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Registered for postage as a periodical, category 'C'

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SPECIAL SECTION ON THE ALTERNATIVES TO NUCLEAR POWER
JAPAN'S URANIUM FOLLIES
MERCURY IN AUSTRALIAN WHALES
RANGER URANIUM INQUIRY
URANIUM AND SOUTH AFRICA
PLUS MORE!!!

the journal of
FRIENDS OF THE EARTH (australia)
NOVEMBER 1975 50c

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We have gone to the trouble of collecting together the information in this special issue on Non-Nuclear Energy Alternatives, in part to coincide with Amory Lovins' visit to this country. But our main objective is to encourage informed discussion and inquiry into the various ways humanity has learnt to harness natural energies over the last 50,000 or so years, before the advent of the "Nuclear Option."

We feel it is about time our readers were informed of the real feelings of the people in countries which are contracting to buy Australia's Uranium. In Japan, the people who oppose an expanded nuclear program are numerous and influential. In fact, going on present trends of unpopularity and unreliability, it seems that Japan will be unable to expand its nuclear reactor program (at least in the next two decades) to the extent that it will ever need to import Australian Uranium.

The whole energy problem goes right back to fundamentals. How we relate to each other and to society at large – determines how we use the energy forms around us.

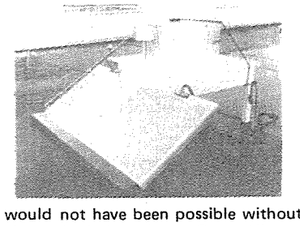
So although most of the material in this edition is technical, we feel that 'energy crisis" is in fact a sympton of a broader "human crisis" and that long-term solutions lie not just in technical developments, but in basic social change.

Today people everywhere are out of touch with their responsibilities and are unconscious or ignorant of the consequences of their actions and lifestyles

As expoitative consumers, we rip-off the earth and its precious resources. At the same time we manage to rip-off over half the human race, squandering resources hundreds, and sometimes thousands of times faster than the people in "underdeveloped" societies.

Our lifestyle and our uses of energies **must** change ... it is physically impossible for our current habits to continue for more than another decade or so the only question now is in what manner these changes will come about

Richard Nankin - Ed.



This edition would not have been possible without contributions above and beyond the call of duty from: Sam, Alison, Judy, Neill, Woody, Weislaw, Andy and Val from La Trobe Uni. Union for the typesetting and bromides, Jill Van for Artwork on the front cover, pages 6, 13 and 17, also Judy for the typing and Vaughan from "The Works" for the printing.

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THE FOE LEAK BUREAU

Given the way things are in government and industry, a great deal of information vital to the interests of the community never gets out. Some of it is simply not noticed by interested people because of limited circulation and some of it is, of course, purposely withheld.

FOE believes that those who anonymously leak relevant information perform a public service of the first rank. In their absence, bureaucratic secretiveness and corporate self-interest too often succeeds in suppressing essential information, frustrating the process of informed and democratic decision-making.

We believe that many employees of the AAEC, of "independent" national laboratories, of private companies, of government departments, of equipment manufacturers, of utility companies, have more than once thought "the public really ought to know about this". But it is sometimes pretty hard to know how to reach the public. A major obstacle is the difficulty of identifying individuals and groups who will be interested, responsible and effective in using the information.

Friends of the Earth hereby volunteers to serve as a conduit for information – a Leak Bureau.

Informants will be guaranteed anonymity and the utmost in discretion. Any information received will be responsibly used and shared with other groups (preserving the anonymity of the informant) which might make good use of it.

Our address is:

Friends of the Earth
59 MacArthur Place
Carlton, Victoria 3053.

In case of an emergency or information that must get out quickly, telephone collect:

347 6630

We look forward to hearing from you.

MERCURY FOUND IN AUSTRALIAN WHALES

AUSTRALIA STILL SLAUGHTERS WHALES:
Since 1955 the draw of the large schools of squid in the vicinity of Albany, W.A., has spelt death for many of the Indian Ocean whales. From mid-March to mid-December every year there is a chance that the whales will be spotted by the Cheyne's Beach Whaling Company's Cessna aircraft and then persued and butchered by chaser boats from the land station. Every year about 1,000 sperm whales belonging to this stock have suffered a painful death at the end of an exploding harpoon.

An average sperm whale weighs about 45 tons (well it used to before the size of whales caught began to decrease due to intensive hunting) and once it is killed this once-intelligent creature is dismembered on the flensing platform and is reduced to 6 tons of sperm oil, 1½ tons of whale meat, 3 tons of dried solubles, and various other commodities such as bone meal, teeth, ambergris, tendons and whale leather. There are known substitutes for all of these products so it is only economics which decides that 1,000 sperm whales will be killed off the Western Australian coast every year.

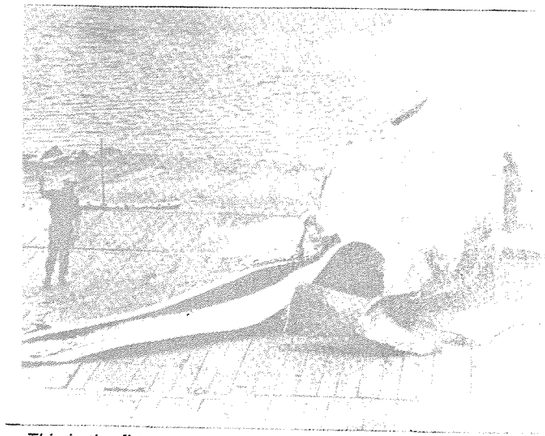
STOCK FEED:
The oil, which is exported to England is the main product, and in 1973 constituted nearly 60% of the total income of Cheynes Beach Holdings Ltd. Whale meat is processed from whale carcase scraps and whale solubles is the dried residue of waste liquors from the carcases. These two products are concentrated sources of protein and are used in stock feed ration, particularly in the pig and poultry industries. Together they constituted about 35% of the total income of the Chenyes Beach company. Some of this meat and solubles is exported to Hong Kong and Japan but most is used in Australia. The use of these products as stock feed additives ignores the fact that they are highly contaminated with mercury.

EXCEEDINGLY HIGH MERCURY LEVELS:
The department of Public Health in W.A. has been monitoring the levels of mercury in sperm whales processed at Albany for several years. These mercury values range from 1.8 to 5.9 parts per million (ppm) in the meat, 1.6 to 3.6 ppm in the kidneys and 21.0 to 46.0 ppm in the liver. These high levesl of mercury are apparently natural legacy for some of the world's large oceanic predator fish and whales. Throughout their long life they are exposed to unknown levels of mercury, some of which may result from man's activities (for example: atmospheric fallout and coastal pollution), but most of which is probably from natural environmental sources. The possibility that these mercury burdens are largely due to natural contamination is supported by the fact that museum specimens of tuna and sword fish caught some 50 years ago had mercury levels similar to those caught today. Also, other toothed whales, such as pilot whales and dolphins, have been shown to have high mercury levels in their bodies.

These high levels of mercury in whale products have serious implications for agricultural industries. Experiments carried out by scientists from the Victorian Department of Agriculture have shown that when whale meat and solubles from the Cheynes Beach whaling station are included in pig and poultry rations at 8.8% (the normal rate of inclusion of protein concentrates for side rations), the level of mercury resulting in the pig and poultry products (both the carcases and eggs) were much higher than the 0.03 ppm recommended by the National Health and Medical Research Council.

LACK OF CONTROLS:
The W.A. Department of Agriculture does not control the use of these products in that state (nor do other state governments), and only recommends that they should not be included in stock rations at a level greater than 1%. In an article in "Australian Fisheries" in July 1974 it was stated that regular tests were made to monitor the mercury levels in poultry products in W.A., and tests on the products of one of the states' biggest hatcheries showed no signs of high mercury levels. They made no mention of any tests carried out on pig products. As well as this, the nature of the use of these whale products (in that they are cheaper protein source and will only be used by some producers) means that the smaller, less profitable producers will make greater use of them, and residues would only be found in certain batches of products.

We at Friends of the Earth are totally opposed to whaling in any part of the world from both a humanitarian and conservation view point. The discovery of these high mercury levels in whales caught by the Cheynes Beach Whaling Company should give added weight to our call for an immediate cessation of whaling in Australia.



This is the first stage in the processing of whales at the Cheynes Beach Whaling Station.....

WHAT YOU CAN DO

It is drawing close to the time when Cheynes Beach Whaling station must renew its whaling licence. In June, it will be remembered, Dr. Cairns reversed the Australian policy on whaling when he stated that Australia would support a 10 year Moratorium if it was proposed at the next International Whaling Commission (I.W.C.) meeting to be held in London. Unfortunately, the moratorium was never brought up at this meeting. The fate of these sea giants now seems as dismal as it was ten years ago. Many of the larger species (the largest mammals on earth) are on the borderline heading for extinction.

The USA has ceased its whaling activities due to public outcry ... inspiring tales of gallantry by the crew of the FRI and the buzzing of visiting emperor Hirohito by an Aeronautical Gymnast have come to us from the US.

Yet despite response from the public (in the main school children) in this country, efforts to save the whales have been thwarted by the Agricultural Dept., whose legion of scientific advisors have furnished information which is totally unrealistic.

Project Jonah is collecting signatures for petitions to be presented to Parliament before the licence is hastily renewed.

You can help by writing letters to Environment Minister Berinson, asking him to refuse to licence the Cheynes Beach Whaling Station. If his Department can be flooded with mail as the Agriculture Dept. was in June (which inspired the Cairns decision), there is a very real possibility that the whales will at last be able to swim in Australian waters without the fear of being senselessly slaughtered by local or foreign whalers.

Write to Project Jonah C/- the FOE group in your State for Whale manuals No. I and 2, petitions and other information on whaling (See Publications Available, back pages).

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:NEWS: :NEWS: :NEWS:

AUSTRALIA AND DISARMAMENT

Antarctic Treaty (Ratified).

Treaty Banning Nuclear Tests in the Atmosphere, in Outer Space, and Underwater (Ratified).

Treaty on Non-Proliferation of Nuclear Weapons (Ratified).

Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space (Ratified).

Treaty Banning Weapons on Mass Destruction on the Seabed (Ratified).

Convention Banning Biological Weapons (Signed).

Treaty Banning use of Napalm and other Incendiary Weapons (Voted in favour Section (a); Abstained, Section (b)).

Total and General Disarmament (Resolution 3261, (XXIX)), 9 December, 1974 (Supported).

Proposals for World Disarmament Conference (Australia supports in principle, but insists that all Nuclear Powers be included in every aspect of planning).

A NUCLEAR FREE PACIFIC-WHY NOT?

The Australian Government has recently achieved a high level of hypocricy in its purported Foreign Policy as compared to its actual internal and external economic and social policies. We are in the process of selling the Arnhem Land Uranium deposits to Japan, but the Japanese Authorities will not guarantee that none of Australia's uranium ends up as Japanese nuclear weaponry in the future.

Whilst the Fijian and New Zealand Government's have lent their support for the Nuclear Free Pacific Treaty in the U.N., Australia remains silent. Of course, if the treaty is eventually ratified by all Pacific Governments, including Australia, we will have to dismantle all foreign military bases, especially those integral to the U.S. Nuclear Arsenal.

What You Can Do

*Write to Senator Willisee (Foreign Affairs Minister)
Senator Wreidt (Minerals and Energy) and
Gough Whitlam, pointing out this hypocricy and suggesting that Australia support the Treaty for a Nuclear Free Pacific.

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UNION ACTION

In 1973 the ACTU congress for the first time set down a very clear policy with respect to pollution and the environment. With the 1975 congress this was extended to cover uranium mining, and the use of nuclear energy. However there has been some confusion about the content of the motion passed. In particular, some people have quoted the motion as including mention of an enquiry and others have quoted it as an unconditional call for a ban.

We have obtained from the ACTU the actual executive motion and the three amendments to it.

The following is the amendment moved by Keith Wilson of the Newcastle THC to the executive motion on environment and resources. Unlike the other two amendments not directly related to nuclear power, this amendment was not accepted by the executive and required a vote to be taken. It was declared passed on the voices and when a show of hands was called for, was again declared passed. (The executive motion in brief called for strong legislation to conserve and protect the environment from the adverse effects of "progress")

In view of the danger of global radioactive pollution, the threat of nuclear proliferation, the problems of disposing of nuclear waste, the energy consumption imbalance between the industrialized countries and the underdeveloped third world, and the denial of the legitimate land rights of Black Australians, Congress demands:

That Australia should immediately halt all uranium mining operations pending the completion of a thorough-going public access inquiry into the whole ramifications of nuclear fission technology.

The Ranger Uranium Environmental Inquiry, currently in progress may satisfy this demand provided the Australian Government accepts that the scope of that inquiry should not be limited only to the considerations of physical and technological questions.

That existing Australian uranium stock piles be used or exported only for bio-medical research and, indirectly through the production of isotopes, for medical diagnosis and treatment.

That uranium exports be refused to those countries engaged in researching or manufacturing nuclear weapons or generating power by fission or breeder reactors.

That those existing contracts for the supply of uranium not in accord with these principles be abrogated.

The interpretation of the amendment remains a source of confusion however: apart from the first of the four demands, it appears that Congress really wanted an unconditional ban. This confusion is probably connected with the fact that the demands in the first clause were added to a motion in the agenda booklet issued before the conference. That is, the "amended" amendment may have been more palatable. The federal executive of the Australian Council of Salaried & Professional Associations, a body representing 37 white collar unions with 380,000 members passed a similar resolution (on 23/9/75) as the ACTU resolution and to its credit did not make a ban conditional on a Public Inquiry.

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Amalgamated Metalworkers Union Commonwealth Council, September 1975.

The Council carried resolutions supporting the Fiji and New Zealand approach to the UN seeking the establishment of a South Pacific Nuclear Free zone, and urging the Australian government to join with Fiji and NZ.

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NUCLEAR NEWS

Amory Lovins arrived in Australia on Friday 31st. October. Press coverage was limited as the airport press conference unfortuneately coincided with the departure of Mr. Khemlani and the arrival of Donovan! Debates with American nuclear proponent Dr. Ralph Lapp should be a highlight of his tour. An indication of Lapp's perspective is provided by the following quotations from his book 'Must We Hide?' written in 1949:

"So the bomb was used. It is good that the atomic bomb came into the open. Had it not been used, free discussion today might not have been possible." (p.3)

"We must never relax our efforts to maintain pre-eminance in the field of atomic weapons. To do so would be to invite disaster." (p.11)

"We accept the hazards of the automobile, whisky and tobbacco because we are familiar with them and have learned to use them with some degree of safety.....To acheive the same rational perspective for radiation, both in peace and in war, the public must be thoroughly informed." (p.48).

"We can conclude that a properly prepared and alerted country can absorb not a huge but a fair number of A-bombs."

Lapp's later writings reflect a greater awareness of the problems created by the splitting of the atom. But you know the saying about the Leapords spots.....Lapp is now styling himself as an energy expert, though neither he nor any others in the field in the US beleive it. It will come as no suprise if Lapp's AEC-paid trip to Australia backfires on the nuclear peddlers.

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RANGER URANIUM INQUIRY

Cast your minds back to last July, FOE was actively engaged in the Field Study into Uranium Mining and Kakadu National Park. The purpose of the study was to produce much more worthwhile evidence for the forthcoming Ranger Inquiry, as well as arming groups around Australia with as much information for the anti-Nuke campaign as possible.

Because of the central role played by FOE, it was apparent that FOE should produce effective action towards this Inquiry. In Sydney, soon after a FOE National Meeting, discussions were held on the pros. and cons. of the Inquiry, with people who have had experience in EIS Inquiries.

Since the Ranger Uranium Inquiry is to travel to most capital cities in Australia, much of the continuity of the environmentalist's case will be lost unless one group attempts to participate in the proceedings wherever the Inquiry goes. So along with the Ranger lobbyists, FOE (NSW) is attempting to follow this Inquiry to the best of its financial and physical ability.

FOE OVERWORKED!

Three people from FOE (NSW) recently wrote a submission to Environment Minister Berinson requesting funds for activities which we defined as "establishing a National and International communications exchange network." The role of this network was to "tap" expert advice and to enlist witnesses to fill the gaps in our evidence. FOE(NSW) has been hard-pressed in preparing evidence to this Inquiry, due to commitments to other campaigns. The major submission and evidence on technical aspects will be presented by FOE (Victoria).

