The CANE TOAD TIMES Presents

ENERGY ISSUES

10c

- **AUSTRALIA'S NUCLEAR FUTURE**
  Nuclear Dump of the World
- **WHY THE NUCLEAR FUEL CYCLE THREATENS OUR CIVIL LIBERTIES**
- **LEGAL ACTION BEGINS AGAINST THE URANIUM PRODUCERS FORUM ADS**
- **SOLAR ENERGY AND JOBS**
  Solution to Unemployment?

Editorial

This special edition of The Cane Toad Times is being published, as the Uranium Producers' forum would say, in the public interest. The articles in it contain the most up-to-date and wide ranging information on the perils of a committment ot the mining and export of uranium. It also contains information on energy alternatives.

We regard the Fraser Government's decision to export uranium as being hasty. The document published to justify this decision, "Uranium -Australia's Decision" is , in our view, a remarkably unimpressive pastiche of flimsy arguments . (Read the article below, written by a former Research Officer to the Ranger Enquiry.)

The Fox Report proposed two strategies to the Government. Either to procede with the gradual and careful development of uranium mining, or a moratorium on mining until the nuclear industry is more able to solve the vast technical and social problems it creates -the disposal of radioactive waste, the threat of nuclear proliferation, the threat of nuclear terrorism, the problem of reactor failure and the environmental release of radioactivity. We support the Moratorium, but believe as well that the development of alternative energy sources is an urgent priority.

The publishers would like to thank all the members of the collective who produced this issue. It was a truly altruistic production.

Opinion Poll

The Uranium Producers Forum has again sought to mislead the Australian people.

They claim that two thirds of the community are in favor of uranium mining but they rigged the questions to show an upswing of support for their attitude.

The conservative weekly, the Bulletin, reported poll findings which refute the Forum claims. On August 10 the journal said:

Public support for the mining of uranium is falling. Now only 47% of people are still in favor of mining, a drop of 3% compared with the result obtained from the same question asked just prior to the ALP national conference in Perth.

The Morgan Gallup Poll referred to recorded the following results:

	1975 JUNE	1976 JUNE	1977 JUNE	1977 JULY
Develop uranium	62	58	50	47
Leave uranium in the ground	25	29	33	36
Undecided	13	13	17	17

Contents

FRASER MISREPRESENTS FOX REPORT

The former research officer to the Ranger Uranium Environmental Inquiry, Dr Hugh Saddler, discusses the government's misrepresentation of the state of the nuclear industry and the findings of the Ranger Inquiry in supporting its decision to mine and export uranium.

Dr Saddler was research officer to the Ranger Inquiry from November 1975 till May 1977. He is now a Research Fellow in the Centre for Resource and Environmental Studies at the Australian National University.

There are two general reasons for concern about the Government's decision to proceed immediately with mining and export of Australia's uranium. Firstly, in arguing that Australia must start to export as soon as possible in order to help prevent the spread of nuclear weapons and to meet urgent energy needs, the government has gravely misrepresented the state of the international nuclear power industry and ignored several key findings of the Ranger Inquiry. Secondly, with respect to control over the uranium industry in order to protect the natural and social environment of the Alligator Rivers region, the Government has claimed that it has either adopted the recommendations of the Ranger Inquiry or adopted alternatives that will achieve the objectives of the Inquiry; I believe this latter claim to be incorrect in respect of several crucial decisions.

Weapons proliferation

Turning first to the international aspects and the question of controlling nuclear weapons proliferation, the Government's argument that this objective would be furthered by the export of Australian uranium seems to depend chiefly on the fact that this is in accord with the policy announced by President Carter on April 7 last. The aim of this policy is to discourage countries from turning to reprocessing of spent fuel and the fast breeder reactor, that is to the plutonium economy, by providing adequate and timely supplies of uranium. So far this policy has been notably unsuccessful. None of the countries with a commitment to achieving reprocessing and fast breeder technology have said they would consider renouncing it; most have said quite plainly that they will press ahead regardless. In any case, the policy is seriously flawed in that once a country has obtained spent reactor fuel, containing plutonium, it does not need a commercial reprocessing plant, costing hundreds of millions of dollars to extract the plutonium to make bombs, but can do it with a laboratory scale plant costing a few tens of millions of dollars.

