

just as much in the dark about the delay as anybody. "In itself", however, "it's nothing momentous", he said. The issues raised by Halluin "have been looked at" and do not challenge the basic claim of Cohen and Boyer.

He also questioned the benefits to anybody of mounting a challenge. "Recall that the royalties are very low and no-one has contested that they [Cohen and Boyer] were the first ones to do this. And given the fact that everyone's getting a licence, I don't know why anybody would challenge it."

But royalties may not continue to be low. One industry observer pointed out that once commercial production begins — especially production of products with a high mark-up — royalties could be "substantial". And the incentive to mount a challenge would also grow. The licence contracts call for royalties of 1 per cent on net sales up to \$5 million,  $\frac{3}{4}$  per cent on the next \$5 million, and  $\frac{1}{2}$  per cent after that.

If a challenge is eventually filed, it could well be based on the issues that Halluin raised, and would probably take the form of a request for a reexamination of the first patent. Since December 1980, it has been possible to file such a request directly with the Patent Office, a much simpler procedure than mounting a lawsuit as was previously required. A recent Supreme Court ruling allows even a licensee to challenge a patent.

The original Stanford patent was a process claim, covering the production of transformants. The second patent, a product claim, covers the transformants themselves. In practice, however, it adds relatively little: the only additional protection it provides is in preventing a foreign company from producing transformants outside the patent and then selling them in the United States.

Stephen Budiansky

## Polish students

### Subjective change

There threatens to be a significant drop in the numbers of Polish students reading technical subjects in the next academic year, beginning in October. According to Warsaw radio, there has been a "qualitative transformation" of young people's attitudes to study. School-leavers, said the commentator, are thinking more frequently in "practical categories" and, in particular, of job prospects.

The swing away from technical studies does not, however, seem to be entirely spontaneous. At the end of June, the Minister of Science, Higher Education and Technology, Dr Benon Miskiewicz, said that the intake quota for the polytechnic universities had been cut this year due to a reduced demand for engineering personnel.

The minister's explanation, that the admission quotas have been deliberately

cut, seems the more likely. In Poland's current economic stagnation, many of the grandiose engineering projects of the Gierek regime have been suspended or, tacitly, cancelled. Moreover, since the alternative to higher education for male school-leavers is military service, it seems highly unlikely that many would deliberately opt for the latter.

Unlike many of its allies, Poland has never attempted to plan university admissions strictly in accordance with job prospects. The ministry has, however, the right to set limits to admissions in subjects that are over-subscribed — a right hotly contested during the public debate on the draft higher education act last year. A parallel situation exists in the medical colleges, where the Ministry of Health can intervene on admission numbers but where, in recent years, the ministry has been pressing for more admissions even though teaching facilities are inadequate.

Last September, the Warsaw Medical Academy took advantage of the then liberalization to reduce its student intake — and triggered a sit-in by the parents of students who had failed to gain admission. Significantly, however, neither the Ministry of Health nor Solidarity and its student adjunct, the Independent Students' Association NZS, backed the parents, on the grounds that the decision must rest with the academy.

Unemployment among young graduates has been a problem in Poland for several years, until the imposition of martial law on 13 December 1981, with its system of compulsory registration and direction to — if necessary — unskilled manual labour.

Part of the explanation is that student admissions have been uncontrolled. University tuition in Poland is free, textbook prices are low, and during the 1970s artificially pegged food prices made it relatively easy for all but the poorest families to support their children through five or six years of higher education. Recent moves to adjust the price structure have, however, produced increases so high that many citizens cannot afford to purchase their (at best scanty) food rations, so that keeping a son or daughter at university is fast becoming a luxury. A system of maintenance grants and/or loans is being considered, which would, presumably, allow the ministry to regulate admissions without having to decree a *numerus clausus* on admissions. It could also, in the long term, help to end the controversial system of "bonus points" by which young people from working class or peasant families receive extra marks in the university entrance examination to compensate for the lack of intellectual background at home. It could also (although this has not been mentioned publicly) provide the ministry with a further means of controlling student unrest without encroaching on university autonomy by ordering that offending students should be expelled or suspended.