The submission to Berinson was unsuccessful, so we will attempt to follow the Inquiry around by train and/or hitch-hiking.

INQUIRY UNCERTAIN

We weren't too sure what to expect from this Inquiry, but the first day's cross examination of Mr. Woods (Gen. Manager of Ranger) by Justice Fox, was thorough. As well as this, the Terms of Reference of the Inquiry have been extended to include virtually all aspects of Uranium Mining and its world-wide implications. During questioning about the financial and contractual arrangements between 'Ranger' and its parent companies, the commissioners asked if Ranger had undertaken a total energy inventory of the nuclear fuel cycle. (It had not.)

This question showed that the commissioners meant business and were not going to pull any punches.

MORE SUBMISSIONS NEEDED

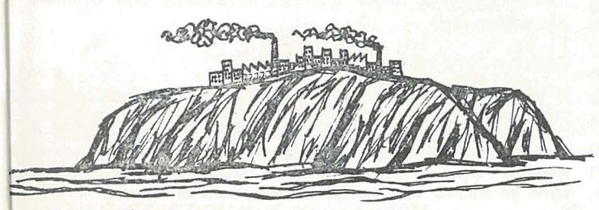
These developments actually led many more people to think about making submissions and giving evidence at this Inquiry. This was evident in Darwin, where only 5 groups were scheduled to give evidence - this expanded to about 20 after FOE(N.T.) and the other active Darwinians held some public meetings and many private discussions with the Darwin people. The women's movement held a demo. outside the Inquiry when it began sitting in Darwin.

There is still time for concerned individuals or groups in the Southern states to give evidence and make submissions to this Inquiry.

INSPECTION OF RUM JUNGLE

Before the Darwin hearings were held, a Public Inspection tour of the old Rum Jungle Uranium mine took place. This was quite eventful.

When two familiar faces, in the form of Steve and Weislaw, stepped from the bus at Rum Jungle, the Ranger and AAEC officials had to pick up their jawbones from the red dirt. We had scored a psychological victory.



Beautiful Mount Brockman, near the Rum-Jungle area. This place is sacred to the local Aborigines. Ranger Inquiry vehicles snooping around in the foreground.

The 'Cooks Tour' of R.J. was not taken lying down. Along with Strider from Camp Concern, we expressed our determination for the Public Inspection to look at the many aspects of the horrific state of the Rum Jungle site.

DESOLATION

A close look at the Acid (tailings) Dam, desolate and lifeless, yielded feeble excuses from the AAEC. The Commissioners appeared to know what the AAEC people were up to, and proceeded to look at the Diversion Channel where the river was diverted. (This river originally ran right over the ore-body.) Here the river and its innocuous but lifeless-looking water runs over a carbonate rock, causing nuetralisation of the Acid. This causes the salts of the dissolved heavy metals to come out of solution and precipitate as thick yellow-white oozes caked onto the surface and bottom of the water in the Channel.

This accumulation occurs every dry season, so that during the floods of the wet season these substances get carried down the Finnis River, affecting the coastal waters of Fog Bay and N.T.

OFF TO RANGER

The Commission then went to the Ranger Site where intensive interrogation of the company people was undertaken in full view of the Aboriginals from Oenpelli.

The Oenpelli disputed with the company people at Ranger over the positioning of the mine's boundary fence. They fear it is too close to their sacred "Snake Dreaming" Jidgi-Jidgi around Mt. Brockman. **It was actually requested that the boundary fence be moved north 2 miles from its present position — of course this would mean the Ranger Co. would have no uranium to mine!**

LAND RIGHTS

Ranger Co. are prepared to get into a land rights struggle with the indigenous blacks over this potentially dangerous rock. In fact, the legend of this area holds that if anyone disturbs the "Snake Dreaming" site, or anywhere near it, a catastrophe will occur. (Almost the same as the legend of the "Green Ant Dreaming" site at Narbalek.)

FOE pitched the "Atom Free Embassy" tent, (of Parliament House fame) on the Aboriginal campsite at Jim Jim in time for an incredible rainstorm. Meanwhile the Commission stayed at a Motel and the Ranger people tossed and turned in air-conditioned units (to get rid of the "hot air") at the construction camp 40 miles away.

The next day we transported ourselves to the Jabiluka site, where Pan Continental propose to build their mine. There FOE had a long discussion with Peter Balmadidal (the custodian of "Snake Dreaming") and his family.

From "Africa". October 1st. 1975.

NUCLEAR CONSPIRACY
WEST GERMANY AND SOUTH AFRICA

In view of the seriousness of the matter, and to draw special attention to it, **AFRICA** *considers it necessary to put this appeal by the African National Congress of South Africa, on its* **Editorial** *page. It is our hope that African Governments in particular, and the international community as a whole, will heed this timely warning and take immediate action to stop the implantation of Neo-Nazi horror on African soil.*

While the Government of South Africa tries to project a public image of peace and *detente*, it simultaneously engages in reinforcing further its military and aggressive power, and the threat it poses to international peace and security has grown in intensity and magnitude. The international community has watched with disquiet the growth of South Africa's armoury of conventional weapons and the development of a locally based armaments industry aided by licensing and technical co-operation agreements with the United States, The Federal Republic of Germany, France and the United Kingdom and Italy. Hitherto, very little attention has been devoted to the growth of nuclear potential, and South Africa has been relegated to the second rank among powers with the capacity to develop nuclear weapons.

However, by 1968, the regime was itself proclaiming its ability to manufacture nuclear weapons. Since then, the determination to construct a uranium enrichment plant, the agreements for its construction recently concluded in the Federal Republic of Germany, and the advanced stage of the development of the project programme finally establish the nuclear capacity beyond doubt; for the regime has now acquired access to and control of both the scientific expertise required and the material resources. The determination to proceed with a project which cannot be economically justified either in terms of the enormous capital required, nor in terms of its operating costs, can only be explained in terms of its military significance; a significance emphasised by the clandestine manner in which the project has been developed, the regime's failure to subscribe to the Non-Proliferation Treaty and repeated objections to placing its mines or ore processing plants under international inspection.

The African National Congress believes that the regime that has not hesitated to use the most ruthless terror against its own people, will not flinch, when driven to desperation, from unleashing a holocaust upon the continent of Africa and the world. The South African regime has long sought to buttress itself and to maintain the privileged status of its White supporters by acting as the tool of the imperialist powers. South Africa is now being established as a convenient loophole in any international agreements to limit conventional or nuclear weapons: for by licensing, technical and financial agreements and collaboration with the imperialist powers, that which the world is attempting to control among the major powers, is being carried out indirectly in South Africa. It is incumbent upon the nations of the world in the interests of their own security to examine closely the development of the armaments industry in South Africa, and in particular the implications of the establishment of a uranium enrichment plant which will produce uncontrolled concentrated fission material for nuclear weapons. Despite Pretoria's boasts of having invented its own "unique" process for enrichment, the evidence available establishes the degree to which its nuclear development has been and still is dependent upon outside assistance. The South African nuclear programme is not yet self-generative nor is the situation beyond redemption.

Ignoring both the appeals from the oppressed people of South Africa and numerous resolutions of the United Nations, the Federal Republic of Germany has increased its collaboration with apartheid. It has established itself as the largest trade partner and supplier of credits. Military co-operation has been increasing, the the FRG has been acting as the agent for the integration of the apartheid regime into the NATO alliance. Clandestinely and in defiance of its own international obligations, it is collaborating in establishing a nuclear arsenal on the continent of Africa.

In the name of the people of South Africa, the African National Congress demands that the Federal Republic of Germany cease forthwith its financial and technical assistance in the building of the uranium enrichment plant in our country.

In the interests of international peace and security, the nations and people of the world must call the Federal Republic of Germany to account ■

N.B. Blacks in Australia have as much to fear from the Mining Companies in Australia as their brothers and sisters do in Namibia. In fact, the Peko-E.Z./Jingellic Deposit, is 50% owned by Oppenhimer's Anglo-American Ltd. which operates illegally in Namibia (in both Uranium and Diamond Mining). Many of the other major investors in Uranium deposits in Australia are subsidiaries or associates of South African companies, which in turn have a controlling interest in the racist South African political and economic system. The West German company, Kaiser, also has major interests in Bauxite and Uranium Australia. - Ed.

WHAT YOU CAN DO:

-Write to the Minister for Minerals and Energy, Mr Wriedt, for the fac on W. German and South African companies and their involvement Australian Uranium.

- Write to the Minister for Foreign Affairs, Mr Willessee, criticisi Australia's stand on the above forms of foreign investment, in view of o stand on Nuclear Proliferation and Apartheid as expressed in the U.

RANGER URANIUM INQUIRY

At Mudgimbarry the Aboriginals were to give evidence according to traditional meeting procedure – however, it turned out that they were confronted by three Commissioners, all the other white advisors and the Ranger Co. employees, all ominously looming over the backs of these young aboriginals.

If this wasn't enough, the questioning by the Barrister was totally inadequate – leading questions, putting words in these people's mouths, and questioning which seemed to be aimed at getting "Scientific" facts from these Aboriginals, who have their own type of science. No attempt was made by the Barrister to understand their science.

This whole scene led to contradictory and useless evidence and it appeared this exercise was a waste of time.

Silas – Chairperson of the Oenpelli Tribal Council – refused to come to the next day's hearings and issued a very non-commital statement, indicating the fact that plenty of employment was already available at Oenpelli and there was no need to provide employment by the mine operations.

BREAKTHROUGH

Eventually, FOE made a breakthrough when we were allowed to engage in cross-examination.

The following days of the Inquiry gave us the opportunity to correct many mis-statements and expose the financial driving forces behind the mining companies.

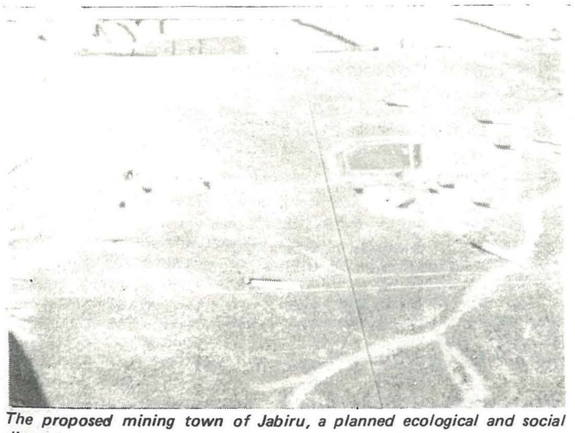
Evidence was given by FOE(N.T.) on aspects of ecology and the proceedings of the commission. Another problem arose when the "expertise" of our witnesses was questioned. Because we were lacking in formal academic qualifications, much of our evidence turned out to be inadmissable. **However, the moral arguments are being firmly established as being most important.**

PASTORALISTS HELP

The Inquiry is now back in Sydney (late October), with Northern Pastoral Services Pty. Ltd., their solicitors and a Q.C. attacking the whole Ranger proposal, as it may affect their pastoral activity at Mudgimbarry. Their case is very strong and has relieved FOE(NSW) of our cross-examination and unpaid work.

Considering our resources, the achievements we have made so far are quite remarkable. So far, there have been replies to our international mailout from FOE in England and the Netherlands, offering technical assistance and to lodge submissions to the Inquiry. However, the response from other groups around Australia has shown that we will rely mainly on people directly interested; our time is very limited and help of any kind would be most appreciated, as we are doing normal FOE work as well as this Inquiry.

It is now becoming clear that this Commission sincerely wants to produce unbiased facts in form of a report to the public.



The proposed mining town of Jabiru, a planned ecological and social disaster area.

Strider from CANP CONCERN hassling the Ranger company soliciter (Mr. Heath) at the Rum Jungle Creek Diversion Channel.Note the way the area has been "restored to it's original beautiful state" since U. Mining took place.

Mr. Justice Fox has publicly stated that this Inquiry is very important and he will not tolerate any attempts by the media or the Government to pre-empt their findings or to prejudice further witnesses with the fealing that their evidence may be futile.

My views are that: with the ACTU withholding its final decision until this Inquiry produces its report; with the House of Reps. Standing Committee on Uranium Mining temporarily deferred, with Minister Berinson still forming his policy on Uranium; the Ranger project being delayed and costing more money; all hinges on the outcome of this Inquiry.

We are attempting to present as much information as possible to this Inquiry and will be anxious to see if this 'independant' body is able to make the necessary decision.

This is from a report by Weislaw Leichacz from FOE (NSW) following their journeys to Darwin with the Ranger Inquiry, written 25/10/75.

STOP PRESS ... STOP PRESS ... STOP PRESS

The Australian Minister for Environment, Mr. Joe Berinson, today responded to comments by the Friends of the Earth, the Australian Conservation Foundation and the NSW Environment Centre that the Australian Government appeared to be unreservedly committed to the development of the Ranger Uranium Province. Mr. Berinson denied this. He emphasised that in accordance with Government policy any decision on development at Ranger is subject to consideration of the report of the Environment Inquiry headed by Mr. Justice Fox.

"Recent press reports have given the erroneous impression that the Government is committed to development of Ranger regardless of the outcome of the Inquiry. This is totally wrong," he said.

"It is the clearly declared policy of the Australian Government that no mining processing or export of uranium from the Ranger field will be permitted prior to completion of the Ranger Inquiry and a full evaluation of its recommendations."

"The Prime Minister Mr Whitlam when Minister for Environment made clear the Government's concern for the environmental aspects of uranium mining by widening the scope of the Ranger Inquiry to allow it to examine not only the local impact of any mining development but also the international implications of uranium exports".

(Ministerial Press Release - Nov. 5th, 1975)

JAPAN'S URANIUM FOLLIES

This article is rather long, but it is a clear expose of the popular myth that Australia "needs" to export its uranium to Japan. It is a precis of the section on Japan in FOE (Victoria's) submission to the Ranger Uranium Inquiry. We hope to reprint our whole submission at a later date.

A few nights ago a friend of mine watched a television documentary on Japan. It showed the result of 20 years of western-style economic growth. My friend wept.

GROSS NATIONAL POLLUTION

By adopting the 'ideal' of economic growth at all costs the Japanese ruling elite has created an environment uniquely hazardous to human health and happiness. Apollo looked down on a Japan more thickly covered with polluted air than any other country in the world. (Moreover, in recent years the impact has tended to be felt outside Japan as the Japanese have begun to relocate their most polluting industries in 3rd world countries such as Indonesia, Thialand and South Korea).

The effect of the environmental destruction on the health of the people has achieved world wide prominence in the last few years. Agonising deaths from mercury, cadmium, and PCB poisoning, substantial increases in the percentage of young and old suffering from respiratory disease and concern about genetic damage amongst people of reproductive age, are a few of the most well known.

The 10% per annum 'miracle' growth rate in GNP achieved by Japan in the 1960's was based on the importation of cheap energy from overseas. In particular cheap oil was the basis of 'prosperity': From the late 50's to the late 1960's the price of oil fell by almost 50%. Oil therefore quickly replaced coal and by 1972 comprised 75% of primary energy supplies, 80% of which came from the Middle East. Overall by the early 1970's 86% of Japan's primary energy was imported.

Small wonder that the so-called energy 'crisis' of late 1973 scared the proverbial wits out of the Japanese captains of industry. (A measure of this scare may be provided by reference to the U.S. situation: The Ford Administration has embarked on a multi-billion dollar effort to avert the possibility of future overseas-induced energy 'crises' because it is dependent on overseas energy for about 10% of its total supplies).

NUCLEAR POWER — A PANACEA?

The four fold increase in oil prices and the doubt about future oil supplies led to a determination by government and industry to diversify the sources of energy. This was to be done mainly by entering into bilateral agreements with Middle East producers, increasing the proportion of oil obtained from Asian sources, and by a determination to change over to nuclear power.

Despite the obvious deleterious impact of growth on the environment, Japanese leaders have proved to be unwilling to abandon the high growth objective: Of course the current recession and the poor prospect for substantial revival in the short to medium term is forcing such a change, in the attitudes of what must be now, a confused and somewhat envious ruling class; a comment by the influential Japan Economic Research Centre illustrates the role of a high growth rate in ensuring the population's acceptance of the fundamentally inhuman social system.

