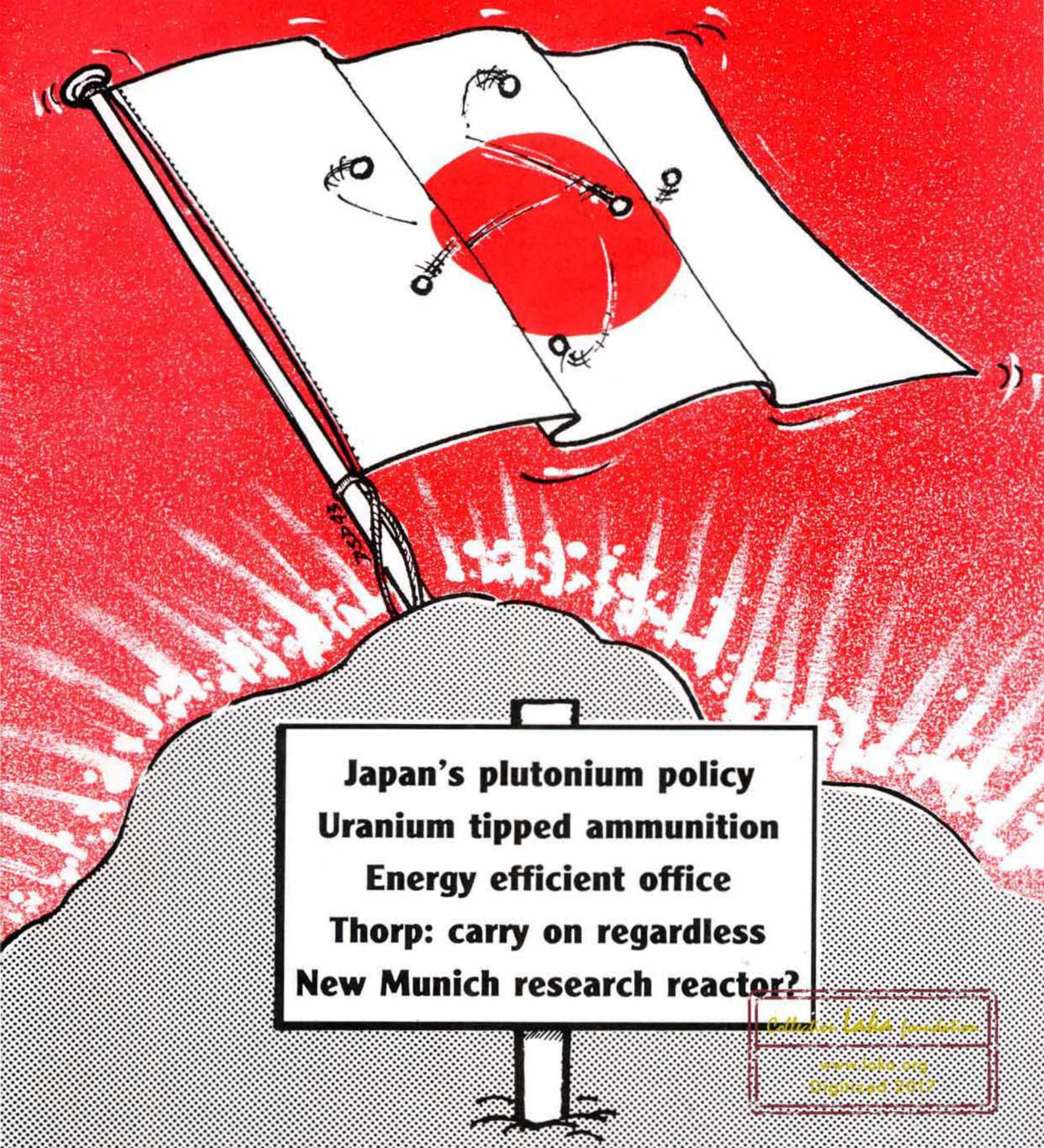
SAFE ENERGY

No.97 October/November 1993 £2.00



Japan's plutonium policy

Uranium tipped ammunition

Energy efficient office

Thorp: carry on regardless

New Munich research reactor?

COMMENT

THE government has come to a nuclear crossroads; it has two choices ahead of it. Either it can sweep away democratic processes and assure the nuclear industry of a future or it can watch its favourite child die at the hands of an open public debate.

A recent report in the *Independent* warns that senior government ministers are "preparing a shift in energy policy including the construction of a new generation of nuclear power stations and privatisation of Nuclear Electric."

According to the source: "The picture has entirely changed. The figures are no longer as bad as they looked. They [the nuclear industry] are more efficient and look like breaking even. It would be madness to do away with nuclear power."

These ministerial posturings do not sit well with the revelation that the nations nuclear waste is being kept in conditions so dangerous that Professor John Horlock, the government's chief nuclear safety adviser, has recommended that democratic processes be streamlined (dumped — as in repository) to accelerate the establishment of a permanent nuclear waste dump. Horlock warns that the industry is unwilling to meet the costs of repackaging its nuclear waste to prevent dangerous levels of worker exposure and to reduce the risk of a major accident. Once more, economics are being put before safety.

The ministers' rosy nuclear view also does not sit well with advice given to Scottish Nuclear by its merchant bankers, namely that nothing has changed since the last failed attempt at privatisation and that it doesn't have a snowball's chance in hell of finding a buyer.

However the 'Mother of Parliaments' does not seem as attached to democracy as it is to the nuclear industry. The government has told its German counterparts that the Thermal Oxide Reprocessing Plant (Thorp) is in no danger of cancellation. Dr Karl-Heinz Berg, head of the nuclear waste section in the German environment ministry, said he had been told the consultation exercise was "a matter of precaution".

The government had told him that the second public consultation was a way of ensuring that when the plant is granted a licence any legal action would be defeated.

While rejecting Greenpeace's legal bid to prevent uranium testing occurring at the Thorp plant, Lord Justice Otton has established the group's right to bring court actions. Dismissing British Nuclear Fuels' assertion that the group was just a "meddlesome busybody" he said: "I regard the applicants as eminently respectable and responsible and their interest in the issues raised is sufficient for them to be granted locis standi [recognised or identifiable legal status]."

Lord Melchett, executive director of Greenpeace, said that if the government gave the go-ahead to Thorp without calling a public inquiry then the organisation would return to the High Court to seek a second judicial review "with our right to do so already established".

It is difficult to see exactly how the government plans to bypass democratic procedures without entirely destroying what remains of its credibility. One wonders exactly how it plans to circumnavigate the simple facts of a crisis in nuclear waste management, spiralling economic inefficiency and ever- tightening radiation protection standards. Perhaps ministers might reply that the way ahead is clear, all we have to do is take a sharp left at the second consultation on the right and keep going straight-on 'till morning. In nuclear Never-Never land ministers never have to grow up and face their responsibilities.

The *Safe Energy* journal is produced bi-monthly for the British Anti-Nuclear and Safe Energy movements by the Scottish Campaign to Resist the Atomic Menace. Views expressed in articles appearing in this journal are not necessarily those of SCRAM.

scram, *skram, v.*
to shut-down a nuclear reactor in an emergency.

CONTRIBUTIONS

We welcome contributions of articles, news, letters, graphics and photographs, which should be sent to SCRAM at the address below.

LETTERS

SCRAM reserves the right to edit letters to fit the available space.

ADVERTISING

Advertising rates are:

Full page (190 x 265mm)	£140
Half page (190 x 130mm)	£75
Quarter page (90 x 130mm)	£40

Inserts can be mailed out with the journal – details on request.

BACK ISSUES

Back copies of the journal are available for most issues. Copies from the previous year cost £1.50 (inc. p&p) or £7.00 for the set of six. Issues more than a year old are £1.00 (inc. p&p).

SUBSCRIPTIONS

For details of subscription rates see the form on the back page.

FOR THE BLIND

The text of Safe Energy is now available on disk for people who are registered blind. This service is available at a charge of £3 above the appropriate subscription rate – this covers the cost of the disks and administration. Further information available on request.

PRODUCTION

Editors:
Mike Townsley
Graham Stein.

Front Cover:
David Shaw.

Published by SCRAM, 11 Forth Street, Edinburgh EH1 3LE.

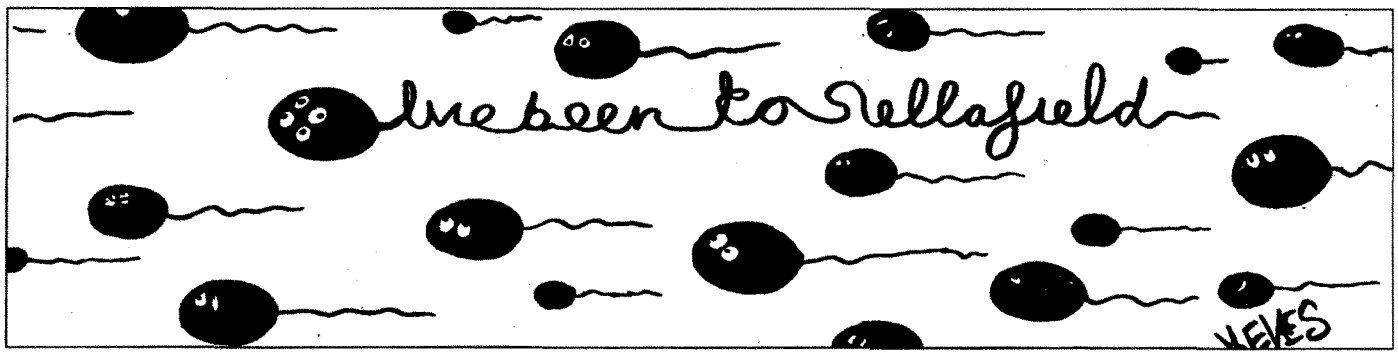
☎ 031-557 4283
Fax : 031-557 4284

ISSN 1350-5114 Bi-monthly

SAFE ENERGY

FEATURES

CONTENTS



From *The Guardian*

Thorp troubles

AS the government considers the 40,000 or so objections received during the second consultation into the controversial Thermal Oxide Reprocessing Plant at Sellafield, which came to an end on 4 October, pressure is mounting in the international community for an end to reprocessing.

Eighteen Japanese MPs, all members of the ruling five-party coalition forming the Japanese government, have written to their opposite numbers in the UK calling for immediate talks on the future of Thorp. Revealing previously secret details of the contract between British Nuclear Fuels plc (BNFL), the plant's operators, and the Japanese utilities — its biggest customers — they argue that there is a substantial risk that the plant might make a large loss.

They say that the contracts specify that the UK is obliged not to reprocess spent fuel which would result in surplus plutonium: "If the rate of reprocessing Japanese spent fuel must be slowed down in order to avoid a surplus, this would have a significant detrimental economic effect on Thorp."

As justification for their concern the MPs cite the repeated delays experienced in Japan of starting its fast breeder programme and the lack of any plans to burn plutonium in conventional reactors, as a mixed oxide fuel.

Given the "utmost attention" being focused on the issue of nuclear proliferation around the world they conclude that it would be "highly undesirable" for Japan and the UK to extract an unwanted surplus.

Mounting concern

In the US concern is also mounting over the proliferation risks of reprocessing. The US House of Representatives (or Congress) has passed an amendment to the 1994 Defense Authorization Act calling for a worldwide suspension of reprocessing.

The "sense of the Congress" amendment argues that the start-up or continued operation of any plutonium separation plant presents "serious environmental hazards and increases the risk of proliferation of weapons-usable plutonium" and should be suspended "until the related environmental and proliferation concerns have been addressed and resolved."

Further, a Bill was introduced by Representatives Stark, Kennedy and Pelosi and 23 others which is explicitly opposed to Thorp being started up. The Bill calls for President Clinton to instigate high level talks with the British government.

Stark said: "Thorp is a direct threat to international security, bringing an additional 59 tons of plutonium into circulation over the next ten years. This much bomb-usable material can't be adequately safeguarded and will make it that much easier for a terrorist group to steal the few pounds of plutonium necessary to build a nuclear weapon."

Sweden and other Scandinavian countries are also putting pressure on the government not to commission Thorp. Sweden, which has had some 140 tons of spent fuel stored at Sellafield since the late 1970s, is now considering repatriating the fuel. In a submission to the latest consultation the country's environment minister, Olaf Johansson, says that they have now moved away from supporting reprocessing. In a separate letter, Johansson, in his capacity as the chair of the Nordic council of ministers for the environment, says that Thorp is not acceptable if there is reason to believe it will "cause additional radioactive discharges into the marine environment."

Johansson says that before reaching a decision on Thorp's commissioning the British government must comply with an agreement reached in June among European nations to impose stiffer controls on radioactive discharges into the sea. His letter is echoed in separate submissions from the Danish and Icelandic governments.

German doubts

Reprocessing is no longer legally justifiable for German nuclear utilities according to the Bundesrechnungshof (BRH), the federal government's accounting office. Title nine of the Federal Atomic Energy Act mandates the reprocessing and recycling of nuclear materials when those operations are "justified on technical and economic grounds." According to BRH, reprocessing is twice as expensive as direct disposal.

"Over the course of 10 years, the calculated cost-benefit equation has shifted in favour of direct disposal," argue BRH: "It should also be taken into account that reprocessing does not reduce the volume of waste but increases it."

According to the industry journal *Nuclear Fuel*, a senior German nuclear utility executive has welcomed the BRH conclusions, saying "they should be accepted by government and industry as another reason not to reprocess." Reprocessing of German spent fuel "continues backed only by the force of political inertia." The federal government in Bonn, he said, "should pay less attention to what Britain, France and Japan think about what we are doing, and more attention to the requirements of our own nuclear programme."

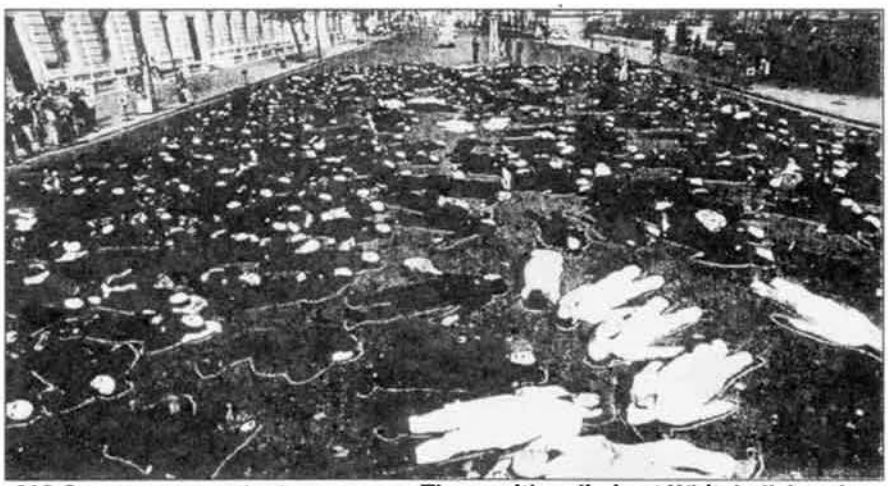
Home front

Things are also not going so well for BNFL in the UK. Both Nuclear Electric and Scottish Nuclear Ltd are trying to force the company to reduce its charges for reprocessing by 20%. The move follows a decision by the President of the Board of Trade, Michael Heseltine, to withdraw a promise to underwrite the risks of unforeseen costs after the three companies decided to move away from cost plus to fixed price contracts. The main risk of price increases is thought to come from any possible future tightening of international radiation protection standards.

