting in fluorescent tubes, and the Industrial Products Division, more dependent than any other on imports from the UK, was affected by the strong sterling exchange rate and low demand in the industrial construction sector.

GEC Diesels Australia Ltd showed improved results, and expects to benefit from the development of the offshore oil industry.



GEC (New Zealand) Ltd performed well in raising sales and profits.

ASIA



	1980	1979
TURNOVER	£109m	£102m
PROFITS	£10m	£9m

The General Electric Company of India Ltd's trading was affected by serious power shortages which continued to disrupt production and delivery schedules. The company also suffered from a dispute with the labour force concerning the need to improve productivity at the transformer and switchgear works at Naini, which remained closed for four and a half months. All the same, the company managed to increase sales and profits through improvements in other activities, and is now beginning to benefit from an intensive programme of product development and the institution of higher quality standards. The winning of a large order for ceiling fans for the US market was particularly gratifying.

tional factory in the State of Tamil Nadu to meet the expected growth of its business in control panels, fusegear and protection relays.

The General Electric Company of Bangladesh Ltd had a further successful year in its representational, contracting and manufacturing activities, which are now benefiting from a broadened product base.

Johnson & Phillips (Pakistan) Ltd fully recovered from the labour problems of the previous year, and a new spirit of partnership between management and labour produced a gratifying improvement in performance through higher productivity.

The General Electric Company of Malaysia Sdn Bhd achieved material improvement in sales and profits and made an important contribution to the success of other GEC companies in winning orders in Malaysia. But with the emergence of more local manufacturers of refrigerators and air conditioners, coupled with a less lively market, the manufacturing company was unable to maintain the profit level of the previous year.

The General Electric Company of Hong Kong Ltd reported record

Fionna Hsung with her colleagues at the Large Projects Division in Hong Kong. Fionna is responsible for electrical design and project co-ordination on the Mass Transit Railway.

The English Electric Company of India Ltd continued to raise productivity and to expand output, sales and profits. It has embarked upon the construction of an addi- results, largely through diligent management of the specialised contracts activities and especially in relation to the recently opened Mass Transit System.

REVIEW OF ACTIVITIES

The General Electric Company of Singapore Private Ltd did not have a good year. It maintained the volume of business, but produced lower profits because of a large bad debt and narrower margins.

AFRICA

	1980	1979
TURNOVER	£19m	£18m
PROFITS	£3m	£3m

L H Marthinusen Ltd's motor and transformer repair business showed improved profits despite strong competition, reflecting the healthy state of the South African economy.

GEC Zambia Ltd made the most of its opportunities to produce satisfactory results in the light of the strained economic conditions and the limitations on imports, even though not reaching the record level of the previous year.

GEC of Central Africa (Pvt) Ltd in Zimbabwe now has brighter prospects for the development of its business following the removal of sanctions.

ASSOCIATED COMPANIES UNITED KINGDOM

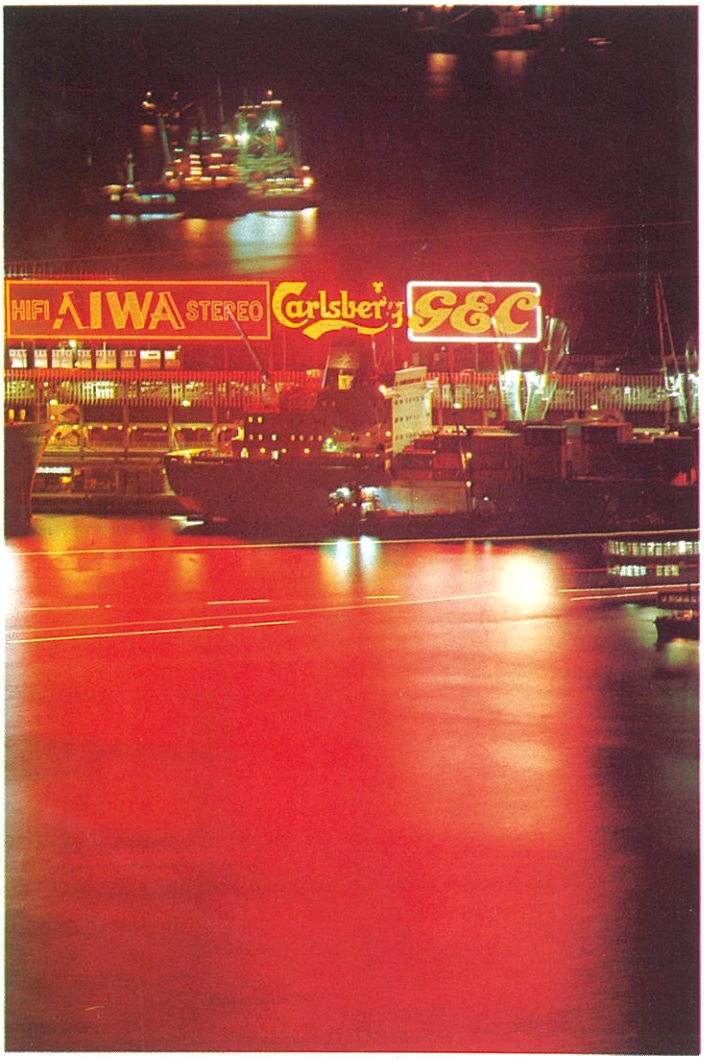
	1980	1979
TURNOVER	£116m	£91m
PROFITS	£3m	£6m

The figures given above show the GEC share calculated by reference to the GEC interest in the equity of the Associated Companies.

