THE SAFE ENERGY JOURNAL

December 1996 - February 1997

# Wind makes waves at sea

ISSUE 111

## Nuclear News



## Features



## Energy News

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# Planning energy generation

When Dounreay was on the cards for the 1950s government, criteria for its location were: within the bounds of operational practicalities, somewhere remote. Initial calculations assuming 1% leakage from the fast breeder reactor showed that the Dounreay site didn't meet specified health criteria. Easily solved though by assuming 0.1% leakage — the site was perfect. Planning approval was just as straightforward with a planning application hand delivered to the county council in the morning and taken away that afternoon with official approval.

One would hope that these days a little more consideration is given to the siting of such a major installation. Certainly, the modern town and country planning process is a much more drawn out affair, often justifiably so — consultation takes time. Planning for major installations and undertakings makes common sense, and no more so than in the field of energy generation.

Just now we are at a turning point in how our energy needs are met. It is no longer a case of we need the power, lets build another power station. Utilities are gradually losing the planning exemptions they previously enjoyed as statutory undertakers, while an original choice of coal, gas, nuclear and hydro has now widened to encompass half a dozen more proven renewable technologies and many more at the development stage. Energy provision to 57 million people requires infrastructure and co-ordination. The environmental consequences of extracting and burning fossil fuels and uranium are huge, and the aesthetics of certain alternatives are hotly contested. Surely a national programme for energy needs to be met with absolute minimum impact is called for.

**"Just now we are at a turning point in how our energy needs are met"**

So can anyone explain why energy generation is left to a grossly imperfect market, and clean renewable generation is forced to compete with a billion pound and 40 year handicap? And why planning applications for wind power are passed or failed on inconsistent whims and nimby objections?

Market forces are not up to the job of ensuring energy supply for everyone with the least possible degradation to the environment. This winter the government is considering bribing gas generators to burn more expensive fuel — last year independent generators had their gas supply cut off when cheap gas ran out at peak demand, risking grid collapse. Former president of the board of trade, Michael Heseltine, having shut down deep mines across the country, prefers to sanction the eminently uglier open cast versions.

Meanwhile, council planning departments try to consider applications for renewable technologies with regard to the wider picture on national energy need and global climate change. But this is increasingly difficult with the diminishing physical areas councils now plan for, and nigh on impossible when nimby objections take the matter out of their hands and into the realms of a public inquiry. A public inquiry should of course address these wider implications, but when wind developers can only afford to go to the windiest hilltops, and when at the same time many people simply hate the look of turbines, inquiries are inevitably overwhelmed with local issues.

Further cause for concern is a few highly influential individuals exerting undue pressure on planning decisions. Hector Monro, former Scottish Minister for the environment and self-confessed opponent of wind, used his term of office to enforce extra strict planning controls for wind. Also, as reported in the ***Safe Energy*** news pages, the MoD no less have cobbled together some vague objections to a five turbine wind farm in the Scottish borders. Not one of the objections stands up to analysis, and personnel at the MoD base of concern, RAF Spadeadam, have indicated to another developer that they had no problem with a proposed 130 turbine wind farm in their area. All leading to speculation that in reality the MoD and its friends in high places just don't like wind farms and are abusing their position to stop them.

This is no way to shape the future of energy provision in Britain. Decisions made on energy generation will affect everything from what the countryside will look like to how high the sea will be in 50 years time. Energy conservation and a mix of renewables is the only long-term option, prudent use of coal and gas to supplement this is the realistic option in the short term. Now's the time to draw up a good plan.

**Planning for wind, p22; Gas deal, p24**

*The Safe Energy Journal* is the international magazine of Friends of the Earth Scotland's Safe Energy Unit. Views expressed are not necessarily those of FoE Scotland.

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Cover photo: Vestas

Printed on recycled paper

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ISSN 1350-5114

# Dounreay's troubles pile up

SAFETY at Dounreay has been compromised following a series of cut-backs designed to minimise the cost of decommissioning at the site, according to the Nuclear Installations Inspectorate (NII); and controversy continues to dog Dounreay over its nuclear waste shaft and plans to continue overseas reprocessing.

The NII has issued two improvement notices instructing management to address the "significant inadequacies" in control of contractors who now make up over half of the site's 1,300 employees. It has been given until the end of November to invest more money in the protection of workers, and until March next year to show it has adequate radiation protection standards. If it fails to meet the terms of the notices the NII is almost certain to prosecute the new Dounreay manager, Dr Roy Nelson, for breaking the site licence.

Further privatisation of the UKAEA at Dounreay is being blocked by the NII until it has seen the new arrangements up and running.

The Wick procurator fiscal, Alasdair MacDonald, is studying a weighty file passed to him by the NII on a possible breach of its licence by the UKAEA in allowing two contract workers to receive ten times their expected radioactive dose over a ten week period, and three others to breathe in radioactive dust.

Meanwhile, further revelations about the site's controversial waste shaft made on the BBC's *Forntline Scotland* documentary programme and in *The Scotsman* newspaper have led to fresh calls for the plant's closure. Using Dounreay's own 11,000-entry computer data base of the shafts contents, they revealed that in addition to the low and intermediate-level waste that Dounreay has admitted to dumping in the shaft, there were also considerable amounts of high-level waste.

As early as 1959, they say, plutonium from the plant's Materials Testing Reactor (MTR) was dumped. The log contains several entries for 1962 referring to fast reactor fuel elements, which, argues *The Scotsman*, cross references with another log highlighting the dumping of 147kg of highly enriched uranium and 2.2 kg of plutonium. By the end of 1962, 86 Dounreay Fast Reactor (DFR) fuel elements and six bins of MTR elements had been deposited in the shaft.

Despite references made to fuel elements in the inventory, Dounreay has denied that the shaft has ever been used "for depositing high-level waste." Dounreay's head of safety, Ken Butler, says no spent fuel has been dumped, instead he says the log entries referring to fuel elements should have read dummy fuel elements.

It was further revealed that contamination after the shaft exploded in 1977 was six times greater than had been officially admitted and that it extended outwith the sites boundaries. At the time of the explosion, the UKAEA said in a report to government inspectors: "Insignificant spots of radioactive material had been deposited on the surrounding grass."

The recent publicity has prompted Labour's new spokesperson on the environment, Michael Meacher MP, to write to the environment secretary, John Gummer, demanding a "full public investigation" into the allegations. Meacher further called on the Committee on Medical Aspects of Radiation in the Environment (Comare) to re-open its investigation into the excess of childhood leukaemias around Dounreay. His call has been backed by Dr Andrew Fraser,

Aftermath of the Dounreay waste shaft explosion

director of public health for the Highland Health Board, who called for a review of "new knowledge concerning radioactive emissions and any association there may be to cancer incidence locally."

While Comare stressed that it had not closed the investigation and that it was part of the Committee's ongoing work, it promised to revisit the investigation "as soon as is practicable."

Regardless of what the shaft contains and the extent of contamination after the explosion, Dounreay concedes that it is an unacceptable model of disposal and that remedial action is required to make it safe for the future. A range of options is being considered, from in-situ immobilisation of the waste to complete removal. While privately Dounreay supports the cheaper in-situ option which would involve back filling the shaft, a series of studies commissioned earlier this year have concluded that removal would be a "safe and viable" option.

Nelson stated: "The option we choose to submit to government in 1997 will be the safest option available for either retrieval or in-situ confinement. We will balance all factors and make recommendations based upon the scientific evidence delivered to us by leading authorities in this matter. Public opinion will be important but it will not over-ride recommendations founded upon safety, science and engineering."

In the meantime, three more radioactive particles have been found on the Dounreay foreshore, despite a major operation in the summer which involved lifting the entire beach and cleaning it. Dounreay says it has every confidence in the cleaning operation carried out by Wastechem, adding, "the source of the particles continues to be a matter for investigation." Since 1984, an average of one radioactive particle has been found on the foreshore each month. Prof. Bryn Bridges of Comare said: "Hopefully, within a year, we should know where the particles are coming from."

In tandem with clean-up operations, the UKAEA annual report reveals that: "Dounreay is seeking to win further research reactor work to support its customers' operations and help the UKAEA maintain employment at the site." This will be no easy task. The reinstatement of the US policy of taking back spent research reactor fuel originally fabricated in the US, and a decision by Cogema of France to enter the research reactor reprocessing market "provides strong competition for the UKAEA."

## Plant closures

After reprocessing 114 Australian spent highly enriched uranium fuel elements earlier this year, the Dounreay MTR reprocessing plant has closed, pending further work.

Dounreay's other reprocessing plant, for fast reactor fuel, is also closed following an accident on 28 September, when it is believed a tiny hole in a cooling pipe allowed contaminated water to leak into the site's waste water tank. The water was subsequently flushed into the sea.

The plant was closed automatically when the leak was detected, but seven gigabequerels of alpha radiation was released, including plutonium, americium and uranium. While remaining within the authorised limits, the discharge is being investigated by the Scottish Environment Protection Agency. Its preliminary investigation has revealed three problems which contributed to the discharge: the reprocessing plant cooling water was contaminated with radioactivity; a valve which could have prevented the discharge was faulty; and one of Dounreay's two liquid waste pits, which could have been used to hold the contaminated water, was out of action because of cobalt contamination.

The UKAEA has said it could be months before the reprocessing plant is back on line. ❑

# BE jobs to go in search for profitability

PLANS by British Energy (BE), the newly privatised nuclear generator, to slash staffing levels by nearly a quarter have resulted in widespread concern that safety is being compromised for profit.

Nuclear trade unions reacted angrily to the news; Mike Jeram of the white collar union, Unison, said BE's staff were fed up with being treated as "dividend fodder"" and warned that the public would want to know how the industry could lose so many people without sacrificing safety. He said Unison would be asking safety questions because of the scaling down of training and research.

Alan Cowan of the GMB general workers union added: "This is a short-term measure to please the City, not a sensible long-term business decision. This move not only raises questions over safety, it could also seriously undermine the commercial future of BE."

The cut of 1,460 jobs, over the next three years, will cost around £100 million but the company says it will yield £50 million a year in savings.

Despite the large job cut, many industry analysts believe that cuts in the price paid by the electricity pool means that BE is standing still and not gaining on its main competitors, gas and coal.

BE's chief executive, Dr Robert Hawley, dismissed as "rubbish" claims that the cuts were a sop to shareholders, insisting they are "to ensure we are competitive with other forms of generation in the UK ... This will be against a background of never compromising on our total commitment to safety."

Dr Robin Jeffrey, chair and chief executive of Scottish Nuclear — the Scottish arm of BE — said: "We will look at everything we do and cut out anything that is not essential. Everything that is important we will look to do simpler. To me simpler means safer."

However, BE has yet to gain the approval of the Nuclear Installations Inspectorate (NII) for the plans. The NII said: "They will have to justify their actions and convince us their proposals are safe. If they cannot justify them then they will not be able to go ahead."

■ The company has also dropped plans to build a combined cycle gas station at its Heysham nuclear site in Lancaster. ❑

# Safety fears over nuclear flights

NUCLEAR transport safety has been compromised in the interest of commercial nuclear activity, following a decision by the International Atomic Energy Agency (IAEA) to allow continued plutonium flights in outdated and inadequate flasks.

Despite having put member states on notice that the type B "all purpose" nuclear transport flask offered less protection in an aviation accident than in a surface accident, the IAEA board of governors has allowed its continued use in plutonium air transports.

Over the last ten years, IAEA scientists have been drawing up design criteria for a new type C air transport flask. While the Board adopted the new criteria, which campaigners point out fail to meet more stringent US standards and are far less severe than those for flight recorders, it will not come into effect for six years ("Plutonium flight flask standards flawed", Safe Energy Journal 110).

The provisions of the new guidelines allows continued use of type B flasks, designed to withstand an impact of only 30mph, for the bulk transport of plutonium and mixed oxide fuel if multilateral agreements exist between the parties directly involved.

The decision has been dismissed as "a sham" by the Washington based lobby group the Nuclear Control Institute (NCI). Paul Leventhal, NCI President, said: "It is noteworthy that the regulations were written specifically to exclude states that are over-flown by these deadly cargoes from having any say in the matter. Since it is now possible to fly plutonium non-stop, even between Britain and France to Japan, the IAEA is imposing an outrageous involuntary risk on dozens of en-route countries."

NCI is appealing to the European Energy Commissioner, Christos Papoutsis, "to take immediate steps to bar any air transports of radioactive material by member states of the European Union under the old guidelines." If urgent action is not taken, it warns: "these shipments could criss-cross Europe for several years in containers incapable of withstanding a serious crash."

Greenpeace International and the NCI have launched a joint campaign aimed at persuading nations to use their legal rights and bar plutonium flights from their air space: "The IAEA has been deaf to technical objections raised by the US government and by international aviation organisations.

We have no choice but to appeal to nations along the prospective shipment routes to protect their citizens by keeping these deadly shipments out of their airspace."

The IAEA has also paved the way for flights of mixed oxide (Mox) fuel to be exempt from the new safety standard when it comes into effect. In order to make such transports, the industry will have to show that Mox fuel meets "low-dispersability" criteria.

According to Leventhal, hundreds of air shipments may be needed to move tens of tons of plutonium from Britain and France to Japan. The most likely route is across northern Europe, Russia, China and the Korean Peninsula.

"The IAEA's approval of air transports of extremely toxic plutonium is a bizarre sequel to the recent TWA crash," comments NCI, "not to mention the 1992 accident involving an El Al cargo plane that crashed into an apartment complex near Amsterdam at 325mph and burned for hours.

If the cargo in the El Al had been plutonium, the human toll could have extended far beyond the crash site, and much of the surrounding area including Amsterdam could be contaminated with deadly radioactivity." ❑

# Thorp emissions set to increase

AS predicted by environment groups, British Nuclear Fuels (BNFL) has applied to the Environment Agency (EA) to increase aerial discharges from its Thermal Oxide Reprocessing Plant (Thorp).

During the summer, Cumbrians Opposed to a Radioactive Environment (Core) issued a report detailing a series of technical problems at Thorp over the last two years. The group argued that if BNFL wanted to meet its base-load commitments then throughput would have to be increased above planned rates and therefore discharges of radioactivity to the environment would also have to increase.

BNFL denied it was having any difficulty, but it is now seeking to increase aerial discharges of tritium from the plant. The company argues that "commissioning experience has shown that a higher proportion of tritium is entering the aerial discharge stream rather than remaining in the liquid discharges to the sea."

As a consequence, BNFL intends to apply for a reduction in marine discharges. According to BNFL, the additional environmental impact for the new limit will be "3 microsieverts a year — equivalent to spending just three hours in Cornwall or 45 minutes flying at cruising altitude."

Almost half of the proposed aerial limits are for a new source, the Solvent Treatment Plant, which has been built to process used solvents from reprocessing. "The company anticipates that the total Thorp discharges being applied for today can be maintained even at future throughput levels. Discharges from the new Sellafield Mox Plant, due to begin manufacturing operations in 1998, will be negligible and will be contained within the current limits for the site."

The EA will now consider the application and produce a "consultation package which will include the application, a draft authorisation and an explanatory memorandum."

News of the application for revised discharge permits is unlikely to please the Irish government which has just thrown its weight behind a private prosecution against BNFL.

The Irish environment minister, Brendan Howlin, has promised to help four people from County Louth who have won leave from the Irish Supreme Court to take action against BNFL. Scientific, research and legal assistance will be made available, and the government is to conduct a "wide trawl" of international evidence to assist the case to have Thorp closed.

Meanwhile, John Graham, the vice-president of BNFL's US subsidiary, BNFL Inc, told a conference in London that a little radiation a day is good for you.

According to Graham there is reasonable evidence that low-level radiation is beneficial. He cited Japanese studies which had shown that rats which had received periodic low doses of radiation were less susceptible to cancers after being exposed to high doses. He suggested that people predisposed to cancers would benefit from radiation exposure throughout their lives.

BNFL rejected Graham's comments, saying that he was speaking in a personal capacity as the immediate past president of the American Nuclear Society. David Young, BNFL Spokesman at Sellafield said: "As I understand it Mr Graham advocates giving people regular doses of radiation. No-one here believes this — there is no safe level of radiation. Mr Graham was speaking in a personal capacity. We disassociate ourselves from his remarks."

However, the company is unlikely to disassociate itself completely from Graham, so far BNFL Inc has won contracts worth over $1 billion in the US. ❑

# French issue potassium iodate tablets

FRENCH authorities have been distributing potassium iodate tablets to thousands of households within 5km of its nuclear stations.

The move has been given a cautious welcome by Greenpeace which hopes it will raise awareness of the dangers of nuclear power: "After years of telling us that nuclear power is absolutely safe, it is surprising that the government suddenly wants to distribute iodine tablets."

Jean Louis of Crii-Rad, a research institute specialising in radioactivity, said: "This scheme does not appear to have been thought through, it could lull a lot of people into a false sense of security."

Taken immediately before of after exposure to radiation, the tablets prevent the thyroid from absorbing radioactive iodine, especially in children. However, they offer no protection from the other effects of exposure.

Louis said that, so far, no one would say at what level of exposure people would be advised by the health ministry to take the tablets. In addition, he warned that 5 km was too small a radius: "Half an hour after an accident contamination can spread beyond 10km."