Also at home the National Trust has thrown the weight of its two million members behind calls for a full public inquiry into the plant. As a major land owner in the area around Sellafield, the Trust is angry that it was not consulted about plans to licence increased discharges from the Sellafield site.

In a letter to the environment secretary, John Gummer, the Trust's director, Angus Stirling said that in the short time available it had sought independent professional advice on the issue. The picture that emerged, he said, was unclear, even government research came to contradictory conclusions. Normally neutral on matters of government policy, calling for a public inquiry is the most political act in the Trust's long history.

It is clear, and has been for some time, that the government cannot maintain any pretence of being democratic if it chooses to ignore the overwhelming concern about Thorp. At the very least it must institute a full public inquiry into the plant. An inquiry where no self-serving BNFL funded appraisals can be allowed to go unchallenged or unseen. ❑



600 Greenpeace protesters oppose Thorp with a die-in at Whitehall, London

Dounreay waste mess

A shaft containing unknown quantities of radioactive waste and a highly volatile potassium-sodium mixture at Dounreay could explode, according to a Scottish Office report.

The 200m shaft, originally sunk to allow the plant's waste discharge pipeline to be laid, had been used as a dump for radioactive waste and dangerous chemicals from 1959 to 1977. Shortly after closing the shaft in May 1977 an explosion, thought to have been caused by a combination of the sodium-potassium reacting with water, blew off its concrete plug.

Now, conclude R M Consultants, while "further explosions are unlikely, the possibility cannot be ruled out." Brought in to identify long-term solutions to the management of the shaft, all they managed to do was rule out every suggested possibility. Two options, a concrete plug or grout curtain around the shaft, have both been rejected as long-term solutions. The integrity of the curtain could not be guaranteed for "more than tens of hundreds of years", they said. This was Dounreay's preferred option, however, R M Consultants said it was unlikely to be effective in restricting the movement of activity to the foreshore." Indeed the report draws attention to Strontium 90 contamination in algae on the foreshore nearby, saying that the source of the contamination "is uncertain, but migration from the shaft could be one explanation."

The obvious option of excavating the shaft and removing the waste to an above ground repository "merits further consideration" although such an operation is "without precedent, costly and potentially dangerous."

Dounreay's head of safety, Ken Butler, has rejected the possibility of a further explosion: "The shaft is safe as it stands and has been licensed as such by the regulatory bodies.

"This report came out in 1991 and has been sitting in the House of Commons library since then.

"It is important to remember that both hydrogen and oxygen have to be present to cause another explosion. The oxygen is being constantly purged by argon gas. We are monitoring for hydrogen all the time.

"The public can be assured that this facility is being actively managed by us in a safe and prudent manner, and that there is no cause for concern."

Since the 1977 explosion, the plant's operator, AEA Technology, has installed monitors to detect any dangerous build up of hydrogen gas and it continually pumps 12,000 cubic meters of contaminated water annually from the shaft into its discharge pipeline.

When asked whether dumping low and intermediate-level waste into the shaft had been prudent, Dounreay press officer, Nicholas Parsons, replied: "It seemed the most sensible use for it at the time. It is well underground and into the rock strata. The authorities at the time evidently agreed in so far as they licensed it."

Councillors on a site visit to Dounreay's shallow burial pits

■ Since abandoning the waste shaft, Dounreay has been dumping its low-level waste in shallow burial pits on site — a move which in recent months has proved no less controversial.

A planning application from Dounreay to extend existing waste pits was rejected by Highland Regional Council (HRC) following a visit to the site. Regional councillors were horrified by what they found — thousands of barrels of nuclear waste scattered on the surface. Many were rotten and 800 drums stacked on top of full pits beside the sea since 1985 had only recently been covered by tarpaulin. Others were covered by a net to keep scavenging birds out of the waste.

Now the Dounreay management have appealed to the Secretary of State for Scotland to over turn the HRC decision. While stressing that they have requested a sist (suspension) of the appeal, the site's manager, Roger James, said: "We have decided to ask for the sist in order to give us time to pursue a dialogue with HRC in search of a mutually acceptable solution to the problem of dealing with low-level waste at Dounreay."

Admitting that they had "shot [themselves] in the foot" during the Councillors' visit to the site, a spokesman said: "We were too close to the problem. It was under our noses and we let it happen." The management have now embarked on a two-year £15 million remedial programme to bring the pits up to standard.

Councillors have reacted angrily to the threat of the AEA appealing to the Secretary of State. Summing up feelings inside HRC, Councillor Jim Fry said: "It will cause confrontation and suspicion. The debate would have been a lot better without this being introduce at this time." ❑

Nirex nonsense

DEMOCRATIC procedures should be overridden in the race against time to establish a permanent waste dump for Britain's growing stockpile of nuclear waste — currently stored in "unsatisfactory" conditions at nuclear sites around the country — according to the government's chief nuclear safety adviser.

In a confidential letter to government ministers, Professor John Horlock, chairman of the Advisory Committee on the Safety of Nuclear Installations (ACSNI), has warned that delays in the industry's plans to transfer the waste to a permanent repository are "producing a situation in which the safety at nuclear sites could be compromised in terms of operator handling and the potential for accidental releases.

"We are far from confident that the company [Nirex] will be able to achieve its current target of an operational facility before the year 2010, or even within a few years of that date."

The risks to the public are such, believes the outgoing chair of ACSNI, that the government should take urgent steps to ensure a "clear commitment by all parts of government to the principle that a final disposal facility should be provided at the earliest opportunity." Further, he is calling for government action "to clear the way for the achievement of this aim — in particular, the avoidance of unnecessary planning hurdles."

Many of the nuclear sites are storing their waste in conditions which are "unsatisfactory for long term storage, they are deteriorating and there is a natural reluctance on behalf of the operator to repackage the waste until the final packaging for disposal arrangements are agreed."

ACSNI has also stressed that the "arrangements for the treatment and eventual disposal of waste are issues highly relevant to the government's forthcoming review of the future prospects of nuclear power."

In response to Horlock's warning the Department of Trade and Industry issued a statement saying that the government was "considering the implications for its nuclear waste storage policy" of the delays in the Nirex store. "In the meantime", it said, "the Health and Safety Executive can require changes to waste storage, including repackaging, whenever necessary." ❑

Cancer cases

THE two families who blamed their children's cancers on paternal radiation exposure at Sellafield have lost a four-year legal battle for damages with British Nuclear Fuels plc (BNFL). However, the families may now appeal following the publication of a new Health and Safety Executive (HSE) study, *writes Pad Green.*

At the centre of the families' claims was the 1990 report by the late Professor Martin Gardner. Gardner had examined the excess of leukaemia in the village of Seascale, two miles from Sellafield, and found a strong link between the incidence of leukaemia and the radiation dose received by the father in the six months prior to conception.

The study sent a shock wave throughout the nuclear industry as it was the first to demonstrate that there may be a genetic risk from radiation exposure. Radiation safety standards currently take little account of the risk of genetic damage and if Gardner is right, current standards are completely inadequate.

However, the judge accepted BNFL's argument that Gardner was unsupported by other studies and had a number of shortcomings which reduced the confidence that could be placed in its results. He gave the benefit of scientific doubt to BNFL and not the families.

BNFL has already attempted to use the judgement as a green light for the Thermal Oxide Reprocessing Plant (Thorp) by claiming that it proves that they did not cause the leukaemia cluster in Seascale. However, the judgment finds only that there is insufficient evidence to conclude that the irradiation of fathers working at Sellafield was responsible for their children's cancers in these two cases. It does not explain the continuing abnormally high rate of childhood leukaemia in Seascale. In fact, neither the judge, nor BNFL in its evidence, offered any alternative explanation for the excess.

Valuable support for Gardner came only two weeks after the cases ended, when the HSE published the results a follow-up study of cancer among children of Sellafield fathers.

The new study supports Gardner's hypothesis that radiation exposure of fathers (paternal preconception irradiation — PPI) can cause leukaemia in their children. It also implies the existence of a further factor that acts with PPI to cause the leukaemias in Seascale.

For reasons best known to itself, the HSE claimed that this Seascale factor was explained by the population mixing theory advocated by Dr Leo Kinlen. This claim is not based upon statistical evidence, only a recognition that population mixing had occurred when Sellafield was built. The HSE report also stated that if population mixing was responsible, it would be unlikely to cause an effect over 20 years after mixing took place.

The excess of leukaemia at Seascale is continuing and is statistically significant even if those cases with fathers at Sellafield are excluded. Consequently, the only convincing explanation for the Seascale factor is environmental contamination from Sellafield. The HSE study, however, did not consider this possibility.

The new study also reinforces the powerful advice to government from its Committee on the Medical Aspects of Radiation in the Environment (Comare) that BNFL's plans to increase discharges by operating Thorp could increase the risk to the population of Seascale.

Comare chairman, Professor Bryn Bridges, advised that: "There are a number of possible causes which may have led to this excess. There is insufficient evidence to point to any one particular explanation and a combination of factors may be involved. As exposure to radiation is one of these factors, the possibility cannot be excluded that unidentified pathways or mechanisms involving environmental radiation are implicated. In the light of this, proposals to increase the level of discharge of any specific radionuclide as proposed in the draft authorisations should be viewed with concern." ❑

Scottish privatisation?

SCOTTISH Nuclear Ltd's (SNL) dream of operating in the private sector has been sorely crushed by advice from Charterhouse, its merchant bank advisers, according to a report in the *Scotsman.*

Company Chair James Hann has already expressed his desire for SNL to be privatised in 1995, following the government's review of the nuclear industry. It is his belief that the time has come for the nuclear industry to start planning its future, and in order to maintain its generating base four new power stations must be ordered over the next five years: "The scale of the Public Sector Borrowing Requirement suggests that providing funding of £8bn over a ten-year period may not be acceptable to the government and it is likely that such funding would need to be raised privately. That implies privatisation of the industry."

Charterhouse has rejected such a future. It has told SNL that a flotation on the stock market, at least in the short term, was out of the question. It has, however, left the door open for some other form of privatisation. The most likely of which, according to Charterhouse, would be a trade sale. This, it says, would be the most practical way into the private sector — if achievable at all.

A trade sale, according to City analysts, would present the same problems as a flotation and those encountered when the government tried to privatise the industry in 1990. These include concern about long-term decommissioning and waste management costs and the risks of an accident. Further flies in the privatisation ointment include: the low price of alternative fuels; the high capital costs of nuclear stations; the limited nature of SNL long-term supply contracts; and Scotland's massive excess generating capacity. ❑

Sizewell C?

A planning application has been lodged with Suffolk County Council by Nuclear Electric (NE) for a third nuclear power station at Sizewell, a move which has angered both the government and environmentalists.

In response to the application, Energy Minister Tim Eggar issued a statement saying: "The Government did not encourage the company to apply now ... capital approval for NE to build any new nuclear power stations after Sizewell B will not be given before the conclusion of the government's forthcoming review of the future prospects for nuclear power."

The new 2,600MW PWR station, Sizewell C, will be required to maintain the company's generating capacity as all six operating magnox reactors are due to close around the turn of the century. NE claims that the plant will cost a mere £3.5bn as development costs have already been met in the budget for Sizewell B. It also believes that Sizewell C will generate electricity at under 3p/kWh.

If the government review gives the nuclear industry the go-ahead, then NE will be hoping that the three-year public inquiry into Sizewell B will not have to be repeated as the economics of the station will have already been considered in the review. Further, it will argue that the Hinkley C public inquiry has already examined the safety aspects. Its hope is that a local planning inquiry — to decide on site access and the colour of the toilets — is all that will be needed. ❑

Rise of Superphénix?

THE ill-fated French fast breeder reactor, Superphénix, could be restarted in the middle of next year if the nuclear installations inspectorate, Direction de la Surete des Installations Nucleaires (DSIN) can establish new security systems for the prevention of sodium fires.

Having been closed for over two years, after failing to solve the problem of leaks in its sodium system, French law requires that a public inquiry be held before a licence to restart can be gained. Operated by a Franco-German-Italian consortium, NERSA, and commissioned in 1986, the 1,240MW station has not operated since 1990. During the time it was running, it operated on only 308 days, producing 4.5TWh — much less than its 30TWh rating — while consuming 1TWh.

The Public Inquiry Commission ruled that: "It does not appear that the station will be particularly dangerous or that, in itself, it constitutes a significant risk of plutonium leakage."

According to the Commission, the reactor's operation could serve to perfect fast breeder technology to deliver power to the national grid and to reduce the long-term nuclear wastes, thus giving approval for the reactor's use as a waste incinerator, ie to burn plutonium and minor actinides.

Opposition

Any moves to reopen the stricken reactor will be fiercely contested within France. Opponents of the plant believe it to be inherently dangerous and technologically redundant. As the rest of Europe moves away from fast breeders, and Japan is struggling with its own programme, French environmentalists reject claims that the plant can be used to burn excess plutonium, arguing that ending reprocessing would be a more sensible move.

They also point out that "restarting Superphénix would ignore a number of important unresolved questions concerning safety." A new organisation, Europeans Against Superphénix,* armed with 25,000 signatures opposing the reopening of the plant, have issued a leaflet outlining their objections, chief amongst which is the fact that the failure which led directly to the plant being closed has still not been explained. They say no insight has been gained into "the unexplained reactivity anomalies that occurred in 1989 and 1990 in Phénix (a short leap to 110% of the normal power followed by a sudden decrease on the edge of the core) and on the preventative measures to be taken on Superphénix." The DSIN, says the group, along with the Parliamentary Office for the Evaluation of Technological and Scientific Options, stated in December 1991 that restarting the reactor would be unthinkable unless the phenomena were explained.

About 77% of France's electricity needs are met by nuclear power, making it the most nuclear dependent country in Europe. Superphénix was conceived as a symbol of the French government's faith in nuclear power and after having spent over £3.2bn they are unwilling to abandon it. They will also be reluctant to abandon the reactor because of fears that they could face enormous compensation claims from foreign investors. ❑

*** Europeans Against Superphénix, c/o Comite Malville, 4 rue Bodin, 69001 Lyon-France. Tel: 78 28 29 22. Fax: 72 07 70 04.**

Chernobyl stays open

FACED with chronic energy shortages, the onset of winter and an economic crisis, the Ukrainian parliament has reversed its decision to shut down the Chernobyl nuclear power station at the end of the year.

