

expenditure for expansion and increased productivity over the next five years of £2,000 million, the Post Office says that charges must be brought into line with costs. The position is being reviewed by the Prices and Incomes Board.

The telecommunications section is aiming to increase the size of the system by 50 per cent without increasing overall manpower, by using more machinery. Improvement of service for the existing 7.7 million subscribers will be the most important task in the coming year, and a net increase of half a million subscribers is expected. The various local, trunk and overseas lines are all being increased, as are exchanges and the number of telex lines. By March 1969 it is expected that 98 per cent of customers will be on automatic exchanges. Automation is progressing in such fields as international telex and telegrams; data transmission services are being expanded, and additional submarine cable links with various European countries are being laid. Aluminium conductors have been successfully used instead of copper in telephone cables, and further use of aluminium is expected to benefit the economy because of the high price of imported copper.

The postal section will see two important developments in the coming year—the two-tier post system in the autumn with lowest rates of postage being open only to mail in “post office preferred” envelopes, and the inauguration of the National Giro Service at its Lancashire headquarters. Modern techniques of management and marketing are being examined for staff and stamps, respectively, and post codes will be allocated to parts of London and twenty-five other towns and cities. During the year, twenty mechanized sorting offices will be brought into service.

New Units for Industry

THE process of changing all Britain's units from the old imperial system to the metric system is a messy business. Colonel J. S. Vickers, chairman of the Planning Group of the British Standards Institution, which is planning the change, calls it “an agony”. But at least everyone agrees that the medicine, once taken, will do the patient good. The arguments are about who should take the medicine first. In most countries which have made the change, the retail trade, which includes packaging, has adopted the new units first, but in Britain the opposite will happen. The plans for the retail trade will depend on the recommendations of the Joint Committee on Metrication, a Ministry of Technology body whose chairman is Mr Arthur Wynne. The committee is widely expected to accept a recommendation made to it by the CBI (see *Nature*, 216, 1157; 1967) and propose the formation of a Metrication Board.

Last week the BSI was able to announce its plans for the engineering industry. After consultation with industry which seems to have been somewhat one-sided (of 1,600 firms to which the BSI sent its original questionnaire, only 250 replied), the BSI has prepared a draft programme which it is circulating to industry through trade associations. The period of transition has been set at 1970–75. The terminal date was fixed by a Board of Trade decree, so all that really needed deciding was the starting date. 1970 seems to have been the overwhelming favourite. The first industry to go metric, chosen because its problems were likely

to be the greatest, will be the engineering equipment manufacturers, who use the basic engineering materials to produce equipment which is then used by the process industries. This time-scale will, the BSI says, fit in with the plans of the construction industry, which is on the way to metrication already. Some 20,000 copies of the draft programme have been sent to engineering companies through their trade associations, and they have been invited to send comments to the BSI by March 29. Companies not members of any trade association can get copies from the BSI.

Another New Reactor

DESPITE its great cost, which might be expected to dictate caution, nuclear reactor design remains astonishingly diverse. Almost every conceivable combination of coolant, moderator and fuel has been studied, on paper if not in actual hardware, although most of these systems are unlikely to evolve into commercial power reactors. Although Britain has so far tended to favour gas cooling for thermal reactors, the United Kingdom Atomic Energy Authority last week invited the Duke of Edinburgh down to Winfrith to open its latest reactor, which is water cooled. In the event, the considerable skill of the authority at public relations had to be directed at those who thought the royal visit had cost a great deal too much, but the virtues of the reactor were not entirely forgotten. It had, after all, cost £16 million itself.

The reactor is called, somewhat inelegantly, the steam generating heavy water reactor, abbreviated to SGHWR. It is a system in which moderation by heavy water is combined with cooling by ordinary water, which boils and drives the turbine generators in a direct cycle. The design uses a number of pressure tubes, rather than a single pressure vessel, an arrangement with several important advantages. The fuel, slightly enriched uranium dioxide, is contained in thin tubes made of zirconium alloy; 36 such tubes go to make up each fuel element. Cooling water passes up the tubes, which are surrounded by an aluminium calandria (vessel) containing heavy water moderator.

The electrical output of the station is 100 MW, which is fed into the National Grid. The reactor can be refuelled either on-load or off-load, although the advantages of on-load refuelling seem much overrated. If the reactor is refuelled off-load, the whole job can be done in a weekend so that most customers are likely to choose this option. The pressure tube design allows much of the fabrication work to be done in the workshop instead of on-site, which is a valuable advantage in places where welding technology is less advanced than it is in the United States. The authority is tentative about quoting costs, but says that capital costs should work out at about £60 per kilowatt, with generating costs of 0.50 pence a kWh or less. The reactor is a good plutonium producer, very much better than the advanced gas cooled reactor, and about the same as a boiling water reactor. The design can also be adapted for natural, rather than enriched uranium. The authority says that there would be no difficulty in building an SGHWR as big as 1,000 MW.

