the Ugine Kuhlmann Group in France, about one-fifth by each of Steinkohlen-Elektrizität AG (STEAG) of Germany and Société Metallurgie Hoboken of Belgium. Companies in the Netherlands, Sweden, Norway and Denmark will supply under ten per cent each. The president of the Company will be Mr J. E. Leger of Ugine Kuhlmann, the secretary Mr de Roubaix (Metallurgie Hoboken) and the chairman of the management board Dr Volcker (STEAG). Ugine Kuhlmann and the Société Industrielle des Minerals de l'Ouest (SIMO) jointly developed and patented the process.

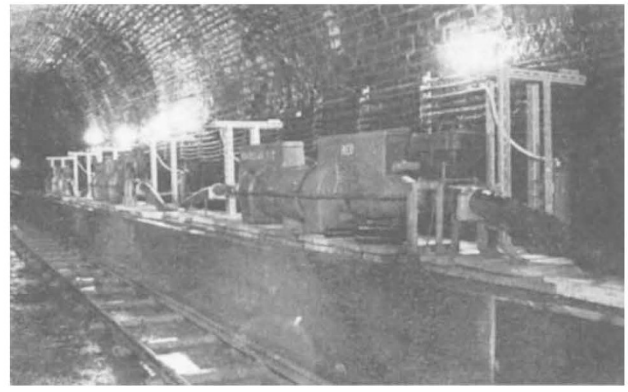
The UK Atomic Energy Authority may not be too alarmed by this news. The conversion of uranyl nitrate into uranium tetrafluoride is an important but small part of the reprocessing operation, and a drastic reduction in the cost of this process may not have much effect on the total cost of the operation. Further, reprocessing shows considerable economies of scale, and the Windscale plant is apparently much larger than the Eurochemic plant. It follows that, although the SFU plant will be able to handle all the uranium leaving the Mol reprocessor, the difference in scale may maintain the economic balance in favour of Windscale. It is also important that reprocessing capacity in the western world is considerably greater than the amount of fuel requiring reprocessing; although the advent of the fast breeder reactor may go some way to redress this balance, the immediate economics of fuel reprocessing do not seem very exciting.

ELECTRICITY

New Use for Old Tunnel

A RAILWAY tunnel beneath the Pennines which is remembered as a major scandal of the Victorian era because of the loss of life involved in its construction is being used by the Central Electricity Generating Board for a section of the 400 kV supergrid. Until 1954, the tunnel carried the Manchester to Sheffield railway under Bleaklow Moor between Woodhead and Dunford Bridge. Its use by the CEGB means that a length of overhead cable across Bleaklow Moor, part of the Peak National Park, can be dismantled. This will be left until after the winter, and in the meantime the three-mile length of overhead cable will be available for research purposes. The overhead cable and its supporting pylons were allowed by the Ministry of Power after a public inquiry in 1963 on condition that it would be a temporary measure until the tunnel link was completed. The pylons are particularly objectionable in this part of the national park because they run along the skyline. At a cost of £2·75 million, the project represents quite a saving for the CEGB—although a similar length of overhead cabling costs £250,000, it could easily have taken £4 million to place the cables in a trench across the inhospitable environment of Bleaklow Moor.

The tunnel being used by the CEGB is in fact one of a pair of single-line tunnels which became obsolete in 1954 when the Manchester to Sheffield line was electrified and a third twin-track tunnel was opened. The old tunnels were becoming too expensive to maintain, and in any case they would have needed extensive modification to accommodate the pantographs of electric trains. Despite the age of the tunnels—the tunnel which carries the cables was finished in 1852 and the parallel tunnel seven years earlier—the engineers of the CEGB were impressed by their good condition and the precision with which they were built. The maximum departure from linearity along the length of three miles twenty-two yards is only one foot, for example. But the tunnels were built at appalling cost. Thirty-two labourers died during the construction of the first tunnel—not only because of accidents and illness but also through riots among the work force—while twenty-five died from cholera alone during the construction of the second tunnel.



Inside Woodhead tunnel today.

The civil engineers of the CEGB found the construction of the tunnel link had unexpected problems. Because the tunnel falls within the collecting area for one of Manchester's reservoirs they were not able to hose away the two-inch crust of soot which lined the tunnel and which would have found its way into the water supply. Instead, the soot was removed by jets of compressed air and carted away. They also had to consider the possibility of a cable failure releasing oil into the cooling water, so a closed circuit cooling system is used.

At present the tunnel is carrying 2,000 MW, but there is room to double this by adding more cables. There are two cables each laid in a concrete trough through which water is flowing at 132 gallons per minute down the 1 in 200 gradient to the Woodhead portal, where it is pumped back to Dunford Bridge for cooling. The total loss in the tunnel when the two cables are on full load is 1·6 MW.

Although the CEGB had to give in to the pressure of public feeling on this occasion, the construction of the supergrid across the national park was made easy by the existence of the obsolete tunnel. The only case of a tunnel being purpose-built for the grid is in Hampshire where the CEGB has dug a tunnel under Southampton Water. Considering the difficulties involved in laying cables in a trench across Bleaklow Moor it seems likely that if the railway tunnel had not existed the overhead cables would have become a permanent feature.

TRAFFIC PLANNING

Are London Roads Viable?