The parliament, voting 221 to 38, has also lifted a ban on the construction or completion of new nuclear plants.

President Leonid Kravchuck told deputies that: "A moratorium means that the days of nuclear power are numbered and without a future. We cannot at the moment reject the development of nuclear power in Ukraine."

Severe energy shortages and a huge debt to neighbouring Russia for imported gas and oil played the vital role in swinging the votes of deputies, who had decided two years ago to shut the station permanently at the end of 1993.

While public opinion is still hostile to nuclear energy, the powerful nuclear lobby argued that the decision will secure an increased capacity of 18,000MW of electricity in less than a year, a powerful incitement given the state of the Ukraine's balance of payments.

Parliamentary deputy Volodymyr Yavorisky has denounced the decision as "senseless and unprofessional ... Ukraine will lose from such a decision. The Chernobyl station is a wounded animal."

The country's environment minister, Yuri Kostenko, also voted against allowing the station to stay open but laments that the Ukraine has little choice with winter coming.

The aftermath of the explosion at Chernobyl's reactor number four still consumes about 11% of the Ukraine's national budget. The concrete sarcophagus which was built around the reactor by soldiers in the immediate wake of the accident is now in a dangerous sate of decay and a second shell is expected to be built in the hope of containing the reactor's radioactivity until a permanent solution can be found. ❑

Russian dumping

RUSSIA has admitted dumping nuclear waste into the Sea of Japan, after a Greenpeace vessel watched a tanker disposing of radioactive liquid, and has agreed to end the practice.

The dumping was witnessed by five Greenpeace activists in an inflatable boat: "The crew of the inflatable, using radiation detection equipment, measured airborne radiation at around ten times background levels around the Russian dump ship."

A ministry official denied that any laws had been broken and said that international organisations and governments had been informed about the dumping. A spokesman for the International Atomic Energy Agency confirmed that it had known about Russia's plans. Although there is an international moratorium on sea-dumping of nuclear waste, it is voluntary. Some 32,000 cubic feet of waste from scrapped nuclear powered submarines was dumped.

Although the news of the dumping caused a storm of protest from the US, Japan and South Korea, Russia had intended to dump a further 28,000 cubic feet of waste. It has now decided that it will not do so, but warns that without financial help it will be unable to build a planned reprocessing plant in its Far East. If the plant cannot be completed within 18 months, says the Russian government, then more waste will have to be thrown overboard.

Russia has run out of capacity on land and the amount it is storing on floating tankers is growing as submarines and other atomic powered naval vessels are decommissioned.

Japan has welcomed the Russian announcement and said that it is ready to discuss ways of helping with the bill for safely disposing of the country's huge radioactive scrap heaps. ❑

STEWART KEMP of the National Steering Committee of the Nuclear Free Local Authorities has just returned from Japan. He reports on Japan's growing nuclear programme and warns that their dedication to the atom, and a plutonium economy in particular, threatens to spark a nuclear arms race on the Korean Peninsula.

Japan's plutonium policy

ON 7 October China tested an 80-90 kilotonne nuclear device. North Korea is feared to be building one using plutonium from its 5MW research reactor and separated at its 'radio chemical laboratory', both at Yongbyon. South Korea has threatened a "tough stance" (*Financial Times*, 9 September) if the North continues to obstruct International Atomic Energy Agency (IAEA) inspection of Yongbyon. Regional tension had already increased with a test firing by North Korea of a 1,000km range Scud type missile delivery system in May. Any evidence of a nuclear weapon programme will sink the December 1991 North/South "Joint declaration for denuclearisation of the Korean Peninsula" and further fuel the fierce debate in the South about the reliability of US 'nuclear guarantees'.

If North and South Korea join China as nuclear weapon states, what would be the impact on Japan, a country already trying to match its economic power with political influence? Outgoing LDP Foreign Minister Kabun Muto on 28 July at the South East Asian Nations conference, Singapore, warned that Japan would develop a nuclear arsenal if North Korea did (*International Herald Tribune*, 30 July). Following the equivocal position taken by Japan on 8 July at the Tokyo G7 meeting towards indefinite Nuclear Non-Proliferation Treaty (NNPT) extension after 1995 (agreeing only if the NNPT had universal adherence and nuclear weapon states began arms reduction), one official stated "It would be a risk to acknowledge indefinite extension while North Korea is developing nuclear weapons. We have to be cautious" (*Washington Post*, 9 July).

Cold war

The Cold war is dead in Europe but it remains alive in North East Asia and any development casting longer nuclear shadows in the region could tip the scales on Japan's nuclear programme from energy towards weapons. Yet Japan is not an innocent bystander. It is part of the dynamic edging the region towards nuclear proliferation.

North Korea points to Japan's plutonium policy as a challenge to regional security and a reason for threatening withdrawal from the NNPT. A recent United States General Accounting Office (USGAO) report *Nuclear Proliferation: Japan's Shipment of Plutonium Raises Concerns About Reprocessing* (p12, June 1993) says a former Department of Defense Deputy for non-proliferation policy stated in evidence that "... by persisting in its plutonium use policy, Japan set a bad precedent for North and South Korea that will complicate US discussions on reprocessing with them." In the same evidence criticism is directed at "... both France's Cogema and the UK's BNFL (with) offices in Seoul, South Korea, whose main objective is to sell reprocessing services and technology."

No-Nukes forum

Speakers and delegates to the 'No Nukes Asian Forum' in Tokyo on 25/26 June warned of a new age of Japanese imperialism as it dislodges Western technical advisers in Asia. Japanese nuclear experts advise in Indonesia with plans to achieve 60% of energy needs from nuclear power by 2000 (currently 0%), and in Taiwan as it pursues a massive expansion from 6 reactors now (generating 38% electricity) to 26 reactors operational by 2000.

Thailand is another target for Japan. Presently it has no nuclear generation capacity but plans 6 power reactors between 2006 and 2014. None of these plans would be realised without Japanese nuclear expertise.

Japan is building its own 'Sellafield' at Rokkasho-mura, Aomori, a 'green field' site on the underdeveloped northern tip of Honshu Island. A uranium enrichment facility and low-level waste shallow burial facility became operational last year. Construction has begun on a reprocessing plant, similar in scale to Thorp, with a capacity of 800 tonnes heavy metal per year (tHM/y). This plant, due to come on line at the turn of the century, is intended for domestic spent fuel but if Japan is selling its reactor technology in other countries then spent fuel services could form part of a customer package.

This is speculation, but future reprocessing and return of separated plutonium from Japan cannot be ruled out. Rokkasho operators, Japan Nuclear Fuels Ltd, could build more reprocessing capacity. Indeed, the USGAO report cited above warns that additional capacity is planned (p3).

Future problems

A small uranium ore processing facility for uranium-308 (not currently operating) and uranium hexafluoride production and enrichment demonstration facilities are located at Ningyo Toge; and small reprocessing (5tHM/y) and fuel fabrication (60tHM in 1991) operate at Tokai-mura. A new LWR/ATR plutonium/uranium mixed oxide (MOX) fuel fabrication facility (35tHM/y) is also under construction at Tokai.

These developments create suspicion and 'worst case' assumptions about future intentions. This was true here in the days before the Soviet Union imploded and Clinton sees it now but can only find enough political latitude to launch a fatally flawed non-proliferation initiative before the UN on 27 September limited to 'weapons' plutonium and a 'strengthening' of the International Atomic Energy Agency still tasked to promote the 'peaceful' use of the atom: "More than a score of nations likely possess such (nuclear) weapons, and their number threatens to grow. These weapons destabilise entire regions. They could turn a local conflict into a global and environmental catastrophe ... Growing global stockpiles of plutonium and highly enriched uranium are raising the danger of nuclear terrorism for all nations. We will press for an international agreement that would ban production of these materials for weapons forever."

Current Japanese nuclear policy is committed to expansion not only in fuel facilities. According to Nuclear Engineering International's 1993 World Nuclear Industry Handbook, Japan currently has 43 operable power reactors (19 PWRs, 21 BWRs, 1 Magnox, 1 FBR and 1 LWR), has ten under construction (4 PWRs, 5 BWRs and 1 FBR) and plans 13 more (2 PWRs, 8 BWRs and 3 ATRs). From about 25% of electric power generation from nuclear now, Japan aims for 40% by 2000.

Japan still pursues a plutonium fuelled thermal and fast breeder reactor programme. The Japan Atomic Energy Research Institute claims to be developing a "94% pure Pu-239 once-through" fuel for thermal reactors to succeed current MOX fuel plans (*Nucleonics Week* p2, 5 August 1993) but sceptics view this with great suspicion believing it to be a political smoke-screen, allowing Japan to argue it is actually speeding up the disposal of surplus plutonium rather than adding to it.

The ostensible rationale for the plutonium policy is twofold. Firstly, to reduce dependence on energy imports and secondly a long term assessment that fresh uranium will be scarce by the middle of the next century and therefore plutonium recovered from 'breeder' or thermal reactors by reprocessing and fabricated into new fuel will become a competitive energy source. 2030 is identified as the date for commercialisation of FBRs.

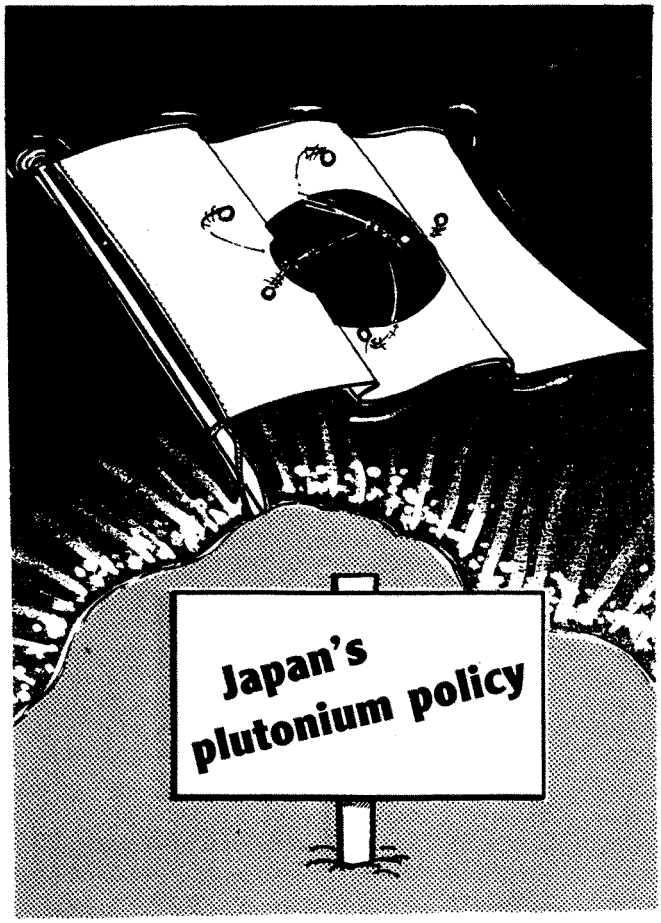
Campaigners in Japan argue the government's policy has no basis in commercial reality. Uranium prices would have to leap tenfold to $100 per pound for fuels from recovered plutonium to become competitive and no uranium shortage to force price increases on that scale can be foreseen. The Monju PFR design cannot be safely scaled up for a commercial FBR and no alternative has yet been agreed. In any event, an FBR operating for 30 years would only 'breed' enough plutonium to fuel another FBR for ten.

Japan's Atomic Energy Commission itself was reported in the financial daily newspaper *Nikkei Shimbun* on 6 January this year to be "re-evaluating the pace of the FBR programme" because of the trend away from FBRs and the difficulty in identifying a site to build a demonstration FBR. These question marks over the coherence of stated policy only serve to cast further doubt about the real purpose of the plutonium.

Any weapons intention is hotly denied. Japan's Deputy Prime Minister and Foreign Minister, Tsutomu Hata has called it an "outrageous misunderstanding". Science and Technology Agency (STA) officials argue that plutonium stocks will be maintained at levels necessary only to fuel the future reactor programme and there will be no plutonium surplus.

However, on 19 August the Minister for Science and Technology, Satsuki Eda told *Nucleonics Week* (p8-9, 26 August 1993) whilst denying the intention, that 'in effect' his country had the capability to develop nuclear weapons. Kazuhisa Mori, executive managing director of the Japan Atomic Industrial Forum the following day was reported by *Nucleonics Week* as saying: "To ask whether Japan has technical capability of developing nuclear weapons is like asking a rich, well-built grown-up whether he is ready to commit a murder and how soon."

Nuclear Engineering International (p17, July 1993) reports estimates by the STA that Japan will need 80-90t of plutonium between now and 2010 — 50t for MOX fuels in LWRs; <10t for two ATRs; and 22-23t for the Monju, Joyo and another planned demonstration FBR. This will be met from Tokai (5t); Rokkasho (50t); and 30t separated from spent fuel at Sellafield's Thorp and La Hague's AP3 reprocessing plant.



This plutonium requirement is challenged by the Tokyo based Citizen's Nuclear Information Centre (CNIC). The 1.7t of plutonium shipped from La Hague by the *Akatsuki-Maru* last November, so desperately needed to fuel the Monju FBR, has in fact gone into storage for at least three years while the STA tries to resolve technical difficulties with Monju fuel fabrication. Monju start-up, originally planned for Autumn 1992 has now been put back to at least Spring 1994 with 'commercial' operation deferred to 1996. CNIC estimates the current plutonium surplus in Japan at 2.2t with a further 2.7t at La Hague. It has been estimated that 20 full MOX fuel cores would be needed to absorb the plutonium output from reprocessing at Thorp and Rokkasho yet only two reactors are currently burning it. *Nuclear Fuel* (p8,10 May 1993) reports resistance in some utilities including the second largest — Kansia Electric Power Company — to burning MOX on the grounds of cost and safety. Up to 10 tonnes of plutonium earmarked by the STA is for future use in ATRs yet to be built.

CNIC considers a realistic plutonium utilisation programme by 2010 could absorb 23t (Thermal Reactors 10t, FBRs 8t and ATRs 1+t). An optimistic programme might absorb 51t (Thermal Reactors 29t, FBRs 13t and ATRs 6t). Three tonnes on both scenarios is currently in use. If govern- ment policy is not changed, in twenty years time Japan could be sitting on a stockpile of 30 to 60t plutonium.

From Beijing, Pyongyang or Seoul a stockpile of 'civil' plutonium in Japan looks like a stockpile of plutonium anywhere. It can be dressed up in IAEA safeguards but in the long term the stakes are too high to plan national security policy on any basis other than the identified capability of Japan. This is the critical path Japan has taken ostensibly in the search for security of energy supply. But policy may be shifting.