"..it will be important to strive for stable growth along the lines of about 6% in order to reduce social frictions by providing for an appropriate rate of operation of industrial facilities and full employment of the labour force." 1 (my emphasis)

Two years ago, nuclear power was seen by the corporations as the answer to the energy crisis, a source of energy which could keep the frantic growth of the 60s alive. Following the OPEC increases it appeared that nuclear generating costs were about half those of oil based costs. This fact in addition to the small volume of uranium required (compared to that of oil or coal) and the lack of SOx, NOx and particulate pollution involved, made nuclear power seem an attractive option for government and electric utilities alike.

Already in 1972 when oil price rises were underway and planners were aware that an energy crunch was imminent, a highly ambitious nuclear program had been formulated. The nuclear capacity targeted for 1985 (60mkw) was roughly equal to the total installed generating capacity from all sources (hydro, coal, oil and nuclear) in 1972. By the year 1990 it was expected that 100m kw would be installed. (In 1972 there was only a little over 1m. kw of nuclear generating capacity). The events of late 1973 led to a renewed determination to achieve the 1985 target.

ATOMS IN ACTION

The first stage of the nuclear industry in Japan is now over. Beset by repeated breakdowns, and safety related accidents, intense dogged opposition by local residents, arrogant dishonest practices by power company and government officials, and an economic recession, the industry has been brought almost to a standstill. Today installed nuclear capacity is just over 4000mw, only 3000 mw more than that in operation 3½ years ago. In the last 2½ years, few plans have obtained even preliminary approval from the authorities and no new reactors have commenced construction.

There are a number of reasons for this. We will have a brief look at these reasons before returning to an examination of the nature of the opposition movement in Japan.

Capacity factors (actual output divided by the potential output) have been amazingly low. As shown in Table 1 **not one** light water reactor has achieved the designers specification of 80%. In the last 18 months the average has been around 35%. This of course represents a huge wastage of capital.

Both Pressurised Water Reactors (PWRs) and Boiling Water Reactors (BWRs) have experienced serious problems. The PWRs have been troubled by tube thinning in the steam generators and the BWRs by cracks in

CAPACITY FACTORS OF REACTORS IN JAPAN-YEAR ENDED MARCH 31ST 1968-1975 TABLE 1

REACTOR	TYPE	RATED CAPACITY MW(e)	1968	1969	1970	1971	1972	1973	1974	1975	1975†
Tokai (25.7.66)*	GCR	166	41;6	71.3	54.9	63.0	69.7	67.4	70.4	67.9	81.9
Mihama 1 (28.11.70)	PWR	340					72.6	36.7	27.4	7.4	0
Tsuruga (14.3.70)	BWR	357				78.9	69.1	72.4	78.9	48.8	20.3
Fukushima 1 (26.3.71)	BWR	460					66.4	65.7	48.4	26;1	0
Mihama 2 (25.7.72)	PWR	500							54.0	63.7	4.2
Shimane (29.3.74)	BWR	460								75.6	61.8
Takahama (July 1974)	PWR	823									68.1

SOURCE: "Gentsu" No. 1279, published by MITI, July, 1975. and Nucleonics Week 7/8/75.
NOTE: In July and November 1974, two new reactors were commissioned: Takahama 1(PWR) and Fukushima 2 (BWR)' There are now 8 reactors in Japan.
* Date operation commenced † 1st 6 months calendar year.

emergency core cooling system pipes. The Mihama 1 is to date the most outstanding failure. Repeated stoppages for replacement of generator tubes has resulted in a situation where it is no longer safe to allow workers to conduct on-site repairs as the level of radiation is so high. It has now been closed down for 15 months and the whole steam generator may have to be replaced - a 3 year task!

Apart from equipment failures there have been a whole series of stoppages caused by human error. As the President of the Japanese Atomic Industrial Forum (AIF) said earlier this year:

*".. When all is said and done, it has to be admitted that there were too many accidents at nuclear facilities during the past few years. Though most of them, it is true, were not nuclear accidents, they were without exception due to negligence on the part of managers and employees and were of such a nature as could as easily been avoided if there had been continual and strict supervision, as well as a full sense of responsibility."*2

SAFETY REGULATIONS

A basic cause of this abysmal state of affairs has been the stubborn and arrogant refusal of the authorities to adapt to the needs of the situation. As in the US until a few months ago, the Japanese Atomic Energy Commission has been responsible for both promotional and regulatory activities. Inevitably the former responsibility has tended to achieve a higher priority than the latter. The regulatory division has been the subject of repeated strong criticism by nuclear opponents. One of these, Dr. S. Ichikawa, (a radiation geneticist and former employee of the US AEC), in commenting on the Committee of Reactor Safety (CRS), has observed that as the materials presented to the Committee by the electric power supplies are inspected only on paper and because those materials are in most cases the only materials for inspection, the committee always automatically gives 100% trust to the suppliers. In June last year one of the Commissioners of the JAEC resigned in protest at the inadequacy of the safety inspection procedures.

A celebrated incident late in 1974 focused national attention on these procedures. After 2 years of being trapped in port because of the opposition of local scallop fishermen, the nuclear-powered ship, **Mutsu**, finally eluded the fishermen and reached the open sea for a trial run. When the reactor was at only 2% of its power rating, it suffered an abnormal radiation leak. Because no port would accept it, the ship drifted at sea for 45 days. Finally under very strict conditions it was allowed to return to Mutsu City port. The nuclear ship program is now in moth balls. The incident pointed up the confusion reigning in and between the various nuclear agencies. For example, it was not clear which agency was responsible. The head of CRS, the most likely agency to be responsible, testified in the Diet *"(CRS) checked basic concepts and design conditions but the detailed designing in question is out of our responsibility."*3

LIES, FRAUD AND DECEPTION

As in the US the brief history of the Japanese nuclear industry is littered with examples of deceitful practices carried out in an attempt to ensure achievement of aims. In 1972 and 1973 the Japanese Analytical Research Institute charged with reporting to the government on levels of radioactivity caused by US nuclear submarines docked in Japan, deliberately falsified reports in order to please superior authorities. Also in 1973, the Japanese Institute of Nuclear Science exhibited its attitude towards academic freedom when it issued a warning to a researcher who dared to publish the results of his work; fortunately his Union and the Science Council of Japan strongly supported his action. An indication of the industry's general lack of respect for the truth is provided in the official report on the Mutsu incident. The report stated that

*"It is necessary to consult the people and the responsible leaders and with correct information. This has not been done until now....At first it is necessary to publish the truth and then negotiate."*4 (my emphasis).

GRASS ROOTS OPPOSITION

Until 1972, the plans of the nuclear industry went ahead unthwarted. As Dr. Ichikawa has observed:

*"...the inhabitants living near those sites were, in most cases, isolated, under the campaign of "energy crisis". Only incomplete, sometimes false, information was given to the inhabitants and safety only was emphasized. Money tactics were common to buy off the representatives of the town or the leaders of the unions of farmers and of fishermen. The land owned by the inhabitants was bought sometimes compulsorily, sometimes with tricks, or sometimes at inordinately high prices. With these processes, constructions of nuclear power plants were enforced one after another until 1972."*5

Then reports of accidents and prolonged stoppages, superimposed on a basic distrust of the atom by a people who had suffered so much in 1945 and thereafter, and an increased awareness of the widespread damage which the corporations had perpetrated on the Japanese environment, led to increased resistance by local residents.

The anti-nuclear groups today form part of over 1000 anti-pollution groups. One newspaper observed in 1973 that these groups have a *'strong revolutionary tendency similar to peasants risings'*! Certainly their methods have achieved enormous success: the nuclear industry is at a virtual standstill due largely to a refusal by local people to allow reactors to be sited in their area.

As the prestigious Institute of Energy Economics has observed: *"...the plans of the EPC's call for a capacity of 50 million KW...the figure attained will be much lower, possibly as low as 30-35 million KW, the reason being difficulty in finding suitable sites in the face of opposition by local residents."*6

The main reasons for opposition are the concern of fishermen about thermal and radioactivity pollution of their fishing grounds, the worry about the integrity of reactor components in the event of an earthquake in 'quake prone Japan, the doubt about reactor safety in routine operation, concern about the wider aspects of waste disposal, and weapons proliferation.

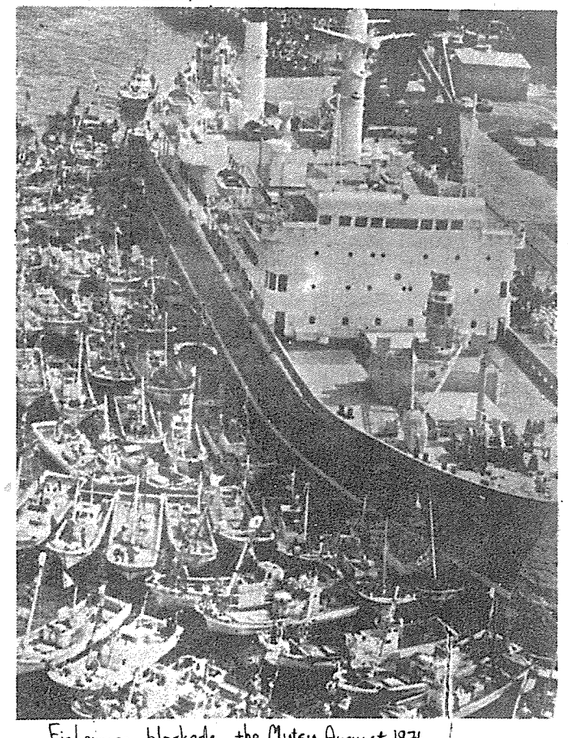
Japanese fishermen have already suffered considerably from the effects of pollution resulting from the industrialisation of the coastline. Nuclear power stations have a significantly greater thermal impact on the water and present the added threat of radioactive pollution. (For example, there have been reports of a decrease in the number and size of fish in the vicinity of the Tsuruga plant since it started up in 1971). It is important to realise that the massive use of sea water by conventional and (especially) nuclear stations, is occurring despite the fact that little is known about the environmental impact. The Japanese Environment Agency has noted that:

*"...the discharge of cooling water from electric power plants is coming to have serious aquatic consequences...practical knowledge on the mechanisms of warm water diffusion and on the changes that should be expected in the aquatic environment is still far from sufficient."*7

Even before the Mutsu incident, the AIF was moved to comment: *"The need to win a majority consensus from the fishermen is beginning to weigh heavily on Japanese industry especially in promoting the development of nuclear power. Some fishermen have such strong apprehension that they demand clarification of measures to be taken to cover intensive and large scale development, the management of waste emissions and other scientific and administrative level matters about which nuclear utilities are not yet in a position to provide answers."*8

Clearly, the Mutsu serves to greatly intensify the opposition. Again a comment from the Atomic Industrial Forum is of interest:

*"It was indeed a heavy blow to our national energy development plan and to all our activities. Biting our lips in silence, with tear-filled eyes, we stood waiting...our task is to do what we can to restore public trust in nuclear power development".*9



Fishermen blockade the Mutsu, August 1974.

And one electric power company leader is reported to have said: *"The Mutsu fiasco has really hurt us. Our years of efforts to persuade local people have absolutely been shot. Now nobody wants to sell us land to build power plants."*10

EARTHQUAKE PRONE

Earthquakes are a common phenomenon in Japan. Each year there are about 10,000 tremors in and around Japan strong enough to be felt by humans and in about 1 year in 3 there is a quake which will cause heavy damage to buildings which ha ve not been specially constructed. While the industry has argued that its aseismic design regulations are fully adequate, opponents have charged that the stresses caused by a quake of not unreasonable proportion may be higher than the authorities have alllowed for.

Six of Japan's 8 reactors are in areas designated as earthquake observation areas; two of these are very close to major fault lines.

When this fact is put alongside the results of a recent survey conducted by the Prime Minister's office in which 85% of people said that of all natural disasters, earthquakes are the source of their greatest worry, we can begin to appreciate the people's concern about reactor safety. The industry has lied in the past - why should it be perfectly honest about reactors' susceptability to earthquake damage?

Even the extemely pro-nuclear bulletin of the international Atomic Energy Agency has admitted concern about the implications of earthquakes for reactor safety. In 1970 it noted that in the event of an earthquake, new auxiliary faults will be created and that:

*"...so little is at present known about this phenomenon of auxiliary or branch faulting, that it emphasises the critical need for further research especially in the intensive investigation and documentation of auxiliary faulting during future large earthquakes anywhere in the world."*11

One of the most notable struggles has been that carried out by the Ikata residents on the island of Shikoku. **The Shikoku Electric Power Company has contracts with Mary Kathleen Uranium and Queensland Mines.** One of the main arguments of the so-called Ikata Lawsuit is that the plant is to be built close to a major fault line in an earthquake observation area. The Shikoku company first formulated its plans to build a nuclear plant in 1967. In 1969 a committee was formed to oppose the plant. In May 1975, after several years of legal action, the Matsuyama District Court ordered the government to give up all safety documents in the case. Other Court proceedings related to the case are still proceeding. Friends of the Earth has formed a close relationship with the Ikata people - they are watching the results of our campaign with great interest.

NUCLEAR REACTION

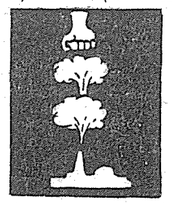
The nuclear peddlers have reacted to the opposition to their grand design, by action on a number of fronts. One focus of propaganda is the schools. An article written with the object of assisting Public Relations efforts in Japan contains the following rather enlightening and self-explanatory comment on the industry's activity in the education sphere.

*"Increasing attention is also being given to the more "attractive" forms of education, especially through exhibitions (preferably with lots of "animated models"), visits to nuclear establishments and such things as essay competitions in which children and/or your people are encouraged to write about the benefits of nuclear power, prizes being awarded in the form of certificates "VIP" visits to nuclear plants and meetings with top scientists, as well as modest sums of cash."*12

Certainly the industry has girded its loins in the last year or so as disaster after disaster has struck. Presumably gritting his teeth the Chairman of the JAEC (who is also responsible for safety and regulation of the industry!) was moved to declare that:

*"What we need is not simply to remain a harmonious group, but to break free of our limitations and carry through the development of Japan's nuclear industry."*13

One way in which it has apparently attempted to carry through the development over the last 5 years or so has been by rather sleazy practices. It has been widely reported that land owners have been deceived into selling their land, that the power supplies of opponents has



been cut off to *"make them keenly feel the necessity of electric power"*, and that town officials and union leaders have been "bought off".

An attempt is now being made to buy off the people in a more legal manner. In June 1974,legislation was passed to enable grants to be given to local governments which accept nuclear power plants. In the budget for 1975/76 almost 20% of the total devoted to nuclear research and development in Japan is allocated to "the construction of public facilities such as gymnasiums and roads provided as a government subsidy to local public corporations." It is the largest item in the nuclear budget and may be compared with the allocations for nuclear safety research (12%) fusion research (2.5%) and enrichment R&D (8%).14 It does appear to be a rather desperate attempt to undermine the opposition to nuclear power. Hopefully the people will not be fooled by the short term benefit.

TABLE 2.

PROJECTED PRIMARY ENERGY SOURCES 1972/73 to 1985/86

	Percentage		
ENERGY TYPE	1972/3	1980/81	1985/86
Hydro	6.3	4.2	3.4
Geothermal	0.0	0.1	0.3,
Indigenous Oil & Gas	1.0	1,0	1.8
Indigenous Coal	5.3	2.5	1.9
Subtotal (Indigenous supply)	12.8	7.8	7.4
Nuclear Power	0.7	6.0	10.3
Total Indigenous Supply and nuclear power	13.9	13.8	17.7
Import LNG	0.4	5.8	6.6
Coal	11.3	12.5	11.0
Oil	74.7	67.9	64.6
Subtotal Imports	86.4	86.2	82.3
Primary Energy total	100.0	100.0	100.0

Source: extracted from "The Energy Crisis and Japan's Response to it" Supplement to Energy in Japan No. 29 June 1975 Institute of Energy Economics Table 1 p.5.