Announced on the tenth anniversary of Chernobyl, the measures are based on a scheme from Austria. Until now the tablets have only been available at nuclear stations and hospitals. ❑

# Tai power

RIOTS broke out in Taiwan last month as the government attempted to overturn a parliamentary vote in May cancelling the completion of the countries fourth nuclear power station, near Taipai.

Opposition parties humiliated the Tai cabinet when they successfully blocked funding for the completion of the US$4.1 billion plant. However, Taiwan Power has already sunk some US$220 million into the station and has been lobbying for the vote to be overruled.

Opposition leaders know that if it goes to a vote they have no chance of gaining the two-thirds majority needed to enforce the cancellation. In the run up to a vote on Friday 18 October, MPs adopted increasingly desperate tactics. On the Tuesday they physically prevented Premier Lien Chein from entering the parliament to defend the cabinet's appeal against the funding cancellation, and on the day of the vote they donned green head bands and vowed to filibuster, occupying the parliament until midnight.

Outside the parliament protesters clashed with police and parts of the government district around the parliament were barricaded off to control the crowds. The demonstrations were progressing peacefully, according to the police, until a truck carrying around thirty protesters crashed into police barricades and the protesters, armed with clubs and shields, began attacking the police.

Inside the parliament that evening fist fights broke out as the government tried to clear the dais for a vote. The vote had to be abandoned, but the government has vowed to try again. ❑

# Nirex rock lab: decision made?

CONCERN is mounting that a decision has already been taken to give the go ahead to the proposed Nirex Rock Characterisation Facility (RCF) at Sellafield, in Cumbria, even before the Inquiry Inspector has delivered his report to the Secretary of State for the Environment.

Writing in the *Quarterly Journal of Engineering Geology*, Sir John Knill, former chair of the government's Radioactive Waste Management Advisory Committee, quotes the chair of Nuclear Electric as saying: "Disposal in the underground repository at Sellafield is the solution for intermediate-level waste. It will happen as it has happened elsewhere."

Knill comments: "These words are unambiguous and members of the public could be forgiven if they come to the conclusion that, somehow and somewhere, a decision has already been made to construct a deep repository for radioactive waste at Sellafield."

A public inquiry into the RCF proposal, which Nirex argues is necessary to establish a safety case for the full repository, was held in Cumbria and concluded on 1 February 1996. The inquiry inspector was due to deliver his report to the environment secretary, John Gummer, by the end of October. As yet no report has been produced, and it is not now expected that Gummer will receive the report before the end of January 1997.

Nirex has already spent £390 million on its investigations at Sellafield, and Dr Stuart Haszeldine, a senior lecturer in Geology at Glasgow University, who presented evidence at the 66-day inquiry on behalf of Greenpeace, has commented: "If Nirex wins this inquiry and the environment secretary approves construction, then [another] £200 million gets poured into a big hole in the wrong place. That doesn't matter, because when the final planning application comes along, spending lots of money up front has previously helped nuclear developers, such as Nirex, gain planning permission."

Indeed, Nirex has already invited tenders for the first of the three phases in excavating the rock lab. Engineering companies are being asked to draw up plans for sinking two 650m to 900m deep five meter diameter shafts at Longlands Farm, near Sellafield. The shafts will be connected at the bottom by a 50m tunnel.

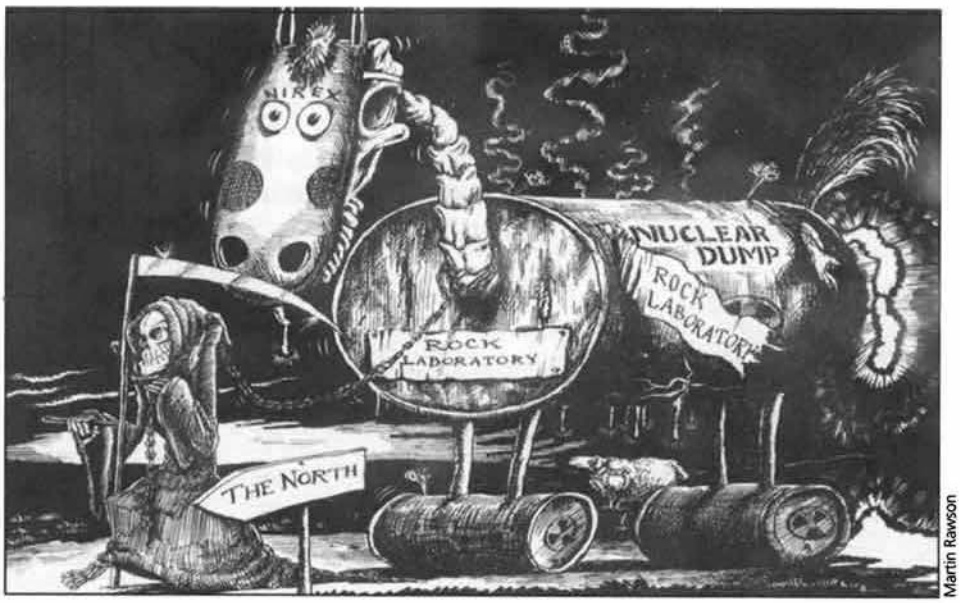
Prof. David Smythe, of Glasgow University, who presented evidence to the inquiry on behalf of Friends of the Earth, and until 1991 served on British Nuclear Fuels review panel which assessed prospective dump sites, says: "The fact is that Sellafield appears to be a highly unsuitable place for a repository.

"East Anglia is probably a geologically more appropriate region in the UK for such a dump. However, Nirex might yet revive its investigations at Dounreay if it is forced to look elsewhere again."

Haszeldine, who, with Smythe, has edited a book of the objectors case at the inquiry,* argues: "It is worth pointing out that the proposed site lies on one of a few active fault zones in Britain; the site is subject to ground water flowing up towards the surface; it is also geologically oxidising — so the waste barrels will rust, dissolving uranium in water moving towards the surface."

Campaigners are convinced that they succeeded in undermining the credibility of Nirex's scientific case at the inquiry. Smythe sums up their position: "They consider that the site is both a complex geological site, and complex hydrogeological site. Additionally, the RCF proposal ... will not resolve these problems but will destroy the in situ data that are needed to make a long term repository safety case at the site, before these data have been adequately recorded." ❑

* "Radioactive waste disposal at Sellafield, UK — site selection, geological and engineering problems", edited by S Haszeldine and D K Smythe; University of Glasgow, £12.




Martin Rawson

# Nuclear reactors all at sea

RUSSIAN scientists are planning to build 15 floating nuclear power stations in order to deliver electricity to remote areas.

Engineers are ready to begin work on the first of 15 planned nuclear ships and are awaiting the approval of the Russian nuclear agency, Gosatom Nadzor.

Two types of reactor, using enriched uranium fuel, are being considered for the task. However, technical details are not yet available.

The first host harbour, according to the Russian authorities, would be Pevek, a city in the far north-east of Russia. Further vessels are planned for the Primorsk and Khabarovsk regions, as well as in other parts of Siberia.

At a cost of around $150 million each, Russia says it will reduce by four fifths the current cost of supplying energy to Siberia and other remote areas. Indonesia, China and the Philippines have all expressed interest in using the concept.

However, Greenpeace in Moscow has dismissed the idea as ludicrous, pointing out that the rough and icy seas in these regions would make the stations even more dangerous than those on land. Edward Gismatulling, for Greenpeace, commented: "Last October near Severodvinsk a tug carrying a de-activated nuclear submarine, still containing its two nuclear reactors, lost its charge at sea during a storm. It was recovered two days later on the shore. Imagine a similar disaster with an active reactor." ❑

# Liquid high-level waste storage — can we tolerate it?

**Sellafield stores its liquid waste from reprocessing in containers requiring 24 hr service and supervision.** *Peter Taylor* **outlines his work for the Nuclear Free Local Authorities on the consequences of a major release from these High Active Storage Tanks.**

WHENEVER consequence studies are performed for melt-downs in nuclear reactors, one nuclide, caesium-137, dominates the results. It is a volatile gamma-emitter with a half-life of 30 years, readily transferred through food chains and not easily removed from soils, tarmac and concrete. About 3 million Curies were released to the air from Chernobyl, accounting for about 90% of the total nuclide releases. The Chernobyl aftermath of widespread agricultural disruption out to 2,000 km from the source, plus tens of thousands of projected cancers in the populations affected, can mostly be attributed to the effects of caesium-137. About 100 times the Chernobyl inventory of this nuclide is stored as hot corrosive liquid waste at Sellafield. The containment tanks require constant cooling, and failure of the cooling systems could lead to an aerial release that would dwarf Chernobyl.

## High Active Storage Tanks

In reprocessing, fuel is dissolved in nitric acid for first stage separation. The liquid mixture remaining — nitric acid, fission products, iron from the corrosion of plant vessels, chemical impurities from the fuel and organic solvent — is one of the most dangerous industrial wastes. This liquid waste is kept in High Active Storage Tanks (Hasts), equipped with cooling circuits (the fission products are thermally hot and intensely radioactive), agitators (to prevent solids from settling on the bottom) and ventilation.

'Active' cooling systems require 24 hr service and supervision. If the heat is not actively removed, the contents will soon boil. Once boiling ensues, the resultant pressure has to be released through venting. Depending on the initiating event, a boiling tank might not be repairable, especially if the cooling circuits have been severely damaged. In such a case, after a few days, the tank will boil dry. Within a matter of hours the remaining salts will reach the melting point of the containing steel. Huge quantities of caesium-137 would be driven off into the atmosphere. Basically, the system is not fail-safe[1].

Imagine these tanks venting between ten and fifty times the amount released at Chernobyl over several days, as the wind changes direction. Glasgow and Edinburgh, Belfast and Dublin, Newcastle, Manchester, Liverpool, and Leeds, are all within 200 km. Well, you shouldn't let your imagination run riot, according to the Nuclear Installations Inspectorate (NII). Not because it could not happen, but because the probability falls within the 'tolerable'[2] range of societal risks – the kind you ought not to want to do anything about. It is argued that all circuits are duplicated or triplicated and there are seven cooling coils when only one will do the job.

Although the potential for a major emission (50 million Curies) was briefly mentioned by the Royal Commission (Flowers Report) in 1976, which talked of public "inconvenience" over a wide area, further information came only after persistent questioning by scientists and engineers of the Political Ecology Research Group (PERG) at the 1977 Windscale public inquiry into the building of a Thermal Oxide Reprocessing Plant (Thorp). British Nuclear Fuel's first response was to demand a meeting in private, as the tanks could be vulnerable to terrorist attack.

PERG was placed in an awkward position — if it publicised the risks, it could be increasing the probability of a catastrophe. So the group decided it would at least calculate the consequences and report to the inquiry. For this they needed appropriate technical data, but such data was refused on security grounds. PERG did, nonetheless, succeed in obtaining copies of the computer codes used to simulate atmospheric releases. By the end of the inquiry, working with the aid of technical documents from a German study on High Active Storage Tank failure potential, PERG presented figures for the consequences of a major release, and argued that a risk of this magnitude could never be justified. Justice Parker, the Inspector, regarded the exercise as unrealistic (because PERG did not have access to engineering detail, catch 22), and argued it would unnecessarily alarm the public to present the data in his report.

At that time there was no publicly available research into alternative methods of storage (other than not reprocessing spent fuel, an infinitely cleaner and safer option). In the UK, bar some efforts to inform the debate in Parliament, the matter rested there. However, PERG was then commissioned by the West German government to critically review controversial plans for a prospective Thorp at Gorleben. Full disclosure of all technical detail was made, and the resultant study presented at a roundtable with ministers. Based on the study findings, Minister-president Albrecht ruled that the state would not license construction unless the Hasts were made fail-safe. Subsequently, the plant was voted out in Lower Saxony's parliament, moved to Wackersdorf in Bavaria, but abandoned finally in 1992 on economic grounds.

Something that did not emerge in the UK until 1994 was that the Wackersdorf design actually met the fail-safe standard. This, coupled with the release by the European Commission of the sophisticated COSYMA software to model atmospheric releases, led to consultancy scientists Terramarès and the UK's Nuclear Free Local Authorities (NFLA) carrying out a consequence study and attempting to finance a full engineering review of safer alternatives.

The first phase of the consequence study was completed later that year and attempts at raising larger sums for the engineering review are ongoing. A public debate took place at Bury Town Hall with BNFL, this author and the NII, following on from the consequence study, and representations were made to the UK and European Parliaments. Strength of public feeling led the NII to publish a response late in 1995, which sought to reassure and explain why the Hasts were licensed at the 'tolerability' standard. NFLA have commissioned a response from Gordon Thompson at the Institute for Resource and Security Studies (he was part of the original PERG team) and myself. During our studies we were granted a meeting with NII's technical team at Bootle in Lancashire in June 1996.

The NII document is revealing (as were our discussions): NII has never liked the design, and admits that the older tanks especially do not meet modern standards (but they also contain much cooler liquid). NII prefers fail-safe modes where 'practicable' and its chief inspector, Jim Furness, has the solidification of the liquid as one of the main aims of his tenure. To this end, and perhaps as a result of the increased public concern, it has pressured BNFL into building a third vitrification plant (once the liquid is vitrified it can more readily be incorporated in passive cooling systems).

## Recommendations

At the outset of this campaign, an objective had been to pressure BNFL into installing fail-safe storage tanks for all the liquid, but we now realise that the German designs were only intended for a limited batch system and the large amounts now held by BNFL would compromise the design. Thus, we have looked to accelerating vitrification, which is dependent upon the number of plant (currently two, with one under construction) and the throughput of spent fuel.

If vitrification, and hence greater safety, was the main priority, then further reprocessing would have to be postponed while the backlog of liquid was solidified. Thereafter, management would be required to hold only small transient stocks of liquid, which could be passively cooled. Holding only small stocks of potentially explosive and toxic material is a cardinal rule for safe plant operation. But NII allows BNFL to vitrify the liquid only at a pace which doesn't compromise their reprocessing activities, and as such NII is placing BNFL's commercial needs above public safety.

To postpone further reprocessing and prioritise vitrification would, at this stage, mean admitting that there was something seriously wrong with the current set-up, and it seems NII is unwilling to admit that its past licensing policy has been flawed. Hence the narrow argument from probability theory that the risk is within 'tolerable' limits. An unsubstantiated assertion in itself, since NII provides no technical data on the probability of failures, no data on past failures of similar technology elsewhere, and gives no indication that a major Hast release would dwarf anything from supposedly tolerable nuclear reactors.

We ought not to be drawn into spurious technical arguments about probability: major failures are caused more by the unpredictable stupidity of operators, by saboteurs, or outside agencies, all of which are beyond any reliable statistical appraisal. For example, in 1980, following an operator error at a French plant in Cap le Hague, a whole tank 'farm' lost power due to an electrical fire. Cooling was restored in four hours by moving equipment from the nearby nuclear submarine yard at Cherbourg. The NII makes no mention of this, nor of the huge area of Russia east of the Urals contaminated as the result of a liquid waste tank explosion in Chelyabinsk in 1957. Where consequences are so cataclysmic (see Box 1), and entirely feasible alternatives exist which render the waste stable, then low probabilities can hardly be cited as justification for stalling on the implementation of an alternative.

The NFLAs have called on NII to instruct BNFL to publish a comprehensive engineering analysis and review of alternative high active waste management strategies. NII have refused, inviting the NFLAs to write direct to BNFL, which the NFLAs intend to do. Meanwhile, there remains no publicly available engineering assessment, though NII holds a "shelf-full" of BNFL's detailed safety case for the licensing of the tolerable design. In the absence of a full public appraisal of the technical risk, alternatives and costs, the absolute minimum demand should be that reprocessing be curtailed, additional vitrification plant built, and the highly active liquids rendered fail-safe at a technically feasible rate, which we estimate would take about three years. ❑

**Box 1**: Impacts for ten tanks boiling dry, assuming current radiological standards for evacuation, relocation and interdiction of food.

**Health and social impact following major release under maintained easterly airflow.**

*Easterly wind maintined for the duration of the release leads to high concentrations above thresholds for evacuation and relocation. Such weather conditions are regularly encountered and can affect all degrees of the compass, thus leading to evacuation of such cities as Dublin, Belfast, Glasgow, Edinburgh, Manchester, Liverpool.*

*Assuming standard radiological protection measures imposed:*

| | |
|---|---|
| total cancer incidence | 30,000 |
| total deaths | 15,000 |
| total economic impact | £46 billion, made up of:- |

80% relocation costs, 10% decontamination costs, 8% in lost agricultural production (production lost for 10-30 years), 2% health costs.

**Impacts under changing winds over three days**

*The effects of changing winds over three days (as at Chernobyl) lead to more widespread contamination below reference levels for evacuation and relocation, thus leaving more people exposed.*

| | |
|---|---|
| total cancer incidence | 676,900 |
| total deaths | 398,900 |
| total health costs | £34.4 billion |
| emergency countermeasures | £20 million |

**References:**

NII, 1995. Safety of the storage of liquid High-Level waste at BNFL, Sellafield, HSE books.