The question of reprocessing also exposes a very serious contradiction in the Government's whole position on waste disposal, which I would be happy to amplify later.

The Prime Minister has also stated that an immediate commitment to export uranium is essential if Australia's voice is to be heard in international discussion on preventing nuclear proliferation. I find it hard to believe that, if the Governments of potential customer countries need Australian uranium as urgently as the Prime Minister and Mr Anthony claim, those Governments would not welcome Australian participation in discussions with the aim of improving the situation to the point where Australia felt justified in exporting.

That such a situation has not yet been reached can readily be demonstrated. In his statement Mr Sinclair referred to Australian obligations under the Non-Proliferation Treaty and stated that "it would . . . be a fundamental error to suppose that uranium export and the objective of non-proliferation are incompatible." However, in its first Report the Ranger Inquiry stated that there were real conflicts in the aims of the Treaty and were "a serious threat to the viability of IAEA and NPT safeguards." Nothing has happened since those words were written to alter the situation.

In formulating its safeguards policy as explained in the Prime Minister's statement of May 24 and again last Thursday, the Government has seriously misrepresented another crucial finding in the First Report of the Ranger Inquiry. The Government's proposed system of bilateral and multilateral treaties to prevent the misuse of Australian uranium will only be effective to the extent that IAEA procedures to detect diversions of nuclear material are effective. Mr Sinclair called these procedures "the second cornerstone of the Government's policy." Yet the Ranger Inquiry found that they were gravely defective (see First report pp 148-49) and the IAEA itself has made similar admissions on many occasions during the last two yearr, including one as recently as last May.

Urgent need?

I now want to say something very briefly about the second reason given by the Prime Minister in his policy speech for his Government's decision—the supposed need of other countries for Australia's uranium. This is in complete contradiction to the finding of the Ranger Inquiry "that it is incorrect to suggest that there are energy impoverished nations which need Australian uranium for survival" (p 164). Since that was written, about 12 months ago, there have been dramatic downward revisions of the capacity of nuclear power stations likely to be operating in 1985 throughout the world (excluding the Communist countries) from about 440,000 megawatts to about 240,000 megawatts, ie to little more than half.

Those few countries which do not already have firm contracts for all the uranium they will need up to that time should have no difficulty at all in obtaining it without turning to Australia. Nobody would suffer if Australia delayed its decision to export a few years.

To summarise my points so far.

Both in the Ministerial statement on August 4 and in the Prime Minister's speech August 28 the Government has tried to present the options as either immediate mining or a permanent refusal to supply. I believe that a third option, a moratorium for several years, which was extensively discussed in the Ranger Inquiry Reports, would be far more likely to achieve the objectives of reducing the risk of nuclear weapons proliferation, without causing any hardship to countries which may wish to buy Australian uranium.

Sequential development

The Inquiry recommended that mines in the Alligator River region should be started sequentially. There were a number of reasons for this—to ameliorate the effect on the aboriginals by controlling the build-up of white people in the region to a slow rate; to avoid excessive pressures on the very limited social and economic resources of the Northern Territory; to reduce cumulative environmental impact. Clearly, to be effective in achieving these aims, the sequential development would have to be spread over some years. The Government has completely overturned this recommendation. The unplanned type of sequence it has referred to might involve intervals of only a few months, and this certainly seems to be the view of the mining companies according to press reports I have seen.

The Inquiry also recommended that the Noranda project at Koongarra not be allowed to proceed at least for the time being and stressed repeatedly the need to confine mining for some time to come to the Magela Creek catchment, thereby excluding Koongarra, the site of which would become part of the National Park. The Government's policy completely overturns this very important recommendation by excising Koongarra from the Park and placing it on the same basis as the other proposals, with simply a slight handicap.

Two other areas where I believe the Government has seriously misrepresented the findings and recommendations of the Inquiry concern the employment generated by a uranium mining industry and the use of the Atomic Energy Act for the grant of an authority to the Ranger Company to mine uranium.

Technological Paradise vs the Real World

The Australian Atomic Energy Commission has confirmed that a former employee died in April this year from leukemia. The Commission admitted liability, and compensation has been granted to the man's family. The man's name has been withheld. A Sydney newspaper rerpoted that the man had died of leukemia after being accidently exposed to radiation at the Commission's nuclear reactor site at Lucas Heights, south of Sydney. The general manager of the Commission said the employee's job "involved exposure to low levels of radiation," but denied that any accidental exposure had occurred. Professor D.W. George, the Commission's chairman, claimed he had not been told of the compensation payments.