BAXTER'S FOLLY

Sir Phillip Baxter has continually expounded the line that Japan so badly needs our uranium for its burgeoning nuclear industry that it will invade us if it doesn't get it. Unfortunately a similar, though less neurotic, view is widely held in the three major political parties and in the community generally. In a recent debate in Federal Parliament, Country Party leader, 'Dug' Anthony in referring to the Japanese asserted that uranium is 'the basic ingredient of their energy needs of the future'.

The figures in Table 2 amplly demonstrate that nuclear power is not now, and will not become in the next 15-20 years at least, a major energy source. Furthermore, when these figures are adjusted for a more likely nuclear capacity of less than 30m KW in 1985, rather than 50m KW, and for a more realistic capacity factor of 55% (the US average) rather than 80%, the likely contribution of nuclear power to total energy supplies is around 6-7% rather than 10.3%.

Now take into account that there is great scope for conservation of energy in Japan. 50% of total energy consumption is accounted for by 4 industrial sectors. These industries should in part, be relocated overseas if countries better endowed with energy than is Japan, will receive them. As we consider matters like this the 'need' for nuclear power steadily diminishes.

Table 1 also reveals that the expected rise in the share of nuclear power corresponds with a decline in the share of indigenous energy sources, hydro, coal,, oil and gas. To an appreciable extent, this is likely to be due to the massive funding of nuclear research and development at the expense of conventional energy technologies. Certainly, the share of the budget allocated to the non-conventional sources - solar and geo-thermal- is very small, about 1.5% of the figure for nuclear.

It is important to realise that the effect which a nuclear program can have is limited by the so-called 'rate of magnitude' problem. Because of the high capital cost and the long construction period for nuclear plants (and to some extent because of the fossil-fuel used in construction and fuel preparation), it takes a very long time for nuclear to achieve a significant share of a growing energy market. And of course in Japan's case additional constrainst are operating: low capacity factors, deep public opposition, and rapidly rising capital costs.

Interestingly in the last 6-9 months, the somewhat disillusioned utilities have begun to explore other energy sources. In June this year a meeting of the 9 electric power companies agreed that they should pool their resources to jointly develop new power sources. A week later, the President of one of the companies publicly advocated that Japan should return to coal-based generation if reasonably priced reliable supplies could be obtained. He noted that Japan has the world's foremost technology for coal-burning electricity generation which is *"safe and reliable compared with controversial nuclear power generation."* He speaks with some bitter experience: the Mihama 1 and 2 reactors are operated by his company.

Why then have Japanese industry leaders been so concerned about Australia's hitherto confused uranium policy? This question is given added importance when it is considered that Japan already has contracts for around 85,000 tons of U308, sufficient to last well into the 1990s if 30m kw is achieved by 1985. (According to the long term plan for nuclear development published in 1972 a cumulative amount of U308 corresponding to the more realistic capacity assumed, then existing contracts would be sufficient for needs.)

The answer to the question is that Japan is desperately seeking to diversify its energy sources. **Around one quarter of the uranium contracted for Japan is to come from South Africa and its illegally occupied colony, Namibia.** Certainly there is a great contrast between Australia and South Africa, where in all probability the blacks will be in control within the next 10-15 years. As Mr. Connor has said: *"In an uncertain and politically unstable world the Japanese know they can deal with one country that is politically and economically stable. That is Australia."* But if South African supplies are maintained then it is difficult to see how Japan will in the forseeable future be a hungry market for Australian uranium. This is especially true when it is considered that, because of the determined local opposition to nuclear plants, even 30m kw may be a mere pipe-dream.

Finally, within this discussion of energy dependence, a comment should be made on the claim that nuclear power is a semi-indigenous energy source. This claim is made largely because of the relatively small volume and weight of uranium compa red with oil and coal (in energy equivalents.) However when it is realised that because of its susceptibility to earthquakes, Japan will remain dependent on overseas countries for waste disposal (and already there are signs that the U'K' is starting to object), and that reprocessing facilities will on present plans be insufficient within 3-4 years, and that for the next 8-10 years at least, enriched uranium must come from foreign sources, it is clear that even if significant substitution of nuclear power for oil were possible, Japan would be merely giving up one form of dependence for another.

THE SANE ALTERNATIVE

It is not the intention of this paper to present a comprehensive examination of the alternative energy strategies open to Japan. However, in brief, it is clear that for social and environmental reasons, Japan must move towards a steady-state economy, restructure its highly energy-intensive industrial system and redirect its research and development expenditure away from the wasteful and hazardous nuclear power alternative towards solar (including wind) and geothermal energy. For example, the official booklet on Japan's version of Project Independence states:

"There is the rapidly growing possibility that solar energy can be effectively harnessed to meet a significant part of our future energy requirements."14

And Amory Lovins has remarked *"With respect to almost all the unconventional energy sources, Japan is the best situated of any major industrial country...(these sources)...together with wide-ranging energy conservation can give Japan a sustainable energy future within a few decades."*

CONCLUSION

There are very good reasons why we need not and should not, sell uranium to Japan.

The major reason why we need not is that Japan's nuclear program is not, and cannot be, nearly as important in the total energy scene as we have been led to believe.

And although the official target for 1985 is 49m kw it appears certain that 30m kw is the most optimistic forecast that one could realistically make - so contracts with other countries are already sufficient for supplies well into the 90s. Any short term deficiency due to a refusal by Australia to fulfil contracts could be satisfied on the open market at little extra penalty in generating costs.

Reasons why we should not include:

(a) The need to move towards a steady-state economy so as to allow the society to recover from the social and environmental destruction wrought by post-war uncontrolled growth.

(b) The associated need for both Japan and Australia to move towards a renewable energy economy whilst embarking on a serious conservation program. Uranium Mining and Nuclear Power will militate against such changes.

(c) The danger inherent in Australia becoming excessively dependent on any country, especially one which has already brought to extreme development many of the evils of advanced capitalism.

Japanese anti-nuclear activists protest outside the Australian Embassy in Tokyo; the placard says:"The Australian Government shouldn't export dangerous uranium to Japan".

(d) The Japanese Government's refusal to bow to the demands of the anti-racist movement which is demanding cancellation of contracts made with South African uranium from Namibia.

(e) The danger of nuclear weapons proliferation (which may be enhanced by the fact that Japan has not ratified the NPT) and the danger of reactor accident, diversion of nuclear material, and accidental release to the environment of nuclear waste. (Opi nion polls indicate growing feeling amongst Japanese people that nuclear weapons are inevitable. Whilst in 1971-2 60-70% of people were firmly opposed to nuclear weapons, more than 50% believed that Japan would eventually acquire such weapons. The efforts by the US and Japanese authorities to desensitise the issue appear to be having effect).

(f) Above all, the assistance such a move would give to the opposition movement in Japan which has grown up partly as a result of factors which have given rise to similar movements the world over, and partly as a result of factors specific to Japan: an extraordinary frequency of occurrence of reactor accidents and breakdowns, a greater concern about radioactive pollution because of the heritage from the past, and possession of a part of the earth already so highly polluted in land, air and water that nuclear power must surely represent the ultimate insult.

If we can persuade, by whatever means, the Whitlams and Carnegies of this world not to supply uranium to Japan we will be doing the people a service - eventually they may invade us but only to offer their thanks.

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Space precludes detailed documentation. However, the unabridged, documented version of this paper is available from Friends of the Earth. Melbourne. The main references include: the four major newspapers, (Japan Times, Mainichi Daily News, Asahi Shimbun, and Yomiuri Shimbun), Energy in Japan No. 29, June 1975. published by the Institute of Energy Economics, Atoms in Japan a monthly magazine published by the Atomic Industrial Forum, Quality of the Environment in Japan, 1974, published by the Environment Agency, AMPO Winter 1975, IAEA Bulletin 12-4, 1970, Nuclear Engineering International, July 1973, personal communications with Jishu Koza and Ikata Lawsuit, and "Dynamic Energy Analysis & Nuclear Power" by Dr. John Price, (FOE U.K., Dec. 1974.)

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Compiled by Neil Barrett

Ecological Alternatives

What you can do now..... And further along

ENERGY CONSUMPTION

Turning lights off when not using them
Low wattage lightbulbs, except in reading lamps
Turning the heater down and wearing warmer clothes in winter; gentle air conditioning in summer, by opening the house in the cool night and keeping it closed in the day
Less dependence on electric blankets, knives, toothbrushes, can openers, pencil sharpeners...
Using the clothes drier only on wet days
Less ironing

Sharing the light — working near each other near windows or outside during the day
Candles for soft evening light
A well insulated house — rugs and wall hangings
More clothing in winter, and little in summer

Real blankets, or quilts and muscles — powered by health food!
Hanging clothes in the sunshine, or, on wet days, on a clothes rack near the heater. No ironing!

TRANSPORTATION

Combining errands — one trip is better than three
Public transportation whenever possible
A low-horsepower car; keeping it in good condition
Low-lead or unleaded gasoline — avoid overfilling

Living near where you work or working near your home
Walking, bike riding, spending more time in the neighborhood
Converting your car to propane, or getting and even less pollutive one (or none at all!) Sharing rides

WATER

pollution is the overloading of Nature's regenerative cycles

Turning faucets off — all the way off! — when not using them
Careful dishwashing, using water and detergents sparingly
Low-phosphate, biodegradible detergents
Filling the bathtub less and bathing together
Enjoying gentler or shorter showers, or showering together
A brick in your toilet tank (saves about one quart of water per flush)
Converting part of your lawn to a garden
Planning for less pavement (let the rain soak in!)

Turning water on gently — just enough for what you need
Fewer dishes — less dishwashing
Try the one-bowl trip — Your bowl.

Saving bath or shower water for washing clothes, pets, rugs
Flushing less often

Finding out about your local water treatment systems
Liberating your soil by pulling up pavement

Use your "consumer votes" for less pollutive products

SYNTHETIC CHEMICALS

Avoiding all chlorinated hydrocarbons (such as DDT) and other persistent pesticides and herbicides
Demanding less toxic cleaning agents, gasolines, food additives, paints, plastics

Organic gardening — no chemical fertilizers or pesticides
Non-toxic fly paper, and keeping your garden and kitchen clean
Rediscovering simpler solutions — like baking soda for cleanser, tooth powder, lemon fizz!

FOODS

Organic fruits and vegetables — fresh or frozen (not in tin cans)
Avoiding highly processed foods
Using leftovers promptly, in casseroles, soups, salads — more creativity, less waste
Enjoying a less carniverous diet — exploring vegetable proteins — nuts, whole grains, beans
Buying in quantity to reduce packaging waste

Growing your own fruits and vegetables organically; freezing or canning enough for year-round enjoyment
Treating yourself to home-baked whole grain breads, homemade jam, fresh garden salads
Raising some rabbits and chickens for meat and eggs
Giving vegetable scraps to the chickens
Composting, for rich, healthy soil
Bee keeping, for honey

Bring your yard full circle

CLOTHING

Buying good quality clothes and shoes that will last
Giving extra clothes and things to thrift stores

Shopping in thrift stores and/or making your own clothes
Having just a few clothes that you really dig (liberation!)

HOUSING

A small house — less furniture, heating, lighting; more cozy
Buying well-rated used appliances and good used furniture

Sharing the Household with several friends
Sharing major appliances (washing machine, freezer, sewing machine) with neighbors. Building some furniture

Limiting family size and/or adopting children

NOISE

Keeping good mufflers on your internal combustion engines
Turning off power tools after 10 PM
Turning off the TV or radio when you're not listening
Listening before you buy appliances such as beaters, blenders, vacuum cleaners

Quieter transportation – like biking
Hand crafting
Playing your own music; listening to sounds of Nature
More peaceful housework (consider the quietness of spoons and brooms...)

SST???

LITTER, CANS, GLASS, PLASTIC

Stop littering! — set a good example for others
Saving aluminum, tin, and glass for recycling
Re-using polyethylene bags and other plastic containers when possible; returning non-reusable plastic to the manufacturer or distributor

Taking time to pick up litter you see
Going on cleanup parties
Buying fewer cans, bottles, and plastics
Reusable containers instead of plastic wrap or foil
Reusing glass jars for homemade jams and fruits, and for storing dry beans, grains, and flours

Natural Conservation: Recycling

PAPER

Saving newspapers and magazines for recycling
Canceling subscriptions you don't read
Reusing paper bags and boxes, and recycling extras
Encouraging manufacturers to reuse packing cases
Letting wet paper towels dry for reuse; buying only white tissue (the colored dye is non-biodegradible)
Using both sides of each sheet of paper — it takes about 17 trees to make just one ton of paper
Reusing envelopes by pasting lables over former addresses

Sharing reading materials with many friends
Using the library
Taking a tote-bag to the store
Instead of buying paper towels, napkins, tissues — using sponges, dishtowels, rags in the kitchen; cloth napkins at table (if needed), cloth handkerchiefs
Keeping a scratch-paper drawer
Making your own envelopes out of paper used on one side, or folding the letter into its own envelope

...and all this adds up to:

less contact with machines, pavement, chemicals — more contact with Nature
less dependence on shopping, driving, money-making — a simpler self-reliance
less craving, competition, fragmentation — more sharing, appreciating interrelationships

from THE ECOLOGICAL LIVING HANDBOOK
published 1970 by The Center for Ecological Living
246 Center Avenue, Pacheco, California 94553

ALTERNATIVES TO NUCLEAR POWER

INTRODUCTION

Friends of the Earth Australia does not pretend to know the answer to all our energy problems. But we feel there is enough known about practical alternatives to centralised energy production, to take these alternatives seriously.

Directions which further Reasearch and Development should take are quite clear, but the basic solutions are not technical.

We must reorganise ouselves - socially, politically and economically, so that our society is no longer dependent on irreplaceable fossil fuels.

Our aim should be to achieve harmony with our living environment and to do this we must commit ourselves to changes in our relationships and lifestyles as much as changes in the political and economic spheres.

Human beings, plants, animals, soil and the inorganic substrate of an ecosystem form a community not merely because they share or manifest a oneness in "cosmic energy," but because they are qualitatively *different* and thereby complement each other in the wealth of their diversity. Without giving due and sensitive recognition to the differences in life-forms, the unity of an ecosystem would be one-dimensional, flattened out by its lack of variety and the complexity of the food web which gives it stability. The horrendous crime of the prevailing social order and its industry is that it is undoing the complexity of the bioshere. It is simplifying complex food webs by replacing the organic with the inorganic - turning soil into sand, forests into lumber, and land into concrete. In so simplifying the biosphere, this social order is working against the thrust of animal and plant evolution over the past billion years, a thrust which has been to colonize almost every niche on the planet with variegated life-forms, each uniquely, often exquisitely, adapted to fairly intractable material conditions for life. Not only is "small beautiful", to use E.F. Schumacher's expression, but so is diversity. Our planet finds its unity in the diversity of species and in the richness, stability and interdependence this diversity imparts to the totality of life, not in the black-painted-on-black energetics of mechanical spiritualism.
"Alternate energy" is ecological insofar as it promotes this diversity, partly by fostering an outlook that respects diversity, partly by using diverse sources of energy that make us dependent on varigated resources.

★★★★★★★

Compiled by FOE (Vic.) from:
"RADICAL ENERGY POLICY" by Hugh Sadler, *Radical Ecologist*, No. 1, April 1975.
"ENERGY AND MATERIALS" section of 'Soft Architecture', a special issue of *Architecture in Australia*, April 1975.
"SOLAR WATER HEATING" by E.T. Davey, CSIRO leaflet reprinted from *Building Materials*, Vol. 8, No. 1, Nov. 1966.
"CONSERVATION OF ENERGY, ALTERNATIVE ENERGY SOURCES AND THEIR IMPLICATIONS FOR ENVIRONMENTAL CONSERVATION AND FUTURE WAYS OF LIFE." by Gerald Leach. Presented at 13th Technical Meeting, IUCN, Zaire, Sept. 1975.
"ENERGY, ECOLOGY & ECOTECHNOCRACY" by Murray Bookchin *Liberation* February, 1975.
More detailed references are available on request.