Taylor P.J., 1994. Consequence analysis of a catastrophic failure of Highly Active Liquid waste Tanks serving the THORP and Magnox nuclear fuel reprocessing plants at Sellafield. Nuclear Free Local Authorities, Secretariat, Town Hall, Manchester.

Thompson G.R. and Taylor P.J., November 1996. Safety of the Storage of Liquid High Level Waste at Sellafield. NFLA, Manchester.

**Notes:**

(1) Fail safe is a term used in engineering which basically means that any situation following on from a system failure is nonetheless safe.

(2) The NII regard a tolerable risk as the release of 4,000 Curies or less every 100,000 years.

**Peter Taylor is a biologist with the Terramares Group of environmental consultants. He has been an advisor on nuclear risks and pollution to both Greenpeace and the Government.**

# Best practice: the real McCoy

**A new report[1] by David Olivier suggests that the UK's ideas of 'best practice' for energy efficiency are well out of line with progress in North America.** *David Somervell* **echoes the author's message: "Look over the pond for inspiration!"**

AN often repeated judgement on the success of energy efficiency programmes is that combinations of a selection of measures produce the best, most cost-effective results. Many of the case studies in a new report by David Olivier, *Energy Efficiency and Renewables: Recent North American Experience*, are of holistic designs, successfully responding to many environmental issues in a single project. These issues include: using energy more efficiently and replacing fossil fuels by renewables; protecting the global and local environment; and ensuring the health, comfort and well-being of the building occupants. These integrated designs are spreading steadily across North America, and dramatic progress has occurred in the last decade.

Energy efficiency and renewables progress is not all government-led, but is the sum of a wide range of initiatives, underway at all levels of society. Federal government programmes in both Canada and the USA have been very supportive, and their impetus helps to explain why North America is well ahead of the UK and the rest of Europe. The UK says that it has a free market in energy, but US experts consider that the market is full of flaws. The USA is regulating it so as to encourage, not discourage, energy efficiency and renewables. Experience showed that the provision of information and advice, by themselves, were not sufficient to bring about the rapid use in this field of new technology. The report describes initiatives aimed at accelerating improvements — many of which aim at nothing less than market transformation.

## Government and utility programmes

Government in North America has played a not exclusive but nevertheless key role in the advancement of energy efficiency and renewables, through funding and market regulation. US research, design and development (R,D&D) funding for solar energy approaches £300m/year, while R,D&D for all renewables in the UK is £18m/year (US population 300m, UK population 57m). Complementary to government support, and to some extent primed by government regulation, utilities initiate energy efficiency programmes themselves.

But in the UK, despite experiments, no utilities yet view improved energy efficiency as a strategic alternative to selling more energy. Compared to North America, one can only say that the concept of investing in energy efficiency and recovering the cost via consumers' bills remains at a primitive stage of development.

Window of opportunity. This Canadian window is designed for maximum insulation

- In 1991-92, a Canadian utility retrofitted a town of 6,000 people, reducing its electricity demand by 17% in 22 months.
- The USA's largest electric utility disbanded its power station construction division in 1993. Its former research director expects that cheap photovoltaic (PV) and other renewables will make central power stations obsolete.

## Buildings' energy efficiency

**Houses:** House building is an area where the UK particularly lags behind North America. Many new homes in the northern USA and Canada use less energy, measured in kWh/m²/year, than so-called 'low-energy' UK dwellings (see figure 1), despite temperatures in the Canadian prairies, for instance, averaging out at about 21ºC lower than those in the UK. An advanced house from these colder climates, transplanted in the UK, would need little space heating energy and might only use 5-25kWh/m²/yr for other purposes.

New dwellings in the north-west USA, with a similar climate to the UK, need one third of the space heating compared to their UK counterparts. In moderately cold climates, new dwellings with a space heating energy need of only 15kWh/m²/yr are no longer unusual, they are just good practice, and many US dwellings use little or no space heating energy.

- A Chicago builder guarantees that the space heating bill of his new detached houses will be less than £120/yr, terraced houses below £60/yr. Extra construction cost is just £250.

**Non-domestic buildings:** Measured energy use of well designed North American office buildings and schools is 30-50% of the North American norm and 15-20% of the norm for UK air-conditioned buildings. The key to achieving this performance is a better integrated design process which the Canadian government is supporting under a special program. Perhaps surprisingly, the dominant electrical load in these buildings, and hence the largest single target for further energy savings, is not cooling or ventilation, but lighting.

- One autonomous school in Ontario uses 3kWh/m²/yr of electricity and little else except a little solar hot water and wood for backup space heating.
- A research centre in Colorado has used 9kWh/m²/yr since 1983.

**Ventilation:** Mechanical ventilation of sealed buildings, according to North American research, provides a healthier indoor environment than leaky buildings with opening windows or other

similar means of ventilation. Except for small structures in rural areas, there is little sign of any move to natural ventilation or 'mixed mode' in non-domestic buildings in North America. Advanced mechanical ventilation/heat recovery systems deliver the fresh air which a building needs in winter and recover 80% of the heat, using 5% as much electricity per unit of fresh air as UK systems.

**Glazing:** The thermal efficiency of the "best" North American window has improved by about 6%/yr since 1980. Windows from Europe which were state-of-the-art in the early 1990s have been overtaken. North American products now offer roughly a 15% lower heat loss and a 25% higher solar heat gain. Again, government has played a part. For instance, designers can predict the energy performance of new windows using software developed with Canadian and US government funding and made freely available to the industry.

**Building materials:** Recycled and re-used materials are finding novel uses in new North American buildings all the time. In some cases, embodied energy has been reduced by 60%, even when compared to buildings of local timber.

- In one Canadian house, the volume of waste sent to landfill during construction was reduced by 98%.
- A new showroom in California has load-bearing straw-bale walls with highly efficient electricity use and a roof-mounted PV system. It will receive a monthly cheque instead of a monthly electricity bill.

## Renewables advances

Recent trends in the field of solar thermal systems and PV, particularly their application in buildings, are outlined by David Olivier. The USA generates 95% of the world's solar thermal electricity and roughly 50% of its PV output. Some individual US cities already have more PV generating capacity than the whole of north-west Europe. PV prices in North America are well below European prices and on good sites they generate electricity at the same cost as fossil fuels.

Large parts of the US now require net energy metering. Utilities must pay the retail price for small amounts of electricity which consumers export to the grid from their own system. In the UK, utilities seem to be forbidden from offering such terms. Also, rather than extend the electric grid, many US utilities rent out standalone PV systems and batteries to remote rural households.

Many cost-effective uses of PV were quite unexpected and only emerged after careful research by the utilities. Both US policy since 1988, and recent projects, give a clear signal that PV is profitable in niche applications and almost cost-effective in many more. In comparison, recent UK policy merely risks signalling that PV is expensive.

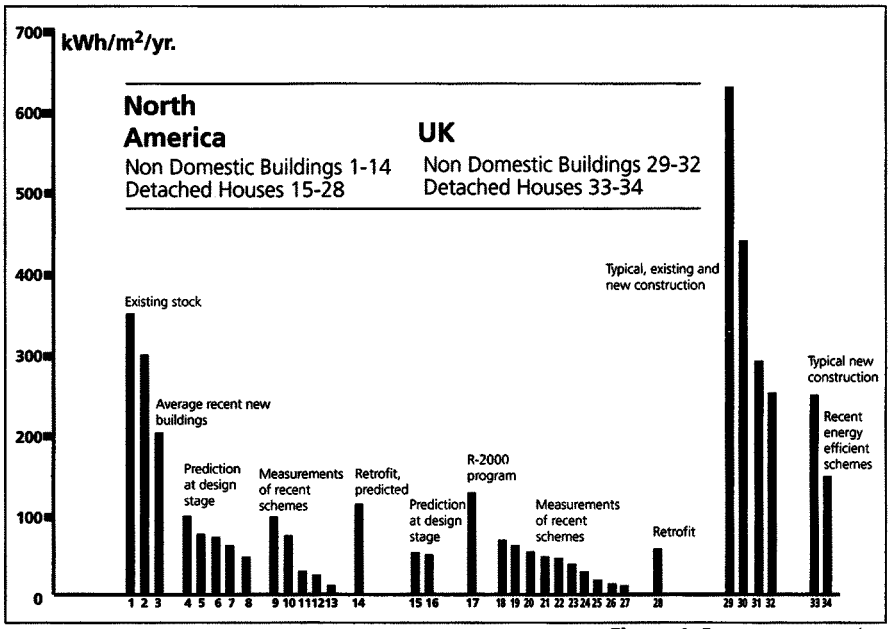



**Figure 1.** Energy consumption of some North American and UK buildings

- Solar produces 3% of southern California's electricity, at a lower cost than its remaining nuclear plants.
- The USA has over 100,000 homes powered by stand-alone PV systems, about the same number as the Third World.

## Best practice?

In the light of this report, the UK Energy Efficiency Best Practice Programme, might better be re-titled Moderate Practice Programme. It tends to focus on producing a tremendous amount of information but is a little short on practical application. North American experience has shown however, that seeing is believing. There are clearly many ways that UK policy and practice could be improved by integrating funding initiatives such as the quango Energy Saving Trust schemes. Integrated national programmes such as the *EPA Energy Star Pollution Prevention* standards for office equipment or the *GreenLights* commercial lighting upgrade programme could be transferred to the UK with great effect.

There is growing international pressure for rapid cuts in carbon dioxide emissions, of a magnitude which can stabilise atmospheric concentrations and moderate climate change. It is essential for the UK to learn from recent North American experience with energy efficiency and renewables — both the advancement of the basic technology, and its integrated implementation. Fretting about short-term paybacks is mistaken. While US energy prices are typically lower than here, they are taking a longer-term view. And with oil prices on the rise again maybe the recent UK slump in energy costs will soon be over. Time to get cracking using the ideas collected here. ❑

**Notes**

(1) Energy Efficiency and Renewables: Recent North American Experience. £70 inc p+p if prepaid. Published by Energy Advisory Associates, 1 Moores Cottages, Bircher, Leominster, Herefordshire, England HR6 OAX. Phone (01568 780868). Fax: (01568 780866) A4 paperback, 60,000 words, 70 illustrations and tables. ISBN 0-9518791-1-1.

Details of the very extensive information and guidance on buildings under the UK Energy Efficiency Best Practice Programme are available from BRECSU Enquiries, Building Research Establishment, Garston, Watford WD2 7JR. (01923 664258 fax 664787 Email brecsuenq@bre.co.uk)

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# Contamination from Russian Northern Fleet

**Disarmament treaties specify what capability should go.** *Thomas Nilsen* **of the Norwegian environmental group Bellona outlines a report which suggests that this is the easy part — how to physically manage the nuclear legacy of the Cold war is the hardest part.**

IN the far north-west of Russia, in an area about the size of the UK, there is one in five of all the world's nuclear reactors. They are in various states — working, out of service but with their cores intact, or in some stage of decommissioning — and most of them belong to the Russian Navy's Northern Fleet. In fact, the Kola Peninsula and Severodvinsk coastline (see figure 1) is the only place in the world thought to house retired nuclear submarines with their fuel still intact.

Proximity to the Atlantic ocean and winter ice-free access make the shores of the Barents Sea and White Sea of particular strategic importance to the Russian military. Nuclear powered civil power stations, ice breakers and light houses can be found in the area, but it was the military posturing between the USA and Russia following the end of World War II which is responsible for the accumulation of so many nuclear military vessels here. Until the end of the 1980s, the Soviet Navy had more nuclear submarines than all other countries put together, and out of a total of 247 nuclear submarines and 5 nuclear powered surface ships built by the former Soviet Union for its navy between 1955 and 1996, roughly two thirds went to Northern Fleet bases in the Murmansk and Arkhanagel regions.

Nearly forty years on from the first completed submarine in 1958, problems associated with the management of nuclear materials and wastes are naturally a cause for concern. These problems are greatly exacerbated, however, by the paranoid secrecy of the Russian military and the dire economic situation in Russia at this time. In a genuine attempt to kick-start some resolution of the problems, and to prevent the situation from becoming even worse than it need be, a Norwegian environment organisation, Bellona, has been investigating sources of contamination in the region. To date, three reports have been published on the subject. Prior to the release of the most recent report, *The Russian Northern Fleet, sources of radioactive contamination*, one of the authors, Alexandr Nikitin, was arrested on 6 February1996 on charges of high treason through espionage, which carries the death penalty. Bellona offices and contacts in Murmansk were raided in the previous year by the FSB (the Russian Security Police), which confiscated all background research material. At the time of writing, the report has been released and Nikitin now faces a reduced sentence of 10 years in jail.

One of the Russian Northern Fleet submarines.

Ironically, on the strength of information which Nikitin helped to supply, western governments will now contribute funds to the cleanup of Russia's Arctic bases. Bellona argues that a precondition to any such funds must be international inspection of the bases, a condition Russia is not at all comfortable with. A reluctance to grant access to military sites has meant that the first project under an agreement to tackle military waste will in fact be civilian: building containers for spent fuel from nuclear powered ice breakers.

What follows is a very brief summary of the main findings of the latest Bellona report, which systematically catalogues sources of radioactive contamination from the Russian Northern Fleet. Table 1 overleaf shows all the main sources of contamination mentioned in the report.

## Contamination sources

**Submarines in service:** Today, five countries own nuclear submarines. China, the USA, Great Britain and France have a combined total of 132 nuclear submarines. Russia has 109 nuclear submarines in operation, with over a hundred more still intact but out of operation.

Of the 109 operational nuclear submarines in Russia, 67 belong to the Northern Fleet. Russian submarines usually have two reactors per submarine, so the 67 submarines actually account for 115 reactors. 'Operational' is perhaps a misleading term for the submarines, as monetary and personnel constraints confine a number of the Northern Fleet's vessels to the pier side for large parts of the year.

Until 1992, four shipyards in the former Soviet Union turned out nuclear submarines at a rate of 5-10 a year. Only Severodvinsk is still building submarines now, 1-2 a year at most. Astonishingly, despite a total failure to adequately deal with the nuclear submarine legacy, Russia (not alone in this) continues to expand and/or renew its nuclear capability, with three new nuclear submarines on order and one new battleship just delivered to the Northern Fleet.

**Naval bases:** Nuclear powered vessels of the Northern Fleet operate from 5 bases on the Kola Peninsula. Together they provide 7 base sites for operational nuclear vessels. Over 100,000 people live in closed towns associated with these bases.

Because priority is always given to completing new ships, infrastructure development has not

been able to keep pace with the delivery of new submarines. This is particularly true for facilities pertaining to storage and treatment of waste, which present many as yet unsolved technical problems, yet which have practically the very last claim on any Northern Fleet funds. Consequently a huge backlog of radioactive waste is stored at most of the naval bases.

**Shipyards:** Six shipyards service the Northern Fleet. Three are allocated to the Northern Fleet, while the remaining three fall under the auspices of the Ministry of Shipbuilding. The shipyards undertake routine repair and maintenance of the fleet, are largely responsible for decommissioning, and one, Severodvinsk, also constructs new submarines.

Cutbacks in the number of operational submarines has meant a corresponding fall in income for these yards, precipitating serious economic difficulties for the yards and their communities, who have never before experienced a capitalist market system. Increasingly, yards are looking elsewhere than the military for their work, with a few now accepting civilian commissions.

Radioactive waste is stored at all of the shipyards, at times in large amounts.

**Solid radioactive waste** is stored at 11 places along the coast of the Kola Peninsula and in Severodvinsk. All of the facilities are full, and at a number of them solid radioactive waste is stored outside the storage building, in the open, without any kind of protection. No regional storage facility exists for solid nuclear waste.

**Liquid radioactive waste** is stored at almost all of the naval bases, either in land-based tanks, on board service ships or on floating tankers. Most of the storage tanks for liquid radioactive waste are full, with a number of them in very poor condition, and alleviation of the storage crisis is hindered by a bottleneck in treatment of the waste. At the existing civilian treatment plant, the nuclear icebreaker base at Atomflot in Murmansk, processing capacity is too small while the costs of its use are too high for the Northern Fleet.

**Spent nuclear fuel:** The Northern Fleet's largest temporary storage facility for spent nuclear fuel lies at Zapadnaya Litsa in Andreeva Bay, about 40km from the Norwegian border. Approximately 21,000 spent fuel assemblies are stored here, corresponding to 90 nuclear reactors. Assemblies are stored either in dry storage in one of three poorly maintained, partially buried concrete tanks, or in rusty containers outside. The concrete tanks were initially taken into use as a temporary measure, following a leak in 1982 from now unusable storage pools, and their design life is just four years (the oldest has now been in use for 13 years). Outside, 32 containers of spent fuel assemblies have been exposed to the elements for close on 35 years.


**Figure 1:** map showing naval bases, shipyards and towns associated with the northern fleet

Another smaller storage facility for spent nuclear fuel in Gremikha keeps formerly liquid metal cooled reactors as well as the pressurised water reactor type. Here too the fuel assemblies are stored outside, and here too there have been leaks of radioactivity from a storage pool.

**Nuclear transport:** Service ships shuttle spent fuel between the shipyards, temporary storage areas and railroad loading points in Murmansk and Severodvinsk. Most of these ships do not satisfy safety regulations, but remain in use.