At least two cases of genetic abnormality have occurred in children of Lucas Heights workers, writes Dr R. Peers of Brunswick (Age, July 27, 1977).

A man who worked at the Mary Kathleen Uranium (MKU) mine for 12 months in 1976-77 now has terminal lung cancer, Labor MP Barnett told the WA parliament. In a statutory declaration, Mr Bill Webb said his work involved sorting uranium and working in the yellowcake drier. He became ill on the job, and lost more than six kilograms in weight. An Inland Medical Service doctor, who was summoned by the company, diagnosed "bronchitis bordering on pneumonia," but said he was well enough to continue work. The illness continued. When Mr Webb left MKU in March this year, he had a final medical examination and x-ray and was passed as fit. But tests carried out on Mr Webb at the Royal Perth Hospital in July showed he had cancer. Doctors told him he has three months to live. In the declaration, Mr Webb said the company had repeatedly refused to return his medical records to him.

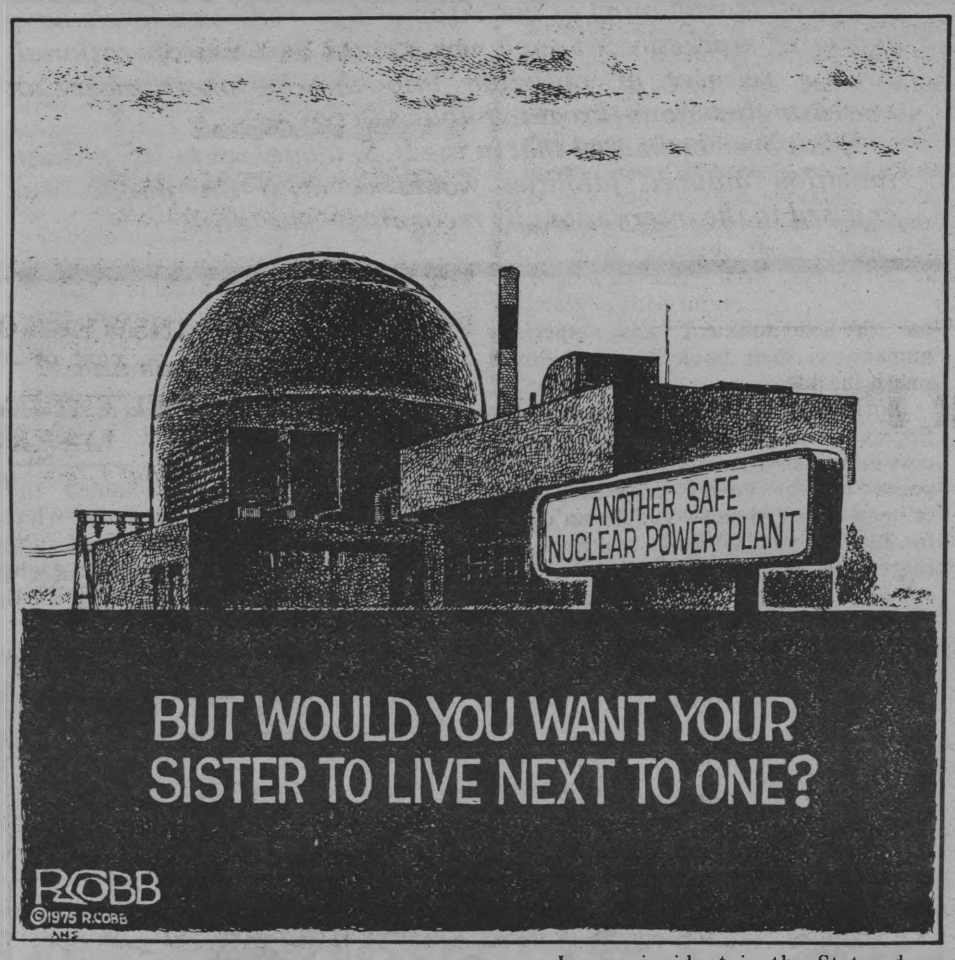
The biggest disposal area in the world is at Hanford, Washington. It encloses a stretch of the Columbia River and a tract of country covering 650 square miles.