The new coalition government led by Morihiro Hosokawa declared on 23 August that it would support the indefinite extension of the NNPT (Nucleonics Week p8, 26 August 1993). Senior energy officials are also reportedly speculating that the new Hosokawa coalition "will modify Japan's long-standing policies on plutonium use and fast reactor development, probably before the end of the year ..." It would take enormous political will and political power to topple the plutonium orthodoxy expounded by officials in the Trade Department (MITI), STA and other government agencies. Does Hosokawa have that will and power? Would reprocessing be abandoned?

If Japan's plutonium policy were consigned to the dustbin of history, then Thorp would follow it. ❑

The possible link between depleted uranium in armour piercing shells and an illness known as 'Desert Storm Syndrome' occurring in some Gulf War veterans has lead to fears that the health of people living near depleted uranium shell test firing ranges could be affected. PETE ROCHE, a Greenpeace disarmament campaigner, reports.

Uranium tipped ammunition

DURING the uranium enrichment process required to make nuclear weapons or fuel, the concentration of the 'fissile' U-235 isotope has to be increased. What is left, depleted uranium, is about half as radioactive as natural uranium, but very dense and extremely hard. Because it is a waste product, it is probably supplied to weapons manufacturers free of charge, or at very low cost, for use in armour piercing shells.

A 1979 Ministry of Defence (MoD) memorandum states that tungsten alloys were then in use but: "The effectiveness of armour-piercing tank gun ammunition depends largely on the density of the metal from which it is made. Depleted uranium has proved the most effective anti-armour penetrator in US development programmes [and] is also considerably cheaper than tungsten."[1]

External radiation levels from depleted uranium (DU) are low. Standing near a DU contaminated vehicle shouldn't be any more harmful than background radiation, as far as external radiation is concerned. However DU is about as toxic as lead and could be harmful to the kidneys if eaten or inhaled. When DU burns in a fire, it converts into a form which can be readily absorbed by the body. If ingested or inhaled, the toxic effects of the DU dust could damage the kidneys, and the (short-range) alpha radiation emitted would increase the risk of contracting cancer.

Reasons for concern

DU first came to the public's attention in November 1991 when an Atomic Energy Authority (AEA) memo was leaked to the *Independent on Sunday*. According to the memo, at least 40 tonnes of DU were left behind on the Gulf War battlefield by the Allied armies.[2] However, documents released in the US under the Freedom of Information Act indicate that the figure could be as high as 300 tonnes.[3]

The AEA calculated that sufficient depleted uranium was left behind in Kuwait and Southern Iraq to cause "500,000 potential deaths". The Authority said this was "obviously not [a] realistic figure" because the uranium shells would all have to be pulverised into dust and each of the half a million people would have to inhale an equal quantity. But the volume of DU does "indicate a significant problem".[2]

The memo admitted that: "The DU will be spread around the battlefield and target vehicles in varying sizes and quantities from dust particles to full size penetrators and shot. It would be unwise for people to stay close to large quantities of DU for long periods and this would obviously be of concern to the local population if they collect this heavy metal and keep it. There will be specific areas in which many rounds will have been fired where localised contamination of vehicles and the soil may exceed permissible limits and these could be hazardous to both clean-up teams and the local population."[2]

The AEA's calculations and comments, whilst worrying enough, were based on the assumption that only 40 tonnes of depleted uranium were left behind in the Gulf. If the figure is actually 300 tonnes the number of 'potential deaths' will rise to 3.75 million!

Unacceptable

The biggest hazard will have been when depleted uranium shells hit and burn out Iraqi armoured vehicles. If airborne particles are inhaled by service personnel passing or looking into these vehicles this can lead to 'unacceptable body burdens'. Furthermore if DU gets into the food chain or water this will create 'potential health problems'.[2]

The US Defense Department (DOD) admitted in a memorandum in May '91 that the use of depleted uranium "results in remnants that are subject to atmospheric oxidation and/or aqueous corrosion. Either process can lead to environmental contamination that has the potential to cause adverse impacts on human health, primarily through the water pathway ...

"Surface oxidation of fragments of depleted uranium penetrators is a significant process because oxidized forms of uranium are more soluble in water, and thus potentially more available for ingestion by humans and animals".[4]

The health effect which most concerns the DOD is nephrotoxicity (toxicity to the kidney).

'Desert Storm Syndrome'

Some troops and support staff involved in the Gulf War are complaining of mysterious illnesses. Symptoms include memory loss, fatigue, skin complaints, headaches, eye and ear infections, bleeding gums, hair and weight loss, facial paralysis, damaged lungs, and a general collapse of the immune system.

The US Army now admits that some US soldiers were unknowingly exposed to depleted uranium in the Gulf War. The DOD and the Department of Veteran Affairs have begun an identification and health monitoring programme for soldiers who were exposed.[3]

In June '93 in Washington, the House Veteran Affairs Committee began an investigation into what is being called 'Desert Storm Syndrome'. Seven thousand Gulf veterans claim they are suffering from serious, mysterious diseases. Several theories as to what has caused these illnesses have been proposed: smoke pollution from the oil fires, vaccines used on the soldiers, and infections spread by desert sandflies, but the depleted uranium theory is gaining most currency.

In the UK the government's attitude is quite different — they refuse to accept that any members of the British Armed Forces who served in the Gulf are suffering from any unexplained symptoms. However, the MoD has agreed to seek further information and monitor the situation closely, and has admitted that not all service personnel in the Gulf were warned about the dangers of depleted uranium shells.

Another theory is that beryllium contained in the depleted uranium shells could be causing the illnesses. Despite the speculative nature of our knowledge concerning beryllium it is known to be toxic to mammalian cells and can interfere with normal immune functions and, after inhalation, can give

rise to an incapacitating lung disease known as berylliosis, and possibly cancer.

By January 1993 reports reached the UK of mysterious and inexplicable postwar illnesses appearing in Iraqi children, including cancers — leukaemia being the most common. However, given the breakdown in the collection of health statistics in Iraq since the War, it will be impossible to prove that there has even been an increase in cancer incidence.

The US has already spent a considerable amount of money recovering contaminated US vehicles from the battlefield, and returning them to South Carolina as nuclear waste. But nothing has been done in Iraq, and little in Kuwait, to recover the remaining DU rounds. Workers involved in the Kuwaiti clean-up operation appear to have been unprepared to deal with hundreds of contaminated Iraqi vehicles.[3]

Weapons testing

A programme of test firings of armour piercing shells tipped with depleted uranium was first authorised and announced to the House of Commons in March 1979. The test firing programme began at Eskmeals in Cumbria in 1980 and Kirkcudbright in Dumfries and Galloway in 1981. A few small calibre rounds were also tested at West Freugh near Stranraer in 1988 and 1990. DU shells have also been test-fired at White Sands, New Mexico, Aberdeen in Maryland and at Gramat in France.

If there is a danger to health and the environment in Iraq from DU, and service personnel are returning from the Gulf with unexplained illnesses, then what is the potential danger from DU being test fired in Britain?

If DU is fired at a target, it will burn and could be potentially dangerous. Nuclear engineering consultant John Large says: "If you fire a depleted uranium shell, you want to see what it does to a target and, if the wind and weather conditions are wrong, you could spread that depleted uranium across the civil population. So of course there are problems but not to the same scale as the potential problems that we've identified for the Gulf War."

As late as June '93, Defence Minister, Jeremy Hanley, claimed that radiation monitoring carried out at the three test sites showed that "No detectable contamination has been found at West Freugh and only very low levels of radioactivity from depleted uranium ammunition have been detected at Eskmeals and Kirkcudbright."

However, when the radiation monitoring reports were finally made public in July, "subject to deletion of some classified details", it became clear that safety limits had been exceeded. Serious contamination was discovered outside the "controlled area" at Eskmeals "in some cases above the level at which it would be prudent to consider remedial action". Grass and soil at Kirkcudbright was found to have uranium levels "well above acceptable limits" after a "malfunction" at a firing point.

A "misfiring" on 13 November '89 at Kirkcudbright led to a DU shell hitting a bank of stone and exploding into fragments. The MoD normally works to a tolerable limit of 72mg of uranium per kilo of soil, and an upper limit of 300mg/kg. But at the site of the accident the level reached 1,692mg/kg.

A total of 91 cubic metres of low-level radioactive waste, contaminated with depleted uranium, is expected to be stored at Eskmeals by 1994, rising to 468 cubic metres by 2030. However, according to the government, there is no radioactive waste at Kirkcudbright or West Freugh nor any likely to arise in the future. This is because at Eskmeals the shells are fired at targets on land which subsequently become nuclear waste, whereas at Kirkcudbright shells are fired into the Solway Firth.

The government announced a "full environmental impact assessment" at Eskmeals and Kirkcudbright on 1 July '93. Approximately 4,000 shells have been fired into the Solway Firth from the testing range at Kirkcudbright, and as part of the environmental impact assessment, the MoD asked the Navy to retrieve a few shells to "allow laboratory assessment of their reaction to exposure to seawater". However, the exercise, which was supposed to take place in August, had to be postponed because of bad weather.

Other sites

The MoD establishment at Radway Green near Crewe is most likely to be the site where these weapons are produced. Fort Halstead, near Sevenoaks in Kent, is a research site where uranium tipped shells are probably developed. There is a small quantity of depleted uranium waste stored at Fort Halstead. Export licences obtained in the United States show that depleted uranium has been exported from the US to Royal Ordnance factories at Wolverhampton and Chorley in Lancashire.

The dangers of DU shell manufacture are illustrated by the fact that the National Lead Company plant in Albany, New York State, which used to manufacture DU penetrators, has been forced to close down, because it was contaminating New York State. DU particles were found up to 26 miles away from the plant.

Conclusions

There may never be any hard evidence that civilians or servicemen have suffered from health problems as a result of the use of depleted uranium. However, the government needs to be a lot more open about the problem and act quickly to dispel any suggestion that they have attempted to silence the victims and launch an inquiry into 'Desert Storm Syndrome'.

Assistance by the Allies needs to be offered to both Iraq and Kuwait to clear up the depleted uranium left behind after the Gulf War, as quickly as possible. That clean-up operation should be carried out by staff fully trained in the handling of radioactive materials. Assistance should also be offered to carry out health studies to ascertain whether the health of Iraqis and Kuwaitis has in any way been affected by the use of these weapons.

Despite all the protests, particularly in South-West Scotland, the MoD plans to press ahead with the introduction of new depleted uranium tank shells for the army's new Challenger 2 tanks, and has begun tests at Kirkcudbright. Whether or not civilians and servicemen have been affected by depleted uranium, it is clear that it represents both a toxic and radioactive hazard to health and the environment. Its use in armour piercing shells, and the testing of those shells should therefore cease immediately. ❑

References

(1) "Anti-Armour Ammunition With Depleted Uranium Penetrators" Memorandum by the Ministry of Defence. March '79.

(2) "Radioactive waste left in Gulf by allies" by Nick Cohen. Independent on Sunday, 10 November '91.

(3) "The desert glows - with propaganda" by William Arkin. Bulletin of Atomic Scientists, May '93.

(4) "Depleted Uranium Munitions" by Dr Joe Osterman. US Department of Defense office of Environmental and Health Science. May '91.

In industrialised countries office equipment accounts for more energy consumption than the steel industry, it is the fastest growing of all energy uses. Here DAVID OLIVIER* assess the vast potential savings from improving efficiency in the office.

Energy efficient office

ELECTRONIC equipment in office buildings is the fastest growing area of energy waste. Design improvements could do much to alter this situation and to alleviate mounting pressure on the environment.

With the proliferation of microcomputers, and office electronics in general, comes a steady rise in the quantity of electricity consumed. Common perceptions may suggest that these devices are insignificant consumers of electricity, but the opposite is true.

US research demonstrates that nearly all personal computers (PCs) in offices were left on all day, and many were left on all night and all weekend. On average, a small PC was found to use as much electricity as a refrigerator. Electricity consumption on this scale has global ramifications.

The electricity consumption of office machines may have more effect on the environment than any other aspect of office design and engineering. However, it receives little publicity.

Worldwide, as more electrical equipment is purchased, the electricity consumption of office buildings is rising. To run the electronic equipment in a small office, fossil-fuelled power stations pump out one kilogram per hour of carbon dioxide. Added up over Britain, or any other country which uses fossil fuel generated electricity, and millions of extra tonnes of CO_2 per year are emitted; not to mention the SO_2, NO, NO_2, other toxic gases, dust and heavy metals.

Many of Britain's universities, hospitals and other large institutions have had energy managers for many years. Despite resultant large reductions in the amount of energy used for space and water heating, electricity use in these organisations has risen relentlessly.

This phenomenon is causing rising concern. It does not indicate failure by energy managers, as this is far outside their remit. It reflects a lack of attention to the possibility of energy-efficient office equipment by other groups of people; namely purchasing managers and equipment manufacturers, who until recently offered no significant innovations.

Not long ago, the world ran on mainframe and mini-computers. Even before adding up the power consumption of the remote terminals, some mainframes consume tens of kilowatts of electricity each, and have to be artificially cooled. A typical small mini-computer, dating from the early 1980s, and designed for 100 users, consumes 6 kW. If 10% of the terminals are in use at any one time, that is 600W per user.

Most modern desktop PCs consume 100-200W per user. State-of-the-art portables use about 10W. The fundamental reason for the energy efficiency of portable computers is that, within the weight constraints of a 3 kg machine, no battery can supply more than a few tens of watts for a few hours. As a result, manufacturers were forced to develop energy efficient computers.

With this exception, energy efficiency has clearly never been much of a design issue in PCs, except for the nuisance value of the heat given off by the electronic circuitry. Worryingly, Intel's new 'Pentium' microprocessor, which is planned to supplant the 80486, consumes a great deal of electricity. Until a lower power version is developed, its use in portables is almost ruled out.

There is little difference in the tasks that can be undertaken by these machines, and with minor exceptions, manufacturers of desktop PCs could use the basic portable technology. The US Electric Power Research Institute (EPRI) estimates that such desktop computers would consume 90% less electricity than existing products.

Photocopiers

Tests carried out in Switzerland, in an office where 500 copies per day were made on a single machine, showed that only 22% of the electricity used was attributable to making copies. 53% was used in standby mode, mainly to keep the fuser hot, and 25% was consumed when the machine was switched off, but not unplugged.

As with computers, advances in technology can reduce electricity use, but so can simple power management, which ensure that a given machine uses less electricity when it is not actually copying.

3M in the USA has retrofitted timeswitches to many of its copiers, switching them off after office hours. The estimated payback time for this measure, which saves about 35% of the copier's total power consumption, was one or two years.

EPRI believes that by redesigning new copiers more than 70% of the electricity may be saved. One option is a resurgence of the cold fusion process, which does not use a heated drum to melt the toner and fix it to the paper. Instead, it uses very high-pressure rollers to fix the toner. This consumes 90% less electricity than the use of an electrically-heated drum.

A small Canon photocopier using this method was sold in the 1980s, but was withdrawn due to the shiny surface which resulted from passing paper through high-pressure rollers. With the renewed interest in energy saving, other models may be relaunched, and paper may be developed with a better finish.