The **Ruston-Bucyrus Ltd** profit was less than half the figure for the previous year. This was largely due to high costs, and a marked fall in demand for quarry and mining machinery and more intense world competition. Prospects are not bright for the current year.

The **National Nuclear Corporation Ltd** continued its work towards the completion of the Advanced Gas Cooled Reactor (AGR) stations under construction, on the design and development of the AGR stations to be built at Heysham and Torness, and on the commercial Fast Reactor. Progress on the preliminary designs of a Pressurised Water Reactor has led to the receipt of a Letter of Intent for the design and manufacture of a Nuclear Steam Supply System.

tering many adverse factors. Exports were lower due to fierce world competition in which the high sterling exchange rate placed the companies at a disadvantage. The CSEU engineering dispute had a specially damaging effect on these businesses, where continuity of production is essential to achieve economic unit costs. These activities have consequently been scaled down, but capital investment has gone ahead to counter rising unit costs



GEC lights up "Fragrant Harbour". The familiar GEC sign as seen from the busy harbour of Hong Kong.

GEC-Hitachi Television Ltd started on 1st January 1979, since when considerable investment has been made in new equipment. Several manufacturing, engineering and quality control operations have been changed. But the UK colour television market has remained depressed, demand having been lower than expected. However, several new television receivers have been introduced for both the GEC and Hitachi brands which are currently selling reasonably well at home and overseas.

The lamp component companies had a very difficult year, encoun-

and to facilitate the introduction of new products.

ASSOCIATED COMPANIES OVERSEAS

	1980	1979
TURNOVER	£227m	£145m
PROFITS	£24m	£16m

The figures given above show the GEC share calculated by reference to the GEC interest in the equity of the Associated Companies.

SRA Communications A B faced a very difficult trading period for the first three-quarters of the year, but recovered strongly before the year-end with substantial growth in both home and overseas orders.

Fisher Controls International Inc met its sales budget of $500 million, and achieved the integration targets set for its first year. Further growth in the United States is expected to offset the depression in European markets. A complete new range of process control instrumentation under the name 'Provox' is due to be marketed, providing the company's main thrust into microprocessor distributed systems control. $10 million of orders have already been acquired before the official launch.

Cable Makers Australia (Pty) Ltd set new records in sales and profits.

GEC South Africa (Pty) Ltd's increase in order input did not fully reflect in the year's sales and profits, which rose more slowly. In transformers, margins were meagre and profits were poor; there are indications of some improvement in the market. Cables, traction, protection relays, process control and Satchwell components all did better, but the biggest improvement came from the electric motor subsidiary which benefited from the programme to raise quality and reliability in the large machines section. The advantages of GEC's partnership with Barlow Rand Ltd become increasingly apparent as, for example, in the support given in planning the essential local content for the large new orders from the Electricity Supply Commission for the turbine generators to be made largely in the UK factories.

Telephone Manufacturers of South Africa (Pty) Ltd increased output of switching equipment and telephone instruments, and concluded a fifteen-year supply agreement with the South African Post Office.

African Cables Ltd increased sales and profits and expanded production facilities for the manufacture of high voltage cross-linked polythene cable.

African Telephone Cables (Pty) Ltd had a good year; the level of demand continues to be satisfactory.

Winding Wires (Pty) Ltd produced fairly good margins and should gain new business from the addition to its product range of enamelled copper strip.

REVIEW OF ACTIVITIES

RESEARCH

In addition to the research and development undertaken in the laboratories of the operating units, GEC conducts research in four central research laboratories.

Generation, control and conservation of energy continue to be major fields of activity. Rising oil prices and other problems related to supplies have led to the consideration of alternative fuels for gas turbines. The exhaust fired gas turbine (EFGT) is being studied for application in novel total energy schemes in the UK and overseas. Studies of renewable energy resources have included the use of solar energy for water heating for a hospital, and the evaluation of evacuated tube, high temperature solar collectors for other large scale applications. Improved computer-based techniques have been developed for assessing energy demands on industrial sites to enable areas of high energy loss to be identified and improved, and rapid assessment of the possible advantages of total energy schemes.