The radioactive liquid wastes are kept in tanks constructed of carbon steel resting in a steel saucer to catch any leakage. They are enclosed in reinforced concrete and the whole construction is buried in the ground, with only the vents showing. Each tank has a million gallon capacity.

The liquid boils from its own radioactivity so there must be a continuously maintained cooling system in each tank. In addition, the vapors generated in the tanks have to be condensed and scrubbed; otherwise, radioactive gas would escape from the vents.

More than half a million gallons have leaked from the storage tanks at Hanford, with the more recent leaks being the larger ones—70,000 gallons three years ago and 115,000 gallons last July.

The tanks themselves are 20 to 30 years old, and a report from their civilian contractors in conjunction with the Illinois Institute of Technology states that "the self-boiling tank structures are being stressed well beyond accepted design limits."



They also postulate the life span of the tanks at 30 to 40 years at the outside.

The 500,000 gallon leak, nearly one-third of the 29-year old tank's contents—was not discovered for several days and released plutonium, strontium-90 and cesium directly into the ground.

Despite the AEC's assurances to the contrary, there has been contamination of the Columbia River partially resulting from Hanford's practice of dumping diluted waste directly into the water. A 1969 study showed that eating half a pound of duck from the Hanford reservation would result in an exposure three times the present permissible federal limit.

People who swim, sunbathe or waterski on the Columbia could obtain a dose of 53 millirems—10 times the dose the AEC says it will put into effect as a standard for nuclear power plant workers sometimes this year.

Edward J. Gleason was a dock worker living in Cliffwood Beach, New Jersey. On January 8, 1963, while he was handling a shipment at the Eazor Express Trucking Terminal in Jersey City, Gleason noticed that one of the boxes in the shipment was leaking. He had handled leaky shipments before, so without thought he simply tilted the box onto a handcart and took it to the loading dock. When the leak began forming a puddle, Gleason turned the box over; as he grabbed it with his bare left hand, the liquid came into contact with his skin. The dripping ceased and, at the suggestion of the terminal manager, Gleason covered the puddle with sawdust. The shipment, originating from the Nuclear Materials and Equipment Corporation (NUMEC) plant in Apollo, Pennsylvania, had been improperly packaged, improperly transported, and improperly labeled. It was not until much later that Gleason learned that the box he had handled contained a glass jug of a solution of chemicals contaminated with plutonium.

Three years later Edward Gleason developed cancer on his left hand, which finally required amputation. Doctors then had to amputate his arm and shoulder in successive attempts to arrest the cancer. Cobalt treatments were initiated, but the cancer continued to spread, and in February 1973 he died. The medical evidence is "overwhelming" that Edward Gleason was killed by plutonium.

In one incident in the States damage to fauna from radium could be traced 50 miles down river from the Durango uranium mill, Colorado. The radium had come from the liquid and slime milling wastes. Radiation levels were 500 times greater than the background level. 30,000 people live along the banks of this river there and use the water primarily for drinking and irrigating their farms. Radiation accumulates in the food chain and flora and fauna in the area were found to contain uranium concentrated 100 to 10,000 times that found in the water. The farmers crops which were irrigated with the radioactive waters of the Animas river were found to have radium concentrated in the order of 100-fold and this is passed on to lifestock, then inevitably to us as we have the honored end of the food chain.

You can't smell it, see it, or taste it, and it has no qualms about entering the food chain.

* The Japanese government spent nine years and $50 million on a prototype nuclear powered cargo vessel. She was christened Mutsu after her home port.

Local fishermen were deeply suspicious, and afraid that radioactive discharge from the Mutsu would damage their fisheries.

Although the Mutsu was ready for sea trials in 1972, public opposition prevented her sailing. For two years the opposition stopped the Mutsu's trial.

On August 25 a typhoon forced the blockade of 250 small fishing craft that were keeping her prisoner to run for shelter, and the Mutsu was able to slip out into the bay under auxiliary power. Once on the high seas, the reactor was brought to criticality; but as power was increased a radiation leak was detected, relatively minor, but nevertheless a leak, and it occurred when it was operating at only 2 per cent of its capacity. Efforts were made to plug the leak firstly with boiled rice mixed with boron and when that was unsuccessful, old socks came to the rescue and were used in the repair attempt. Because of public opinion the crew feared for their safety if they attempted to return to port with the leaking reactor housing. It was 45 days before they were allowed to return to an isolated northern harbor. Government attempts to sell the ship have failed. They are now considering giving the ship away, most likely to Saudi Arabia or Brazil.