From the rail loading points, spent fuel is transported by rail to the reprocessing facility RT-1 in Mayak. Rail capacity for this purpose is not sufficient, and stockpiles of spent fuel are increasing (besides which, reprocessing at Mayak is expensive for the Northern Fleet). Another solution under consideration is to build a large long-term storage facility for spent nuclear fuel in north-western Russia.

**Decommissioning:** Eighty-eight submarines are earmarked for decommissioning and are laid up in various locations along the Kola Peninsula and at Severodvinsk. In a perilous state, they are out of dock for the majority of time, and posing the greatest safety risk are 52 submarines yet to be defuelled.

Various immediate measures are employed directed at preventing the situation from getting any worse. For instance, compressed air is pumped into the hulls to keep the vessels afloat,

reactors are treated with self sealing solutions to prevent leaks of radioactivity from the core, and coolant is periodically circulated through the primary circuit.

**Accidents:** Between 1961 and the present time there have been many accidents involving Soviet/Russian nuclear submarines, with the loss of at least 507 lives. Accidents have occurred while vessels are out on patrol (the most common instance), during refuelling or during repair operations. Most of the vessels affected belonged to the Northern Fleet, including all of the four Soviet submarines that have sunk, ten instances of loss of coolant, and four serious fires. It would seem that in the rush to build nuclear submarines, a policy of replace rather than repair was forced by default upon the Soviet navy, so much so that in one instance a damaged submarine was scuttled in the Kara sea rather than decommissioned.

## Economic Problems

Murmansk and Arkhanagel mirror much of Russia in experiencing severe economic upheaval. However, economic deprivation in this particular instance is massively hindering efforts to cope with actual, and an even greater potential for, nuclear contamination.

Just 35% of 1994 funds earmarked for the Northern Fleet were actually transferred, in real terms, while in 1995 the 600 billion rouble budget allocation just didn't arrive — what money was received went largely to paying salaries and welfare benefits for Northern Fleet personnel. It is not uncommon for wages to be delayed, for officers to be scrounged from neighbouring bases to make up the full complement of a submarine crew, or even for submarines to leave base short of a full crew.

Resources for maintaining waste storage facilities have been sharply cut back from their already meagre level, and in the last two years hardly any work at all has been done in securing radioactive waste. Shipyard services formerly provided by the state are now beyond the economic means of the Northern Fleet, which has outstanding bills totalling billions of roubles. On 21 September 1995, the power company Kolengero shut off electricity to Gadzhievo naval base, including supply to weapons stores there, in response to a US$4.5 million unpaid bill. Power was restored again 40 minutes later after the Northern Fleet sent soldiers to the transformer station. The Northern Fleet command later stated that never again would Kolengero dare to shut off the power. On 26 September, the power was again shut off for 20 minutes, this time at Sevmorput shipyard.

A number of alternative income earning possibilities have been suggested for the Northern Fleet, including leasing its nuclear vessels for other than military purposes or just selling them to other countries. One submarine was used, for instance, to transport potatoes and fruit, while another launched an experimental German rocket. India has plans to build nuclear powered submarines and has entered into a co-operative venture with Russia to develop the reactors for the new class of submarines.

## Conclusions

To allow such a situation to arise, never mind to obstruct its resolution, is simply irresponsible. Russia is certainly not alone in its blinkered attitude to nuclear power, being obsessed with advancing its immediate application with little idea of how to manage when anything goes wrong or of how to cope with the waste (and the military of most countries operate under some degree of secrecy). However, a combination of economic difficulties and a zealous rush to build nuclear submarines has resulted in a particularly large amount of nuclear material in a particularly hazardous state. There are several immediate needs such as the establishment of a regional storage facility, and to deny this on the grounds of national security is highly questionable and extremely dangerous. ❑

Bellona can be contacted for copies of their reports.
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Grunerlokka
N-0505 OSLO
Norway
URL: http://www.grida.no/ngo/bellona/

**Thomas Nilsen is a member of the Bellona Russian group, and is one of the authors of the report *The Russian Northern Fleet, Sources of Radioactive Contamination.***

| Place | Facility | Amount |
|---|---|---|
| Zapadnaya Litsa | Naval Bases | 26 operational nuclear submarines<br>1 inactive nuclear submarine with nuclear fuel<br>1 inactive nuclear submarine<br>23,260 spent fuel assemblies<br>2,000m³ liquid radioactive waste<br>6,000m³ solid radioactive waste |
| Vidyayevo (Ura Bay) | Naval Bases | 4 operational nuclear submarines<br>1 reactor of Nurka class<br>14 inactive nuclear submarines containing nuclear fuel<br>at least 3m³ liquid radioactive waste<br>solid radioactive waste |
| Gadzhievo (Skalisti) | Naval Bases | unknown number of nuclear submarines<br>200m³ liquid radioactive waste<br>2,037m³ solid radioactive waste<br>occasional service ship containing nuclear fuel<br>occasional service ship with liquid radioactive waste |
| Saida Bay | Storage Facility | 12 submarine hulls with reactors |
| Severomorsk | Naval Base | 2 nuclear powered battle cruisers |
| Gremikha | Naval Base | some operational nuclear submarines<br>15 inactive nuclear submarines<br>300m³ solid radioactive waste<br>2,000m³ liquid radioactive waste<br>795 spent fuel assemblies<br>9 reactor cores from submarines with liquid metal cooled reactors |
| Nerpa | Shipyard | 2 submarines in process of being decommissioned<br>Periodical service ships containing spent nuclear fuel<br>Periodical service ships with liquid radioactive waste<br>200m³ solid radioactive waste<br>170m³ liquid radioactive waste |
| Shkval (Polyarny) | Shipyard | 1 submarine in for maintenance<br>1 service ship with spent nuclear fuel<br>1 service ship with liquid radioactive waste<br>7 inactive nuclear submarines with fuel<br>storage facility for solid radioactive waste<br>150m³ liquid radioactive waste |
| Sevmorput | Shipyard | 1 inactive nuclear submarine with spent nuclear fuel<br>1 inactive nuclear submarine — defuelled<br>occasional service ship with liquid radioactive waste<br>storage for solid radioactive waste |
| Severodvinsk | Shipyard | 12,539m³ solid radioactive waste<br>3,000m³ liquid radioactive waste<br>4 nuclear submarines in for maintenance<br>12 inactive nuclear submarines with nuclear fuel<br>4 reactor compartments from decommissioned nuclear submarines |

**Table 1:** Northern Fleet sources of contamination

# Italian energy conservation reform threatened

IN 1991 the Italian parliament passed a law enacting the country's National Energy Plan. Among the decrees that were subsequently issued to implement this framework law, one provided incentives for renewable energy schemes and also for high efficiency conventional power plant. Known as CIP 6/1992, this decree was generally considered to be an important first step towards a policy of efficient energy use.

The decree had several important consequences. First, it stimulated the need for an upgrade and renovation of the entire power infrastructure in Italy; second, it served to break the electricity production monopoly within the country by enabling independent power producers to sell electricity; and third, it led to the gradual decentralisation of the energy system. With large-scale power plants and inflexible central planning evidently not being able to take into account local needs and local resources, this last point is considered by many to be a prerequisite for sustainability.

A ranking system was used to determine which schemes would be granted money from the initiative. Renewable energy sources were at the top of the ladder, whilst other, non-renewable schemes were only accepted when they achieved a very high level of energy efficiency. The financial support which each producer received varied in accordance with the energy efficiency of their operations. Independent producers which qualified to deliver the electricity to the grid were paid a price comprising two components: the cost avoided by the National Utility ENEL, and an incentive. As with the Nffo and SRO in the UK, the money to finance this incentive was raised by a very small increase to electricity consumers' bills. Also, again as in Britain, payment was made on delivery of electricity to the grid and not as a payment during the building of the scheme.

Over the last three years, the initiative has proved to be very successful, surpassing most people's expectations. Over 500 new small or medium-scale power plants have been proposed and accepted, having an installed capacity of 7,500 MW, and applications for an additional 9,000MW are pending. Schemes are well distributed throughout the country and have been developed particularly in areas where there was previously an electricity deficit. To date, the majority of schemes have utilised renewable, waste and residual energy sources. However, combined-cycle cogeneration plants have been developed to benefit from the initiative, and in such cases, when fossil fuels are used, the efficiency of the plant is significantly higher than most existing plant within the country.

As would be expected, the national electricity utility, ENEL, though able to benefit from the initiative has been opposed to it as it has led to the loss of the utility's monopoly position within the country's electricity market. Until now ENEL has been in a position where it had to accept the reform, but with the new Italian government intending to privatise the utility, the new managers who have been appointed have been lobbying to protect the company against the effects of the new legislation. They are finding a favourable response because the market price of ENEL shares is likely to be higher if the company is a monopoly, so the government stands to gain from listening to their pleas. CIP 6/1992 has been suspended while new laws and measures, which could nullify the reforms, are under discussion. Should the decree be cancelled, the consequences are likely to mean:

- the elimination of one of the few instruments that could reduce fossil fuel consumption, and thus reduce emissions, as required by the international agreements signed by Italy;
- the loss of an important opportunity for reduction of energy imports from abroad;
- the interruption of the newly begun process of renewal of the national power sector;
- giving the signal that Italian energy policy is contrary to European legislation aiming to improve energy efficiency levels; and
- privatisation of ENEL would lead, in effect, to the creation of a private monopoly in the production of electricity.

Should the situation revert to that of the past, Italy would lose one of the key measures which it has been using to comply with its obligations under the Climate Convention to which it is a signatory. Indeed it is evident that even now it has only a very limited ability to comply. With next year likely to see further measures being agreed to at the third Conference of the Parties' signatory to the Climate Convention in order to limit $CO_2$ emission levels, the suspension of the reform appears to be a very short sighted action. ❑


FoE Italy campaigners celebrate 25 years of FoE International. FoE Italy is campaigning to save energy reforms.

**An important energy conservation reform which has operated for the past four years in Italy is presently at risk.** *Laura Radiconcini* **explains why.**

Amici della Terra is urging people to send protest faxes to the Italian Minister of Industry, Pier Luigi Bersani, expressing concern over the decision to suspend and perhaps nullify the reform. He can be contacted at: Ministro dell'Industria, Via Molise 2, 00187 Roma, Italy; Fax +39 6 47887964, with a copy to: Minister of the Environment; Fax +39 6 6797257.

**Laura Radiconcini is international co-ordinator for Amici della Terra in Rome, Italy**

# A ray of sunshine in Scandinavia

*Kerr MacGregor* **recently went on a trip to Sweden and Denmark where solar applications supply the heat needs of anything from small housing developments to small towns.**

CONTRARY to popular opinion, it has been claimed that for applications such as heating of buildings, solar energy is actually of greater use at higher latitudes. Quite simply, the climate is colder, heat requirements are greater and so any solar heating will be used for more months in the year compared to sunnier climes. So although the amount of sun falling on Sicily is substantial, its use for two months does not equal the use of Shetland's lesser resource for eight months. Add to this the fact that the potential for solar heating in higher latitudes tends to be underestimated — data is usually collected by horizontally placed solar panels when oblique panels are required for maximum energy capture when the sun is low in the sky — and it becomes apparent that the sun is an unnecessarily untapped energy source in Britain.

The Scottish Solar Energy Group (SSEG) was founded in 1980 and has acted as the main focus of solar energy research, development and application in Scotland. Amongst its activities the SSEG has organised meetings, field trips, and conferences, including the very successful Northsun series of international conferences which focus on exploring the special problems and possibilities of using solar energy at high latitudes. This summer, a group of SSEG architects, engineers and students went to see solar applications working in two Scandinavian countries of similar climate to the UK: Sweden and Denmark. This is a summary of the tour, which only just touches on many such examples in the two countries, with some background to begin with.

**Solar technologies** can be divided in to three main categories: active photovoltaic, passive thermal and active thermal. Photovoltaics involve transformation of the sun's energy to an electric current. Passive thermal methods make the best use possible of the sun's heat and light through clever building design. Finally, active thermal methods use solar collectors to capture the sun's energy to heat air or water, for use as space heating and/or hot water supply. The Swedes and the Danes have over the years developed some of the world's best solar collectors, which are presently cheaper than photovoltaics. In reference to their less than sunny climate, Denmark's Energy Agency motto is: "We produce some of the most efficient solar collectors in the world — because we simply have to!"

Kerr MacGregor models solar collectors in a Swedish field

**Gothenburg, Sweden:** Christer Nordstrom is a Swedish architect who is active in developing retrofit solar techniques, for existing housing stock. Under his supervision, a group of multi-storey flats owned by a housing association have been modified for solar gain during a normal upgrading of the flats. The entire roof surface of each block of flats has been transformed into a solar air-heating collector. During the day, heated air is forced by small fans (the energy to run the fans equals about 5% of the total energy saving) through a cavity created between the old wall and a new insulating external wall, providing space heating to supplement the local district heating system. On summer days when building heat is not required, the hot air is passed through an air to water heat exchanger to pre-heat domestic hot water. The energy demand on the district heating system has been reduced by about 65%.

**Chalmers University:** Thanks to a funding arrangement between builders, a housing association and solar equipment manufacturers, plus modest government support, two new housing developments have been built to research engineers' solar specifications. Solar heat collectors were integrated into ordinary roof surfaces prior to being lowered onto the body of each house (as opposed to being added on to old housing stock as in the previous example). Communal heat stores were also incorporated into the development, which can store heat, piped from the houses for several weeks.

Five miles south of Gothenburg is the **TeknoTerm** factory, which produces the advanced absorber strips used in most Swedish, and many other countries', solar collectors. A selective absorbing surface of aluminium covers copper tubing for a minimum of radiative heat loss, and thin membranes between the absorber plate and the outer glazing suppress convective heat loss.

Over 5,000 square metres of high efficiency solar collectors, located in a field in **Falkenburg** (see photo), represent one of the biggest solar heating systems in Sweden. Pipes connect the collectors to a huge subterranean cavern filled with water, which heats to almost boiling point by the end of summer. Solar heat is delivered into the local district heating system and heats a small town over the long, cold Swedish winter. There are about eight such 'mega' solar systems with inter-seasonal heat storage in Sweden, and there has been clear progress over the years in improving efficiency and reducing costs. One of the key factors has been the development of large-scale, ground based and site built solar collectors, of flat-plate design.

**Copenhagen:** At the Danish National Solar Test Laboratory in the suburbs of Copenhagen are test facilities for both thermal and photovoltaic solar collectors. The Danish government is keen to

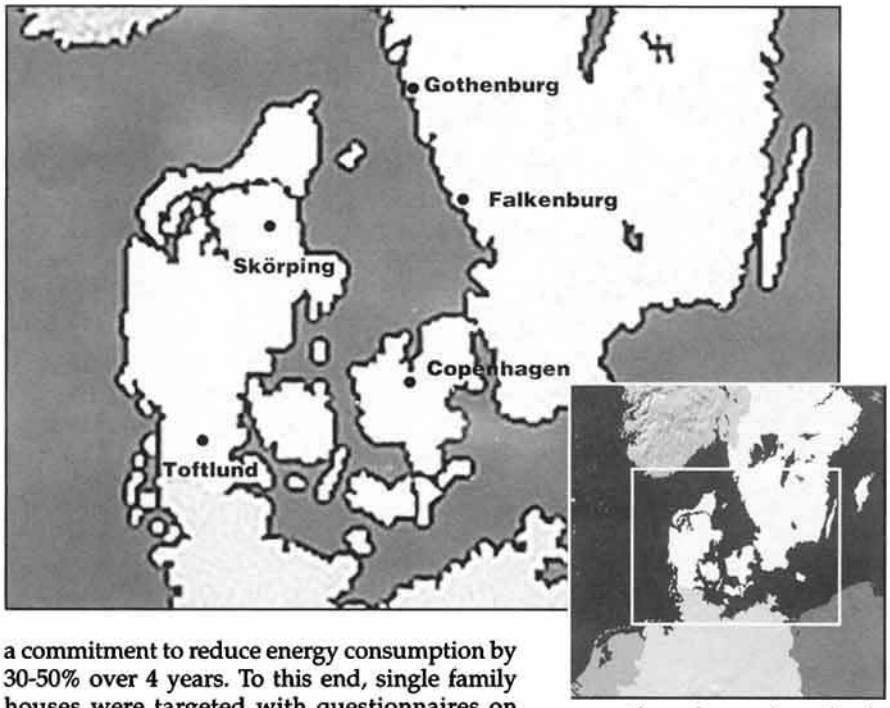
promote solar energy and it provides an installation subsidy of about 30% to householders, subject to satisfactory installation and use of approved components. Subsidy levels are fine tuned according to the magnitude of energy savings measured at the test laboratory. At the same time, national government funds a comprehensive publicity campaign for solar energy, and as a result of all this support, the Danish public has a lot of confidence in solar water heating — installation rates are increasing at about 25% per year, with about 10 small to medium-sized companies making components and systems.