Vera Rich

## British nuclear power

### Risks assessed

The British Central Electricity Generating Board (CEGB) published a final appendix to its case for building a pressurized water reactor (PWR) in the nick of time last week, just one working day before the public inquiry into the siting of the reactor at Sizewell in Suffolk opened this Monday (26 July). The publication of appendix M, on degraded core accidents and their consequences, added the last few kilogrammes to the more than 100 kilogrammes of reading matter that is CEGB's statement.

Participants at the inquiry, however,

### The Sizewell inquiry

Organizing the Sizewell inquiry is by no means simple, to judge from the length of meetings set aside for the task. The hearings earlier this week were the second in a series of three to discuss the precise procedure of the main inquiry, beginning on 11 January 1983.

The Department of Energy has promised a wide-ranging inquiry that will consider the need for the proposed pressurized water reactor (PWR) in the light of the government's long-term energy policy, the safety of the design, waste management and local environmental issues. Sir Frank Layfield, the inspector, favours hearing evidence topic by topic rather than each organization making its complete case in one session as at the Windscale inquiry. The order of witnesses is expected to be the Central Electricity Generating Board (CEGB) followed by government departments and other statutory bodies, local authorities, objector groups and individual objectors, although the order may well depend on the topic.

The procedural hearings are designed to help the inspector to determine precisely how to order the main inquiry — for example, how to split topics and what guidelines to issue on the release of documents. The formal opening of the inquiry this week gives the inspector statutory powers to request documents he believes should be made available before the main hearing. The inspector seemed eager to take up those powers on Monday when he promised to draw up guidelines on the release of documents that have not been voluntarily disclosed.

The inquiry is planned to take place at the Maltings, Snape, the closest large meeting place to the proposed site. But the inspector has suggested that part of the inquiry, perhaps during June and July 1983, should transfer to London in view of the national importance of much of the debate. Some objectors will be arguing the case for holding more of the hearings in the capital, especially those on need and economics.



have longer than a weekend to read and digest appendix M. This week's opening of the inquiry was purely formal, designed to give Sir Frank Layfield, the inspector, statutory powers to request documents before hearing the first evidence on 11 January 1983 and to deal with procedural matters (see box).

Although making up the tail of CEGB's case, appendix M is by no means insignificant. It is concerned with the probabilities and consequences of major accidents resulting in the melting of the reactor core. CEGB commissioned studies from the Westinghouse Electric Corporation, the company from which the basic PWR design is being licensed, on the probability of degraded core accidents, and from the British National Radiological Protection Board (NRPB) on their radiological consequences.

The risk analysis is similar to that pioneered by Rasmussen in his 1977 study of fault sequences in PWRs. Thus the Westinghouse analyses are based on event trees which trace the probability of minor faults leading through a chain of further incidents to core meltdown. The NRPB study assesses the risk to individuals living near a reactor of each type to 12 types of release considered by the Westinghouse Corporation.

The errors in the analyses are themselves uncertain, says CEGB. Nevertheless, it draws conclusions. Degraded core accidents are expected to occur 1.16 times every  $10^6$  years, near enough to CEGB's own limit of frequency of  $10^{-6}$  severe accidents per reactor year. But 97.5 per cent of core meltdowns would not breach the containment, says the appendix, so that the estimated frequency of core meltdown accompanied by containment failure or bypass is  $3 \times 10^{-8}$  per reactor year. But CEGB admits that one of the most uncertain aspects of the studies is the frequency of core meltdown resulting in containment failure.

According to NRPB's analyses of the consequences of core degradation the risk of early death to an individual living near the reactor is  $10^{-9}$  per year, says the appendix. An accident resulting in no more than one death would be expected about every  $10^6$  years. But an accident involving 1,000–6,000 deaths, the largest number considered, would be expected only about once every  $10^{10}$  years. Similarly, the risk of cancer directly attributable to the reactor is found to be very low, 40 million times less than the general risk of contracting cancer.

CEGB believes these analyses are more refined and accurate than those used by Rasmussen. The probability of a core meltdown is within the bounds of acceptability, it says, although it is asking for further assessments of the uncertainties. Whether CEGB's confidence will convince those who are sceptical of the value of risk analysis must remain until 11 January to be seen.