So far, however, the whole contracting position is a mystery. The authority firmly says that “the team which built this reactor will take on contracts anywhere”. Under these circumstances, the AEA would

be the prime contractor and no move seems to have been made to license the consortia of industrial companies to build the design. The AEA has already submitted tenders in Finland, and has signed a contract for the supply of information to Japan; it seems determined to keep the SGHWR to itself. Meanwhile, the Minister of Technology is still wondering what to do with the nuclear power industry in Britain. He should think quickly, before the authority answers his questions for him.

Experimental Factories

from Angela Croome

A SECOND stage in the Akademgorodok (science city) experiment in Siberia is now actively under way. This involves the development of areas outside the main centre, containing experimental factories, design offices and special training facilities to speed the transition from good idea to industrial production. The scheme was put forward by the Siberian Academy of Sciences led by Academician Mikhail Lavrentiev in 1966 and adopted by the Soviet Government last year. The site chosen is about 2.5 miles from Akademgorodok on the banks of the Ob Sea and is to be called Pravye Chomy. The population will be limited to 15,000—much less than the total of 40,000 which Akademgorodok attained last year, its tenth anniversary.

The object is to improve the ways in which basic research is turned into industrial practice. The ideas, which will come from the research institutes of Akademgorodok, will pass to design offices at Pravye Chomy linked with the appropriate institute. Designs produced here will then be developed at centres on the spot which are described as “something between laboratories and factories”. In these centres development will go at least as far as the production of prototypes, still under the guidance of the original inventor. Academician Lavrentiev commented, “We have recently come to the conclusion that the traditional ‘conveyor belt’—academic institute/design office/industry—by which scientific discoveries are brought into practical use in industry, often works too slowly. . . . The Siberian Design Office experiment, whereby valuable scientific ideas are brought to the point of practical industrial use under the direct control of the inventors themselves, has proved highly successful”. The Institute of Hydrodynamics at Akademgorodok has pioneered the procedure. The hydraulic impact forging techniques introduced by the institute are estimated to have saved the Soviet oxygen equipment industry alone 100 million roubles a year. An interesting feature of the Pravye Chomy scheme is that most of the capital cost is being found by industry.

The scheme will be mostly operated by young people. This is seen as a unique opportunity to provide, after the 3–4 year development phase, not only effective designs but the people to put them to work on the shop floor. Linked to this is the introduction of a new type of degree to be given by Novosibirsk Technical College, shortly to be opened. This qualification will be intermediate between that of the full engineer and skilled factory hand. Novosibirsk University is adding an engineering faculty soon in support of the new technological developments. A large workshop block with a floor area of 1,500 square metres is nearly ready at Pravye Chomy.

French Scientists on Strike

from our Paris Correspondent

IF French politicians of all political parties rarely show an active and informed interest in research—election speeches contain polite but woolly references to the “progress of science” but are singularly lacking in precise policies, and the discussion over finance each year is carried on before a virtually empty House—scientists themselves seem to have long ago made up their minds to direct the attention of politicians and the Government to their future.

This is why an order to strike was given by two trade unions two weeks ago at the Centre for Nuclear Research at Saclay. The immediate aim was to protest against a plan for professional classification which would harm certain categories of personnel. In the longer term the question was that of fixing a date for a possible reorganization of the Atomic Energy Commission (the CEA). Is the CEA, which provides work for approximately 30,000 people and which, because of the size of its budget, is in French science a considerable *force de frappe*, threatened with disruption? In political as in research circles, many people would very much like to reduce this tremendous power by giving to various other organizations functions which originally were mistakenly attributed to the CEA for reasons which are no longer valid. The CEA, even under this system, would remain, if only for military reasons, an institution of considerable importance. Inevitably, however, a certain amount of reorganization would take place. At all events, it is doubtful whether strike action would weigh very heavily on Government decisions which will probably be taken at the highest level and in accordance with well known political and military strategy.

Despite this, another strike took place on February 20 and 21, organized this time on a national scale by the three research workers' unions. It seems that the strike was 70–80 per cent effective. It is the mode of operation of the National Centre for Scientific Research or CNRS (6,000 research workers, 8,500 technicians) which is the issue at stake, or, rather, the method of professional promotion agreed on by the responsible ministry, the Education Ministry. Having decided to push the research workers into the industrial sector, by force if necessary, the minister, M Alain Peyrefitte, has created a bottle-neck between the first grade of the CNRS hierarchy, that of research assistant, and the second grade, that of research organizer. This year, seventy-nine assistants, all holders of doctorates and having the recommendation of the commissions concerned, have not been able to enjoy the promotion they were expecting, which is virtually forcing them to leave the CNRS once and for all.

Those who defend this measure argue that the almost automatic passing from one grade to another leads to “functionalization” of research and threatens to make the CNRS, which ought to be a dynamic body, stagnant. Their opponents, while agreeing that this argument does have some justification, deplore the improvised nature of this new policy and see in it a threat to basic research. The desire which the minister professes for “irrigating” industry is for them based on a dangerous illusion: French business men who are extremely timid in their attitude towards research are certainly disinclined to pour capital investment into this field