At **Skotteparken** (meaning the park of the Scots) on the outskirts of Copenhagen, is an innovative housing scheme supported by the EU Thermie programme, built by the Danish Building Association and designed by architects Henning Larsen and energy consultants Cenergia. Architects and engineers involved in the project took great efforts to integrate the engineering systems into the architectural and landscape context of the scheme. Since completion in 1994, the Skotteparken development has been used as a model of good practice, including special mention at the Habitat II Istanbul conference.

Each house has special built-in low-energy features. Double glazing with low emissivity glass minimises heat loss. Heat is recovered from ventilated air and there is high insulation in the fabric of the buildings. On a more elaborate scale, some of the buildings have large roof-mounted solar collectors which, with medium-term heat storage, work in conjunction with the low-temperature district heating system to provide both hot water and space heating. An energy management system is used to control the operation of the district heating network, so that its heat is delivered only when one out of six local solar storage tanks calls for heat. Because heat from the district heating is supplied in pulses, and because it operates at low temperatures, there has been a 65% saving of district heating network losses. Energy use for heating and hot water has been reduced by about 55%.

**Jutland :** One of the biggest solar manufacturers in Denmark, Ar-con, in Skorping, uses solar strips made by the Swedes in assembling solar collectors to their own specificaions. Specialising in district heating, they have installed a number of large systems, including 3,000m² of solar collectors at Ry in Jutland, Denmark's largest solar energy system, using a super efficient collector with a teflon coating between the absorber and the cover.

Further south, not far from the German border, is the town of **Toftlund**. Toftlund is one of a group of European cities which have made a commitment to reducing energy consumption and environmental impact, in the spirit of Gro Harlem Bruntland, formerly prime minister of Norway. As a Bruntland town, Toftlund has made a commitment to reduce energy consumption by 30-50% over 4 years. To this end, single family houses were targeted with questionnaires on energy consumption, eliciting a 90% response rate. Those with medium to high energy consumption were subsequently presented with a package of energy saving measures for a fixed price, an offer taken up by 139 out of 570 houses.



The main stopping points in the Scandinavian tour of solar initiatives

Also in Toftlund is the Bruntland Centre, built as an educational showpiece for low-energy and solar building techniques, and using a minimum of bought energy. Features include photovoltaic cells integrated into the glazed roof of the main atrium, smart glass (changes its optical properties in response to temperature and light), the use of dense building materials to minimise temperature swings and numerous educational, hands on displays.

**On Reflection:** In taking a longer-term view of investments, in having a high regard for the environment, and in having real energy policies and plans, the patience of the Swedes and the Danes in developing solar technologies is now paying off. Both the companies mentioned, Ar-con and TeknoTerm, export around the world, and solar research in the two countries is among the most advanced in the world. The population at large benefit from a better, safer environment with absolutely no loss in comfort. And all this in climates not dissimilar from those in northern Britain.

Projects are designed within the limits imposed by individual building design and characteristics of existing energy supply, such as district heating systems common in Scandinavia. Obviously there will be aspects that cannot be replicated piece for piece elsewhere. But the support given to technological innovation, and the faith in solar technology evidenced by large-scale practical application and government help, is within the bounds of any northern European country which might have formerly believed that solar was not for them. ❑

**Note:** A list of contacts for all the schemes mentioned in the article is available from the editor.

**Kerr MacGregor is chair of the Scottish Solar Energy Group and a senior lecturer at Napier University.**

# District heating in Lithuania

*Dr V Klevas* **and** *Prof. M Tamonis*

**continue their look at district heating in Lithuania** (SEJ 110), **suggesting possible ways forward for reform of the sector.**

DISTRICT heating reforms have been a by-product of the changes within central and eastern European countries, as they struggle to adjust to a market economy. Lithuania, having perhaps the most developed and comprehensive district heating systems in the world, has been the key exception, avoiding the need for significant reform.

However, growing economic and technical problems have begun to affect the district heating systems within Lithuania, primarily caused by the following factors:

- there has been a decline in the amount of heat produced at combined heat and power plants, mainly due to the availability of cheap electricity produced at the country's Ignalina nuclear power plant;
- state and municipality authorities have been partially subsidising energy prices;
- the tariff system for district heating is centrally fixed, preventing differentiation according to the costs incurred at different district heating plant throughout the country;
- the main assets of energy companies have seen significant depreciation over the last few years, leading to a situation where it is more difficult for them to invest in the restructuring process which is required; and
- the district heating system has been subject to increasing centralisation.

These factor have led to a dramatic decrease in the demand for heat produced and consequently a major increase in the costs per unit output. Heat tariffs have now reached such a level that they are generally considered to be socially dangerous.

At present all district heating systems operate at a loss and face rapidly increasing heat production costs. Costs increased by 29% between 1993 and 1994: materials and similar costs increased by 21%, salaries and wages increased by 67%, and other production costs grew by 78%. With consumers also becoming more and more in debt to the district heating companies, the industry has been left with negative working capital for the last two years and are surviving by either their costs being artificially supported by other activities, or by increasing their debts.

The seriousness of the situation should not be underestimated — it could cause a crisis in the economic and social structure of the country. The underlying problems of indebtedness need to be tackled, but widely held beliefs that increasing the price of heat and paying subsidies to those consumers not able to afford the increase, are unlikely to tackle the root of the problem.

In a study "Decentralisation of district heating management", carried out by local and foreign experts under the European Commission Phare programme (probably one of the most important projects funded by Phare in Lithuania), decentralisation was recommended as the best way forward. Its recommendations to decentralise district heating management down to the municipal and district level will be a major task, but it is presented as being the best way of restoring financial viability of the system.

The proposed district heating management concept, the main elements of which have been verified by the experience of other central and east European countries, include the decentralisation of district heating management. This can be achieved by implementing corporatisation, commercialisation and privatisation of district heating entities.

Corporatisation is achieved by transferring state owned assets of district heating companies to the ownership of the municipalities (equity capital) and by forming horizontal district heating management structures. Commercialisation of district heating should restore the economic viability of the district heating trading companies, ensuring efficient use of present assets and provide economically attractive conditions for investment capital.

If the plans go ahead, market conditions in district heating will be initiated by the government splitting up and privatising separate district heating schemes. Decentralisation will need to be implemented with great care and by a gradual restructuring of the present district heating system, as they are transferred to municipality and district heating companies. It will be important, however, to set pre-conditions to prevent massive growth in heat prices and to promote the reduction of heat consumption.

The deepening economic crisis in the energy sector has shown clearly that centralised management is unable even to start solving the real problems and decentralisation is desperately needed. The main purpose of any reform must be to prevent crisis by ensuring the restoration of financial viability, halt the rise in heating prices, and introduce measures to reduce heat consumption and corresponding production. Energy problems were the subject of a most passionate debate in the recent elections, which saw the communists lose power for the first time. ❑

**Dr V Klevas and Prof. M Tamonis, are researchers at the Energy and Air Pollution Information Centre, Lithuania.**

# Solving the Caucasian energy crisis

STRADDLED by the Black Sea to the west, the Caspian Sea to the east and with Russia to the north, the Caucasian states are suffering, along with many former-Soviet Union countries, from the effects of a devastating energy crisis. They are at a crossroads following their newly found independence, with decisions needing to be taken over whether to continue their reliance upon imported fossil fuels, which they are finding increasingly difficult to afford, or to develop their renewable resources which are in abundant supply.

Although in recent years the importation of fossil fuels has fallen significantly, and looks likely to continue to do so, in Georgia, for example, they account for nearly 90% of the commercial energy supply. Illegal felling of firewood is a major problem within the country, accounting for about 14% of total energy consumption. The region already uses some hydro power, but there is still an abundant resource which could be exploited. However, plans in the early 1990s for a large-scale hydropower scheme in Georgia were abandoned primarily due to environmental concerns.


There are three large-scale power plants within the Caucuses, including an 880MW nuclear power plant in Armenia. Situated only 40 km from the Armenia capital, Yerevan — within an active seismic zone — there is genuine concern over the safety of its two ageing VVER-440 reactors, built in 1976. Following the nuclear accident at Chernobyl in 1986, the power plant was shut down, but with a worsening shortage of electricity within the country, two years ago it was decided to reopen the plant.

The European Union (EU) Tacis programme, which is designed to help former-Soviet Union states in their transition, has concentrated upon conventional resources which the states are finding more and more difficult to afford. NGOs within the region are frustrated by what they see as European taxpayers' money helping to soften opposition to unpopular nuclear reactors and inefficient fossil fuel plants in the region. Meanwhile, energy experts within the countries propose several renewable energy projects to utilise the abundant renewable energy resources.

There are several existing hydropower schemes within the region which are in need of renovation, and wind, geothermal, solar and small-scale hydropower are all considered to be feasible. While there is a need to develop sources of energy quickly, NGOs also believe that the region would be an ideal place for development of solar thermal technologies, having a good level of solar insolation, at 1300-1800 kilowatt hour per square meter per day.

One idea has been to develop a large scale Air Thermal Power (ATP) scheme. Germany's Federal Minister of Science and Technology offered to provide 50% funding for such a project, but co-funding has yet to be found. The principal components of the ATP 'Solar Chimney' are: the collector — a kind of a greenhouse where air is heated and expands; the tower which provides an up-draft for the heated air; and the turbine and generator which convert the energy of the air ascending through the tower. The air rotates as it travels up the chimney and so a special system is required to utilise this rotational air flow. A joint venture proposal between Georgia, Stuttgart University and Cranfield University was put forward to develop the demonstration project, following on from a prototype of the design built in 1982 near Madrid by the German partners.

Though innovative technologies such as this will not meet the short-term problems facing the region, it is important for the countries not to become dependent upon unaffordable imports. EU funding is available for demonstration projects, so why not place them in a region which is suffering from an energy crisis and which would ultimately benefit from their development. ❑

**The Caucasian states of Georgia, Armenia and Azerbaijan are suffering a major energy crisis. The region should be attracting innovative technologies, argues** *George Mamulashvili*

**George Mamulashvili, PhD, is Chairman of the Alternative Energy Commission of the Georgia Greens, Tbilisi, and the Corresponding Member for Georgia of the UK Institute of Mechanical Engineers.**

# Britain is best — for ideas

**Plans for an ambitious offshore windfarm on the Norfolk coast come as no surprise to Britain's wind farm advocates. But why, asks *David Ross*, did we have to wait 15 years for the idea to be taken seriously?**

A small article in the *Financial Times* in the summer of 1996 sparked a flurry of interest in a joint Powergen/Vestas venture for a windfarm off the coast of Great Yarmouth. Up to 25 wind turbines are proposed, with a combined capacity of 37.5MW, making it larger than any windfarm operating in Europe to date (the largest has just opened at Carno in Wales with a total 33.6MW capacity). Extra large 1.5MW wind turbines have been developed by Vestas for use offshore (the normal size is around 0.5-0.7MW for terrestrial wind farms), which, when coupled with site specific factors such as an underwater sandbank three kilometres from the shore for anchorage of the turbines, make the project technically and economically feasible for today's generating climate.

Yet the idea for offshore windfarms for Britain, and for one at this location in particular, is not a new one. I am a proponent of wave power and offshore wind, and put forward offshore wind as an alternative to Sizewell B at its 1984 inquiry. The idea was rejected, and in the meantime Sizewell B has been built to the tune of £2.9 billion, while the Danes developed superior wind power technology which the British now import.

## Missed opportunity

Powergen's announcement comes 15 years after the scheme was first put forward — by PowerGen's own mother company, the pre-privatisation Central Electricity Generating Board (CEGB). We could, and should, by now be obtaining a large proportion of our electricity from windfarms at sea, where the environmental trade offs are less contentious than is the case for their land-based counterparts. And it could have been so, if it had not been for the drive for nuclear, followed by the dash for gas.

Offshore wind, the shape of things to come?

The first public disclosure of the vast potential in the wind around our shores came in a paper presented to a British Wind Energy workshop at a conference in Cranfield in April 1981. It came from three scientists in the planning department of the CEGB. They showed that wind turbines based in shallow water in appropriate offshore locations around Britain (see figure 1), and at least 5 kilometres from the shore to avoid visual blight, could "on conservative assumptions" produce 243 terawatt-hours per annum, "comparable with current UK electricity generation." This they called Class I. Reductions to take account of shipping lanes and fishing areas bring the figure down to 101TWh/year, or Class II.

Eighteen months later, another paper was presented at the Fourth International Symposium on Wind Energy Systems at Stockholm. It came from another four scientists, all again from the CEGB. They put the potential resource at 230 TWh/year, almost the same as their colleagues' figure.

These were sensational findings. They should have been taken up with enthusiasm by the CEGB, which employed the scientists and paid for their research at its own laboratories at Marchwood and Leatherhead. But the papers came at a time when Britain was considering Margaret Thatcher's Ten Commandments, to build one Pressurised Water Reactor (PWR) a year for the following ten years so as to free the country from the power of the National Union of Mineworkers. The CEGB was dominated by nuclear engineers and scientists and was not going to concede the case for wind. They might have diverted resources from the nuclear drive, but instead the plan for offshore wind, like the case for harvesting wave power, was ignored.

The attitude of the CEGB policy-makers was revealed by Sir Walter (later Lord) Marshall, at the opening of its Carmarthen Bay wind turbine in November 1982. Marshall, then chairman of the CEGB, was reported as saying that "it was the CEGB's aim to establish not only whether wind power could be economic but whether it would be environmentally acceptable to the public. This was by no means certain. About 1,000 large machines spread over 300 square miles would be needed to match the planned output of the proposed PWR nuclear power station at Sizewell" (quoted from a CEGB press release). What a way to launch a promising new resource!

When alluding to offshore windfarms, the release stated: "looking to the longer term, the Board had offered to host an internationally-mounted offshore prototype wind machine." That meant that if some other countries would provide the money, they could use our water. How very generous.

This was confirmed as government policy at the Sizewell B inquiry when Mr Priddle of the Department of Energy said, in reply to my argument that offshore wind power should be developed as an alternative to another nuclear power station, that offshore studies would continue to "the minimum level required to keep

options open for worthwhile international collaboration." A vast potential source of energy was deliberately being put aside.

The energy establishment pursued this policy until the present time. Principal among its motives was to avoid having to face a popular demand for investment in anything other than nuclear power. And wind power, based on land, was regularly used as an excuse for the failure to invest not only in offshore windfarms but also in wave energy. Both of them, admittedly, would need considerable expenditure on infrastructure but the potential reward was, and is, enormous. The official line was to press on with onshore wind power, thinking, as Marshall had said from the start, that it could not alone become a serious rival to main sources on the Grid because of the lack of suitable space (in England and Wales, if not in Scotland).

## Wind and wave

How does offshore wind compare with wave power? The view expressed in those CEGB papers was that the offshore wind resource is greater. My personal view is that if you go to sea it makes more sense to harvest the waves, which are a more concentrated form of the wind's energy (per unit area there is more energy in waves than in the more diffuse winds). However, there are no grounds for thinking that the one necessarily precludes the other.

Wind turbines at sea are particularly stressed, standing high above the water, reaping the wind before its strength is dissipitated at land, and subject at the same time to enormous pressure down below from tides, currents and waves. Wave power generators, mostly lying low in the water, should survive better. Admittedly, Osprey One challenges that view ("Wave power ups and downs" SEJ106), but wind power too had some unfortunate experiences in California and elsewhere before it became established.

An ideal solution would be for the wind turbines to be based in the North Sea, where the conditions are milder, while the natural site for wave power is off the Hebrides on the west coast. That was the CEGB idea. There is room enough at sea for both. The case for wind turbines off the coast of East Anglia was made by me, a wave power man, because it was the appropriate technology for the sea off Sizewell.

## So what about now?

Sited only three kilometres off the coast, the proposed PowerGen offshore windfarm will be nearer to the shore than the earlier CEGB plans suggested, namely that the turbines should be at least five kilometres from shore, "to minimise visual impact." The closer siting might evoke some protest, but it is a matter of subjectivity with people like Bernard Ingham (former press secretary to Margaret Thatcher and vice president of the anti-wind group Country Guardian), who think that nuclear power stations are beautiful.

PowerGen is expecting financial support under the government's Non Fossil Fuel Obligation scheme which sub-sidises non-polluting sources (and enables the owners of gas fields, oil fields and coal mines to eke out their diminishing resources for a little longer). The unit cost of offshore wind-electricity is generally regarded as high — one estimate is that it will cost 50-100 per cent more than from onshore windfarms. The range of costs in itself, from 50 to 100 percent more, would suggest a lot of guesswork was involved. Changes in the discount rate of a few percent will alter the economic picture quite dramatically. A windfarm is capital-intensive — that is, the main expense comes at the start and the benefits show later on when the "fuel" arrives free, and high discount rates discriminate against such a source. If windpower seems expensive, change the discount rate!