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The Nature of Energy Consumption

It might be helpful to start with some physics. Although the term "energy consumption" is in general use, energy is not, in fact, consumed, but meraly converted from one form to another. The initial form is concentrated or high-grade energy (e.g. oil, natural gas) which may be converted to mechanical energy (as in an internal combustion engine), to electricity (as in a generator), to high temperature heat (as in a blast furnace) and to many other useful forms. Eventually, however, all the energy ends up in one form – that is heat at a low temperature, (less than 100°C), otherwise known as low-grade heat, from which no more useful work can be extracted. The end result of rapid rates of conversion of high grade energy can be seen near the centres of cities, where the average air temperature is several degrees higher than in the surrounding countryside. Thus, although energy is simply converted high grade energy is consumed.

This distinction is very important, because our present energy economy is overwhelmingly based on the use of finite reserves of high grade chemical energy in the form of fossil fuels. These are being consumed and cannot be replaced. When we consider solar energy, either as radiation or in the form of hydro-electricity, questions of reserve consumption are meaningless since the sun is an infinite energy source, (at least on the time scale of human evolution) which provides energy at a fixed rate. Although for convenience the term energy consumption will be used throughout the paper, the wider underlying implications must always be remembered.

Turning from the physics to the economics of energy, the term energy consumption has further connotations, praticularly in advanced capitalist countries where energy is "manufactured" and marketed as a commodity. This is much less true of underdeveloped countries: for example, it has been estimated that in Tanzania over 90% of energy consumption is in the form of wood and charcoal and is outside the commercial economy. Presumably, the proportion would be almost as great as in many other African and Asian countries. Official energy statistics are almost invariably concerned only with commercial energy sources. This is one reason for treating these statistics with great caution particulary when they deal with underdeveloped countries. Use of the term energy consumption in the remainder of this paper is intended to embrace all sources of energy.

Production Of Materials

The amount of energy consumed during production seems to be the best indication of how detrimental to the environment a material is. Researchers in the United Kingdom and the United States are compiling energy cost figures for building materials, but very little work has been done in Australia.

Looking just at the energy cost of building materials, the Bureau of Census and Statistics publish figures giving energy consumption for various industries and some building materials. However, only a small range of materials is listed and this is not itemised to give sufficient correlation between the product and energy used. Other considerations are the pollution caused by production processes and the destruction of natural landforms of raw materials; both of which are difficult to quantify. A production process can be viewed in terms of the many sub-systems providing inputs of materials and energy, and unless an energy cost assessment specifies which sub-systems have been included, it is difficult to correlate energy costs from different sources.

An example illustrating the problem of analysing too small a sub-system comes from a copper smelting industry in the United Kingdom which changed its fuel fired furnaces (operating at 27% thermal efficiency) to electric furnaces (with an efficiency of 61%). Thus the comparison of heat inputs required within the industry per ton of copper shows a factor of 2 in favour of electricity. However, if the sub-system is enlarged to include the electricity supply industry, where in the UK generation is approximately 25% efficient, the comparison for the different furnaces is reversed, with the total efficiency now 15% – (25% of 62%). What seemed to be an energy saving to the industry was to the wider system (and the country) a loss.

Ideally, an energy cost figure should include all materials and energy inputs, plus their transport costs, until the addition of inputs from the next widest sub-system makes no significant difference to the figures.

Energy for Need or for Profit?

Energy consumption is both a physical process and a socio-economic activity. Most energy policy studies place emphasis on the former by starting with a consideration of energy resources. The key to a radical approach lies in reversing the emphasis. The crucial question is not "How much energy do we have?" but rather "What is energy used for and how fast should it be consumed?" In other words. is energy consumption carried out for need or for profit? It now becomes clear that examination of energy policy should start not with resources, but with what is termed end-use consumption, that is the amount and type of energy used by each sector of the energy economy.

This approach to energy policy accords with the radical view of the future, as willed by us, not on us. It is up to us to decide what we want the future to be like and take whatever action we consider appropriate to achieve our vision of the future. I presume that most of us approach political processes and institutions on this basis and find no difficulty in rejecting the mystification of conservation ideology which attempts to project the future as being outside our control (or course, members of the ruling class are not mystified; they know that the future is controlled by them as long as the present structure of society is maintained). The tehcnological structure of society is potentially no less subject to our control than the political structure. Development is technology (in this case, the technology of energy use) result from political and economic decisions. It is not difficult to recognise that decisions being made all round the world to give far more government support to nuclear energy research than solar energy research are political, and that unless this bias is reversed, solar energy will not become available for widespread use.

The Myth of Autonomous Demand

However, radicals must go beyond the advocacy of mere support for (say) solar energy. We must question the whole basis on which decisions about energy sources are made. In Australia, as in most other countries, the rate of energy consumption has risen much faster than population, i.e. the per capita rate of consumption has been rising. Extrapolation of these rising trends, slightly modified by factors such as changes in industrial structure, yield so-called "projections of energy demand". It is suggested that "demand" is an autonomous factor which expresses the wishes of society about energy consumption, and that it is the responsibility of energy supplying companies and public authorities to "meet the demand".

What actually happens is that the energy industries draw up the "projections of demand" on assumptions of continuous growth in per capita energy consumption. They then set about the task of persuading the public to increase their rate of energy consumption, so as to make the projections come true. Two of the best examples in Australia are provided by the Victorian SEC and the Tasmanian HEC, which devote a large proportion of their resources (perhaps up to 11% in the case of the SEC) to marketing campaigns aimed at inducing industrial and domestic consumers to use more electricity. The results of this activity are used to justify the construction of Newport and the destruction of Lake Pedder. The operation of these publicly-owned authorities is almost indistinguishable from that of profit-oriented private companies (if anything, they are more ruthless than, say, the oil companies, because they are monopolies protected by their respective Governments and have no need to worry about their public image).

The concept of autonomous energy demand is thus a myth which obscures the true nature of the social processes that are causing a steady increase in the rate of energy consumption. Ideological justification is provided by rhetorical assertions that "standard of living" is proportional to the per capita energy consumption rate. The conservative political bias of such statements is more clearly revealed when they are extended to suggest that, without rising rates of energy consumption, employment will fall, worker discontent rise and revolution ensue. The "standard of living" myth has been capably exposed by the radical ecology movement and needs no further refutation here.

The difference between establishment and radical approaches to energy policy are now clear. The establishment creates "demand" for energy by manipulative mass marketing techniques and devotes all its research efforts to finding new, more abundant energy resources. Resources are the primary focus of attention; social and environmental considerations are a poor second. The radical approach is the reverse, social and environmental questions are of prime importance. With this perspective, complex technical debates about the size and nature of fossil fuel reserves assume only minor importance. It is no longer possible for the social realities to be obscured by technical jargon. The remainder of this paper will be devoted to an examination of energy policy, using this radical approach.

Criteria for Decision Making

Judgements must be made as to what rate of energy consumption is appropriate for each sector of economic activity and what energy source should be used. Judgement is the key word; energy policy decision must be based on firmly value-laden choices about how we want the world to be. The first step in formulating a policy must therefore be the establishment of criteria for making judgements. These fall conveniently into three groups.

Resource Costs

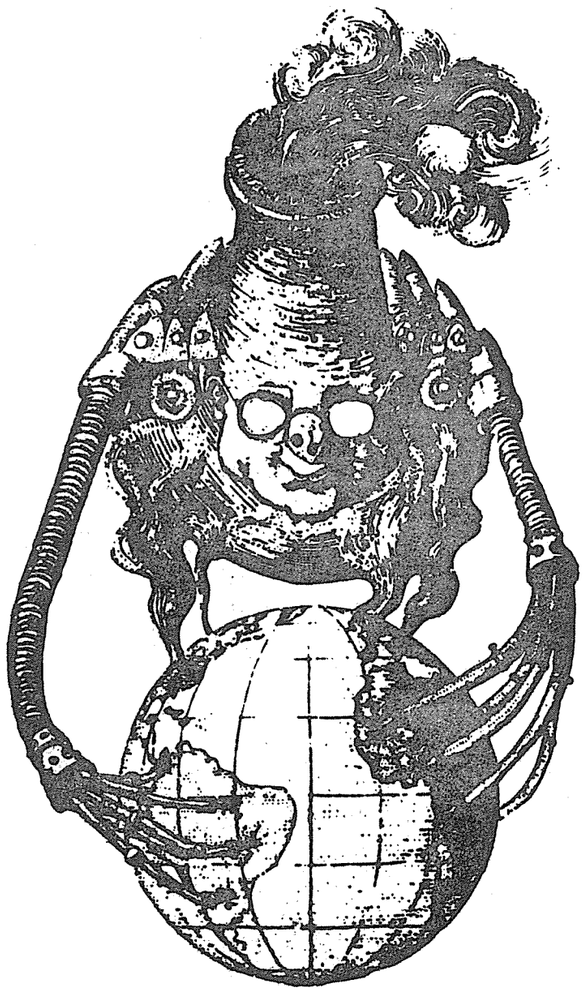
The first concerns the size of the effort, in terms of human skills and material resources, that would be needed to meet the sort of targets energy "demand forecasts" imply. Last August, the Department of Minerals and Energy published ' End-use Analysis of Primary Fuels Forecast 1971-72 to 1984-85". This document proposes that the absolute rate of energy consumption in Australai should rise by 84% during the next 10 years; consumption of electricity will rise by 109%, i.e. power station capacity to be built in the next 10 years will be greater than the total capacity existing today. Corresponding per capita increases are 55% and 75% respectively. Such figures clearly indicate the need for a massive commitment of economic resources to produce more energy. The effect is compounded by the rapidly increasing cost of new energy resources, such as offshore oil, oil shales and tar sands. Because the most accessible reserves have now been exploited, each extra barrel of oil produced from now on will, on the average be more expensive in terms of resource costs (labour and materials) than a barrel of oil produced prior to 1975. This phenomena is now the cause of considerable anxiety in the U.K., where many people fear that the country will be unable to afford the massive cost of North Sea oil. Thus we see that energy consumption is projected to rise faster than national income and that each unit of energy will require a greater share of national resources than heretofore. Such a rise in energy consumption could only be achieved by greatly increasing the share of national income devoted to energy production This must be a matter of grave concern to all radicals

THIS GRAPHIC IS ONE OF THE PAGES FROM "ROCKY", COPIES AVAILABLE FROM FOE (SEE BACK PAGES)

It comes as no surprise that people such as Herman Kahn have compared the mobilisation of economic resources that such massive development of energy supplies would require to the Apollo Project and even to the Second World War. Obviously such resources could be far better spent on housing, public transport, aid to underdeveloped countries, and all sorts of other projects. Investment in energy, however, bears far more resemblance to investment in the armaments industry than any of these, for it offers the prospect of increasing power and profits for the large capitalist corporations, without change in the underlying inequalities of capitalist society. For this reason, radicals should reject a policy of rapidly increasing rates of energy consumption.

Environmental Impact

Secondly, the effects on the environment of different energy technologies and different overall levels of energy consumption must be considered. These effects are well known to environmental activists: marine oil spills from offshore oil wells and from tankers, thermal pollution from power stations, massive waste tips from coal mines, the possibility of long term climate changes as a consequence of increasing amounts of dust and/or CO_2 in the atmosphere, SO_2 pollution from the burning of coal and oil, the long-term storage of high level nuclear fission wastes, and many more. Several general points may be noted. The nature and level of environmental impact depends, of course, on the particular energy technology; some technologies are far worse than others and this is the basis of the argument against nuclear fission – that its potential environmental hazards are so great that the technology should be totally abandoned. Nevertheless, all energy technologies, not excluding wind power and solar energy, have some environmental impact, which will naturally increase as the rate of energy consumption rises. Hence, environmental considerations provide grounds for preferring some energy technologies to others and also for aiming to minimise the overall level of energy consumption as far as possible; a balance with social objectives concerning life styles. A further important point is of particular relevance to fossil fuel consumption. Just as the resource cost of developing new fields has been rising as more accessible reserves are exhausted, so the environmental impact per unit of output has also increased. The same examples prove both points – offshore oil wells, the Alaskan oil fields, oil shale exploitation, and so on are all far more dangerous to the environment than older land based oil fields.



Social Effects

The third group of criteria of importance to energy policy formulation may be termed socio-political. There is an intimate relationship between the nature of technology and the pattern of social organisation. Modern industrial societies have a highly centralised structure and use large scale, highly centralised sources of energy. The level of organisation is national in the case of the electricity industry and international in the case of oil. Both require highly sophisticated technology and correspondingly high skills in the workers who design and operate the systems. The average individual user has scant understanding of the technology involved and almost no control over his personal pattern of energy consumption; for example, he usually cannot even choose whether to use gas or electric cooking. He certainly cannot choose to replace his car with an electric vehicle. Energy technologies not now widely used, notably certain forms of solar energy offer far greater possibilities for decentralised control and individual choice. These arguments hold with redoubled strength for the underdeveloped countries. The use of energy intensive industrial technologies based on oil has increased their dependence on technological skills and equipment imported from the industrial countries, while doing nothing to relieve the poverty of the rural masses. Reflection on that poverty should remind us, finally, that increasing consumption of energy in the appropriate forms will, up to a certain level, bring steady improvement in life style. Our responsibility is to choose a level of consumption that is large enough to make a good life available to all, yet small enough to avoid undesirable social and environmental effects.

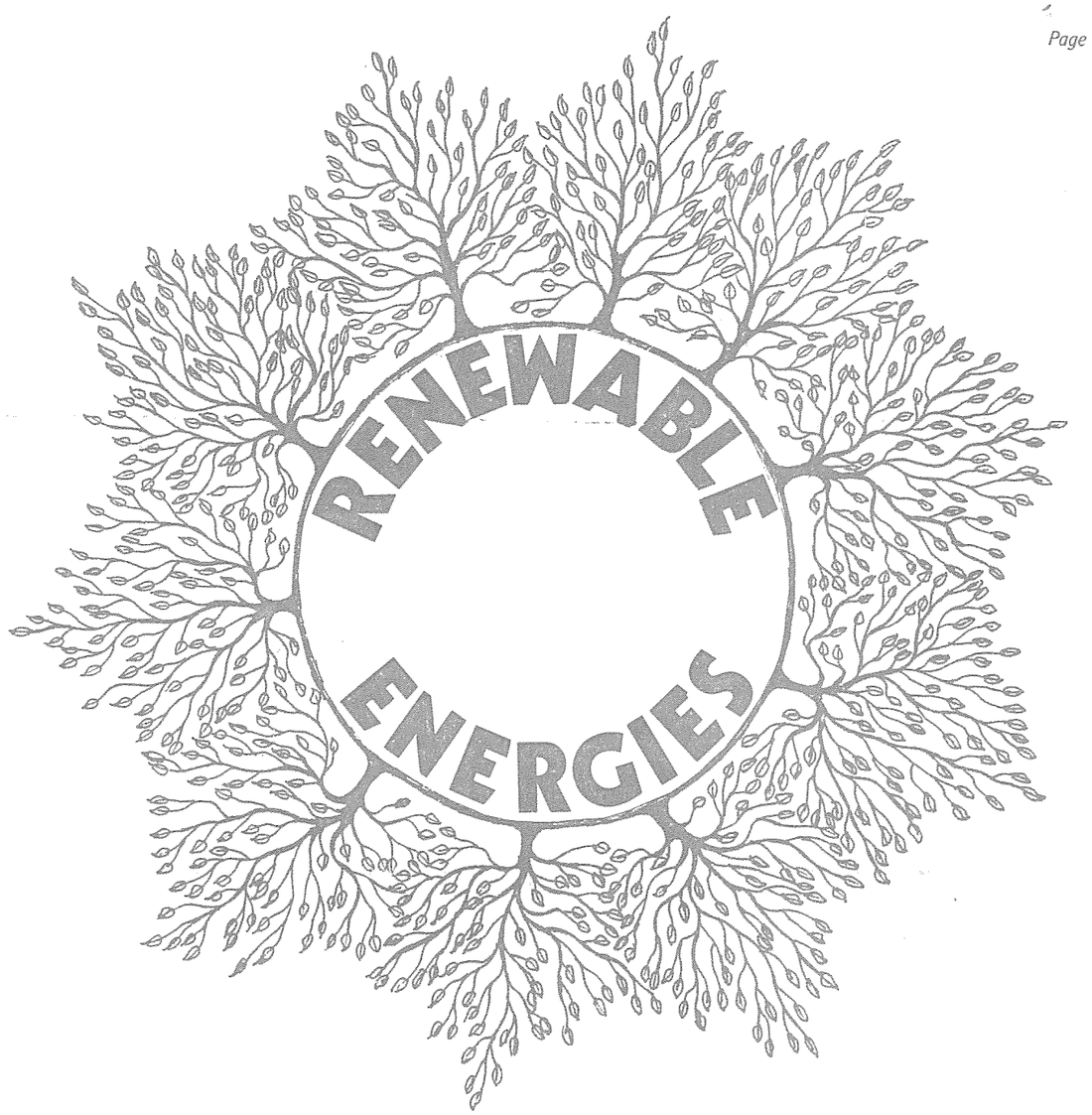
Towards a Radical Energy Policy

These three sorts of consideration – resource cost, environmental impact and social impact – will determine our choice of energy policy. Certain broad principles have already emerged: an emphasis on energy conservation by efficient use, complete rejection of nuclear fission and a preference, in principle, for solar energy. It should also be obvious that a radical energy policy cannot be based on such simple propositions as "solar energy is a good thing", for this leads to the advocacy of large satellite power stations or gigantic reflector arrays in the Australian desert, which on social and resource cost grounds are hardly more acceptable than nuclear fission. I believe that the approach I have described in this paper makes it possible to examine all the implications of any particular energy option.