Computer printers

There is no systematic connection between the amount of electricity used per printed page, and the quality of the output. Inkjet printers, whose output is becoming indistinguishable from ordinary laser printers, use 20 times less electricity per page than lasers. The old daisy-wheel printers, and dot matrix printers of most types, use intermediate amounts.

Laser printers themselves could be improved by simple power management measures. Hewlett Packard (HP) already has a policy that its employees should turn off idle equipment. As laser printers can withstand frequent on-off cycling, HP recommends that small laser printers be switched off whenever they are idle for over 15 minutes. It plans to distribute a leaflet to this effect with new printers, and will incorporate more power management features in new models.

Recent laser printers do tend to consume less electricity in standby mode, and do switch more quickly to standby. However, the rate of progress is frustratingly slow.

Typical fax machines use about 10W in standby mode, and 20W when printing. Even these modest figures could be reduced by further 'tweaking' of the circuitry: the EPRI estimates a potential saving of 40% and 60% respectively.

Plain-paper laser faxes are another matter. Using the same technology as laser printers they consume as much electricity. Most fax machines are left on all night and at weekends, so unless their power-management controls are improved dramatically, an increase in their use would be very bad news for the environment.

Ink-jet faxes are available, producing similar results to laser faxes on plain paper, using about 5% of the electricity.

Almost everywhere in the office there is scope for large electricity savings. A few years ago, the US Rocky Mountain Institute discovered that their 10-year-old internal telephone exchange consumed 95W, day and night. When this device was replaced by a modern one, the building's electricity consumption fell by 90 W.

The consequences

In Britain, assuming that around eight million PCs are in use, the same per capita ratio as the USA, the generating capacity of at least one huge 1.2 GW power station has undoubtedly been needed to supply the extra electricity consumption of the inefficient PCs that were sold. This generating plant has probably cost £2,000m. It may have cost a further £250m per year to fuel it, and a further £1,000m to reinforce the electrical grid to meet the increased demand. Of course, we, the electricity consumers, paid these billions of pounds.

Meanwhile, building services engineers have been commenting on the high cost of the air conditioning systems they were obliged to fit to new buildings. This need for cooling was partly due to the electricity-consuming electronic equipment within them. Some old buildings could not cope with the increasing heat gains, and were retrofitted with expensive air conditioning.

By 1990, it appeared that it might cost less to fit more energy-efficient office equipment in some office buildings than to pay for a large cooling system. The electricity saving, and the beneficial effect on the environment, was not just free but had a negative cost: it was not just a free lunch, but a lunch that one was paid to eat.

Energy-efficient computers make striking example. Within an office building, replacing several hundred heat sources of 100-200W by heat sources of 5-10W has a dramatic effect on the summer comfort standard which the building provides for its occupants.

In some climates, office buildings are fitted with cooling systems as a matter of course. In central and northern Europe, they are not. In practice, in south-east England, 100% of new offices now have space cooling systems, most of them electrically-powered.

Let us assume that 600 people work in a 6,000 m^2 building, and that there are 500 PCs — the per capita figure predicted for North America in the near future. Then the original heat gain on a summer day is almost 75kW and the new one, after choosing energy-efficient PCs is only 2.5kW.

Air conditioning systems are very expensive. In the USA, they cost roughly £170/m^2 of floor space (British ones can cost double this). A large building, containing 6,000m^2 of office space, may thus need expenditure of £1m on its cooling system.

The extra price of an energy-efficient 80486 PC is currently about £500. The residual differences are assumed to cancel out; desktop PCs have a better screen, because of the residual limitations on colour LCDs, but portables provide the convenience of an uninterruptible power supply, at no extra cost, and LCD screens present no concern about radiation from monitors.

In this same building, the extra cost of purchasing energy-efficient PCs adds up to £250,000. This is a quarter of the cost of the air conditioning. So if the purchase of energy-efficient PCs obviated the need to install a cooling system, it could actually save a building's owner £0.75m.

Energy-efficient computers don't have to cost £500 extra. If energy-efficient technology was used in all PCs, thereby spreading the development costs over larger sales, the added costs would certainly be less than £500. Some US manufacturers believe workstations or fileservers designed to use 30W may be cheaper to build than the present models, owing to the cost savings from eliminating the cooling fan, and using a smaller power supply.

US research in the period 1988-89 showed that unless office equipment quickly became more energy-efficient, hundreds of large power stations, costing billions of dollars, would have to be built. There are now some serious moves being made in North America.

In 1992, eight US companies, accounting for 35% of the US desktop market, established, with the Environmental Protection Agency, an 'Energy Star' program. To qualify for this label, computers must use either less than 30W, or less than 20% of that used by the normal version of the same machine in standby mode, and they must have controls to automatically switch off the screen when not in use. All eight agreed to launch at least one energy-efficient desktop PC.

Some US electricity companies have a statutory duty to invest in energy efficiency where this is cheaper than the cost to the utility and its customers of building new power stations. Pacific Gas and Electric, a large utility on the US west coast, announced that, because of its concern about office equipment electricity consumption, from mid-1993 it would only buy Energy Star computers and peripherals. Other large PC users, culminating in the US federal government, followed suit.

Swedish authorities are also trying to introduce energy-efficient office equipment. The Board for Industrial Development supported the production of retrofit controls for PC monitors, and new monitors with built-in automatic controls. It also helped with the development of laser printers that have a very low standby power consumption — below 25W. These products are now entering the market.

Conclusions

Fundamentally, the lack of energy efficiency in office machines came about through apathy, ignorance, and perhaps even sheer disbelief that the humble PC could have global consequences. Not to mention the rapid changes in the basic technology, from one month to the next, and many manufacturers' and dealers' ignorance of the wider implications of what they are selling. Few consumers even realise that there is an issue here.

To date, except for Sweden and North America, there is little sign of serious efforts in this field. As the USA is one of the first countries to try to reverse this soaring electricity use, we might consider it fortunate that its firms have such a worldwide influence over the design of office equipment. The environmental impact justifies innovations by all countries which have a manufacturing base, such as Japan, Germany, Italy and much of the Far East.

The energy efficiency of future office equipment will depend on the actions of hundreds of manufacturers, dozens of governments and millions of consumers. We may debate which factor is the more important, but the outcome depends critically on all of them. It is a tricky area for governments to regulate in detail, but merely to follow the US government, and try to phase out the most egregious cases of energy waste, could benefit us all. ❑

*** David Olivier, is Principal of Energy Advisory Associates, 8 Meadow Drive, Credenhill, Herefordshire, HR4 7EF; Tel (0432) 760787, Fax (0432) 760787-0088.**

The government's decision-making process considering whether Thorp should open has been fundamentally flawed and has failed to take account of its radioactive waste management policy, internationally recognised principles of radiological protection and legally binding European Community Directives, reports Dr PATRICK GREEN of Friends of the Earth.

Thorp: carry on regardless

IN April 1992, British Nuclear Fuels plc (BNFL) applied to HM Inspectorate of Pollution (HMIP) for new radioactive discharge authorisations under the Radioactive Substances Act 1960 for its Sellafield site which would enable the Thermal Oxide Reprocessing Plant (Thorp) to commence operation.

In response, HMIP along with the Ministry of Agriculture, Fisheries and Food published draft authorisations and launched a public consultation exercise. This lasted for about ten weeks (ending January 1993) and attracted over 80,000 responses of which two thirds objected to the granting of the authorisations. Regardless, HMIP concluded that its draft authorisation would; "effectively protect human health, the safety of the food chain, and the environment generally."

This did not, however, lead to the granting of the authorisations. Instead, the Department of Environment (DoE) launched a further period of public consultation. This was to address a number of "wider policy issues" which, according to the DoE, were outside HMIP's remit. HMIP considered only the question of "environmental acceptability of radioactive discharges from the Sellafield site."

These "wider policy issues" included the question of Thorp's justification. Such questions were judged, by government, irrelevant to granting radioactive discharge authorisation under the Radioactive Substances Act 1960. However, because of "wider [government] responsibilities" a further period of consultation was ordered. Which it prefaced with the warning that it was "minded" to allow Thorp to carry on — regardless.

This decision-making process is fundamentally flawed. "Wider policy issues" are directly relevant to consideration of the acceptability of a radioactive discharge. Indeed, the government is explicitly required to establish the justification for a practice, such as Thorp, before it can decide whether the risk from radioactive discharges is acceptable. It is required to do this by its own radioactive waste management policy, by internationally accepted radiological protection principles and by legally binding European Community (EC) directives.

The requirement to justify a practice which causes radiation exposure, such as Thorp, means that the need for the practice must be established in terms of a net positive benefit which outweighs the increased risks from radiation exposure. This decision-making process requires that detriments, benefits and alternatives are fully considered and quantified.

Current government policy and Euratom directives are based upon the 1977 recommendations of the International Commission for Radiological Protection (ICRP) which introduced a basic system of protection, based around the concept of justification, to ensure that radiation doses were as low as reasonably achievable and within stated dose limits.

This system aims to "ensure that no source of exposure is unjustified in relation to its benefits or those of any available alternative, that any necessary exposures are kept as low as reasonably achievable and that the dose equivalent received do not exceed certain specified limits."

Justification

These recommendations have been incorporated into the government's radioactive waste management policy, which clearly requires that: "all practices giving rise to radioactive waste must be justified, ie the need for the practice must be established in terms of its overall benefit."

The justification principle was also given full legal force by the EC in 1980. Article 6(a) of the Euratom Directive 80/836 as amended by Article 2 of Euratom Directive 84/467 requires that: "the various types of activity resulting in an exposure to ionising radiation shall have been justified in advance by the advantages which they produce."

Because the UK has not directly implemented this Article the Euratom Directive itself has "direct effect". It is binding on the government and BNFL, a state-owned company. The principle is that member states cannot take advantage of their own legal failures when implementing EC law.

The ICRP's latest recommendations were published in 1990 and have been endorsed for use in the UK by the National Radiological Protection Board (NRPB). They provide further information on the processes to be considered when deciding if a practice is justified. The Commission explicitly recommends that radiation detriment be included: "when practices involving exposure, or potential exposure, to radiation are being considered, the radiation detriment should be explicitly included in the process of choice."

The detriment to be considered is not just confined to the health detriment from exposure, it includes "the costs of the practice." From this, it can be seen that the process of justification involves the identification of the health and other detriment caused by radiation exposure and the identification of the benefits arising from the practice causing the radiation exposure. The exercise should also establish whether the same benefits can be produced by an alternate means that does not cause the same degree of detriment. The ICRP states: "Decisions concerning the adoption and continuation of any human activity involves a choice between possible options and are often carried out in two stages. The first stage is the examination of each separately in order to identify those options which can be expected to do more good than harm. This provides a 'short list' from which the preferred option can be selected. The second stage, the final selection, will often involve the replacement of one existing practice by another. The net benefit of the change will then be the relevant feature rather than the net benefit of each option separately."

The need to justify a practice is not a one-off exercise. The ICRP has explicitly stated that it is a continuous process. Practices that were considered to be justified in the past can be re-evaluated and can be judged to be unjustified. This clarification is particularly relevant to the issue of reprocessing and Thorp in particular: "The process of justification is required, not only when a new practice is being introduced, but also when existing practices are being reviewed in the light of new information about their efficacy or consequences. If such a review indicates that a practice could no longer be claimed to produce sufficient benefit to offset the total detriment, withdrawal of the practice should be considered. This option should be treated in the same way as the justification of a new practice".

However, the ICRP has added the caveat that this action may not actually remove all of the sources of exposure: "it must be remembered that the disadvantages of withdrawing a well established practice may be more obvious than the advantages of introducing a comparable new one and withdrawal of the practice may not result in the withdrawal of all the associated sources of exposure."

"Preventing the further extension of an existing practice that is no longer justified may sometimes be a reasonable compromise, but will introduce an anomaly between the past and the present that will not always been seen as logical," argues the ICRP. The continuous nature of the justification criteria has now been incorporated into a draft Euratom Directive which is due to be adopted by the European Community Council of Ministers later this year: "all practices resulting in exposure to ionising radiation shall be justified in advance by, and kept under review as to the benefits which they produce."

The government's view

Contrary to international understanding of the justification principle, the government has argued that it is a one-off process. Its stated support for Thorp rests on the "principle" that the justification should not be challenged once a plant has been built: "The government's policy is that the principle of whether a plant — such as Thorp — should be built and used should be decided in or at the time of the planning process ... and not after the developer has built the plant."

As detailed above, this is a flawed interpretation of the principle. It is certainly true that the planning process determines whether a plant such as Thorp can be constructed. However, the government already accepts, through its policy, that justification is a continuous exercise. In particular, government policy requires that justification be reconsidered before the plant is allowed to produce radioactive waste and start operation. Even after that decision-making process, a future decision can still decide that the practice causing the waste is unjustified.

BNFL's justification, and by implication the government's, for Thorp heavily depends on alleged economic benefits. Yet, at the Windscale Inquiry into Thorp in 1977, the Inspector explicitly accepted that the economic case for Thorp was far from proven and that there would be future development which could either support or undermine BNFL's case; "I should stress, however, that it is yet too early to reach any conclusion on the economic position. If the project proceeds, there may be changes which will affect the position. Developments in the design, alterations in the requirements for the control of emissions or a failure to obtain the amount of foreign business presently expected might change the situation."

Such further developments, he implied, would require that the issue of justification for Thorp be revisited. This clearly implies acceptance of the argument that changed circumstances can lead to the justification for a project being challenged. Consequently, even though Thorp may have been considered justified when planning permission was granted, circumstances may have changed and the project may no longer be considered justified today. This fact has already been accepted by government at the Inquiry into Scottish Nuclear's plans to construct a dry store for its spent fuel at its Torness AGR. The Inquiry Reporter stated in his draft report: "Mr Hetherington [Scottish Office Environment Department] accepted that circumstances had changed since the government had made its response to the select committee in 1986. The relative economic advantages of obtaining uranium from reprocessing rather than direct mining had changed, and dry storage of spent fuel had emerged as a practicable possibility ... The reprocessing route did not appear to offer any immediate and significant advantages, from a waste management point of view."

Additionally, the government's foremost adviser on radioactive waste management has publicly stated that Thorp would not be built today. Professor John Knill, Chairman of the Radioactive Waste Management Advisory Committee, has been quoted saying there would be "no justification" for Thorp if BNFL applied for permission to construct it today.

Consequently, the government's argument that Thorp has already been justified by the Windscale Inquiry does not stand up. It is entirely correct for the justification for Thorp to be challenged 15 years after BNFL was granted planning permission.

Quite clearly, the government's decision-making process to date has not complied with these principles. The issues of justification and risk have been separated and the intrinsic link between the two ignored.