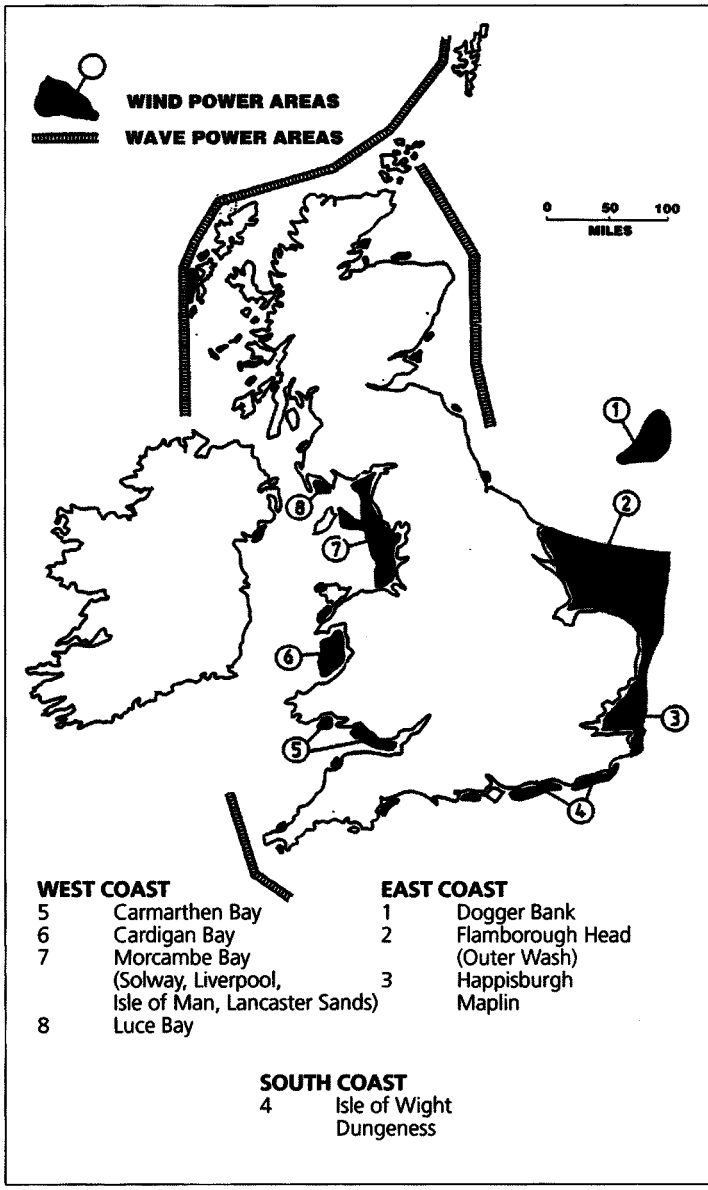



**Figure 1:** Offshore wind and wave power. Appropriate locations.

None of this detracts from the fact that the proposal from our second-largest generating company is welcome. It is to be regretted, however, that Britain lost the chance to take the lead in this enterprise. Back in the eighties, the James Howden group in Glasgow led the world in developing wind turbines. After losses in California, and with practically no market in the UK, Howden abandoned wind energy. Britain could have won a huge export market and led the world. Instead, PowerGen has had to go to Denmark to buy its machines. And the PWRs and AGRs which we were going to sell around the world to the great advantage of British industry have failed to find a single buyer.

It is not often that the people who said the virtuous things can utter so soon the immortal words: "We told you so." ❑

**David Ross is a writer and journalist. He is author of *Power from the waves*, OUP, Dec 1995.**

# Planning for wind

AN initial, relatively successful, pass rate for wind planning applications for the first couple of years of the Non-Fossil Fuel Obligation (Nffo) in England and Wales has been superseded by a clamp-down across the UK. Par for the course nowadays is a heated struggle between pro and anti-windfarm factions, fought out through the country's planning process. Sir Hector Monro MP, formerly Scotland's environment minister, has even admitted masterminding extra stringent planning regulations for windfarms in Scotland.

Since January 1995, 77% of all wind farm applications in the UK have been rejected according to figures collected by the British Wind Energy Association (BWEA). Anti-wind group Country Guardian is happily accepting credit for this — a BWEA survey covering four months of media coverage found that the 47% of negative wind coverage was heavily influenced by Country Guardian identical 'round robin' letters appearing in many newspapers.

Monro, Scottish environment minister when the Scottish Office was considering its stance on windfarms, admitted to the *Scotland on Sunday* that he is responsible for policy requiring every planning application for 10 turbines or more warranting an automatic referral to the Secretary of State for Scotland. Sir Hector believes climate change predictions are overstated and not an immediate cause for concern.

A brief snapshot over past months on windfarm planning applications clocks up two failures, two successes and three ongoing public inquiries. Twenty-six turbines at Cilciffeth in Pembrokeshire and six turbines for the Merseyside docklands industrial complex failed to make it through planning. The Merseyside proposal was rejected on the casting vote of the planning committee's chairman, going against the planning officer's recommendation (even Country Guardian supports wind turbines in industrial settings: of Blyth Harbour, Robert Woodward of Country Guardian says it is "already industrialised and perfectly appropriate for turbines"). On the successful side, an inquiry reporter has ruled in favour of five turbines at Carlesgill Hill in Scotland, angering Monro, the local MP, and developer Border Wind has had a revised proposal for four turbines at Wearside approved by the planning authority.

Outcomes from public inquiries at Islay, Largie and Newcastleton, all in Scotland, are awaited. Objections to both the Islay and Largie proposals hinge on populations of Greenland whitefronted geese. On Islay, turbines will be in the line of flight of geese flying to and from their roosting site at nearby Duich Moss.

## RAF objections

Border Wind, proposers of a five turbine development on Blinkbonny Hill near Newcastleton (in the Scottish borders) has a rather daunting objector in the form of the Ministry of Defence (MoD). A preliminary statement of fact (Phase 1) from the Blinkbonny reporter indicates that objections relating to visual and noise impact have been rejected, but that the MoD's objections are being taken seriously. Whether this means that the reporter is minded to reject the wind farm based on the MoD's objections of course remains to be seen. However, documents seen by *The Safe Energy Journal* cast serious doubt on the validity of the MoD's arguments.

There are two main MoD objections to the wind farm, which relate to nearby RAF Spadeadam: the turbines would necessitate avoidance by low-flying aircraft, reducing training value of the range; and rotating turbine blades could interfere with radar equipment in use at the base. Consultant and witness for the developer Malcolm Spaven takes issue on both counts in his report to Border Wind. On the first, Spaven says that due to there being alternative preferred routes, military aircraft are unlikely to choose to fly over the top of Blinkbonny Hill. In fact, to do so would be to increase the chance of radar detection which low flying is designed to avoid.

Also, contrary to what the MoD claim, there are precedents for avoidance areas in the Spadeadam range danger area and that anyway, there was no suggestion that formal avoidance status would be sought for the windfarm. With regards to radar interference, civil telecommunications and broadcast facilities are likely to have more of an overall effect. A trials facility in the USA currently used by the MoD is being moved to a new location in close proximity to 5,000 wind turbines.

*The Safe Energy Journal* has also been in contact with EcoGen, a company proposing a 130 turbine wind farm in Northumberland, also in RAF Spadeadam's range. Initial consultations with the RAF at Spadeadam led them to believe that there would be no problem at all with the development, either on low flying or radar grounds. A letter from RAF Spadeadam in EcoGen's planning files[1], dated 9 December 1992, states in reference to the Humble Hill windfarm "the Electronic Warfare Tactics Range at RAF Spadeadam has no objection to the proposal".

It wasn't until December 1993 that EcoGen received a letter from the MoD informing the company that the MoD intended to lodge a holding objection. It then took an MP to write to the MoD before EcoGen knew the details of this objection — interference with radar and low flying. Tim Kirby of EcoGen told *The Safe Energy Journal*: "We have had an OK from the RAF staff commanding Spadeadam reversed — seemingly by MoD politicians. Whatever you think of the windfarm, and virtually every other consultee is supporting it, either the RAF staff were incompetent, or the MoD has been meddling." ❑

BWEA

(1) Ecogen intend to have planning information available on the web, http://www.ecogen.co.uk

# Wind farm firsts

EUROPE'S largest wind farm to date, Carno in mid-Wales, opened in October, coming on line with 33.6MW of installed capacity.

Comprising 56 turbines each of 600kW maximum output, Carno is National Wind Power's ninth and Powys' fourth operating wind farm. The combined yearly production of 225 million kWh from Carno, Llandinam, Cemmaes and Bryn Titli means that 40% of total electricity demand in Powys is now wind-supplied (the total population of Powys is 116,000).

Similarly billed as Europe's largest wind farm, but not yet built, Lichtenau wind farm in the former East Germany will have a total generating potential of 36MW. Developer Winkra-Project has been given district government approval for the 57 turbines, and it is expected to come on line mid 1997. Even without Lichtenau, Germany will match the USA in installed wind energy capacity by the close of 1996, with about 1,600MW expected to be operating, compared to the USA's 1,650MW. The UK's total installed capacity is about a sixth of this.

■ Luxembourg, Iran and Costa Rica are all set to get their first wind farms. Luxembourg's is the smallest of the three at a planned 0.5MW, while Iran is to get a 10MW project funded by the World Bank. Costa Rica's first commercial-scale wind farm (19.8MW) is being funded through a Joint Implementation (JI) Scheme, which allows companies to meet required greenhouse gas reductions with cuts in a country other than their own.

The rationale for this arrangement is cost-effectiveness — for a certain amount of $CO_2$ reduction, it is often cheaper for Western companies to pay for that reduction in a country such as Costa Rica, than to cut emissions from its own operations. Costa Rica's is the first wind farm to be built under JI. ❑

# Solar discovery

TEAMS of researchers from Germany, Glasgow and Cambridge have combined to prove what every scientist knows, that the first reference book for ideas is nature. Using advanced microscopy techniques, they have unravelled the molecular structures and arrangements which make it possible for a bacteria to transfer solar energy with an estimated 95% efficiency.

*Rhodopseudomonas acidophila* is a photosynthetic bacteria (it synthesises sugar from water and carbon dioxide using the sun's energy) which has evolved to survive in the low light conditions of polluted ponds. All photosynthetic organisms contain certain pigments which enable them to absorb light, but the mechanism by which *R acidophila* does so must be extra efficient for it to survive in such conditions. Using X-ray diffraction and electron microscopy, scientists have built a clear picture of the physical structures which trap, funnel and finally transfer light to the photosynthetic reaction centre with a transfer efficiency of 95%. If a solar cell could be modelled on the bacterial light harvesting system, solar output would substantially increase, as would solar's range of applications.

■ Just outside Geneva, in Switzerland's 'solar city', work has started on a series of rooftop solar collectors for a large complex of flats and shops, in what is the largest installation of its kind in Switzerland.

The black panel collectors will be combined with a two-way flow ventilation system which provides air conditioning in summer and in winter taps into air heated by the earth. It is expected that solar heat will meet all water and space heating needs between June and October, with back-up gas heating being required in the winter months. ❑

# Island power

A major electricity distributor in the Netherlands wants to supply 1,500 inhabitants on the island of Vlieland with energy generated entirely from sustainable sources. Vlieland is not connected to the grid and its average energy consumption needs of 800kW are currently met by four diesel powered generators and one Combined Heat and Power unit.

Powering the island with a mixture of renewables is seen by the distributor Nuon as an option which could be realised within five years. Capacity would more than double, from 2.3MW up to 6MW, to achieve the required electricity supply, and experimental techniques for long-term storage of electricity (weeks rather than days) would be used for the first time. If given the go-ahead by the local council, European and Dutch government funding will be sought for the project, mainly to cover the cost of pioneering technology. ❑

# Biomass: largest Nffo

CONSTRUCTION has begun in Thetford, Norfolk, on the largest Nffo project yet and Europe's largest biomass-fired electricity generator. Operator Fibrowatt expects the 38.5MW chicken litter plant to be the first of many similar plant across Europe. There are already plans for six more: three in Italy where the electricity can be sold at 10p/kWh, much higher than the price Fibrowatt is getting in the UK, and one each in Germany, France and Ireland. At a time when EU regulations governing organic waste disposal are imminent, chicken litter fired plant are a welcome relief to European poultry farmers. In Venice, one of Fibrowatt's planned locations, organic pollution is turning its lagoon green with algae.

■ Plans for Britain's first wood-fired combined heat and power station (CHP) were shown to the residents of Newcastleton, in the Scottish Borders, in October. Biomass developers Borders Biofuels want to use an annual 10,000 tonnes of waste wood from local forests, 7,750 to generate electricity and 2,250 tonnes to fuel a district heating system for the village. The estimated £11,000 cost for installation of pipes and heating systems would be repaid over 25 years through customers heating bills, requiring no immediate capital outlay on their part. With the cost of building the CHP plant included, the total bill for the project comes to around £5.5 million.

Under standard tariffs and fuel prices, and assuming 75% of householders and businesses sign up to the scheme, unit costs are expected to drop by 10% for electricity (from 7.35p per unit to 6.62p) and 47% for heating (from 4.56p to 2.8p). Customers can also expect to pay monthly standing charges of £2 for electricity (plus any levy Scottish Power charge for use of the grid) and £12 for heating. Overall, compared to current costs, this represents about a 50% cost saving on heat and a 10% saving on electricity. ❑

# US takeover fever

IF Ian Lang, trade and industry secretary, passes US takeovers of two more regional electricity companies (recs), just three independent recs will remain. Rumours of a third US takeover in as many months adds to speculation that companies in the US are lining up to break in to the UK market.

From an original 12 Recs formed at privatisation, seven have already been taken over, three of them by US companies. East Midlands, one of the five remaining independent recs, has accepted US based Dominion Resources' offer, and the only hurdle now is the possibility of Ian Lang referring the bid to the Monopolies and Mergers Commission (MMC). In deciding on a referral, Lang must take advice on whether the takeover will degrade competition in the sector. He also needs to know if Dominion has the resources to meet supply obligations.

At the same time, a hostile bid for Northern Electric by CEEnergy in the US is in the balance. Northern is resisting the takeover, claiming that the share offer price undervalues the company. CEEnergy was not deterred, however, from launching a dawn raid on Northern shares, accumulating a 29% stake, helped by the fact that the possibility of an MMC referral of its bid depressed share prices! For CEEnergy to get a controlling interest, it needs Lang's permission. This latest bid is particularly galling for Northern as it hasn't yet recovered from a hostile bid from Trafalgar House, only staved off by promising shareholders extra dividends, a preference share issue and shares in National Grid.

Rumours of further US bids for remaining recs turned all eyes to Offer's Prof. Littlechild. In order to regulate the industry, he needs comparitors, that is independent electricity companies whose share prices are quoted on the stock market. This gives Littlechild an indication of the finances of an average rec. The government blocked previous rec bids by PowerGen and National Power because they would have resulted in vertical integration, a problem none of the present US bids present. ❑

# Transmission impossible

## English pool

THE Electricity Pool is proposing that the pool price paid to generators be indexed in some way to the distance electricity has been transmitted from its source to end use point. It would thus reflect losses which occur in long distance grid transmission. This could result in stations in the north east having their payments cut by up to 9%, while those in the south could see income rise by up to 2%.

## Pile on the cables

Residents in Spain and Switzerland are between them fighting four separate battles against new transmission lines or voltage upgradings.

Red Electra de Espana (REE), Spain's high-tension grid company, wants to link Spain and Morocco with a 400kV cable. REE has offered compensation to the town most affected by the scheme, but will not recognise the town's no vote in a 37% turn out referendum on the cable.

Swiss campaigners claim they are having dangerous electricity lines imposed upon them simply because of the country's strategic position for the liberalised European electricity market. Three grid proposals are being contested: one against an upgrade of the grid to a higher voltage and two against new lines, one of which is to complete the last link via Switzerland of an Austria to Italy connector. Those backing a grid upgrade in the canton of Uri have even been accused of pressuring the canton's environment department into doctoring a report on the effects of electromagnetic radiation,removing reference to long-term chronic health effects.

## America

A Democrat politician in America has cited summer problems with transmission in the US to push renewables and energy efficiency to the fore. Customers in 9 western states and Mexico suffered huge black outs when thransmission lines melted, sagged on to trees which then caused an automatic shut-off of the system. One of the many benefits of moving to decentralised renewable generation, said Democrat Tom Hayden, would be a reduced dependence on the transmission system. ❑

# Selling Nesa

DENMARK'S energy minister, Svend Auken, is fighting to keep the country's biggest electricity distributor, Nesa, in Danish hands. Foreign interest in Nesa heightened in September with Swedish energy giant Vattenfall acquiring a 10.5% stake in Nesa.

Gentofte county council currently holds a 56.7% controlling stake in Nesa, which it wants to sell. Auken is adamant that the distributor's assets, paid for via the bills of about 2m customers, should not be sold to a foreign company for the gain of Gentofte's 67,000 residents. But Gentofte has decided to sell its stake, and the government cannot forbid the sale. Danish legislation does however act as a disincentive by requiring profits from state-controlled energy companies to be recycled back into the business.

Gentofte could finance a whole years activities if Nesa's share price remains at its current high. But the longer the council has to wait, the less it will get from a sale. Copenhagen council, another stake holder, has first refusal on Gentofte's shares and two months in which to decide. ❑

# Hydro shortage

LOW snowfall in the winter of1995/96 followed by a dry summer, exacerbated by energy companies' failure to conserve resources has left Norway's reservoirs short on reserves for this winter.