* In January 1961, three young servicemen John Byrnes, Richard McKinley, and Richard Legg had been detailed to reassemble the control rod drives after the reactor had been shut down for some work on instrumentation. The function of the control rods are to either shut down or reduce the rate of nuclear fission. Later investigations into the accident suggest that the control rods got stuck and Legg and Byrnes tried to heave them up manually, and they came too far out of the reactor core. The result was catastrophic. The reactor core went supercritical, the fuel fried itself, and the resulting steam explosion blasted a virtually solid plug of water at the roof of the reactor. The reactor vessel rose three metres, right through the pile cap.

Legg and McKinley were killed instantly. McKinley's body was impaled in the ceiling structure. Byrnes was cut down by a withering dose of radiation. The radiation dose metres were reading off scale. Recovery of the bodies was carried out with remote handling gear. All three bodies remained so radioactive that 20 days elapsed before they could be handled for burial. They were buried in leadlined caskets in leadlined vaults.

Meanwhile back at the accident site it was to be many months before radiation levels were low enough to allow investigation into what had happened.

On March 22, 1975 a meltdown was barely averted at the Browns Ferry twin nuclear reactor in Alabama.

An electrician and his assistant were checking air flow through wall penetrations for cables, by holding a candle next to the penetration. The candle ignited some foam plastic packing. The electricians could not extinguish the fire but the plant operator noticed the temperature rise and flooded the room with carbon dioxide. It didn't help. The fire was spreading along the cables into the reactor building. When erratic readings began to appear on the controls the plant operator pressed the manual scram button which shuts down the fission reaction in the reactor. The fire raged for seven hours and knocked out all five emergency cooling systems on unit one. It was potentially the most serious incident in the industry's history.

* The Fermi plant 30 miles from Detroit suffered a "partial core melt" in the last '60s. "A month followed during which no one knew whether Detroit would have to be evacuated." It took more than a year to dismantle the core.

* In the first four months of 1976 there were 56 accidental releases of radioactive material from commercial reactors.

On October 5 1977 a road accident in Colarado USA scattered 19 tonnes of powdered uranium oxide along the highway. Two truck drivers were taken to hospital to see whether thye had been contaminated.

The Nuclear Regulatory Commission said the uranium had been in 50 steel drums that were pierced or crushed in the accident. Emergency steps were taken around the scene of the accident to prevent dispersion of the uranium.

The team removing the uranium powder with hand shovels had to wear protective clothing. Mechanical shovels could not be used for fear of spreading contamination. The material belongs to the Exxon Corporation and was being shipped for processing.

Is any radiation safe ?

An increasing body of scientific thought believes there is no such thing as a 'safe' dose of radiation.

Since the beginning of the 'Atomic Age' radiation levels have increased markedly. As each new reactor becomes operational, routine releases of radiation into the biosphere pose an increasingly serious threat to public safety.

It has been estimated that in the U.S. alone, up to 1.5 million radiation induced fatalities would occur if the public was exposed to the internationally recognised 'safe' dose.

Originally "acceptable" radiation safety limits were set up by the US Federal Radiation Council in 1959 with little experience and without adequate well-developed statistical data.

Studies of the survivors of the atom bomb blasts at Hiroshima and Nagasaki have raised doubts about radiation safety standards adopted throughout the world.

Survivors now show a much lower incidence of diseases of all kinds than the population of Japan as a whole. This indicates that they are genetically tougher than the average—the reason they survived the holocausts.

Health studies of these people have been the major source of information about radiation effects on humans and are the yardstick by which standards of safety are set.

If the survivors turn out to be more resistant to the effects of radiation than the average person it means that what have been regarded as acceptable levels are set too high and the health impact of radiation has been seriously underestimated.

Prof. J. Rotblat, a leading radiation physicist, compared the survivors with rescue workers who entered Hiroshima and Nagasak after the blasts. They were exposed to lower levels of radiation left in the areas—induced radiation and radioactive dust.

