

of this department, however, is assessing the commercial value of quality. What is most important, colour, taste or texture?

The biochemistry, histology and physiology department is investigating the biochemical changes immediately before and after slaughtering. Meat becomes more acid after slaughtering, because proteolytic cathepsins are liberated from lysosomes and the acidity affects the juiciness and tenderness of the meat. The institute would like to devise some method for accelerating the natural autolysis—hanging meat for two to three weeks is far too expensive, although it is done in the United States for the best steaks, and adding papain or ficin, which only begin to work in the oven, is unsatisfactory. Depending on the speed of cooking, the meat ends up either far too tender or no more tender than untreated meat. The institute is also studying the effect of tranquillizing animals before slaughter. It seems clear that if an animal gets excited before slaughter, the post mortem rise in acidity is either reduced or greatly increased and the quality of the meat suffers.

## Defence Research

At its fourth public session on March 28, the Select Committee on Science and Technology spent two hours trying to find out what the Operation Analysis Committee of the Ministry of Defence does and what goes on at the Ministry's Defence Operation Analysis Establishment at Byfleet. It may not have succeeded, but at least it now has an invitation to a day out at Byfleet to see the war game facilities.

The committee was told by five taciturn representatives from the ministry that the Operation Analysis Committee investigates and supervises major long-term studies based on broad strategic assumptions. And the Byfleet establishment does for all three arms of the British forces what the Rand Corporation does under contract for the United States Air Force. But in the United States there are three independent organizations employed in strategic studies as well as the Rand Corporation and the Department of Defense, and Sir Ian Orr-Ewing expressed concern that in Britain all such work was kept within the ministry. The witnesses admitted that independent assessment was desirable and said that links with the Institute of Strategic Studies and the Institute of International Affairs have been increased in the past two to three years. By the initiative of the ministry, five university lectureships have also been established recently to support independent strategic studies. Dr David Owen, a Labour member of the Select Committee, agreed, however, that it will never really be possible to challenge defence and strategic decisions until expertise is developed outside the ministry, and that will not happen until the ministry contracts out work and also does away with the undue secrecy that shrouds its work.

The almost Byzantine structure of the Ministry of Defence prompted Mr Arthur Palmer, the chairman of the Select Committee, to ask why the ministry finds it necessary to have so many separate committees. He was told that defence is such a complex subject, with endless ramifications, that proliferation of committees is inevitable and even useful when it comes to making interdepartmental or inter-service decisions. Sir

Harry Legge-Bourke could not have been convinced, for he advocated an independent business management study of the structure of the whole ministry. As he said, there is a universal tendency for "old boy networks" to develop behind the facades of committees, and the secrecy that surrounds so much defence research can only exacerbate it.

The Navy, which keeps things to itself more and welcomes outsiders even less than the Army and Air Force, came in for particular scrutiny. Why did the Navy need to have its own research and development establishments rather than rely on industry? Were companies approved by the Navy still running a Buggin's turn system? And did establishments such as Portland take contracts from private companies? Answering these questions, Mr Stuart Watson, who at the last meeting admitted to being pestered with ideas from the hovercraft industry, reminded the committee of the complexity of warships and maintained that the Navy is best at integrating all their components.

Mr Eric Lubbock, dissatisfied, called for a comparative survey of the age structure in naval research establishments and the Navy's civilian contractors. And as a parting shot, the chairman asked if the Navy had ever considered asking a contractor to build a complete warship.

## French Nuclear Energy Policy

from our Paris Correspondent

THE long awaited report of the PEON Commission (Production of Energy of Nuclear Origin) over which M. Jean Couture, Secretary of State for Power, is presiding, will be published at last towards the end of April. Even now, certain of its main outlines are becoming known in Paris, and one can thus get a general idea of the policy which will very probably be drawn up for the coming years. A new report will, however, be issued in 1969, and this will constitute the definitive basis for the Sixth Plan (1970–1975).

Two aspects immediately come to one's attention. Firstly, the French effort will be more modest than was expected. Between the "high" theory which foresaw the building of generators capable of the production of 10,000 megawatts of nuclear electricity and the "low" theory which limits its horizon to 4,000 megawatts, it was the second which was chosen. This restrictive policy is based on the conviction that a much bigger programme would lead to premature investment, bearing in mind the fairly optimistic hopes of the breeder plants to which the Atomic Energy Commission is devoting two thirds of its official research budget. On the other hand, a much smaller programme would not be a sufficient incentive for the manufacturers of thermal generators: the competition for nuclear generators effectively forces the fuel producers to lower their prices to such an extent that it is to be hoped that we will soon reach a record low cost.