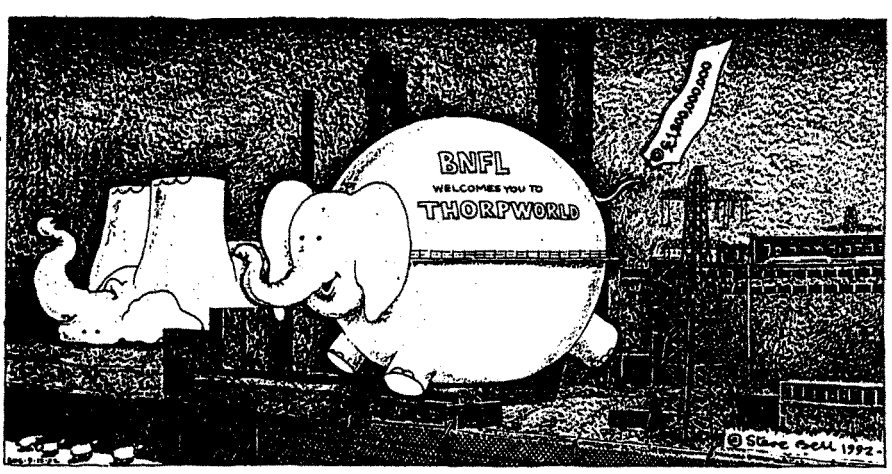
Thus, HMIP's conclusion that its draft authorisation would "effectively protect human health, the safety of the food chain and the environment generally" is wrong and solely based upon its assessment that the draft authorisations would ensure that members of the public were not exposed above currently applicable radiation dose limits.

This conclusion is based upon a flawed interpretation of government policy and the recommendations of the ICRP. Furthermore, the government's separate considerations of safety and justification have both been inadequate. Its consultation on safety did not allow the detriment resulting from Sellafield discharges, and from Thorp in particular, to be assessed. HMIP's conclusion explicitly ignores the opinion of the government's main advisers in this area. The Committee on the Medical Aspects of Radiation in the Environment said that no attempt has been made to calculate the total health detriment of the Sellafield site discharges, or from Thorp in particular.

Equally, the offered justifications for Thorp are inadequate and the government has not considered whether its alleged benefits can be achieved differently while producing less detriment. Instead, the government has relied entirely on a self-serving analysis by BNFL of the economic performance of Thorp. Scant details of this assessment have been made public.

Even if justification and risk had been consider as part of a single exercise, the government would not be able to substantiate a claim to have justified reprocessing in general, or Thorp in particular. ❑

A fully referenced version of this article is available from Scram, £1 inc. p&p.



Steve Bell — reproduced with permission

The Technical University of Munich (TUM) is planning to erect a new nuclear research reactor in Garching near Munich. There is strong opposition to this environmentally risky project, reports TUM physicist HANS-MARTIN ADORF.*

NewMunich research reactor?

SINCE the mid-'80s, and largely unnoticed by the general public, the Technical University of Munich has been planning a new nuclear research reactor. According to the project managers, the planned "Forschungsreaktor München II" (FRM-II) will replace the so-called "Atom-Ei" (atomic egg) nuclear reactor at the research park in Garching.

The Atom-Ei is north of Munich on the river Isar, FRM-II is to be built about 100m to the east — into a totally changed environment. The research facilities of the Technical University and the Ludwig-Maximilians-University of Munich, which have settled during the past 20 years in the immediate vicinity of the old reactor, have largely outgrown the small research reactor and its 50-odd employees.

Within a radius of a few hundred metres around the proposed site, about 6,000 researchers and associated staff pursue mainly non-nuclear work. They will be joined by another 4,000 or so research staff if the Technical University succeeds in moving its Electrical Engineering faculty from Munich to Garching.

The development of Garching itself has not stood still. Since the years when Werner Heisenberg started his "Institut für Plasmaphysik" (IPP) GmbH, the once tiny village has grown into a town of about 13,000 inhabitants. A 2km radius around the proposed reactor site encircles its latest residential development, including a kindergarten.

A 10 km radius includes the northern parts of Munich, far more than 100.000 people live or work in this area, with the well-known central Marienplatz being only 16 km away from the present and proposed reactor sites.

FRM-II is intended for the production of neutrons for fundamental physics research, medical purposes and commercial production processes. While the old reactor has a rating of 4MW (thermal), FRM-II will produce 20MW of heat with a fifty-fold increase in neutron flux output.

This much improved ratio of usable neutron flux to waste energy will be achieved by combining an ultra-compact core design fuelled by highly enriched uranium (HEU), a weapons grade material. The novel silicite material, in which uranium atoms are embedded in a crystal structure at a much higher density than that of metallic uranium, was originally proposed to allow research reactors traditionally using HEU, to be converted to medium or even low enriched uranium (LEU).

The reactor core will contain about 8kg of HEU and about five fuel-cycles are planned per year leaving about 40kg of highly contaminated and still highly enriched (80 %) weapons-grade uranium waste, reprocessable only in a military plant.

The project has been planned so far by Interatom and Kraftwerks-Union (KWU), two subsidiaries of the Siemens combine, with a strong foothold in Bavaria in general and Munich in particular. No call for tenders is foreseen, leaving Siemens as the company to eventually build the FRM-II.

Proliferation

The proposal to burn weapons-grade HEU (90 %) in a research reactor has raised some serious concerns. Driven by non-proliferation considerations, the policy to forego using HEU for non-military purposes was initiated in 1978 by the US Carter administration and was subsequently successfully supported by the International Atomic Energy Agency (IAEA). In recent years all European research reactors have, wherever possible, have switched to LEU.

The FRM-II project managers try to sell the idea of using HEU with the argument that burning HEU-fuel produces less plutonium. While this is true by the laws of physics, the argument can (and should indeed) be inverted: one cannot use HEU because of the proliferation concerns; and one cannot use LEU either, because of the inevitable plutonium production.

The proposed usage of HEU instead of LEU is especially disconcerting, since from the laws of physics there is no compelling reason to use it, other than to minimise heat production, construction size — and cost. The projected cost for the FRM-II, which has already risen from a mere 350 million DM at end of 1990 to a 530 million DM earlier this year (still not believed to be the final price tag), has been a major argument used by the project managers to fend off a competitor design known as spallation neutron source, and estimated to cost more than 1,000 million DM.

Fuel supply

Another point being argued is fuel supply. The US has reduced its HEU exports from 750kg per year to zero, leading to concerns that the new reactor will be left without fuel. During a public hearing in the Bavarian Landtag (state parliament) in April this year, the FRM-II project leader Professor Böning argued that he could earmark 400kg HEU in Germany, sufficient for 10 years of FRM-II operations.

This statement came much to the surprise of even those long engaged in the German anti-nuclear movement. Given that Germany is not a nuclear military power, given that its research reactors no longer use HEU (apart from potentially burning their stockpile), the question is: why is it hoarding 400kg HEU?

Waste disposal

Reprocessing of burnt HEU-fuel is possible only in military reprocessing plants. The current FRM reactor used to feed the Hanford military plant in the US, but the US no longer take in any used fuel. The project managers argue that both France and the UK would welcome the spent fuel.

In order to get approval by German authorities, the managers of any nuclear facility must prove that they can safely dispose their radioactive waste. Apparently driven by concerns of not being able to always get rid of their burnt fuel cores, the project managers plan large intermediate stores for 50 radiating cores — sufficient for 10 years of operation.

While the managers argue that they are going to build a "mini-reactor" in comparison with a standard nuclear power plant — they like to compare their 8kg of HEU in the active core with the 10 tons or so of LEU in a power plant — potentially hoarding up to 400kg of highly radioactive waste makes the

FRM-II comparable in implied risks to a large nuclear plant.

There are a variety of other criticisms and objections that have been raised against the project, some *only* of local relevance, but some of relevance on a larger scale. Here is a selection:

1. There are no railway tracks leading to the proposed reactor site, leaving lorries as the only means of transportation for fresh and used nuclear fuel.

2. There is a planned steady release of gaseous radioactivity including tritium and noble gases into the surrounding air. There are also some concerns about synergetic effects, eg with cadmium found on the surrounding fields — a remnant of earlier thoughtless sewage sludge disposal. In addition to gaseous releases there will be regular liquid releases of radioactivity into the Isar.

3. According to present plans the FRM-II will be insufficiently protected against aeroplane crashes.[1] Fast-flying military aircraft and large commercial aeroplanes are likely to penetrate the 1m concrete containment. The site lies in the flight control zone (FCZ) of the recently opened airport Munich II. And there is a rule established by the German "Reaktorsicherheitskommission" (RSK — nuclear safety regulatory commission) that a nuclear reactor should be protected against Phantom-class military aircraft as well as commercial aeroplanes and should not lie within an airport's FCZ.

4. The FRM-II will suffer a core melt-down should the cooling pumps fail. The project managers simply account for the risk, which they never numerically specified, in the so-called "Restrisiko" (remaining small risk).

5. In addition, their is another risk specific to this new research reactor, namely a so-called "cold (neutron) source", a container holding liquid hydrogen less than 20cm from the core. If the cooling of that container fails, the hydrogen will rapidly expand and very likely damage the mechanics of the reactor core. There is the added risk of the reactor containment being blown up.

6. There is a less dangerous alternative to producing neutrons with a fission reactor: the so called "spallation source". Two European projects are in preparation, Bavaria being invited to participate in at least one of them.

7. The enormous cost is straining the weak German financial resources. The Eastern build-up, shortage of flats and an immense state debt (about 21,000 DM per capita, or 42% of the gross national product) make the project appear ill-placed not only geographically but in time.

8. There is no insurance against working disability caused by ionising radiation in case of a major nuclear accident. Contracts offered by private insurance companies explicitly exclude such risks. No alternative state-provided insurance has been offered thus far. Similarly, there is virtually no insurance cover for private property.

9. A not-so-serious nuclear accident leaving most people's health unaffected would nevertheless render private property in the whole area virtually unsaleable. (This has happened elsewhere in Germany.) The price of potentially affected property has been estimated to easily exceed 1,000 million DM, dwarfing the 50 million DM covered by the present insurance contract.

10. Emergency measures, including evacuating major portions of the population from the surrounding villages, are bound to fail, since on normal days traffic is already congested.

11. Last, but not least, the project managers have failed to forward a scientifically compelling reason why the reactor, only a medium-level neutron-flux source by world-standards, should be built at all.

Current state of affairs

The whole issue of the planned nuclear research reactor was brought to the attention of the Garching public by an initiative launched at the end of 1990 by the local Green Party.

Almost forgotten are the days when reactor critics had to overcome massive opposition by both the Garching and the Munich leaders of the Bund Naturschutz (BN), who in a strange coalition tried to protect the FRM-II project. Both leaders are gone now and the present ones are very supportive of a critical assessment. The grassroots position has been supported by the vote of a specially formed BN-commission.

During the BN internal struggle for an ecologically sound position on the project, a citizen's initiative "Bürger gegen Atomreaktor Garching" (BGAG) formed which has since become a focal point for the opposition.

In January 1993 the Bavarian government ordered the minister for cultural affairs to get the project officially under way. Early in February the Technical University launched the "Antrag auf Raumordnung" (application for planning assessment), one of the two procedural steps a nuclear reactor project has to pass to be licensed. (The "Raumordnungsverfahren" generally assesses the suitability of the location of a major facility.) The project description was publicly displayed in Munich, Garching and some villages within 10km of the site.

The supporting documents supplied by the FRM-II managers were very thin (about 60 pages), superficial and contained many errors, indicating once again that the project staff is overstretched by simultaneously operating the existing reactor and preparing the construction of a new one. But the assessment, completed in October, found in favour of the development.

Simultaneously with the "Raumordnungsverfahren" the "atomrechtliche Genehmigungsverfahren" (nuclear approval procedure) was launched. An important part in the procedure is the risk assessment report (euphemistically called "safety report"). This report, although completed months ago, was returned by the ministry in charge of the project because of serious deficiencies, and only made available to the general public at the end of October.

Since the launch of the two legal procedures the Bavarian CSU government has changed: the new Prime Minister Dr Stoiber, a law-and-order conservative, has put the construction of the FRM-II at the top of his agenda. He has since initiated a partial privatisation of the largely state-owned Bayernwerke (a major Bavarian electricity company) in order to raise some money for the project.

A recent "Bürgerversammlung" (citizen's gathering) in Garching, forced to take place by the BGAG collecting a sufficient number of signatures, was generally rated as a success for the local anti-nuclear movement. All eight motions passed, some with overwhelming majorities, one without opposition — in the presence of project staff, some of whom were entitled to vote.

An anti-Siemens campaign is forming right now with the aim of persuading enough potential buyers of Siemens goods to boycott the company until it withdraws from nuclear commerce. About 2% of Siemens revenues come from nuclear industry deals, mainly by maintaining the 20-odd German nuclear power plants. ❑

***Hans-Martin Adorf is a physicist and works on the premises of the research park at Garching. A member of the German Green party and the Bavarian Bund Naturschutz, he has been active for over two years as an opponent of the FRM-II project.**

Coal sell-out

BRITISH COAL (BC), having been ravaged by government energy policy, is now to be privatised. Announcement of the BC sell-off in five regional divisions — Scotland, Wales, North East, and two Central regions comprising Yorkshire and Nottinghamshire — was made in September by energy minister Tim Eggar.

It is expected that the sell-off will raise £500m at most, while the taxpayer will be left to meet around £3bn of liabilities.

With 19 of the 31 pits "reprieved" in March by the President of the Board of Trade Michael Heseltine ("Little help for coal", *Safe Energy 94*) already shut, Neil Clarke, BC's chairman, has admitted that there is little hope for the remaining 12 threatened pits, and that some of the 19 "core" pits may also close.

It is widely expected that, with nothing having been done to improve the market for coal, there will only be around 12 to 15 BC pits left open come privatisation in mid-'94.

Heseltine's white paper "The prospects for coal" was never anything more than a political manoeuvre to quell a backbench revolt and dampen public opposition to the October 1992 announcement by BC that 31 pits would close with the loss of 30,000 jobs. The dash to gas has continued apace with government approval for new gas-fired power stations at Didcot (1,500MW), Seabank (1,200MW) and Keadby (710MW). And HM Inspectorate of Pollution has given PowerGen permission to burn the dirty fossil fuel Orimulsion at its Ince and Richborough plants.

The attempt to lease closed BC pits to private operators has been a flop. Just seven of the 19 pits put out to tender have received mining bids.

Meanwhile, it has emerged in Parliament that the cost of coal from most of the pits threatened with closure is competitive with imported coal, improving its cost advantage for electricity generation over gas and nuclear. A debate in the Commons on the future of coal, 27 October, highlighted the failure of the government to create a market for coal or create a level playing field. Five Conservative MPs voted with the opposition but the government won the vote by 317 votes to 283 thanks to the support of Ulster Unionists.

■ An industry-led group has been set up by the government to find commercial applications for the British Coal developed Topping Cycle clean coal technology. The group will have at its disposal most of the £12m allocated for coal research over the next three years in Heseltine's coal white paper. ❑

Rio ripples

MANCHESTER played host in September to a low-key follow-up conference to last year's Rio Earth Summit. "Partnership for Change" was a surprise proposal made by John Major to environmental groups at Rio.