Norway is almost totally dependent on hydro, but water levels are much lower than the norm for this time of year. Liberalisation is being blamed for a failure to act in the public's interests. Prices were high at the start of '96, and generators produced at capacity. Also, best use has not been made of the connector to Denmark — a revised agreement for exports from Denmark to Norway where Denmark's Elsam agreed to share export profits with its Norwegian partners means that unless Norwegian prices far exceed those in Sweden, it is more profitable for Denmark to export to Sweden.

The Norwegian government is now funding a campaign for energy efficiency, while customers pay dearly for their scarce electricity. ❑

# Gas deal

IN an attempt to avoid grid collapse this winter, the government is considering a scheme to compensate gas-fired generators for the extra cost of switching to higher cost fuel at peak demand. Despite generators being obliged by the Electricity Act to guarantee their contribution to meet demand, on one occasion of peak demand last year British Gas cut off gas supplies to independent producers on interruptible supply contracts. ❑

# Regulation wrangles

AFTER the latest round of regulation wrangles, four power utilities have acquiesced to regulators conditions and another two are to take their chances with the Monopolies and Mergers Commission. Any acceptance of price controls has been at best grudging, in what is a painful time for the utilities as more competition is introduced in the run up to liberalisation in 1998.

Electricity regulator Stephen Littlechild's proposals for the National Grid Company (NGC), which cut roughly £1 billion from its revenues over four years, reducing domestic electricity bills by around £4, will be implemented in 1997. Similarly, British Gas (BG) has decided to accept gas regulator Claire Spottiswoode's price controls which force its supply business to restrict price rises to 4% below the rate of inflation for three years from April 1997. In both cases there were claims that the cuts were far too severe, but with the alternative of a referral to the MMC, revenue cuts proved the lesser of two evils for the companies. Pre-1998 trials of increased competition in gas supply have perhaps added salt to the wound for BG, with new competitors not subject to the same controls.

Scottish Power and Hydro Electric have quietly accepted a reduction in the price they are paid for exports to the English pool, effective for one year up to April 1998.

Meanwhile, in September, Northern Ireland Electricity rejected the utility regulator Ofreg's price controls which would cut revenue by about £353m over five years, and in so doing can expect to wait six months for the MMC to report on its case. Weeks later, Transco, British Gas' pipeline business, also opted for the MMC. A relaxing of Ofgas' original proposals failed to satisfy Transco, and now the case has gone to the MMC Ofgas says it will recommend the tighter controls to the Commission.

Trade Unions and environmentalists have joined the companies in attacking the regulators. Trade Union fears of further job losses at the NGC following on from Offers recommendations ("1998 looms large", SEJ110) have been realised as the company announced higher than expected job losses over the next five years. With the pressures of keeping shareholders happy, regulators sweet and the boardroom in pocket, environmentalists are doubtful as to whether companies will pay due regard to meeting environmental standards, if they come at a cost.

FoE Cymru has sent representations to the MMC concerning a requirement for investment in Transco's pipelines. Methane, a greenhouse gas, could be leaking from up to 50% of the UK's distribution network, which badly needs a programme of renewal, it says. ❑

# Efficiency

A new Energy Saving Trust (EST) programme to encourage domestic energy efficiency schemes made awards totalling £4.7 million to local authorities in November.

The awards aim to support the Home Energy Conservation Act 1995 (HECA) which requires councils to draw up energy efficiency strategies for all housing in their area. The thirty-four schemes, involving 70 local authorities, given HECA Action Awards have also attracted £65 million of private sector funding, and will be self-financing after March 1997.

Savings in carbon dioxide emissions of over 100,000 tonnes a year are forecast by the EST.

■ Electricity regulator Offer is considering if there is any future for energy efficiency in a fully liberalised electricity market, after the deadline for representations passed in October. An energy Efficiency fund run by EST and known as the Energy Efficiency Standards of Performance (SOP) is secure only until March 1998.

SOP projects are funded by allowing electricity suppliers collect a levy from consumers which must then be spent on energy efficiency measures, and spread broadly in proportion to the mix of contributors to the levy. Offer needs to decide if regulation is required which would oblige or encourage suppliers to preferentially save rather than generate electricity. ❑

# Environmental assessment

A legal loophole which exempts Public Gas Transporters (PGTs) in Britain from environmental assess-ment requirements is set to be closed, with the DTI having issued proposals for consultation in September.

The UK has implemented in to law a 1985 European directive on environmental assessment, but there are some activities which the new law does not cover. For Transco, Britain's only PGT, the move will in reality not make any great difference as Transco has chosen to supply environmental assessments for major pipelines since the 1970s. But with the advent of competition, it was thought prudent to bring this under the letter of the law.

■ Meanwhile, the DTI is under attack from the Marine Conservation Society for its failure to bring offshore oil and gas under the environmental assessment regulations. The DTI promised this over a year ago. After a threat of court action over the matter however, draft regulations are to be published "within weeks". ❑

# Northern Ireland Nffo

SUCCESSFUL applicants for Northern Ireland's second round of contracts under the Northern Ireland Non-Fossil Fuel Obligation (NI-Nffo) have been announced.

There are ten contracts in all, totalling 20MW installed capacity — two each go to wind, biomass (coppiced willow), landfill gas and hydro, with the remaining two awarded to a slurry based biogas scheme and a waste incineration scheme.

Northern Ireland Electricity (NIE) has stated that prices bid for some technology bands, particularly wind schemes, are "approaching current market prices for conventional generation".

In response to a request from the electricity and gas regulator Ofreg, from April 1997 NIE will offer customers the option of paying a "green tariff" for electricity generated from renewable sources. This will be outside the NI-Nffo system and the price charged will in the first instance be higher than that for fossil fuel generated electricity.

Customers will specify the proportion of their consumption they wish to be sourced from renewables and NIE will then contract with renewable generators for the required amount. NIE want the scheme to obviate the need for a Nffo levy. ❑

# A review of nuclear disarmament

**Beyond the bomb**
Huub Jaspers (Ed)

Transnational Institute, Wise,*
Greenpeace International;
1996, 226 pp, $15.00 pb


IT'S a small world: nowhere is that more true than when it comes to the possible consequences of nuclear war or civil nuclear disasters. We share the planet with a devastating array of nuclear devices from which no corner of the globe, no matter how remote, can hide.

We also live on a planet where, for the first time since the advent of the atomic age in 1945, it is possible to be optimistic — however fleetingly — about progress being made in nuclear disarmament. There can be no doubt that the Start treaties and the Comprehensive Test Ban Treaty have generated a huge collective sigh of relief.

But is it justified and how far have we come? While the prospect of the Cold war going critical is becoming a memory, what still needs to be done to put the nuclear genie back in the bottle?

Through publishing the results of five international seminars, the Transnational Institute, World Information Service on Energy and Greenpeace International have produced an extremely important volume which seeks not to take sides but to represent the views of all in the nuclear disarmament debate: "Scientists, writers, government officials and activists were brought together to discuss the history and meaning of the Nuclear Non-Proliferation Treaty and the future of nuclear disarmament."

In many ways an examination of the NPT is the ideal way to explore the new nuclear world.

Last year, after a quarter of a century, the signatories to the treaty were drawn together in New York to decide on whether it should be made permanent, cancelled or extended for a fixed period followed by a review. They fell into two distinct camps: the weapons states and their allies and the non-aligned, non-weapons states. Put crudely the haves and the have-nots. The North versus the South.

While no one seriously suggested the treaty should be abandoned, the have nots wanted an extension and periodic review conferences, to allow them some leverage under article VI, which instructs the weapons states to pursue disarmament and "in good faith", to push for further disarmament.

The haves wanted, and got, a permanent extension. They argued that disarmament was already taking place and that failure to make the treaty permanent would create an unstable climate and hamper further progress towards disarmament and could pull the political rug out from underneath the negotiations for a comprehensive test ban treaty.

However, their victory owes more to their economic might than the strength of their argument.

During the negotiations non-governmental disarmament organisations were extremely active and played an important role. Unfortunately they failed to pull in the same direction. Surprisingly, many were in support of indefinite extension. However, a thorough reading of the cases presented in this book can do nothing but to compel one to the view that the world has taken a large step back in its bid to become Nuclear Free.

To illustrate the absurdity of indefinite extension, Shaun Burnie of Greenpeace International produced a crude table of nuclear events which had occurred during the month-long conference:

- the US spent $780 million on nuclear weapons;
- the UK sent its newest trident submarine on patrol;
- France inaugurated a new above-ground nuclear test facility and threatened to resume testing in the Pacific;
- Russia continued to produce new nuclear warheads;
- some 4.8 tonnes of plutonium were created in nuclear power reactors worldwide; and
- around one ton of weapons usable plutonium — the equivalent of 130 nuclear weapons — was produced in civil reprocessing facilities globally.

Before trying to move the campaign for nuclear disarmament forward, it is time for the disarmament community to take stock and then come together in pursuit of a common goal using a common strategy with each bringing its particular strengths to the struggle.

**Mike Townsley**

*** Wise, Ketelhuisplien 43, 1054 RD Amsterdam, The Netherlands; Fax +31 20 689 21 79.**

# An aesthetic

**The landscape impact and visual design of windfarms**
by Caroline Stanton

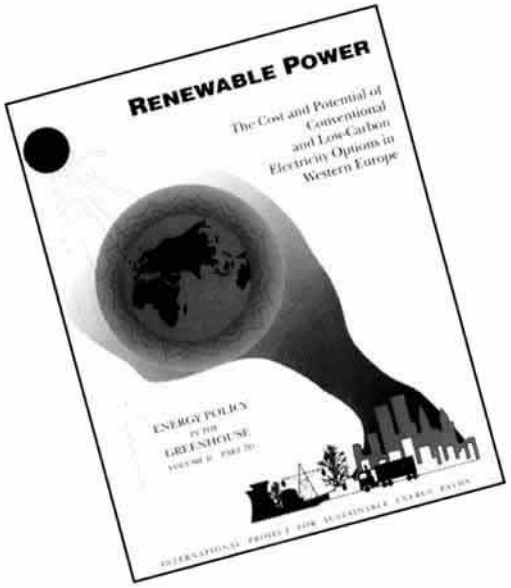
School of Landscape Architecture, Edinburgh College of Art, Heriot-Watt University; 1996, 54pp, £10

THIS book is probably unlike anything that has been reviewed in the *Safe Energy Journal* before. It does not deal with the number crunching details of wind farms — the costs of electricity produced or comparative figures on $CO_2$ emissions are not to be found here. This slim volume instead deals with aesthetics. Proponents of wind have in the past assumed that because of the environmental benefits of wind, the aesthetics were bound to be positive. However, recent history has proved that a small but highly vocal minority do not share this view. Anti-wind groups have been quick to play on people's uninformed fears regarding the visual change a windfarm will make when added to the local scenery.

# Energy options for Western Europe

**Renewable power — the cost and potential of conventional and low-carbon electricity options in Western Europe***
by F Krause, J Koomey and D Olivier

International Project for Sustainable Energy Paths, 1995, 120pp, US$50




FORMING part of a wide-ranging study looking at the economic costs of cutting carbon emissions, this book, effectively an appendix to the study, assesses the potential for and future cost of renewables in Western Europe.

The key assumption behind the study, which differentiates it from most others attempting to assess the renewables potential, is that economic credits are used to account for externalities. Siting, modularity, environmental damage, the cost of pollution control and the cost of back-up for intermittent sources of power such as wind power, are each given externality points and costs. For example, siting flexibility credits of up to 1.3 pence/kWh are given to photovoltaics (PVs) to account for their ability to be developed near to existing load centres; and modularity credits are given for non-intermittent supplies, such as biomass, as the technology is suited to enabling capacity to be introduced gradually, as opposed to the large increases which would be seen by developing a coal-fired plant.

One controversial assumption is that externality costs of biomass-fired plant are considered to be comparable to, or even slightly larger than, those for baseload gas-fired plant. Of all the renewables assessed, rooftop PVs fair the best with an externalities cost of less than 0.01 pence/kWh, as opposed to fuel-wood which is allocated a cost of up to 0.33 pence/kWh. One downfall of the book is that the externality costs and emissions of conventional power plant are not shown for comparison, although they may be included within other reports from the study.

As well as arguing for externalities to be accounted for in the price and the decision-making process, the book also suggests that: front-loaded payment structures for renewable power projects be supported; that the renewables industry be put on the same footing as the oil and gas industry which has tax breaks for intangible drilling costs; and that capacity credits be given to wind power schemes, as the presence of wind power capacity reduces the time for which thermal units are required to operate and so capital intensive base-load thermal plant become less valuable than fuel-intensive plant. The authors also believe that for up to 20% penetration of intermittent sources, the associated penalties are offset by cost savings from reduced use of intermediate and peaking plant.

This is a technical report which does not stand fully on its own, but forms part of a much larger study. Other books in the series cover the study's review of demand side efficiency improvements; fossil-based generating technologies; nuclear power; and the implications of an integrated carbon reduction strategy upon gas demand. The book will be of interest to all those who are interested in assessing the long-term potential for and true value of renewables when externalities are taken into account.

**John Green**

*** This report is Volume II, Part 3D of Energy policy in the greenhouse; IPSEP is based at 7627 Leviston Ave, El Cerrito, California, 94530.**

# view of wind turbines

So, given that many people's fears about windfarms centre on their visual impact, this is an extremely important book. It tackles the issues surrounding visual impact in a rational and dispassionate manner. Having said that, the underlying theme is one of viewing wind turbines and windfarms as forms of sculpture in the landscape, an approach which has both strengths and weaknesses. For example, Stanton argues that turbines should normally be white on the grounds that "this honestly acknowledges the human made and sculptural image of wind turbines and their inability to blend in," and that "grey or metallic coloured wind turbines also seem more technically primitive, and tend to result in a windfarm being visually linked with industrial elements in an area, rather than being portrayed as a distinct clean sculptural element."

This contrasts with early experience — people objected to windfarms because, in their opinion, they were industrialising a rural landscape, even though all the early windfarms were white. Stanton herself argues in a later chapter on planning and public perception that one reason windfarms might be labelled as industrial is that wind turbines have an "unfamiliar 'high tech' image". But she does not make the connection that painting turbines grey may help to reduce the shock value of a new windfarm, by making them appear less high tech.

However, the approach in this volume is to promote the acceptability of windfarms in the landscape, and the discussion is extremely useful is laying out the issues that need to be addressed. The text style is clear, and understanding is aided by simple illustrative line drawings. Particularly useful are single side summaries looking at the issues in particular generic landscapes: agricultural landscape, the coast, mountains and moorland, variable landform (eg, undulating hills), and industrial landscapes.

Overall this report should provide an extremely useful tool for planners and designers of windfarms in conjunction with the technical advice provided in government guidelines and planning advice notes, and is therefore recommended.

**Chris Revie**

# LITTLE BLACK RABBIT

Rabbits drawn by Wilf Plum

## Sir Hector Quixote

Little Black Rabbit had long wondered why it is that wind farms in Scotland have to go through a more rigorous planning process than those in the rest of the UK.

The answer is Sir Hector Monro. The MP for Dumfries was Scottish environment minister at the time the planning procedures were being drawn up, and his personal dislike of wind turbines and disregard for the problems of acid rain and global warming led him to insist on planning regulations designed to deter wind farm development.

Asked by *Scotland on Sunday* newspaper about the scientific evidence on global warming and the damage caused by acid rain, Sir Hector commented: "I think it's happening on a longer timescale than some scientists and people make out. I don't think it is quite as imminent a disaster as people try and make out. I think there is a lot of time on our side." This statement confirmed the belief of environment groups in Scotland that Sir Hector, unwilling (or unable) to master his brief, failed to take into account anything other than his own prejudices.

## Fact follows fiction?

In a selfless quest for all the news on the subject of Safe Energy, LBR worked a little overtime watching the new Keanu Reeves film. For those of you who haven't managed to catch it yet, the basic plot is: idealistic wouldn't harm a fly professor and his team of young helpers manage to fire a laser into water getting more energy out than they put in. Seconds before he can transfer his "solution to pollution" on to the internet for all to use, the professor gets it from the CIA. Our hero Eddie (Keanu) is the only person alive who knows the secret frequencies for the experiment to work, and for this he and accompanying bint are hotly pursued by the petroleum addicted crowd.

Imagine LBRs surprise at reading the very next day that Indian officials wanted to patent a herb which, when boiled in water made an excellent kerosene substitute — LBR thought the man behind this discovery had seen the film as well, because he was reportedly hiding out in the jungle from would-be kidnappers anxious for the identity of his secret herb. The secret turned out to be a kerosene filled hole in his special stirring spoon.

## All a red herring

LBR begs the question as to why the MoD cites the requirement for "signal fidelity" as an objection to a proposal for a windfarm in its training range. The MoD says the five turbines could be mistaken for an enemy target by its radar equipment at RAF Spadeadam.

As a witness for the developer quite mildly put it, "the possibility cannot be discounted of British and US forces finding themselves fighting in an area where there are wind turbines. The presence of a wind farm in the Spadeadam range area could help train aircrew to understand the effects of these facilities on radar and other electronic facilities."