The next stage in the process of developing an energy policy requires that each sector of end-use consumption be examined. Energy resource questions now become important in the form of constraints which preclude certain policies. One constraint overrides all others in the long term: all fossil fuels will eventually be exhausted and the world will then have to rely on renewable energy sources based on the sun, and, possibly, nuclear fission. Even though it may take several hundred years to reach final exhaustion, it would be sensible to start immediately on orienting our energy economy towards this long term goal. In the short and medium term, oil seems likely to be exhausted sooner than coal, which makes the question of oil reserves important when considering those economic sectors for which it is the major fuel. We do not have the option of expanding the consumption of oil in all sectors; some will have to convert to other energy sources and the speed and direction of the conversion will be affected by the estimated size of oil reserves as well as by many other considerations.

MAKING AGRICULTURE INDEPENDENT OF FOSSIL FUELS

People have to have food before they can do anything else; the most urgent need, therefore, - whether from the point of view of fighting hunger in the Third World today, or of developing new life-styles in the advanced countries to meet oil scarcities tomorrow - is a reconsideration of agricultural methods and policies. At least agriculture should be relatively independent of fossil fuels, which means independence of large-scale mechanization and intensive chemicalization. At least agriculture should be so organized that it can, in case of crisis, absorbe large amounts of labor, thereby giving large numbers of people the chance of making a living. There is no branch of production more suitable for the intelligent utilization of solar energy and other "income fuels" and also for the systematic practice of "recycling". Nor do we have to look for entirely "new models" if we want to develop a truly self-supporting agriculuture. Many successful farmers around the world, in rich countries as well as in poor, are today obtaining excellent yields without mammoth mechanization and without using any products of the chemical and pharmaceutical industries. Their methods are properly attuned to the cycle of nature which, as we all know, requires no other fuel input but that of solar energy.



Apart from food, the sun already provides one of the world's most important fuels - wood. Between 80 and 90% of the people in most of Asia, Africa and parts of Latin America depend on wood as their chief fuel sources, consuming over a ton each per year, mostly for cooking. In India wood, vegetations and animal waste account for nearly 70% of all fuel use, while 78% of all fuels are for residential use, mostly for cooking.

Such figures make a nonsense of statistics based only on the consumption of commercial fuels. They also point up a dependence on firewood and other solar-based fuels that has appalling environmental and personal consequences. The reckless felling of trees for fuel with subsequent erosion and creation of deserts has brought many civilisations to their knees in the past and as pressures on wood increase, costs soar and supplies dwindle, the process still continues, especially in arid and semi-arid regions. In parts of Africa many families now spend a quarter of their income on firewood while others are forced to scrounge further and further into the countryside for anything that can be burned - even stripping the bark off trees.

Ending this fuel-starvation and depredation by providing alternatives for cooking and everyday needs is perhaps the greatest challenge of energy development. Fortunately, the sum holds many answers - and in a wide variety of forms, for rich and poor, sunny and cloud-swept countries alike.

HIGH TEMPERATURE SOLAR

Several proposals have been made for large-scale solar-powered systems for generating electricity or liquid fuels such as hydrogen. They are often dismissed as American high-technology fantasies; and perhaps they are. Yet on straight cost comparisons some of these schemes could be within sight of competing with conventional and nuclear electric generation: on a broader costing base they could even now be ahead.

Perhaps the most promising idea (by Drs. A.B. and M.P. Meinel of the University of Arizona) is to use cylindrical parabolic collectors, steerable on one axis to follow the sun, to concentrate solar radiation onto heat collection pipes. The resulting energy is stored in molten salts or rock from which it can be extracted as required (night or day) to drive conventional steam turbines to provide electricity. Overall efficiency is estimated at 25% (1973) Thus with average US year-round solar intensities at the surface of 180 w/m2 (but 240/m2 on a steerable collector) a **continuous** 1,000 MW electrical output would require 16km2 of collectors.This sounds ridiculously high but is in fact no more than 10 times the land area required for an equivalent nuclear system. Capital costs were estimated in 1973 as $1,000-2,000 per kW installed which is high compared to competing electricity-generating systems, but certainly not ridiculously so. No one knows what further development and nuclear cost escalation could do to the comparison.

DIRECT CONVERSION TO ELECTRICITY

The second major type of development is the direct conversion of sunlight to electricity. Achieved efficiencies using panels of photovoltaic materials such as silicon and cadmium sulphide are in the 16-18% range, with a theoretical ceiling of about 35%. This is promising, but large-scale applications are presently ruled out by the exorbitant costs of solar cells - around $20,000 per kW capacity in 1973 - while there is the awkward problem that outputs peak during the day when electricity demands tend to be lowest. Energy storage - for example, by converting the electricity to hydrogen - would lower efficiencies. The problem of weathering and attack by pollutants of the cell surfaces could also prove critical. However, an intensive international research effort involving many commercial firms is now tackling the problems, and costs could be slashed. Tyco Laboratories, a leading US organisation in the field, recently forecast a selling price for solar cells of about $350 per kW capacity by the mid-1980s. It is on such estimates that the Japanese 'Operat-

ion Sunshine' programme is planning to construct a 1 MW solar-electric station by 1980.

There are other problems though, such as the current usage of rare and ecologically hazardous metals (either cadmium, titanium or silver) which are limited in supply.

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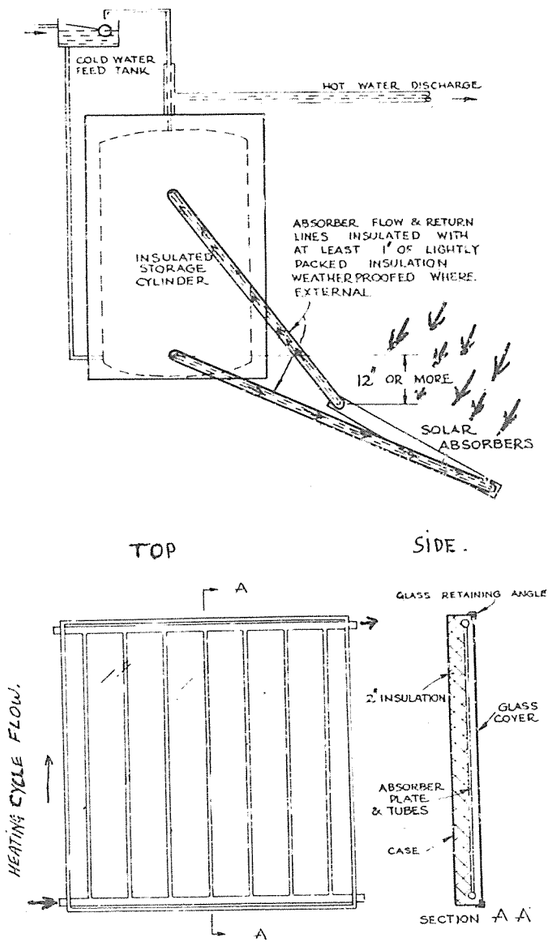
LOW TEMPERATURE SOLAR



A BASIC SOLAR WATER HEATER (Flat plate 'thermosyphen' or natural-circulation system'

The familiar rooftop solar water heater of sunny regions is being developed intensively around the world and is widely - and rightly - heralded as a major weapon in energy conservation. Since in the developed regions some 20-25% of primary fuel consumption is for space and water heating their possible target for fuel saving is very large. In fact the recent upsurge of interest in these devices has shown that even in cloudy, temperate climates they can indeed go a long way towards meeting this target, and at costs that are becoming highly competitive - although at the moment adequate insulation is far more cost effective.

Recent developments in Australia due to steady increases in sales and improvements in design are very promising. An average household of 4 to 5 people using 10 gals. a day each needs to spend about $500.00 for a complete solar hot water system, vs. @ $250.00 for a 'convenional' system. **But this solar system will pay for itself within 4 to 5 years.**

Even more hopefully, "Solar hot" in Sydney should soon be marketing a completely new design which is estimated to cost about half that of the present systems available, as well as being more efficient.

These advances are due to a combination of the Focusing and Absorbtion principles, a collector which enhances the advantages of each design and cuts down the disadvantages.

Although using polyester and copper, the unit uses less of these materials than a flat-plate collector due to the absence of most conventional tubing.

At present there are about 30,000 solar hot water systems in use in Australia, with Darwin (before the cyclone) having the second-highest proportion of solar systems in the world, after Tel-Aviv.

The current usage will certainly increase in the near future, and will be aided if the finance companies and power utilities provide low-interest loans or other mortagage-type arrangements combined with realistic energy prices and an end to "consume more/pay less" tarrifs.

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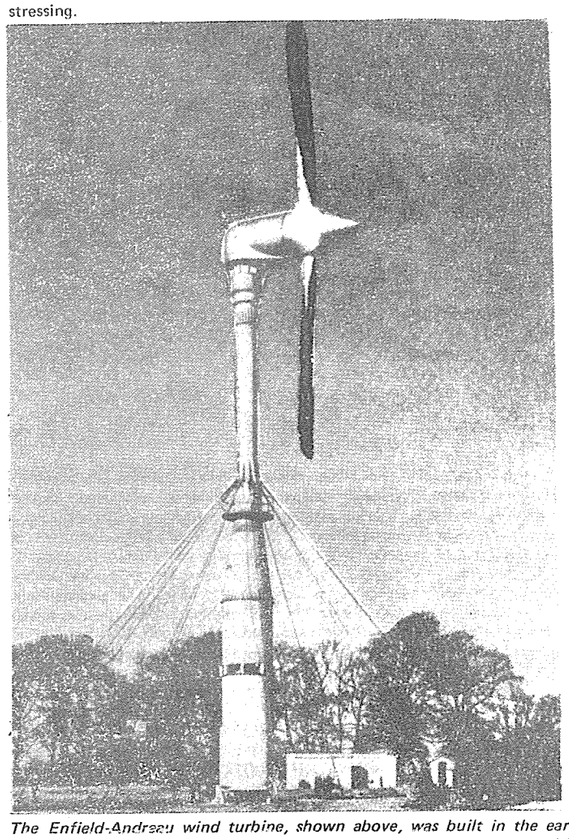
WIND ENERGY

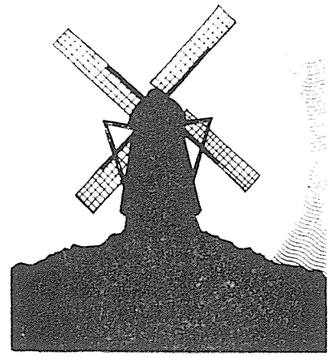
Man has been harnessing the energy of the winds for millenia and on a very impressive scale. In the last century many thousands of windmills, with maximum capacities of about 2 kW. were scattered over Europe and the USA' The great sailing ships of the period - the windjammers - each captured about 4 MW and were the largest energy-converting devices then known.

Estimates of the energy that might in time be harnessed from the wind vary widely but are usually in the 200-700 x 1018J per year range, bracketting the present global rate of fossil fuel use. But so much depends on siting and cost assumptions that, in fact, such figures mean little. The basic problem is that wind energy is diffuse so that large collectors are needed to obtain useful outputs. Furthermore, wind speeds are very variable, so that designs have to match the particular wind profile of each locality to make the most of what there is when speeds are low and to avoid structural damage during gales. Since outputs often fall to nothing when power is needed, wind generators either need expensive storage facilities such as batteries, or can be used only to back-up conventional generating devices. However, they are often best used in tasks such as lifting water where power fluctuations do not matter (the lifted water is the energy store). This can be a great bonus in many tropical regions where wind speeds tend to be highest and most constant at just those periods when irrigation is needed most. Since a small 1 kW machine can do the work of at least five people in hauling water, their potential for eliminating sweat and drudgery hardly needs stressing.

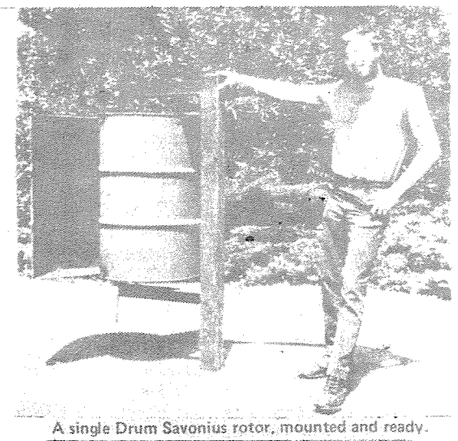


The Enfield-Andreau wind turbine, shown above, was built in the early 1950's in England. It had a capacity of 100 Kilowatts, and a rotor of 79 feet , with hollow blades which acted as a centrifugal air pump to pull air up the hollow tower. The generator was run by an air turbine and was mounted near the ground, which is of great structual advantage.

ALREADY ECONOMICAL



A general consensus seems to be that in favourable areas - chiefly the temperate zones with their high average wind speeds, and the winds-wept islands of the tropical oceans (South Asia, Pacific, Caribbean, etc) - with a little more development, and on **present** costs, wind generation could be a significant contributor of pollution-free electricity. Indeed, in some areas the costs equations, are now tantalisingly close to the break-even point with nuclear and fossil-fired electricity. For example, Engstrom (1975) argues that on 1974 costs and interest rates a wind plant on a good coastal site in Sweden would need to cost $420-860 per kW installed to break even with nuclear power. **Actual 1974 costs of a conventional 2 MW wind plant would have been $670-890 per kW installed capacity - well within the range.** However, as mentioned earlier, nuclear costs are escalating rapidly: while Engstrom bases his calculations on a nuclear cost of $530-670 per kW installed, including distribution lines, figures more than twice as high as this are now being quoted in the USA. It is on this kind of argument that the Dutch government is now exploring the possibility of very large wind generator 'parks' floating on the North Sea; a recent British study susggests that earlier estimates of a minimum 3,000 MW of wind capacity for the UK delivering 3-4 x 10^{16}Jper annum "are still valid"; and US studies point to a potential in 2000 of about 5 x 10^{18}J. However, while such figures may seem impressive they are only guesses and, if achieved, would raise some formidable problems: for example, the visual intrusions and siting conflicts arising from 1,000 1 MW wind plants (equivalent to a single large nuclear reactor) are not to be ignored.



A single Drum Savonius rotor, mounted and ready.

For developing regions the practical potentials for wind energy are even harder to estimate and also vary enormously from region to region. The main problem is that extensive research is still needed to develop low cost, high-efficiency machines to cope with the generally low average wind speeds of 8 to 10 kilometres per hour. Whether these innovations will come from the sophisticated laboratories of the West, or will be 'home grown' to suit local conditions more closely, is a compelling question. In some areas there may be a strong case for developing quickly ultra low cost and **technically** inelegant but socially most relevant solutions. If the survival of a village depends on adequate water from a deep well it matters little how finely the bearings of the wind pump are machined.

☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆

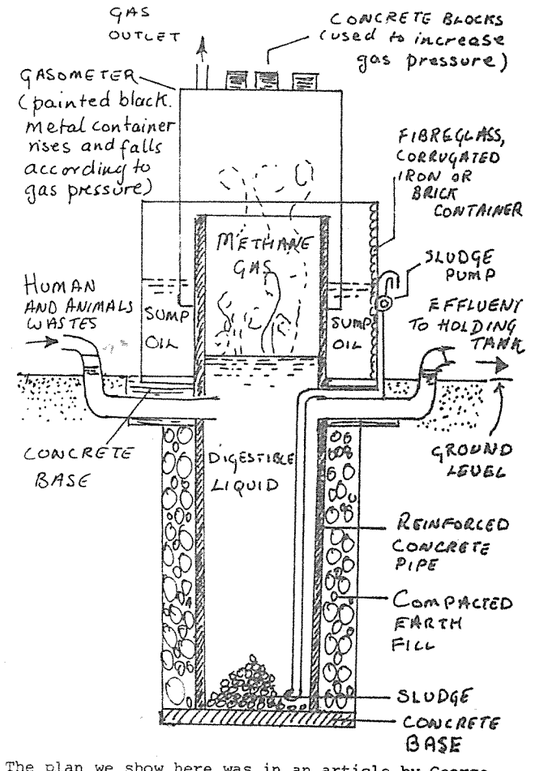
FUEL FIELDS AND FUEL FORESTS

There seems little doubt that the greatest potentialities of all for solar energy, especially in the rural areas of the developing world, lie in the use

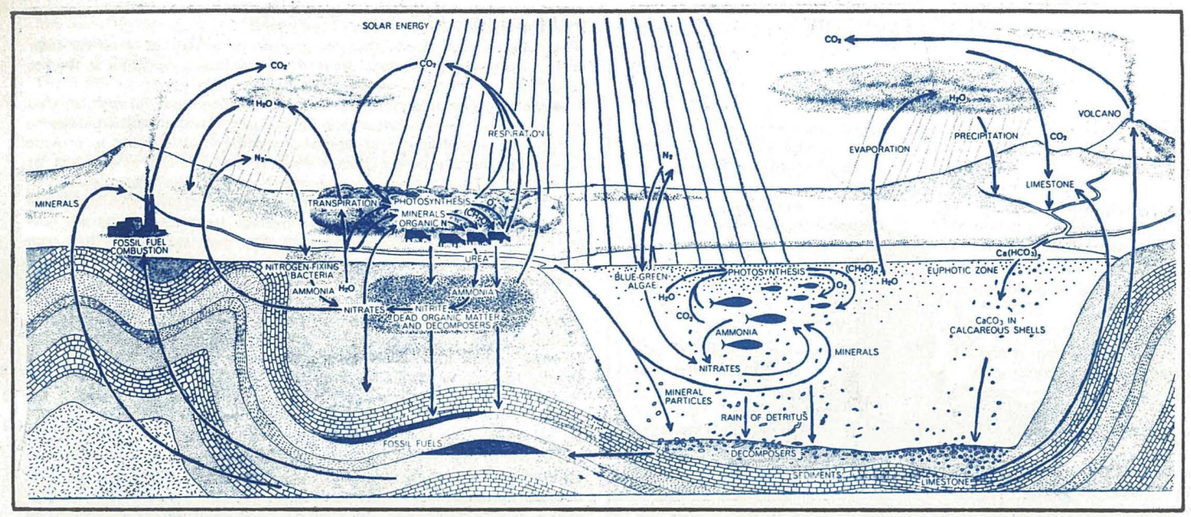
of plants: well-managed forestry; quick growing 'fuel forests' or 'BtU bushes'; use of forestry urban and agricultural wastes; and the deliberate planting of 'fuel crops' with high photosynthetic efficiencies to provide fuels either directly or via conversion to liquid fuels such as methane gas or alcohols. This is already happening on a reasonable scale in Australia, with the conversion of bagasse and other cane"wastes" into fuel for the running of sugar refineries. Some sewerage treatment plants are now producing more than enough methane than they require for their own use. There are three main points to be considered in the conversion of plants to fuels:

The first is the very broad one that the potential of 'bio-mass conversion' fuels to solve energy problems varies enormously from country to country. High populations and high energy consumption per capita already bar several countries from any large-scale use of these sources. Notable examples are the UK, West Germany and Japan, which are already using fossil fuels at rates, respectively, of 385, 388 and 278 GJ per hectare of total land surface, which in the UK and Germany is equivalent to just over 1% of solar radiation at the surface. (Per hectare of total arable land, forest, meadows and pastures the figures are 445, 465 and 320 GJ/ha respectively: (FAO, 1974; UNEP, 1975). In other words, if the entire land surfaces of these countries were devoted to photosynthetic fuel production at a very optimistic 1% efficiency they could just match present fuel demands. In fact the gross primary production of UK agriculture is about 1.11 x 1018J per year - an efficiency of only 0.18% - and is equivalent to only 12% of annual fuel consumption while agriculture itself uses over 4% of this total. But in contrast, the fossil fuel energy densities of most developing regions are so low - for example, 1 GJ/ha for Nigeria, 10 GJ/ha for India and Mexico - that despite large population densities the potential scope is enormous in principle, although obvious limitations such as water availability must be considered.

METHANE DIGESTER



The plan we show here was in an article by George Chan in Earth Garden No. 8. He has been responsible for the construction of about twenty of these in Niugini. There are also other articles in Earth Garden No. 8 and sources of further information.



The second point concerns economics. Many recent studies have produced cost estimates which are highly variable but are often only marginal - or worse - in comparison to conventional fuels. Thus for the USA, conifer plantations with a 12-year cycle could produce fuels at around $2.8/GJ compared to unrefined oil at $1.9/GJ or $12/barrell. A 1000-ton per day plant for converting urban wastes to methane has been thoroughly costed, allowing credits for waste disposal, scrap recovery etc, at a gas selling price of $0.2/GJ or about one third less than the present, typical selling price. For India, Bhatnaga (1974) has reviewed various fuel plantation schemes and shown that they can produce a net fuel output of about 220 GJ/ha - equivalent to 5 tons of oil- with net returns of about 3000-3200 rupees, or rather less than the 4000 rupees that could be achieved by growing grain with yields of 3t/h. In the UK the yield of straw from cereal production is about 45 GJ or one ton of oil equivalent per hectare, but it is still vastly uneconomic to do anything but burn off the quantities not required for animal feed and bedding.

This brings us to the third and final point. Are such conventional economic comparisons really the best judge of future priorities and actions? Most systems for solar-fuel conversion appear to match all the requirements of a new energy source in a world where providing for all people for all time has become an imperative for development. They use simple, existing technologies and skills; they can almost certainly be developed on a large scale in a decade or two; they can store energy for use at will and produce fuels with high thermodynamic availability; they are forever renewable (with care); ecologically inoffensive (with care); and widely available. In the rural areas of the developing world they could produce very important synergistic effects: for example, by allowing greater irrigation or by providing fuels for mechanisation and this releasing land now devoted to draught animals. Perhaps above all, they are ideally suited to small-scale, village-level, self-help, decentralised development and therefore to the great majority of the world's peoples who still live in scattered, rural communities.

These advantages have been broadly recognised by developing countries, yet there is still a strong tendency -especially among city-based economists and planners - to consider as appropriate only those schemes which give a substantial plus in narrowly defined and short-term economic calculations.

☆ ☆

HYDROPOWER:

The most recent estimates, based on a world survey of river gradients and flows, now put the global hydropower potential at 16 x 10^{18}J per year (4,443 x 10^{9}kWh) or just over 6% of annual primary fuel consumption. This figure is based on flows available for 95 per cent of the year, and is only 45% of the average flow potential. Only 12% of this global potential is now utilised but in the USA the proportion harnessed is 30% and in Europe as much as 53%.

Of greater importance is the distribution of hydropower in relation to energy needs. The five countries with the largest hydro resources include China, Zaire and Brazil (with 13.5, 6.7 and 5.3% of the global Genav total). Africa and Asia each have one quarter of the world's potential and South America 17%, making 69% in all for the most energy-hungry regions. Yet the fractions of this resource which have been utilised are very small: 1.7% for Africa, 4.5% for Asia and 5.1% for South America.

So there is a great potential for increasing hydro-electricity. But there are also great problems in doing so. A major one is cost. The huge capital costs for dams and distribution grids have often led to unhappy cases of foreign economic and technical domination. Schemes that are 'economic' tend also to be so large that they provide far more power than can be used: as a result, energy-intensive industries such as aluminium smelting have to be set up (perhaps under foreign ownership) to consume the excess. The effects on balanced development have not always been for the best.

There are also a number of environmental dangers. Flooding large tracts of land can destroy human settlements, drown habitats, interrupt migration routes and introduce water-borne diseases such as bilharzia and malaria unless stringent surveys and precautions are taken before hand. Silting behind the dams makes hydropower in effect a depleting resource: lifetimes of 100 years may prove to be exceptionally high while the financial (and energy) costs of dredging are largely unknown.

For many regions a more promising approach than the large high-cost dam is to harness the normal flows of rivers, streams and even canals using small axial flow turbines. These mini hydropower devices are now made at moderate cost and could provide ample and continuous power, except perhaps for drought periods, for tens of thousands of villages in the river valleys of the developing world with practically no environmental costs. Surveys of potential sites and economics are urgently needed. This has already been done in China, which today has the majority of its agricultural communes powered by combinations of small hydro plants, coal for steel smelting and plants and wood for domestic cooking and heating, with minimal use of liquid fuels for small tractors, trucks and buses.

GEOTHERMAL AND OCEAN RESOURCES

The heat flows of the earth's crust, the thermal gradients of tropical oceans and tidal power are widely canvassed as valuable potential energy sources. In fact their true potential (or lack of it) is hardly known. In exploitable form these are highly localised sources and neither the thorough exploration nor the development of the relevant technologies needed to exploit them has really begun.

Geothermal plant for generating electricity or providing space heating are in operation in several countries - including Iceland, Italy, Japan, Mexico, New Zealand and the USA - but their contribution to total energy use is minute. The main hope is that deep drilling to tap hot dry rocks will prove feasible despite formidable technical difficulties, in which case the potential could be enormous in many regions. With thermal gradients the theoretical potential far exceeds present global energy consumption rates but low efficiencies, corrosion problems and the need for large scale structures make large-scale economic operations unlikely for perhaps a century, if ever. Tidal power will probably always be a minor source, though a useful one in certain favoured regions: for example, one estimate suggests that India could develop a 25,000 MW capacity from tidal power at acceptable cost. Essentially these are longer term possibilities that will have to be explored.

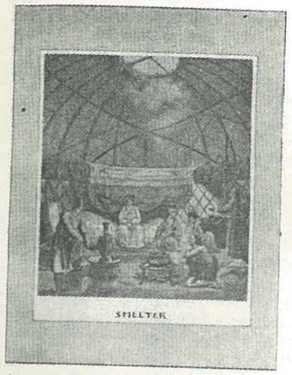
It has been estimated that we could reduce the present energy consumption in countries such as Australia and the U.S. from 15% to 25% by 1985, without any significant change in our lifestyles or material standard of living. The major changes would be in the wasteful production patterns and industrial processes which are with us at present; due to a previous cheap supply of non-renewable fuels and a cynical regard for the energy cost of superfluous consumer items (e.g. packaging).

This section has mainly been lifted from Gerald Leach's paper, with graphics from many sources.

energy & materials back-up

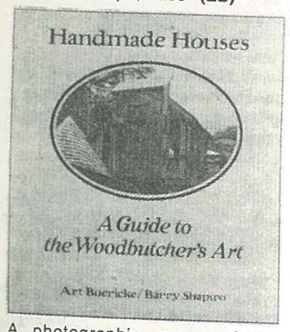
HANDMADE SHELTER

"Shelter", Lloyd Khan, ed., Shelter Publications, approx. $6.00 (B) (EB)



A uniquely amazing book, Shelter fits into all categories of this issue, it is **the** manual of soft architecture. Covers hand-made housing all over the world, materials and techniques, designs, domes and a good section on energy and waste. The essay by Lloyd Khan "Smart but not wise" page 112, 113, could well become the manifesto of soft architecture. It's ours at present.
Most often spoken of as a source book, the publication is much more. A demonstration of owner-builders' abilities and an exhibition of the need for a change in architects' values, make Shelter the most "revolutionary" book around at present. (See Book Review, AA Feb. 1975). An absolute must.

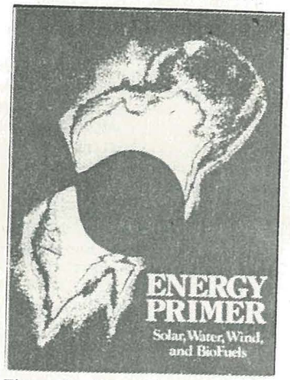
"Handmade Houses—a guide to the Wood Butchers Art" Art Boeriche/Barry Shapiro, Scrimshaw Press, $12.95 (EB)



A photographic survey of the best of the funky owner-builders work in the United States. Most of the houses would not get a building permit here (but then they didn't in the USA either). The owner-builders either ignore the regulations or designate their erstwhile homes "potting sheds", "temporary structures", "garages", and the like. A book that proves that the unskilled designer has more talent, ingenuity and taste than most architects would care to admit. Try not to be put off by the text which is often singularly inappropriate — the pictures speak for themselves.

ALTERNATIVE ENERGY SOURCES

"Energy Primer", Portola Institute, 1974, Around $5 (EB)



The only thorough compilation of alternative energy. Put together by four United Statesian groups with a lot of experience in alternative systems. **Whole Earth Truck Store, New Alchemy West, Ecology Action/ Paolo Alto and Alternative Sources of Energy.** The book covers solar, water, wind and bio fuel energy systems, with an excellent section on Architecture and integrated systems. Special Reports were written for each of the sections by leading authorities and there are detailed review sections in the Whole Earth Catalog/Epilog format.

★

SOLAR ENERGY

"Direct Use of the Sun's Energy", Farrington Daniels, Ballantine 1974, $2 approx., (EB) originally Yale, 1964 (L)

Books on solar energy abound as people cash in on the energy crisis, but this is still the **best** introduction. Comprehensive, well written, it is a curious comment on technological optimism that the book is not out-of-date: there won't be any great breakthrough in solar energy and there won't be any great gains to be made in radical new equipment. The principles and equipment set out in this book are still our best hope. The most detailed information on solar energy can be obtained from the **International Solar Energy Society (ISES)** and its journal.
Membership ($14/pa) can be arranged through the CSIRO:
ISES
C/- Solar Energy Research
Box 26
P.O. Highett, Victoria 3190.
An excellent summary of the state of the art of solar energy is covered in:

"Solar Energy Research in Australia", Australian Academy of Science report number 17, 1973 (AGPS)

This covers various aspects of research in Australia, including recommendation for further work on Flat Plate Collectors, water heating, heating and cooling of buildings, biological methods of convection of solar energy and electricity generation.

★

SOLAR ENERGY AND BUILDINGS

A good introduction to the possibilities for the use of solar energy, particularly for housing, is given by Colin Moorcraft in a series of three articles in **Architectural Design** 10/73, 1/74, 2/74. The first issue particularly is the only summary available of diverse work on space heating and cooling, collecting together some of the better information from the 1973 Conference on "The Sun in the Service of Mankind".
AD has run a number of articles on topics in this area, including Colin Moorcraft on **"Designing for Survival"**, 7/72 and a report by Alexander Pike on his plans for **"An Autonomous House"**.
Another good introduction is **"Sun Power", by Marguerite Villecco in Architecture Plus, Sept/Oct 1974.**
This article has a large number of photographs of various solar absorbers and solar heating and cooling ideas, but lacks a good critique of most of the systems.

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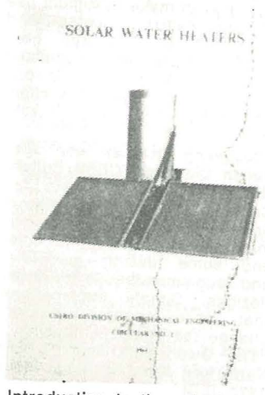
SOLAR WATER HEATERS

"Solar Water Heaters", CSIRO Mech. Eng. Circular No. 2, 1964, from CSIRO



Introduction to the principles of Design, Construction and installation of a flat plate absorber and tank. The design is tested and is the basis for most of the commercially available models. There is a great deal of further technical information on this and other designs in various journals (see bibliography), as water heaters are the most researched and well documented aspect of solar energy entrapment.