The 330 delegates from 86 countries attending the get-together of non-governmental organisations (NGOs) included environmentalists, city planners, industrialists, bankers, employees, officials and politicians. Discussions centred around eight case studies ranging from Greenpeace's collaboration with an east German refrigeration manufacturer to produce CFC-free fridges to Filipino waste disposal schemes.

While there were worthwhile discussions on individual projects, the conference failed to address the broader issues.

The UK government's £1.25m financing of the event did little to disguise its own failure to follow up commitments made in Rio. Of four reports due to be published by the end of the year, outlining plans for preserving forests and for protecting of rare animals and plants should not be too arduous. However, stabilisation of CO_2 emissions and sustainable development are causing the Department of the Environment (DoE) considerable difficulty.

The DoE and the Department of Transport are in bitter opposition over road building, with increased vehicle emissions threatening to undermine the DoE's flimsy package of policies to tackle CO_2 emissions ("Transport troubles", *Safe Energy 96*). Relations with the Treasury and the Department of Trade and Industry are also strained with the DoE's position being undermined ("Carbon tax progress", below). ❑

Carbon tax progress

SOME progress has been made on plans for a European Community (EC) carbon energy tax, but the UK government continues to oppose the proposal.

A report on the tax by UK Conservative MEP Thomas Spencer was adopted overwhelmingly by the European Parliament's committee on the environment, public health and consumer protection. The report's proposals, which supports the European Commission's provisions for an even split between taxes on CO_2 emissions and energy, will benefit natural gas and renewables over coal and oil. An amendment adopted by the environment committee will impose an additional charge on nuclear-generated electricity.

Other amendments were introduced to strengthen energy saving and CO_2 reduction efforts in central Europe and to ensure a fairer distribution of the tax burden among Member States.

The Spencer report will go before the European Parliament's plenary session in November for a final vote.

The EC's four 'peripheral states' — Spain, Portugal, Greece and Ireland — have been lobbying for special treatment in introducing the tax, having already been allowed less rigorous CO_2 targets.

A meeting of national environment ministers, in Luxembourg, October 4, proposed a plan for progressive introduction of the tax in those countries whose per capita CO_2 emissions and GNP fell below the EC average in 1990.

■ Despite the progress on the detail of the carbon energy tax, the UK government remains resolutely opposed to the plan, and has upped the ante by stating that it will prevent joint EC ratification of the Rio Climate Change Convention unless the carbon energy tax is dropped.

However, most EC countries believe that it is only through measures like the carbon energy tax that the EC will be able to meet the Rio commitments. ❑

Energy saving

A new scheme to support residential combined heat and power (CHP) systems has been launched by the Energy Saving Trust (EST). The government quango has made £1m available to local authorities and housing associations for around 20 pilot projects.

Administration of the scheme will be carried out for the Trust by the Combined Heat and Power Association, and the first projects are expected to be operational by the end of 1993.

As part of its strategy to meet the international commitment to stabilisation of CO_2 emissions at 1990 levels by the end of the century, the government recently put its faith in the EST to produce one quarter of the savings in projected growth and increased the target for CHP use by the year 2000 from 4,000MW to 5,000MW ("Transport troubles", *Safe Energy 96*).

■ A network of energy advice centres is to be set up to promote energy efficiency in homes and small businesses. The scheme will be monitored for the EST by the National Energy Foundation, Milton Keynes.

■ The government has announced that it is to abolish the client contribution required under the Home Energy Efficiency Scheme (HEES), which provides low-income households with grants towards draughtproofing and insulation. In welcoming the announcement, Andrea Cook, Director of Neighbourhood Energy Action, said that: "By abolishing the client contribution, the government is removing a barrier which has prevented HEES from reaching those households in most urgent need of assistance." ❑

EC boost for wave

THE world's first wave power device in the open sea is to be stationed off Dounreay next year. It is one of three wave devices which will benefit from a European Community (EC) decision to allocate 2.6m ecus (about £2m) to its pilot wave energy programme, *writes David Ross.*

As forecast in *Safe Energy 96* ("Wave prospects improve"), the three projects chosen for EC funding are the ART Osprey, the Islay shoreline gully and a device on the island of Pico in the Azores.

The Osprey is the big breakthrough — it will stand in the open sea about 1km north of Dounreay, in 18m of water. Designed by Professor Alan Wells, inventor of the Wells turbine, and Applied Research and Technology of Inverness, it has support from industry (something the EC insists on). Its backers are believed to include Scottish Hydro-Electric, British Steel, GEC and AEA Technology.

The EC has rejected the practice, much admired by the British energy establishment, of 'costing' projects on the basis of estimates for the future price of electricity derived from assumptions about one unconstructed prototype. But in the case of the Osprey the government should have moved in: at £1.9m, the 2MW device breaks through its £1 a watt barrier.

The Osprey has benefited from two cost cutting ideas: it will be built of steel rather than concrete which is more usual for oscillating water columns; and it will sit on the ocean floor, held down by 'gravity anchoring'.

EC funding will also go to a second shoreline gully wave station on Islay, Inner Hebrides, five times the size of the present one — which has successfully survived its first two winters, an achievement for an experimental prototype. The new plant will have a man-made, 'designer' gully instead of the less efficient natural inlet with jagged walls currently used. It will also have 'harbour walls' reaching out into the sea to increase the wave capture. "In terms of production," says its designer, Professor Trevor Whittaker of Queen's University, Belfast, "it will be the equivalent of the modern wind turbine, and we can go bigger in the future."

A problem for the Islay project is that the EC funding of around £0.4m is dependent on equal funding from other sources. Its main backer, the Department of Trade and Industry, refuses to make any decision on future funding until after the 30 November Budget.

A third plant, rated at 500kW, will be built by the Portuguese on the island of Pico in the Azores. The three projects will absorb about 1.5m ecus (£1.2m) with the rest of the money going to research involving Professor Stephen Salter, Coventry University, the National Engineering Laboratory at East Kilbride, the Greek University of Petra and the Danes who have a design using a float which drives a pump on the seabed.

All the allocations are only about 20% of what the teams asked for and there remains considerable discussion to ensure that there is enough money to meet the EC's expectations, but for the first time since Nigel Lawson shut down the UK wave energy programme in 1982 — to make way for Thatcher's plan to build 10 pressurised water nuclear reactors — there is well-founded hope. ❑

World energy reports

RENEWABLE energy and energy efficiency have been given greater prominence by the World Energy Council (WEC) in two new reports assessing future world energy use.*

The Council, a non-governmental organisation with members from 100 countries, has taken its first systematic look at the potential role of renewables in meeting energy demand. Predicting that 'business-as-usual' would lead to a doubling of energy use by 2020 (and the exhaustion of all fossil fuels resources by 2100), the Council considers that the increase could be restricted to 28% through strong energy efficiency measures.

The prospects for 'new' renewables (excluding large-scale hydro and fuelwood) has been assessed over the past four years by a specially formed committee. It has concluded that use of new renewables could triple by 2020 increasing its share of total energy use from 2% to 4%. And changes in energy prices, special aid from governments and international initiatives could see this figure improved to 12% rising to 50% by the end of next century in what the committee calls the "ecologically driven case".

In a campaigning tone uncharacteristic of WEC reports, the Committee is critical of the Council for having previously given renewables "secondary status as minor contributors to the overall energy picture."

In assessing other energy sources, the Council believes that coal and nuclear power have the strongest long-term prospects provided their associated environmental problems can be resolved; present international agreements on pollution reduction timetables are considered unrealistically tight.

Known reserves of oil and natural gas are put at 40 and 65 years respectively; coal reserves are put at 250 years, or 100 years if it is used to replace oil and gas. ❑

*** "Renewable energy resources: opportunities and constraints 1990-2020" £25, and "Energy for tomorrow's world" £35, World Energy Council, 1993. Details on 071-930 3966**

Teesside energy park

AN innovative energy park with facilities for industry, business, research and development, and leisure is to be built in Teesside. The £100m scheme, backed by Teesside Development Corporation (TDC), is aimed at the energy industry of the 21st century. It will include state-of-the-art, environmentally sensitive building materials and solar powered transport.

TDC chief executive Duncan Hall believes the development "holds out the exciting prospect of Teesside becoming a world renowned centre for research and development in the energy sector, [including] the development of new forms of transport, new fuel sources and improved energy efficient materials and products."

The park will be sited between University College, Stockton and the Tees Barrage, Middlesbrough, and plans have been mooted for a hydro-electric scheme, a heat recovery system using a local lake and a wind farm on nearby land.

There will be a sophisticated communication network linking the R&D facilities to more than 30 universities and educational institutes in the US, Japan and Europe.

Work on the first phase of the project, consisting of nine pavilions, is due to begin later this year. It is expected that the first of the R&D facilities will be taken up by the UK electricity industry, whilst negotiations with European, American and Japanese companies are in progress. ❑

Wind round-up

PLANS for up to 250 wind turbines at a site in Kielder Forest, Northumberland have been passed in principle by Tynedale District Council, though the final decision rests with President of the Board of Trade, Michael Heseltine.

Environmentalists are split over what, at 80MW, would be Europe's largest wind farm. Neither English Heritage nor the Countryside Commission has raised any objections but the Council for the Protection of Rural England is opposed to the development. English Nature and the Royal Society for the Protection of Birds have both submitted 'holding objections' until further information on the impact on wildlife is available.

Guardian demons?

In response to the growing use of windpower, a nationwide network of opposition has been formed. Based in Warrington, the group, Country Guardians, has sent out thousands of letters to local newspapers outlining the 'horrors' of wind farms, and make representations at public inquiries. The mastermind behind the group is Joseph Lythgoe, a 71-year-old landowner who describes himself as a lifelong environmentalist. A recent recruit to the group, as vice president, is Sir Bernard Ingham. The former press secretary to Margaret Thatcher, who has used his column in the *Daily Express* to attack wind power and other renewables, is a paid adviser to British Nuclear Fuels.

Parys Mountain inquiry

A public inquiry was held recently into a proposal by Anglesey Mining Company for an 8 turbine, 4MW development on Parys Mountain, Anglesey. Opposition to the wind farm came from local residents, councillors, the Council for the Protection of Rural Wales and a representative of Country Guardians.

Much of the debate has centred on noise levels, in particular whether or not these would exceed 42 decibels at the nearest house to the site. The debate seemed bizarre as none of the objectors appeared to know what 42 decibels sounded like (roughly that of the hum from a refrigerator outside the house), and figures provided by Vestas, the Danish turbine manufacturers, claimed that noise would be nowhere near this level in any case.

As Parys Mountain is the highest spot on the north east of Anglesey, the problem of visual intrusion was also raised.

Grampian secret

Grampian Windpower, the developers planning a 3.5MW wind farm one and a half miles from the village of Whitecairns near Aberdeen, are showing how not to win support from local people by refusing to reveal their identities.

Although Gordon District Council's Director of Planning recommended approval of the scheme in August, the council deferred a decision until 9 November. The site is considered marginal, and other wind developers have expressed surprise at the proposal. Opposition from local residents (the nearest house is just 320m away) is being fuelled by the secretive approach of the north-east businessmen behind the scheme.

Orkney wind down

The 3MW Orkney wind turbine, once described as the flagship of the renewables, has been out of service since 21 December 1992 following discovery of a fatigue crack in its rotor.

Repair of the machine, by bolting several splice plates across the crack, would be straightforward, taking just a few weeks and cost around £30,000. As the turbine is capable of generating 5-6GWh/y, earning over £100,000 (at the low rate of 2p per unit paid by Scottish Hydro-Electric), with an annual maintenance cost of £20,000, the one-off repair cost is more than justified.

However, the Department of Trade and Industry, which is responsible for its operation, has not yet taken action to carry out the repair and return the machine to service, causing concern for the turbine's future.

Body Shop

Body Shop, the toiletries and cosmetics group which aims to generate the equivalent of its UK electricity needs through wind power, has placed contracts for a 22 turbine, 10MW wind farm at Bryn Titli, mid-Wales.

The estimated £11m cost of the project is being provided by National Power whose subsidiary National Wind Power, along with construction group Taylor Woodrow, will be responsible for building the wind farm. ❑

Geothermal plan

A honeycomb of disused coal mine shafts in Lanarkshire may bring economic revival to the area. Eight hundred million gallons of water in the tunnels could become an inexhaustible source of heating for buildings above.

A computer study commissioned by Lanarkshire Development Agency has estimated that 20 million kWh of energy a year could be extracted. Water at a temperature of 14°C, would be drawn up 150-200m, passed through a heat exchanger and piped back to the mine shafts.

The study estimates that this heat source could reduce energy costs by up to 30% and it is hoped that this will attract high energy using companies in fields like biotechnology and micro-electronics to the area.

Six months of trials will now be required to prove the computer study's findings. ❑

Tyre power first

EUROPE'S first power station fuelled by waste tyres, a 25MW plant in Wolverhampton, is to be officially opened on 9 November following successful commissioning tests.

The £48m station will burn around a quarter of Britain's waste tyres — 8-10m a year — and output from the plant will be sold to Midlands Electricity under the Non Fossil Fuel Obligation.

The power station's American owner, Elm Energy, is keen to point out the environmental benefits of the plant. Anne Evans, managing director, says that it will be one of the cleanest power stations in the UK, with emissions "between one hundred thousandth and one billionth of the allowable limits."

Potentially harmful by-products like zinc oxide, steel particles and calcium sulphate will be extracted and sold to industry.

Plans by Elm Energy for a similar plant in East Kilbride have met with strong local opposition ("Tyre power", *Safe Energy 95*). An environmental impact assessment carried out by Wimpey Environmental Ltd found that the 6MW plant would meet world pollution standards.

However, the MEP for the area, Ken Collins, who is chair of the European Parliament's environment committee, has called for the plant to be blocked, saying that the assessment presents certain inadequacies. His main concern is the lack of consideration of alternatives such as recycling. ❑

Gabcicovo dam problems

ENVIRONMENTAL damage resulting from the controversial Gabcicovo hydro-electric scheme in Slovakia is increasing as the water-table drops, *writes Bridget Gubbins.*

Rated by the International Rivers Network as one of the most environmentally destructive hydraulic engineering projects in the world, the damming of the Danube between Slovakia and Hungary is the greatest single hydro scheme in Europe.

Hungary, a partner in the project until 1989, is now locked in dispute with Slovakia. The disagreement was submitted to the International Court of Justice in the Hague in April 1993 for arbitration ("Dam shame", *Safe Energy 94*).

Just 20% of the former volume of the Danube flows along the original river bed causing surrounding groundwater levels to fall by up to ten metres, affecting crops, forests and drinking supplies.