Alternatively, if the radar equipment is unable to distinguish a wind turbine from an enemy helicopter, then LBR suggests they take it back to the shop and swap it for the electronic combat trials facilities their American counterparts are about to install at a nice spot just 15 miles away from some 5,000 wind turbines.

Otherwise, all the enemy will have to do is deploy a few tactical wind turbines and the RAF will be flummoxed.

## Offering excuses

When perusing through Offers *report on distribution and transmission system performance 1995/96*, as one does, LBR came across a classic piece of British excuse making.

It goes thus: "As in previous years, the number of supply interruptions in SWALEC and Hydro-Electric areas were markedly higher than in other areas. Hydro-Electric has indicated that its result for 1995/96 would have been markedly lower but for three severe storms". And trains would run in autumn if it weren't for those green things on trees which suddenly turn brown and fall to the ground.

## Typos of yester year

While doing some research on the Scottish electricity industry, LBR was reading through 1965 Hansards. At the time, the future of the North of Scotland Hydro-Electric Board was in some doubt, Willie Ross announced.

According to the official report for the 29 November, in reply to a question from Teddy Taylor, then a Glasgow MP, the Secretary of State for Scotland Willie Ross stated that "the Hydro-Electric Board, despite the wishes of some of [Taylor's] hon. Friends, is still in existence and will carry on with useful schemes to satisfy the neds of the north of Scotland."

## Sensitive leaks

In the middle of September Roy Nelson, site director at Dounreay, announced to staff that "there is now no need for people at Dounreay to be secretive about what goes on on the site." With the exception of commercially and security sensitive issues, Dounreay from that day on had an "open and honest" policy. What he forgot to say was that he didn't really mean it. Because just a week later the UKAEA Constabulary were trawling though the plant's telephone records in an investigation to find the person responsible for leaking details of a radioactive leak.

Perhaps Nelson regarded the information as sensitive to the price of shares in the just privatised AEA Technology plc, proud new owner of the marketing expertise at Dounreay.

## Happy Christmas

Safe Energy is embarking on some marketing for the new year. To start the ball rolling, Little Black Rabbit would like to help you all with your present-buying worries. A year's subscription would make an excellent stocking filler for mum, dad and the kids, who, we're quite sure, would much rather get an informed journal than chocolates or Buzz Lightyear. If you decide to subscribe as a result of this little plug, could you please quote reference 251296chrispromo and say what it was in the advert that made you want to subscribe.

the EASE newsletter

Issue 3 Energy Alternatives for a Sustainable Europe Dec. 1996

# Energy taxes, fuel poverty & renewables

SEPTEMBER saw two EASE seminars take place in Scotland. The primary aim was to work towards consensus on energy/environment issues with delegates from a wide range of environmental, conservation and recreational groups throughout Scotland. Energy taxes and the effects on those of a low income was the focus for the first seminar, with NGOs' hopes and concerns for renewables being the focus for the second.

### Energy taxes and fuel poverty seminar

Energy taxes are a highly contentious issue in Scotland (see article in the September 1996 EASE Newsletter). The purpose of this seminar was therefore to explore the underlying issues in more detail, in order to see where differences of opinion and common ground existed between environmental and social action NGOs.

The seminar enabled presentations to be made from two contrasting standpoints. The first focused upon the results of research looking at the effects of the imposition of Value Added Tax on domestic fuel use. Research has shown that those on a low income spend a greater proportion of their income on fuel than those who are better off, and as the amount of money they can afford to spend on fuel is fixed, the poor respond to changes in fuel prices by varying their energy use. This results in their homes being heated to lower temperatures, which in turn has implications upon health in the cool, damp Scottish climate. With low income households being unable to afford the investment needed for energy efficiency measures, they are unable to get out of their fuel poverty trap.

The second presentation outlined a recent paper on eco-taxes from the Institute for Public Policy Research (IPPR). Believing that taxes on domestic energy consumption would be unpopular and ineffective, the IPPR are proposing an energy tax on industry and commerce. Rather than use the income for energy efficiency measures, they suggest that the revenue would be used to lower employment taxes, which in turn would make it cheaper to employ people.

In the discussion which followed, environmental groups felt that a domestic energy tax was important in order to put pressure upon people to take personal responsibility for the impact of their actions upon the environment. However, it was recognised that safeguards need to be implemented so that the poor are not penalised. It was generally thought that an effective way of achieving this could be by providing those on a low income with energy credits so that the poor would not suffer from a rise in fuel bills. These credits could be continued until sufficient investments were made to their homes to achieve a high level of efficiency (e.g. NHER 7), thus providing incentive to authorities to invest quickly in order to reduce the level of credit payment.

### Renewable energy seminar

Scotland has some of the best sites for renewables in Europe and since the government announced its support mechanism for the development of new renewable energy projects in Scotland, the Scottish Renewable Obligation (SRO), many developments have been proposed. These have received a mixed reception from the public and from local authorities, and some conservation and recreation groups have actually objected to specific proposals. FoE Scotland believed that there was an opportunity to bring these groups and some of the developers together to reach agreement on the role of renewables in Scotland and dispel some of the myths being propagated by anti-wind groups such as Country Guardian.

All groups at the meeting expressed support for the concept of renewable energy in principle, however, a number made it clear that they had objected to specific developments because they had no accurate information on the benefits of renewable generation to compare against the disadvantages of a particular proposal. The concerns of most centred around the visual impacts of wind farms in scenic areas, particularly in areas perceived to be 'wildland'. Concerns were also expressed about the ecological and visual impact of hydro schemes and impacts upon biodiversity when monoculture crops are grown for biomass production. However, groups expressed their welcome for additional information if it would help them to support renewables.

From the developers' side, the meeting heard that whilst they were quite willing to site developments such as wind farms in less profitable but less visually intrusive sites, the nature of the SRO was such that they were forced to choose, in the case of wind farms, the windiest sites in order to have some chance of obtaining a contract to supply electricity. However, in several cases they were later having problems obtaining planning permission in those areas.

The seminar proved useful in identifying areas where groups' knowledge about renewable energy was lacking and has been a vital step towards achieving consensus among environmental groups on the need for renewables to be sited sensitively.

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## Contents

# The role of NGOs in promoting sustainable energy in Ukraine

**"... it is the non-governmental sector that has the greatest role to play in facilitating the transition to a sustainable energy system in Ukraine."**

THE experience gained during the EASE campaign has demonstrated the real potential for NGOs to have an influence on energy policy within Ukraine. This newly found influence, based upon the constructive alternatives presented by experts from 'Zelenyi Svit', has had a significant impact upon several major energy policies. Round table discussions with scientists, industrial representatives, businesses and the Ministry of Machinery Construction and Conversion, have influenced decisions affecting state financed energy-saving projects in the Ukrainian iron ore industry, and have led to a review of the contents within the energy chapter of a government initiated Sustainable Development report on the Ukraine. Unfortunately, however, scientific and environmental organisations have not been given access to government discussions concerning energy saving and alternative power source utilisation within the country.

Countries the world over are having to come to terms with the unsustainability of their energy supply industries, none more-so than Ukraine. High levels of energy consumption in the industrial sector and a range of environmental problems have been two of the root causes of the country's lengthy period of economic and social crisis. The effects of the world's most horrific man-made disaster at the Chernobyl nuclear power plants, the enormous reduction in water flow due to the series of hydroelectric power stations along the Dnieper river, and the very high pollution levels emitted from the country's fossil fuel power plant, all urgently require significant levels of investment in order to tackle the problems.

Under these conditions, governmental bodies have focused their resources onto developing solutions to the short-term problems, without giving adequate attention to the long-term economic, social and ecological consequences. The Parliament made a decision to prioritise the development of nuclear power, and as a consequence, additional power generating units have been built at two nuclear power stations. Large financial assets are also envisaged 'to increase the safety of nuclear power installations' and to develop the raw material base for the nuclear power facilities. The government's next area of priority is for thermal power plant, but no effective plans are being developed to significantly reduce the volume of emissions into the environment.

The business sector, still in its youth in the Ukraine, is suffering from the pressures of high taxes and an inadequate legislative structure. As a result businesses have yet to command the same level of influence as they do in western Europe.

For these reasons, it is the non-governmental sector that has the greatest role to play in facilitating the transition to a sustainable energy system in Ukraine. In order to achieve this effectively, the NGO sector needs to further develop its strategy, to inform and encourage the following groups of people:

1) Experts in the fields of science, engineering, economics, ecology and sociology, particularly from outside Kiev. The majority of state-run structures are based in Kiev, there being few state-sponsored experts in regions of importance to the energy industry, including highly polluted industrial cities such as Dnipropetrovsk.

2) Mediators and the media, needed to distribute information among the different strata of society.

3) Managers, in order to provide the necessary infrastructure, technical support, finance and training, as the nature of industry changes within the country.

4) The country's youth, in order to make campaigns more dynamic and to help spread activities to different parts of the country.

The experience with the EASE campaign has proved that it is possible for an efficient and consistent network of people and organisations concerned with Sustainable Energy to have an influence upon policy. In the future such a network could expand its scale and activities, based upon the expertise developed during the campaign. The coordinating centre of such a network could have the following functions: policy development, information distribution, involvement of experts and public awareness. Interaction with foreign NGOs also seems to be of critical importance, providing a means of exchanging information, ideas, experience, resources, real mutual assistance and solidarity. If such a network had actively functioned in the past, it could possibly have prevented the Chernobyl disaster, and it certainly would have reduced its consequences. As far as the future is concerned, this network will help to facilitate the transition of the energy sector towards sustainability within Ukraine, alongside the move towards this goal throughout Europe and world-wide.

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# Paving the way for a Renewable Revolution

THIS autumn saw the opening of the largest wind farm in Europe, at Carno in mid-Wales, with the scheme having the capacity to supply electricity to 25,000 homes. Supported by the provision of a guaranteed market for the renewable industry under the Non-Fossil Fuel Obligation (NFFO) and the Scottish Renewables Obligation (SRO), renewables have now grown to supply 2% of electricity supply in Britain. Dramatic falls in the cost of electricity from renewables have been seen since the NFFO began to provide financial support for renewables in 1990, particularly in the case of wind power where costs have plummeted from 11p/kWh to under 4p/kWh. Wind power is now competitive with new coal-fired power stations, and is cheaper than nuclear power.

However, the development of wind power in Britain has been hampered by the persistent campaigning of a small minority of anti-wind protesters. Over the past 18 months, planning permission for 77% of wind power applications in England and Wales has been turned down, even though many of these had financial support through the NFFO. Whilst the main reason for turning down wind power applications is due to visual impact, a range of public opinion surveys have consistently shown that wind power is popular. In twelve independent surveys carried out over the past five years, between 74% to 96% of the public said they were in favour of wind power. To ensure that the views of the silent majority are heard, Friends of the Earth in England, Wales and Northern Ireland (FoE), in conjunction with the British Wind Energy Association, recently launched a pro-wind public awareness campaign. FoE have been campaigning for the sensitive development of wind power projects for some time [1], but a new awareness campaign was thought necessary in order to counter the trend of local authorities deciding national energy policy, and to ensure that the benefits of wind power are clearly understood.

Biomass, an emerging renewable technology in Britain, is now the focus for a second set of Good Practice Guidelines produced by FoE. Focusing upon environmental, social and economic issues they have been drawn up in conjunction with a range of other NGOs and representatives of industry, with support from the Department of Trade and Industry. The 'Good Practice Guidelines for Short Rotation Coppice', was launched in mid-November.

One of the opportunities for growth in the renewables industry in the forthcoming years will come from the liberalisation of the energy market. In April 1998, domestic energy consumers in the UK will be able to choose their energy supplier, and although it is not clear what impact this will have upon the energy industries, it appears to offer a significant window of opportunity for renewables. However, a pilot project in the South West of England with the gas industry has illustrated that the public are quickly overwhelmed and confused by a range of claims from different energy companies. There is a need for clear public information to be provided in the move towards liberalisation, with the media playing a central role in providing independent information and analysis.

The potential for green consumerism in the energy market is potentially huge. A public opinion survey recently commissioned by MORI illustrated that 86% of the British public would prefer to buy their energy from renewable sources, with 24% of these willing to pay a premium price. By encouraging public demand for sustainably produced energy, and through partnerships with industry and the financial sector, significant growth in the development of renewable energy can be achieved.

As global climate change achieves greater visibility in the media and the minds of the general public over the forthcoming year, with the Third Conference of the Parties (COP3) in Kyoto focusing on greenhouse gas emission targets for after 2000, the search for solutions will hot up. Britain is uniquely placed to drive investments towards sustainable energy solutions, in the run up to energy liberalisation. If the results of the MORI poll prove to be correct, we may be at the beginning of an energy revolution.

[1] 'Planning for Wind Power - Guidelines for Project Developers and Local Planners', Friends of the Earth England Wales and N. Ireland, 1995 (second edition).

**"... 86% of the British public would prefer to buy their energy from renewable sources, with 24% of these willing to pay a premium price."**

## 'Energy Sector Study' seminar

An 'Energy Sector Study', to be published in January 1997, will be followed by a national debate on energy use and production. This EASE event, to be held in March 1997, is targeted at three main groups: politicians, industry, and consumers.

See the next issue of the newsletter for details.

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# Building for sustainability

SUSTAINABLE architecture was recently the focus of a week-long event organised as part of the EASE project in Austria. The aims were twofold: to illustrate the possibilities for a drastic reduction in energy consumption, and to show how renewable energy can be used in building design. Major points of discussion included:

- with energy consumption in buildings accounting for 50% of the total energy consumption in the industrialised world, sustainable architecture will form a fundamental component of the move towards sustainability;
- high technology and new techniques can be used in the implementation of sustainable architecture, enabling planning and building processes to become more closely aligned with the environment's natural cycles;
- the urgency of the problems being faced are rarely given sufficient support by political processes which are often restricted to declarations of intent;
- the concept of efficiency and sustainability in buildings needs to be incorporated into the school curriculum.

The event opened with a public discussion by renowned architects and experts in the field of solar architecture and low energy buildings. During the following week, prize-winning entries to the Austrian national competition, "Solar-based low-energy Buildings", were on display. Excursions took place throughout the week to various sites demonstrating how the concepts of sustainable architecture have been put into practice. The week also saw inauguration of the first bio-gas facility in the region: a practical, working example of sustainability in action, utilising agricultural and kitchen wastes to generate heat and electricity. The week ended with a symposium on architecture taking place on the internet.

Participants to the events included architects, planners, farmers, building owners and the general public, and along with the broad media coverage which the events attracted, awareness of the cost-effectiveness of sustainable alternatives in building construction was raised across a wide audience. Information on the appropriate use of renewable energy technologies and energy efficiency measures in the remodelling of buildings is also soon to be published.

The other major area of focus for the EASE project in Austria to-date has been with "energy contracting". In January 1997 a conference is being organised in collaboration with the National Chamber of Commerce and proponents of the insulation industry, concluding with a press conference being held in conjunction with the national Minister of Environmental Affairs. Four consecutive workshops are being organised, having the following themes:

- technical aspects of energy contracting;
- financial aspects of energy contracting;
- legal aspects of energy contracting;
- international examples.

The benefits of energy contracting are not yet widely known and, therefore, the aims of the conference are to demonstrate its economic advantages to the following target groups:

- prospective constructors - e.g. property management agencies, public authorities;
- opinion leaders - e.g. politicians, government officials, and journalists;
- financial institutions;
- engineers and architects.

The EASE coordinator in Austria would be grateful for information on energy contracting from around Europe.

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## EASE Seminars

| | |
|---|---|
| **Austria** | |
| • Sustainable architecture | 28th Sept - 4th Oct |
| • Energy contracting | January '97 |
| • Conditions for a national referendum on energy alternatives | To be decided |
| **England, Wales and N.Ireland** | |
| • 'Energy Sector Study' seminar | March '97 |
| **France** | |
| • Social and environmental costs of electricity generation (provisional) | To be decided |
| **Georgia** | |
| • "Limiting environmental impact of hydropower in Caucasian Region" | 26th June '96 |
| **Italy** | |
| • Working group on marginal fuels | June '96 |
| • Energy plan for the City of Florence | December '96 |
| **Lithuania** | |
| • "Energy efficiency and saving - Identifying problems and solutions in the implementation of an energy efficiency policy" | 18th October '96 |
| • "Development of alternative & renewable energy sources in Lithuania" | 10th April '97 |
| **Scotland** | |
| • Renewable Energy Seminar | 12th September '96 |
| • "How can the effect of energy taxes on the poor be minimised?" | 26th September '96 |
| • Energy 21 conference | 28th-29th Nov '96 |
| **Ukraine** | |
| • Conception of Sustainable Development in the Ukraine | 17th Jul & 29th Oct |
| • Problems of town development - sustainability and energy saving | 22nd-23rd Oct '96 |
| • Energy round table in Dnipropetrovsk | January '97 |

## Acknowledgements

**The EASE Newsletter is produced by Friends of the Earth Scotland**

**Editor:** Dr. John Green

**Contributors:** Chris Revie, Victor Khazan, Tricia Allen and Thomas Zelger

**Design:** William Bealey

**Layout:** Dr. John Green

This newsletter and the EASE project is being part-funded by the European Commission DG XI.



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