★

WIND ENERGY

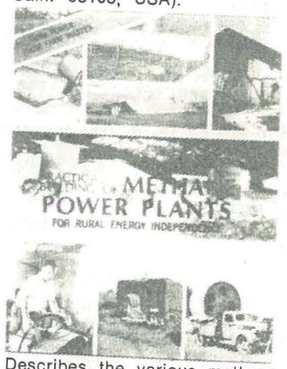
"The Generation of Electricity by Wind Power", E. W. Golding, Spon, 1955 (L)

Although out of print this is by far the best of the few books that deal with wind power, dealing with large, medium and small units. The book has a fine introduction, and manages to keep the discussion between the two extremes of home-made mini machines that usually won't see it through a summer storm, and the super large windmills, over engineered and over centralised. However, before anyone sets out to build a windgenerator they should consider Jay Baldwin's advice in his article "Sun and Wind in New Mexico", p. 164 of **Shelter**, that basically it's a tough climb. Better off investigating the manufactured models unless you are a really serious technological wizard.

★

METHANE DIGESTERS

Information on methane digesters abounds in very obscure sewerage journals, but there are few good texts. These two, the first on small digesters, the second on larger ones are the best introduction.
"Methane Power Plants", L. John Fry, Standard Printing $US12 (from Author, 1223 North Nopal Street, Santa Barbara, Calif. 93103, USA).



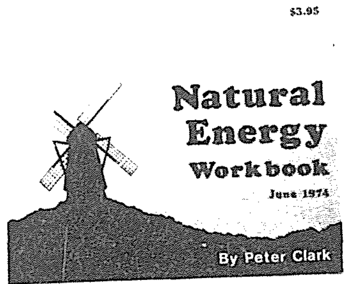
Describes the various methane plants that have been built and work, including the ingenious use of an inner tube for a digester. Deals at length with all the safety problems and the design considerations necessary.
"Bio-gas Plants: Generating Methane from Organic Wastes", 1971 and "Bio-gas Plants: Designs with Specifications", 1973, Ram Bux Singh, $US5 and $7 from Gobar Gas Research Station Ajitmal, Etawah (UP) India.
There are 7,000 of the plants described currently operating in India and a target of 100,000 has been set for 25 years hence. Larger designs are constructed to give Indian villages independent power from cow manure.

★

ALTERNATIVE ENERGY ANTHOLOGIES

Producing your own Power", Carol H. Stoner ed, Rodale, 1974, Around $9 (EB), Reprints.

"Handbook of Homemade Power", Mother Earth News, Bantam 1974, Around $2 (EB)



Natural Energy Workbook by Peter Clarke. $3.95 **(EB)**
This is a practical guide to building small community-sized autonomous energy systems. Sections on Wind, Solar, Hydro and Fuel-Gas generation. One of many of a similar ilk, this one is more concise than most.

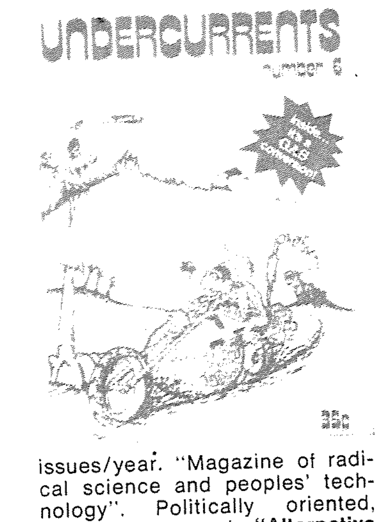
★

SOFT TECHNOLOGY MAGAZINES

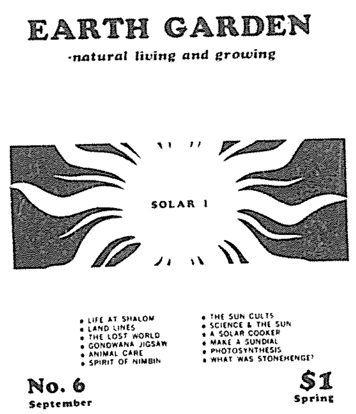
The two magazines worth searching out are:

● **Alternative Sources of Energy, Route 2, Box 90A, Milaca MN, USA $US5/six issues/year or (EB)** Issue No. 15 October 1974, is an excellent Access guide: the best bibliography so far, of people and institutions interested in soft technology. The first ten issues are now in book form **"Practical Technology and Philosophy for a Decentralized Society" (EB)**

● **Undercurrents**, 275 Finchley Rd, London, NW3, UK. £2/six



issues/year. "Magazine of radical science and peoples' technology". Politically oriented, but if you read **"Alternative Technology and the Politics of Technical Change", by David Dickson, Fontana (B)** you will probably be convinced that technology and politics cannot be separated. So **Undercurrents** is usually very firmly based.

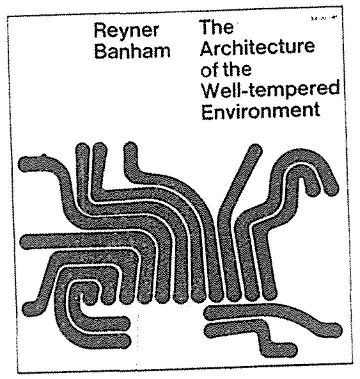


E Earth Garden P.O.Box 111, ... 2041. Australia $1.00 per. issue; quaterly. **(EB)**
A basically non-technical mag., this is the Australian equivalent of **The Mother Earth News** Very good on organic farming and gardening, it is filled with ideas and inspirations for developing a more co-operative and natural lifestyle.

★

ENERGY & BUILDING DESIGN

"Architecture of the Well-tempered Environment", Reyner Banham, Architectural Press, 1969 (AP/AA)
A historical perspective of the rise of mechanical services as a dictator of architecture. Wide-ranging and provocative, it proposes that high rise offices perhaps owe more to the inventor of the lift than to steel and concrete. Shows how building



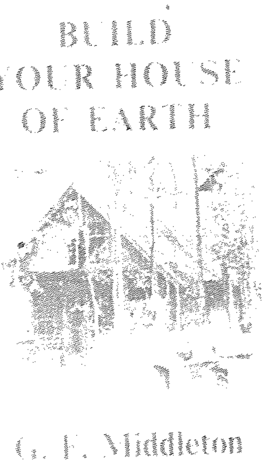
design was often freed from practicalities by mechanization to the point where the building consumed inordinate amounts of energy in operation.

The problems of designing buildings to make maximum use of the natural climate and hence minimise energy consumption have been neglected as Reyner Banham points out, but these are several excellent introductory books on the subject:
"Designing Houses for Australian Climates" CEBS, Bulletin No. 6, (AGPS)
Contains outlines of climates of Australian regions and specific information for the capital cities and some design guidelines and recommendations for house designs. Simple explanations, that when adopted radically change the shape of housing.
"The Owner-built Home", Ken Kern, Ken Kern Drafting, 1969/1972 (EB)
The first chapter on site and climate offers a very simple and clear introduction to the problems and some solutions and Ken Kern's own ingenious ideas (see Community Back-Up).

★

BUILDING WITH EARTH

"Build Your House of Earth", G. F. Middleton, Compendium 1975 (Originally Angus and Robertson, 1953) (EB)
"Earth Wall Construction", G. F. Middleton, CEBS Bulletin No. 5, 1952 (L) Out of print.
The bibles of earth building for over twenty years. Compendium have recently published the book, but there is some additional, more detailed information in the CEBS bulletin.
One of the beauties of the book



is that it is written for the average owner-builder, not only was the author so knowledgeable about this material, but he chose to direct it to as wide an audience as possible. Both works cover pise or rammed earth construction, where forms are used to shape a whole wall as illustrated in the Ecological Approach to Housing article and also adobe or sun dried blocks laid similarly to conventional blockwork.
Now G. F. Middleton's test slabs of earth, almost unweathered after almost 30 years, stand surrounded by the encroaching bush at North Ryde Experimental Station, NSW. If anyone remains unconvinced they should visit this monument to a building system that deserves immediate revival.

★

SOLAR WATER HEATER MANUFACTURERS

● **New South Wales:**
Braemar Engineering Pty. Ltd.
167 Bonds Road,
Punchbowl, 2196.
Solarhot Water Systems
34 Flinders Street,
Earlwood, 2206.

● **Victoria and Tasmania:**
Braemar Industries Limited
400 Princes Highway,
Noble Park, 3174.
Somer Solar Installations,
Sandy Point Road,
SOMERS, VIC. 3927

Autonomous Energy Systems,
127 Atkinson Street,
OAKLEIGH, VIC. 3166

Tasmania
Braemar Engineering Pty. Ltd.,
14 Wenvoe Street,
DEVONPORT, TAS. 7310

● **South Australia:**
Braemar Engineering Co. (SA) Pty. Ltd.
Findon Road,
Kidman Park, 5025.
Beasley Industries Pty. Ltd.
Bolton Avenue,
Devon Park, 5008.

● **Western Australia:**
S.W. Hart,
112 Pilbara Street,
WELSHPOOL, W.A. 6106
(G.P.O. Box X2311, Perth, W.A. 6001)
Smalls Sola Heeta Co.,
10 Goongarrie Street,
BAYSWATER, W.A. 6053
Sola-ray Appliances,
6 Boag Road,
MORLEY, W.A. 6062
(P.O. Box 75, TUART HILL, W.A. 6060)

● **Queensland:**
Braemar Engineering Co. (Q'ld) Pty. Ltd.
Bilsen Road,
Geebung, 4034.
Thermax Electric Water Heaters Pty. Ltd.
P.O. Box 173,
Hamilton Central, 4007.
Turbon Engineering Pty. Ltd.
Birubi Street,
Coorparoo, 4151.

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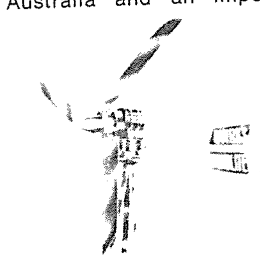
WINDGENERATOR DISTRIBUTORS

● **Quirks Victory Light Co. Pty. Ltd.**
33 Fairweather Street,
Bellevue Hill, NSW, 2023.
Stocks the 2kw machine made in Australia and an imported



12 volt/300 watt model imported from the US.
● **Dunlite Electrical Company**
21 Frome Street,
Adelaide, 5000.
Stocks a similar machine to the large Quirks.

WINDPUMP DISTRIBUTORS

● **Southern Cross Machinery Pty. Ltd.**
1 Grand Avenue,
Camellia, NSW, 2142.
Manufacturers and distributors of the best selling and now famous "Southern Cross Windmill".
● **Sidney Williams and Co. Pty. Ltd.**
Williams Parade,
Dulwich Hill, NSW, 2203.
Handle Comet Windmills.
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PUBLICATIONS FROM FOE:

energy: :general

"WORLD ENERGY STRATEGIES: FACTS, ISSUES, AND OPTIONS" by Amory Lovins. Foreword by Hannes Alfven. For those seeking responsible energy decisions around the world, and uncertain which experts and which numbers to trust, a careful assessment of the constraints upon already inadequate energy resources. Lovins suggests where the merits may lie in technical disputes and shows what energy options exist for the long term and what short-term actions must be avoided if we are to preserve those options. (Co-published with Ballinger.
132 pages $4.20 plus 60c postage. (Price to FOE members $3.50 plus 60c postage).

"NONNUCLEAR FUTURES: THE CASE FOR AN ETHICAL ENERGY STRATEGY" by Amory Lovins and John Price. The authors describe some economic and ethical matters that should no longer escape our attention. The book enables intelligent, concerned people to correct the executive's failure to take notice. In different ways, the authors explain the unattainable amount of capital needed for the nuclear dream, so unattainable as to be ridiculous, yet sought nonetheless because advocates have not bothered to do their sums carefully enough. (Co-published with Ballinger Publishing Company.)
224 pages, paper $5.00 plus 60c. postage. (Price to FOE members $4.00 plus 60c postage).

"OPEN PIT MINING" Earth Island, London, 1973. Amory Lovins and Phillip Evans. (Price undetermined, but less than $5.00).

"EYRIE & THE MOUNTAINS OF LONGING" in the Earth's Wild Places Series. FOE/McCall. 1971. $25.00 postage incl. 35cm x 27cm.

"NON NUCLEAR FUTURES" (Supplement to Not Man Apart - August 1975) by Amory Lovins. This is an excellent summary of Lovins' thesis. 8 pages 20 cents plus 18 cents postage.

"RADIOACTIVE POLLUTION OF THE ENVIRONMENT BY THE NUCLEAR FUEL CYCLE" by John P. Holdren - 20 cents plus postage, 18 cents.

"THE INCIDENT AT BROWNS FERRY" by David D. Comey. Reprint of 8 page "Not Man Apart" centrespread; an account of the most serious reactor accident this year, coming within minutes of a reactor meltdown. 20 cents plus 18 cents postage.

"GIVE ME WATER" Stories of Hiroshima and Nagasaki after the bombing. 60 pages, 60 cents plus 18 cents postage.

"FRI ALERT" Story of the yacht FRI and crew and their 1973 nuclear protest voyage, 138 pages $5.85 post. incl.

"KOGAI - THE NEWSLETTER FROM POLLUTED JAPAN" by Jishu Koza resident action movement (back copies to No. 1 1973, $4.00 for 4 copies per year incl. postage.

"URANIUM STUDY" - with the aid of a Federal Government Grant FOE has over the last four months carried out an intensive study of the major environmental, social and political implications of uranium mining and nuclear power. This study is the basis of our submission to the Range Ranger Uranium Environmental Inquiry which will receive evidence in Melbourne early in 1976. We hope to publish it for wide distribution as part of our campaign, around the turn of the year.

"FORESTRY MASSACRE" No. 1 - Friends of the Earth - 10 cents plus 18 cents postage.

"RUSH TO DESTRUCTION" - by Graham Searle - an appraisal by FOE New Zealand of the Beech Forest Madness. 218 pages, colour photographs - $4.25 plus postage (Available from FOI New Zealand).

"WHALE MANUALS" of Project Jonah - FOE - No1 $1.50 No. 2 $1.00 both plus postage.

"INSIDE MICRONESIA - WHO GIVES A DAMN?" - Reprint of N.M.A. centrefold. A review of the new book in the FOE U.S. series on "Earth's Wild Places", titled "Micronesia - Island Wilderness" Nth Micronesian Islands are being annexed by the U.S. for military bases. 20 cents plus 18 cents postage.

"IS RECYCLING THE SOLUTION?" by Ian Pausacker. This new paperback is perhaps the most comprehensive and hard-hitting book available on the packaging and recycling rip-off in Australia. Full of facts, references and good ideas. Available from FOE at the special price of $1.20 postage included. 93 big pages.

"FOOD" - An information and ideas booklet put out recently by the RMIT Food Co-op. Sections on Growing Your Own – Why China Doesn't Starve – Growing Shoots – Foods We Shouldn't Eat – Food to Eat – Controlling Pests Without Eliminating Humans – Recipies – Herb Guide etc. etc. 25c. each or 50c. posted. 40 A4 pages.

"ENVIRONMENT SUBSCRIPTION SERVICE" – A new group based in Tasmania produce this list of articles that they reprint; based on the "Education Subscription Service" example. Write directly to the Tasmanian Environment Centre, 102 Bathurst St., Hobart, Tas. 7000. for an up to date list, encl. 20c. for postage and handling.

"THE INCREDIBLE ROCKY" - The Australian reprint of a U.S. comic book describing the amazing adventures of the Rockerfeller family, and the operations of multinationals in general. 75 pages. $0.75 plus 30¢ postage.

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"CHAIN REACTION" No. 3 – Canberra bike ride, nuclear power and the third world, Greenpeace saves Whales, Cook Island Cronies, bicyclisation, Concord Discord etc. 50c incl. post.

FILMS AVAILABLE

Friends of the Earth will provide speakers and ~~three~~ films upon request. The films (16mm) are "Energy: The Nuclear Fission Alternative" (colour, twenty minutes, 1974) and "The Bodily Effects of the Nagasaka–Hiroshima Explosions".

'Mururoa 1973" - A film about the voyage of the protest yacht to Mururoa Atoll during the French nuclear tests in 1973.

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