**Judy Redfearn**

## Academy rebuts Idso on CO<sub>2</sub> research

Washington

A new National Academy of Sciences (NAS) study\* has upheld the conclusions of an earlier one in concluding that a doubling of carbon dioxide in the atmosphere will cause a warming of the globe's mean temperature by  $3^\circ \pm 1.5^\circ$  centigrade. The conclusion, which is based on computer models, came as no surprise, as a consensus on this point has been building among scientists for some time.

But the NAS study did raise eyebrows by singling out for rebuttal the views of Dr Sherwood Idso. Idso has been a vocal minority, of virtually one, in dissenting from the generally accepted view of the effects of carbon dioxide increases.

Dr Idso, a physicist at the Department of Agriculture's Water Conservation Laboratory in Phoenix, Arizona, asserts that his "natural experiments" show that the prediction of the modellers is too high by an order of magnitude. The NAS study attempts to rebut his conclusions by showing how Idso's experiments are "on time and space scales clearly inappropriate to the carbon dioxide problem and do not involve the components of the climate system that are important for long-term climatic change".

The panel was apparently split over whether to single out for criticism Dr Idso (and, to a lesser degree, two other

researchers, Drs R. E. Newell and T. G. Dopplick). A minority on the panel had felt, as one participant put it, "that we shouldn't dignify the arguments of Idso with a comment". But the panel eventually decided that Dr Idso's findings needed to be answered to set the record straight. "Policy makers were getting confused", says Dr Joseph Smagorinsky of the Geophysical Fluid Dynamics Laboratory at Princeton University, the chairman of the academy panel. Dr Stephen Schneider of the National Center for Atmospheric Research, whom the panel had called in as an "invited expert", pushed hard for an official rebuttal of Dr Idso's conclusions. "I think there was a period of about six months when my phone rang every hour with someone wanting to know why" there was this difference of opinion between Dr Idso and everyone else, he says.

As for Dr Idso? "I am a very small minority sill," he admits. But he appears undaunted: "The model results are far from conclusive". He says the modellers themselves admit their inability to include many important factors, for example cloud feedback and aerosol effects. "When you read their caveats, it seems to me that anyone who put faith in the models is foolish, really."

**Stephen Budiansky**

\*"Carbon Dioxide and Climate: A Second Assessment", National Academy Press, Washington, DC.

## French robotics and engineering

### More, please

Paris

Jean-Pierre Chevènement, the French minister of state for research and industry, fired a broadside at his critics last week in a major speech outlining his policy for the robotics and mechanical engineering industries. "I am not a technology fanatic", he said. "We do not choose technology; it imposes itself on us." France must compete in the world economy and so must automate and modernize as fast as her competitors. "France is not on the Moon; it is on Earth."

Chevènement said that change would have to be fast. The productivity of French industry would have to increase by 7 per cent a year for the next ten years, to double over the decade. The social consequences of this change would be vast: as great as the historic shift of labour from the land to the cities. But the change would be democratic: efforts were already under way to establish "contracts for progress", outline development plans for industrial sectors to be signed by industry chiefs, trades unions and government, which would take into account the fear of automation increasing unemployment.

In reality, the minister said, automation need not increase unemployment at all. Japan, through the automation of the car industry, had opened up new markets in

Europe and America, and so had increased (Japanese) employment in that area. France could do the same in other sectors, and could also increase employment in the industries that must supply the hardware and software (for example robots and control systems) which will re-equip the rest of French industry.

Chevènement has even introduced a new word to the French language to describe these industries: "*productique*", a word that — for the moment — lacks the resonance of unemployment and de-skilling which attaches to "robotics" and "automation". *Productique*, as Chevènement defines it, is the industry of advanced (typically electronically controlled) machinery, robots, industrial software, computer-assisted design and systems engineering. It employs 20,000 people and has a total turnover of FF8,000 million (£700 million) (see Table). This group of industries, together with electronics, will transform the whole of the rest of French manufacturing industry. It will "reduce human intervention" in systems of production. It will also "modify the balance between capital and labour, and increase the role of intelligence as a productive factor". Thus "tens of thousands of workers" must retrain, and means must be found to re-educate them and to shift France's system of professional education towards new forms of employment.

But for the present, the state of auto-