Research programmes have been started on semiconductor materials with the special characteristics needed in future high performance microwave and millimetre system components. High quality quartz crystals of improved purity and with even fewer imperfections than previously are being grown for use in quartz crystal filters and surface acoustic wave devices. Aluminium phosphate, a potential new alternative to quartz, has been grown in single crystal form and shown to have some piezo-electric properties superior to those of quartz. Glass-ceramics with controlled expansion characteristics have been used for coatings which need to be highly resistant to chemical attack. A technique incorporating a thermocouple in the glass-ceramic lining of steel vessels used in the chemical industry has improved the speed of measurement of temperature changes in the vessel and hence the response of the control system. The use of fibre reinforced composites for insulation in high voltage applications has been extended by a new manufacturing technique involving vacuum impregnation as part of a computer controlled winding process.

Research on components, centred on silicon integrated circuits and other solid state devices, is of increasing importance to all our activities and is being expanded accordingly.

Work on complementary MOS on sapphire (CMOS/SOS) technology has led to the successful design and manufacture of several large scale integrated (LSI) circuits. Special circuits have been developed for high speed signal processing; one which will have extensive application is a 1024 gate uncommitted logic array (ULA). Computer programs have been developed which automatically complete the ULA design for a chosen purpose, providing a quick, low cost method of designing some integrated circuits. Research is under way into a second generation of CMOS/SOS technology for very large scale integrated (VSLI) circuits.

Optoelectronics constitutes a major area of research activity, and progress on solid state imaging has continued with the development of what is believed to be the world's first device to meet 625 line television standards. Research continues on DC electroluminescent flat panels, which are particularly promising for displaying several hundred letters and figures, as an alternative to the cathode ray tube.

A variety of sensors for measurement of such quantities as density, pressure and viscosity, based on several different physical phenomena, are being studied. A recent application has been the monitoring of the condition of vehicle batteries. New work on all-optical transducers for use in the process control industry has revealed exciting possibilities in temperature measurement devices.

The Communications field continues to present major research challenges and opportunities.

Work on a digital telephone containing an analogue-to-digital converter, and on digital transmission giving multi-service facilities on a single pair of telephone wires (allowing simultaneous transmission and reception of speech, viewdata, and other data services), has reached the stage of public demonstration. An advanced viewdata terminal has been developed combining the intelligence and versatility of a powerful microcomputer system with the widespread availability of a viewdata network. Advanced circuit techniques have extended the capacity of our optical communication system to 560 Mbit/sec, equivalent to 7680 telephone channels, on a single optical fibre.

A glimpse of the businessman's desk and (possibly) the home of the future. A viewdata receiver is accompanied by an editing terminal (in white) which can input or change viewdata material and a new digital telephone system (in red) which can operate the viewdata service and leave the telephone free for making calls. Both have been developed at GEC's Hirst Research Centre.

In signal processing, new device concepts interact with systems and their applications. Several forms of signal processing are essential parts of our research, since they offer ways of improving and extending a range of information handling systems. Programmes include the extraction of acoustic or ultrasonic signals from background noise, the differentiation of aircraft radar echoes from those of stationary objects or raincloud, and the recognition of a radio signal against man-made or natural interference. Methods range from the wholly electronic to a combination of electronic, acoustic and optical techniques. One application is the detection and enhancement of infra-red signals, particularly for security and surveillance devices. Related research investigates the separation of radio signals from unwanted information by spectral characterisation, and work is being done on highly selective spectral filters using reflective surfaces produced by laser holography.

New topics in radar include the signal and data processing problems associated with the use of separate sites for transmitting and receiving systems, and improved methods of obtaining necessary information in air traffic handling systems. For communications applications, several ways of reducing the problems of congestion of the frequency spectrum are being examined.

Medical diagnostic equipment too depends heavily upon improved signal processing, but our current research programme in this area is also concerned with extending the capability of real-time ultrasound equipment by the use of higher frequency transducers, for example for giving good visualisation of the carotid artery.

Research on Nuclear Magnetic Resonance is investigating the value of the additional information which cannot be measured by other diagnostic equipment.

Microprocessors are being applied both as experimental tools and for incorporation in new products. Applications include the development of an advanced multiprocessor governor for a prime mover, investigation into self-learning control systems, and other products ranging from small domestic appliances to advanced military vehicles.

Research is under way on a new type of computer based on a number of modules each using standard microprocessors and memories. This machine is primarily intended for controlling future telephone exchanges, but it will also be suitable for more general application, each module having a computing capability equivalent to a present day minicomputer.

Manufacturing and design functions throughout the Group benefit extensively from research. Improved numerical techniques are making an important contribution to design methods for electric motors, generators and power transformers. Other programmes are making an important impact on the design of turbomachinery components, and new test facilities and advanced instrumentation systems have resulted in the acquisition of new, valuable data on complex real turbomachinery flows. This work is invaluable for current design techniques and for the further development of the computer modelling which is essential to modern turbomachinery design. The design process is being further enhanced by the development of an efficient interactive computer aided design (CAD) system.

Research continues to determine the ways in which computers and their associated displays, printers, and other peripheral equipment, can make our engineering and manufacturing procedures more effective throughout the GEC.

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