SERIOUS criticisms of the Greater London Council's proposed network of motorways in London are made in a recent report by an independent working party

led by Mr Michael Thomson, a transport economist at the London School of Economics (*Motorways in London*, Duckworth: London, 50*s*). The team of ten specialists was asked last January by the London Amenity and Transport Association—an organization representing many civic and amenity groups—to appraise the council's plans and to "make such assessment as is possible taking account of the wider transport implications and the effects on environment, housing, town planning and other relevant matters". It is on these wider issues that the team largely takes issue with the GLC.

The network proposed by the GLC consists broadly of four ring roads (the innermost being Ringway 1, formerly known as the Motorway Box) and twelve radial roads all of motorway standard or thereabouts. Understandably, the scheme has already led to howls of protest on the grounds of its expense, its disruption of housing and its effect on the character of life in London. The working party says that the GLC has considered London's transport problem only as a road building operation, and has consequently ignored the effects of more roads on public transport users, on the environment and on accidents. It complains that the GLC has done no more than mention proposals for solving the transport problem by devices such as parking control, parking charges, traffic restrictions or road pricing; the staggering of shopping and working hours; simultaneous improvements in the public transport system and facilities for pedestrians; and creation of environmental areas protected from traffic nuisance—all factors that the team believes must accompany any programme for new roads. According to the team, the motorways will "generate a volume of traffic some 70 to 100 per cent greater than would otherwise materialize. The existing roads would in general be more congested than they are today, and the levels of traffic in most residential and shopping streets would be greatly increased; there would be widespread deterioration in the environment, higher fares and falling quality of service on the buses and the underground, and a serious rise in road accidents". Except for the minority of long-distance traffic, the team believes that the traffic "would not lead to large savings in overall time for motorists, especially in Inner London where the projected motorways appear to be out of balance with the secondary road programme".

When the motorways are built, the report says that about 1 million people could find themselves living within 200 yards of a motorway, and a quarter of these could be within 200 yards of Ringway 1.

On the cost of the whole scheme, the team says that the GLC has under-estimated the cost of its programme for 1972–83, which it puts at £1,106 million; according to the report, this sum excludes expenditure on many additional works, and the final cost of the primary road network as envisaged by the GLC for the whole of London will instead be more than £2,000 million, most of which would be sought from the Ministry of Transport. The report also says that the council has exaggerated the economic benefits of the network. Ringway 3 and some of the radial roads could give good value for money, but the inner roads, and particularly Ringway 1, would give returns on capital less than the 10 per cent usually considered to be the minimum acceptable by the Ministry of Transport.

Parliament in Britain

Nuclear Power

Mr Anthony Wedgwood Benn, Minister of Technology and Minister of Power, has now estimated the cost of the delays to the steam generating heavy water reactor at Winfrith and to the Dragon high temperature gas cooled reactor, first mentioned a few weeks ago in the report of the Atomic Energy Authority for 1968–69. The cost of rectifying the Winfrith plant, he said, was about £6,000, but the costs arising from the fuel failure could not easily be assessed and, in addition, the estimated loss in revenue amounted to about £20,000. He did, however, assure Mr Clifford Williams that the 45 per cent load factor achieved at Winfrith is satisfactory. The cost of replacing a complete set of fuel elements in the Dragon reactor was about £60,000, but because this reactor is not being used to produce electricity, there was no loss in revenue.

Mr Harold Lever, Paymaster General, also said that the prototype fast breeder reactor at Dounreay is expected to be completed at the end of 1972, and that a commercial fast reactor could be ordered to come into operation at the end of the 1970s. Mr G. Elfed Davies had drawn attention to the report of the Atomic Energy Authority which had mentioned delays at Dounreay, but Mr Lever said that these were caused by difficulties in welding the biological shield roof, and were not connected with the fast reactor system.

Mr Lever also refused to give an undertaking that the government would withhold permission to build any more nuclear power stations until the advanced gas cooled reactor system had been operated long enough for its running costs to be determined. He said that the government is already satisfied that the AGR will generate base load electricity at lower cost than conventional stations and if permission were withheld for the construction of further AGRs this would delay both the reduction of electricity costs and the further development of nuclear power. (Written answers, October 17 and 20.)

Sodium Fluoride

A number of questions about the addition of sodium fluoride to drinking water provoked heated exchanges between Mr Richard Crossman, Secretary of State for Social Services, and some members of parliament. Mr J. Rankin asked why those who have no teeth should be made to drink fluoridated water, and Mr John Biggs Davison said that because conscientious objection to vaccination has been respected, is it right that individuals should be subjected unwillingly to this form of compulsory medication? Mr Crossman said that he strongly supports adjusting the level of fluoride in drinking water as a safe and effective way of reducing the incidence of dental decay. He said that he does not regard fluoridation of drinking water as medication because it would prevent hundreds of thousands of cases of dental decay, and that it is simply a case of adding a little more where water is deficient in fluoride to get the content exactly right. He hopes that local authorities will take action, but it is disconcerting to see how a very small group can deliberately spread misinformation and lies to deter an important social reform. Mr Rankin said that he was not satisfied with Mr Crossman's replies, and gave notice that he would raise the matter again at the earliest possible moment. (Oral answers, October 20.)