It seems that this fairly circumspect nuclear gamble meets the wishes of *Electricité de France*, which considers that in the present market conditions and for several years to come "classical" electricity will hold its own. EDF is not therefore intending to intensify its efforts, the more so because the series of incidents during the last few months in the French nuclear



generators—although they affect the conventional parts of the installations (as is the case in other countries) and in no way call into question the whole idea of the reactors—are creating at the present time an unfavourable psychological climate. But would a restriction on the programmes which are imminent be the means to solve the difficulties which have arisen? This is doubtful. The recent failures can be ascribed to manufacturers who in France have not had enough experience and who anyway became involved in the development of nuclear power with a certain reticence.

If the specialists in the EDF have reasons for appearing satisfied with the amount of investment envisaged, it is no secret to anyone that they were in favour of building American style reactors (PWR or BWR) under licence. They will certainly be disappointed by the wish expressed by the writers of the report that they should confine themselves essentially to natural uranium. After the decision already taken on December 7, 1967 (to construct two graphite gas generators at Fessenheim on the Rhine), the recommendations of the Couture Commission show once more the perseverance, or rather the stubbornness, of the French policy. The defenders of natural uranium had, however, seen their ranks scattering in recent years, particularly at the Atomic Energy Commission, and it was believed a few months ago that there would be a sharp trend towards enriched uranium through the continuing adaptation of American techniques to French conditions. Several members of Parliament, some of whom belong to the majority party, had obviously taken a stand in this direction. Although several experiments are envisaged, however (for example, the Tihange generator of the PWR type in collaboration with Belgium), enriched uranium has not won the day. The writers of the report, in order to justify their support of natural uranium, use an economic argument, the details of which are not yet known, but which no doubt draws on the well-known difficulty of making exact financial comparisons between the different systems. It would be quite surprising if political preoccupations do not, however, play a determining part. The plan for a civil French isotope separation factory making use of the military factory at Pierrelatte also appears to have been abandoned. French participation in a European factory is not, however, excluded, but this will be in a theoretical future which is still some time off (about 1978).

The first phase of the Sixth Plan would be devoted above all else to effecting and reproducing the Fessenheim technique. However, the Couture Commission (the chairman of which has submitted a personal report under his own name on the thorny problem of relations between the CEA and the EDF) is credited with intending, should a detailed study confirm the current assumptions, to propose that work should begin on a heavy water station of the Canadian variety. It is said that a group of French experts, among whom figure representatives of industrial firms (among them Babcock and Wilcox) came back very interested from a study tour of Canada. All these official rumours will probably be confirmed and defined in the near future and they will probably be the subject of statements and discussions in Parliament towards the end of April.

## Parliament in Britain

### CERN Accelerator

ON March 26, Sir Harry Legge-Bourke opened a short debate on the proposed 300 GeV accelerator to be built by CERN. He said that he fully supported the proposal, and hoped that the Government would put all the pressure it could on CERN to come to an early decision to go ahead. He hoped that the machine would be built in Britain. Mr Eric Lubbock disagreed. It was splendid, he said, that the Government had been prepared to publish the advice of the Council for Scientific Policy and added that the Ministry of Technology might well learn a lesson from it. But he did not accept the arguments in favour of the machine. It would be too expensive—the British share of the costs would be £37 million by 1977, without taking into account the effects of devaluation or the cost of any additional equipment which might prove necessary. The Council for Scientific Policy had asked for an assurance that the science vote would increase by 9 per cent until 1973, and by 8 per cent thereafter. If this was done, the costs could be covered. But could these rates of growth be maintained indefinitely? Mr Lubbock said that if they were, the whole of the nation would be engaged on scientific research by the end of the century, and half the population would be nuclear physicists.

Mr Lubbock said that Britain could either opt out altogether, pursue the idea of a world machine as the next step after the Serpukov 70 GeV and US 200–400 GeV machines, build less ambitious and less costly machines, or simply wait to see how technology developed. It might one day be possible to achieve these high energies at much lower cost. Mr Tam Dalyell disagreed; why should the cost of the machine not be compared with defence expenditure, rather than scientific expenditure in other fields?

Mrs Shirley Williams, Minister of State at the Department of Education and Science, replied. She said that the construction cost of the project would be £175 million, with recurrent costs of £30 million a year. The British contribution over the construction period of eight or nine years would be £44 million. There was a feeling in the scientific community, she said, that the share of the budget that had gone to high energy physics was rather high; Britain was also eminent in molecular biology and in plasma physics. How was one to determine where money was best spent? It would be easier, she implied, if the return in industrial contracts from British investment in CERN had been higher. But all she could say was that no decision had yet been reached. She hoped one would be reached soon. (Debate, March 26.)

### Airbus Engines

MR ANTHONY WEDGWOOD BENN, Minister of Technology, announced that the Government would be giving launching aid to Rolls-Royce for the development of the RB 211 engines which are to power the Lockheed airbus. The aid will take the form of a loan by the Government to the costs of launching the engine and getting it into production. The loan will cover 70 per cent of the cost of launching the engine and will be recoverable from sales, and was therefore reflected in the prices quoted. It was not possible, Mr Benn said, to say what the exact sum of money involved would be. (Oral answer, April 1.)