At Vojka, Slovakia, villagers stranded on an island between the old Danube bed and the new 17km canal now have to take a ferry to mainland Slovakia. Vojka and other villages are between 10 and 18 metres below the level of the canal, and live with the knowledge of the huge bulk of water flowing above their heads.

Once a vast inland delta, what remains of this ecologically unique river wetland of channels, islands and forests is threatened by loss of water. In an attempt to control this, crude concrete barriers have been erected across the channels, known locally as 'arms', to allow backing up of water.

In the village of Dunakiliti, Hungary, forester Imre Maj manages 1,000 hectares of water woodland. His trees are dying: "This year the poplars are dying ... They are the first trees to go because they have short, spreading roots. Two or three more years of this and the whole area will be dead. Water levels in the Danube arms has dropped by 3 to 4 metres since last October." He also reports that five-metre wells have had to be dug down to 15 metres. An active campaigner for restoration of the water, Maj declares: "The way of life of fifty thousand people who live next to the river depends on this happening."

The potential energy benefits from this massive project are minimal. The yearly average output from the Gabcicovo turbines will be 340MW, which is 6-7% of Slovakian electricity consumption. And most of this is available in the summer — with the ice-melt in the Alps — when it is least needed.

Slovakia, like most east European countries, has a high over-consumption of electricity, and a technical savings potential of 40-50%. Energy campaigners lament the money spent on this project which should have been invested in energy efficiency. ❑

Three Gorges problems

WORK on the Three Gorges hydro-scheme on the Yangtzi, China, has officially progressed to the preparatory stage, despite considerable opposition to the damming of the river and flooding of the valleys.

Initially proposed in 1923 by Sun Yatsen, founder of the first Chinese republic, it is planned to create a 350 mile long reservoir and provide a generating capacity of 18,200MW by constructing the world's largest hydro-electric dam.

The project will displace 1.3 million people and endanger wildlife in an area of oustanding natural beauty. In an unusual show of dissent, more than a third of the National People's Congress voted against or abstained when the project was considered last year. But the overwhelming majority of Chinese believe the fight is over and that the dam, the country's largest engineering project since the Great Wall, will be built.

Proponents of the scheme argue that it will fuel China's industrial revolution and save millions of people from the threat of flooding. Critics warn that silting behind the dam may turn it into a useless $30bn bog.

Involvement of the US Bureau of Reclamation and the US Army Corps of Engineers in the project has led US environmentalists to take legal action. The two US agencies are being sued over claims that they are violating the Endangered Species Act by helping to design and build the dam, which threatens the existence of the giant panda, the Chinese tiger, the Siberian crane and the Chinese river dolphin. ❑

Dam emissions

THE environmental benefits of hydro-power in reducing emissions of greenhouse gases has been questioned in a recent Canadian government study.

It is claimed that emissions of CO_2 and methane from flooded forests, soils and peat bogs can make as great a contribution to global warming as coal-fired power stations.

The study, by the Freshwater Institute in Winnipeg, however, accepts that emission levels can vary greatly depending on the characteristics of the reservoir, the type of landscape flooded and the mode of power generation. Another recent report, for Lahmeyer International, has found that where land is cleared of vegetation before flooding, the carbon emissions resulting from biomass lost in constructing the facility would be offset in around three years of electricity generation. ❑

Hydro in brief

Concrete plans changed

In an attempt to overcome environmental opposition, plans for a large concrete dam in Tirol, Austria have been amended to a smaller scheme using an earthwork structure.

The proposals are from the Austrian Federal Railways (ÖBB) which argues that it needs the energy to power the trains which are necessary if freight is to be transferred off the roads.

Run of the river

Approval by the Valais cantonal parliament, Switzerland, for the first of ten run of the river hydropower stations on the Rhône was given by 98 votes to 16 with 8 abstentions.

The decade-old project has been delayed in the past by opposition from farmers, anglers and ecologists, but the first barrage could now be open as early as spring 1995.

■ Voters in the Berne canton gave their support to hydropower in a referendum in September. The regional electricity company will now be able to upgrade several hydro schemes.

French low-head

France is giving a boost to low-head hydro and emphasising those projects which have the least environmental impact, as part of a programme for more renewable energy projects.

Greenland

Greenland's first large hydropower station, supplying its capital Nuuk, will replace the town's oil-fired generating plant and cut oil consumption in Greenland by one third. ❑

REVIEWS

Thorp: the Whitehall nightmare;
by Crispin Aubrey.

John Carpenter Publishing; 1993, 83pp; £5.99.

Thorp "is not just about opposing visions ... There are wider issues involved. The development raises fundamental questions which extend far beyond the boundaries of Sellafield. There are questions about the handling of the aftermath of nuclear power, the best way to dispose of nuclear waste, the uses and risks of plutonium, the health effects of radiation and the dangers of an international trade in radioactive waste" argues the introduction to this slim volume.

Aubrey, an environmental journalist who contributes regularly to the *Guardian's* environment page, has set out to whittle down the complex political and scientific arguments surrounding the fate of British Nuclear Fuels' (BNFL) massive Thermal Oxide Reprocessing Plant (Thorp). In the wake of the government's second consultation into the plant, he hopes the book "presents the arguments in a readable form that will be useful to those who have not yet made up their minds, or who want a handy guide to the major issues." He has achieved his objective, and presents a sorry saga of government intransigence, institutional inertia and international confusion.

The world has moved on since the early seventies when Thorp was first mooted but the nuclear industry has not. The argument that the plant would produce useful by-products, specifically uranium for re-use in existing reactors and plutonium either for use in fast reactors or as a mixed oxide fuel is no longer valid, if ever it was. The spot price for uranium is at an all-time low, and no country has been able to make fast reactors work. Indeed, only Japan still has a fast reactor programme, and that is proving far from successful. The argument that uranium reprocessing will reduce waste generated by spoil heaps at uranium mines is less of an argument for reprocessing as one for cleaning up the mines, argues Aubrey.

Growing concern about vast stockpiles of weapons-grade plutonium are in themselves a powerful argument against reprocessing

Any suggestion that reprocessing represents the best environmental approach to managing the nuclear waste legacy has in reality already been lost, as many countries are turning to on-site storage of spent fuel with the intention of despatching it directly to a final (mythical) repository after a period of around 100 years — those countries include Scotland, the US, Canada, Sweden and Germany.

The claim by both the industry and the government, that the plant will make money for the UK plc, is highly contentious and shrouded in secrecy. Sellafield is notorious for cost over-runs and this could cost the taxpayer dearly as BNFL do not have the funds to underwrite their own liabilities.

It is difficult to believe that anyone reading this book would come to the conclusion that the Thorp plant should be allowed to open. Embarking on a massive plutonium producing programme at a time when the world faces an ever-growing risk of terrorist groups obtaining weapons grade material is a scenario that even an infinite number of monkeys with typewriters would be hard pushed to come up with in an infinite amount of time.

On a perhaps more churlish note I can't help feeling somewhat irritated by *Safe Energy's* exclusion from Aubrey's list of contacts for further information.

MIKE TOWNSLEY

REVIEWS

The UK 'coal crisis' origins and resolution; by Mike Parker

The Royal Institute of International Affairs; 1993, 47pp, £7.50.

As chief economist with British Coal until 1991, the author of this paper is able to explain the events that led to the pit closure announcement on 13 October 1992, and what followed. The basic premise of the report is that the decline of coal is the inevitable result of government policy.

In seeking confirmation of the political motivation behind the run-down of the industry, Parker turns to the memoirs of two former Secretaries of State for Energy: Nigel Lawson and Cecil Parkinson.

Lawson wrote that: "The PWR was seen as vital to demonstrate to the NUM that coal was not fundamental to the economy any longer", and Parkinson stated that "privatisation of coal ... would mark the end of the political power of the NUM."

Parker produces a number of useful tables to chart the decline of coal, past and future, showing trends in price, output and demand.

Michael Heseltine's white paper on coal, which quelled the backbench revolt and public disquiet, is summed up as "a triumph of presentation over substance."

Parker's conclusion is that the 'coal crisis' of 1992/3 was "the beginning of the last chapter in the story of a once great industry."

This is a helpful reference on the coal industry in the run-up to privatisation, though it contains nothing startling or particularly incisive.

The writing is rather dry, and would have benefited from a lighter and more barbed approach; the events of the last year have, after all, been a farce within the black comedy of the coal industry's sad decline.

GRAHAM STEIN

An introduction to sustainable energy: an educational guide; by Peter Daley & John Glover

Network for Alternative Technology and Technology Assessment; 1993, 24pp, £2.

With the supply of energy information to schools being dominated by the nuclear industry, and with the rise in opposition to renewable energy which has come with its limited progress, this is a welcome publication from NATTA.

It covers all the renewables, usually in detail — though it is surprisingly sparse on hydro power and understates the untapped resource in Scotland.

Not surprisingly, the guide does not match nuclear industry information for glossy presentation, but it is very evenhanded in its approach, presenting the problems as well as the benefits of each renewable.

There is also a list of useful contacts at the end of the guide, though I was surprised that it did not include SCRAM or *Safe Energy*.

GRAHAM STEIN

OBITUARY

Andrew Holmes

Andrew Holmes, as editor of the Financial Times newsletter *Power in Europe*, was one of the shrewdest observers of and incisive commentators on the energy industry. His untimely death, a fortnight before his 37th birthday, after a long struggle with brain cancer, has saddened everyone at SCRAM.

The following tribute to him appeared in *Power in Europe*, of which he was founding editor.

Born in Greenock, Scotland, Andy was educated at the universities of Stirling and London, taking a first in English, something that will come as little surprise to those who recognised in his much-loved prose an occasional suggestion of the English-language greats.

Andy joined the Department of Energy as a press officer on leaving college, where he developed an insider's knowledge of the electricity industry, one which he brought to bear with such devastating effect when he joined Financial Times Newsletters in 1982, first as editor of *European Energy Report*, and latterly as editor of *Power in Europe*.

Although Andy's career in journalism was short, his insight, intelligence and accuracy rapidly made their mark in the electricity world. His articles, notably on the UK privatisation process were felt to be so influential that he was awarded energy journalist of the year in 1989 by the British Institute of Energy Economics. The citation noted that he had "raised the level of public debate on the whole subject".

Andy was early in recognising that nuclear would be removed from the privatisation process and was almost clairvoyant in his realisation of what the newly-privatised UK electricity market would mean for coal.

A strident critic of the manner of that privatisation, which he felt — rightly — would lead to the devastation of the coal industry, he described the UK's energy policies earlier this year as akin to *Alias Smith & Jones'* dubious card game, Montana Red Dog, where the rules change as the game progresses and the bandits always win. He felt the coal crisis, however, with its political overtones, was maybe more complex.

He was diagnosed as having a brain tumour shortly before his award in 1989. This failed to deter him for long, though, and he was soon back at work, continuing, with customary flair, until his illness resurfaced last February. Even after the stroke which robbed him of speech and mobility, he was determined to recover, succeeding so well at first that he was rumoured to have been the first person almost expelled from a hospice for the dying.

This writer worked directly with him for only a few months, but his intelligence, dry Scottish wit and generosity with time and knowledge are sorely missed. His early death has taken a wicked vein of humour from his colleagues; a source of insight from the electricity supply industry, and a much-loved friend from those who knew him best.

To quote Dr Kim Howells MP in a letter published in the *Financial Times* "His death ... at the age of 36 is a cruel blow not only to his wife Claire and to his children, Lottie and Jack, but to all who counted him as a friend, and adviser and, quite simply, as one hell of a good bloke."

Andrew Holmes, 29 September 1956 - 11 September 1993.

LITTLE BLACK RABBIT

The man for the job

Once upon a time there was a Tory backbencher who earned some extra cash as a paid adviser to merchant bank Hill Samuel. In the run-up to electricity privatisation the MP tipped the SSEB for a swift and successful privatisation, because it had such a lot of nuclear power and would be particularly attractive to the market.

But things didn't work out as he had predicted; nuclear power could not be sold, and the SSEB, stripped of its nuclear plant and renamed Scottish Power, was last in the queue for privatisation.

Some years later, our MP's obvious understanding of the energy industry made him the perfect candidate for the job of Minister for Energy, and so Tim Eggar, for it was he, took responsibility for the nation's coal industry. 30,000 miners did not live happily ever after.

Award winning

SWEB, the south-west of England's electricity company, has picked up a brace of awards for service to its customers.

From the Department of National Heritage came a Consumer Charter award for "exemplary service" And from the Consumers Association *Which?* magazine, for competence of service, the wooden spoon — worst of the 12 regional electricity companies (recs). LBR wonders which trophy will have pride of place in the SWEB boardroom.

Taxing question

Does a tax on energy damage a nation's economy? The American Petroleum Institute says yes, the European Commission says no.

The API has a publication to prove its case, so does the EC.

The API's was produced by a prestigious firm of consultants — DRI McGraw-Hill. So was the EC's.

Independent?

On the subject of independent consultants, a recent report "BNFL: an independent research report" by Nigel Hawkins was published by BNFL. The future is, apparently, already glorious, but "once the Thorp plant comes into commercial operation BNFL income will soar." The arguments for Thorp are "compelling".

Hawkins, formerly employed at the Conservative Research Department and an unsuccessful Tory candidate at the 1987 general election, compiled his 'independent' report "on the basis of published information by BNFL and an analysis of its accounts."

An interesting disclaimer in the report states: "Although this publication has been commissioned by Dewe Rogerson, on behalf of its client BNFL, it has been independently written and the views expressed by the author are entirely personal."

WakeAEA wakeAEA

According to a promotional letter: "Recent interviews with a range of senior managers in industry showed that, surprisingly, many did not know about the UK's leading business dedicated to solving problems in the fields of safety, environmental protection and plant performance."

Have these senior managers not heard of the highly successful Fast Breeder Reactor at Dounreay (to close next year), or the imaginative solution to radioactive waste disposal (dump it in a hole in the ground with some sodium and potassium and stand well back)? Because the UK's leading business in safety, environmental protection and plant performance is AEA Technology, allegedly.

And it has a catchy new slogan: "EurekAEA" (pronounced You reek AEA).

All at sea

As part of AEA's diversification into other fields, it has been involved in wave energy monitoring work off Dounreay for the proposed ART Osprey device.

However, the power of the sea was obviously stronger than our leading problem solver had expected. Its monitor was wrenched from its moorings and swept off by the waves.

Luckily it carried a tracker beacon allowing its precise location to be pinpointed: er, somewhere in south-east England? A second grid reference was slightly closer, but still on dry land. Third time lucky, the monitor was recovered off the Wick coast.

Sponsorship news

With news that the nuclear industry worldwide is suffering from a shortage of graduates prepared to work for it, LBR has found a helpful booklet: "Careers in ecology and environmental management" — sponsored by BNFL.

Christmas gift ideas No. 1

What train set would be complete without the latest offering from Appleby Model Engineering, your very own BNFL Sellafield spent fuel wagon. Don't forget to buy some model emergency service vehicles as well.