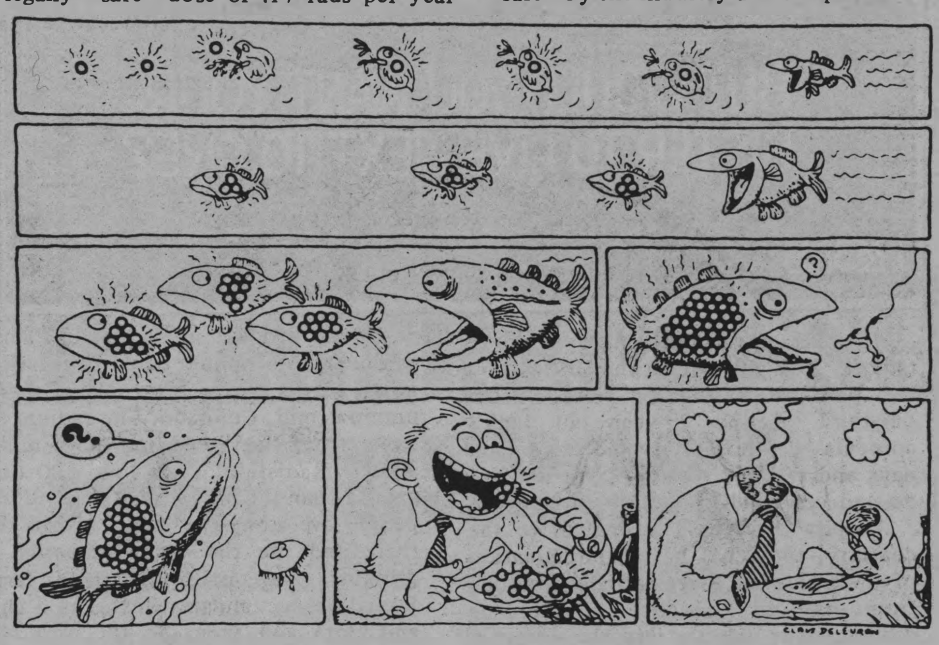
His findings strongly suggest the higher incidence of leukemia in this group compared to the survivors of the direct dose.

The results imply a sensitivity in the general population five times that of the bomb survivors on whom the exposure standards are based.

The whole concept of a "safe" level of radiation is in doubt. No one has ever produced evidence that any specific dose of radiation will be without harm. The nuclear manufacturing industry, the electric utility industry and government agencies lead us to believe there is a safe dose of radiation.

Dr Gofman (inventor of processes of plutonium separation) and Dr Tamplin both internationally known for their research into the effects of radioactivity on the environment and especially humans, in their book Poisoned Power smash this idea.

Both were assigned by the US Atomic Energy Commission in 1963 to assess the cost in human disease and death for proposed nuclear energy programs. They estimated that there would be an excess fo 32,000 cases of fatal leukemia and cancer (each) every year if the average exposure of the US population was the legally "safe" dose of .17 rads per year



average (the US Federal Radiation Council guideline).

The Gofman-Tamplin estimate of genetic deaths from exposure to "allowable" doses of radiation is 150,000 to 1,500,000 extra deaths per year for a population of 300 million people.

Since the standards were set it has been discovered that most of the major killing diseases of humans have a genetic component. Originally when radiation hazard levels were set the kinds of genetic injury that cause death were though to be only the single gene diseases such as hemophilia, gactosemia and other rare diseases. It is now known that most major killing diseases of humans have a multigene component, eg coronary heart disease. The real genetic hazard problem extends between 50-100 per cent of all causes of death.

Thus radiation standards were set with an under-estimation of genetic hazard by 50 to 100 times.

It has been wrongly assumed that there is a hazard threshold under which radiation levels are safe, ie will not cause cancer, genetic damage, etc. "Legally permissable" has been confused with "safe" by the industry and the public.

The linear theory of radiation hazard is generally accepted by scientists concerned with radiation—ie if 100 rad produces 10 cancer deaths then 10 rads will produce one death.

Because radiation concentrates in the food chain and is cumulative any increase in the amount of radiation to which we are exposed is dangerous. The human population already receives .130 rads from natural background radiation and .118 rad from artificial sources (especially medical equipment), and this estimate ignores radioactive fallout from atmospheric testing.

Natural and medical radiation produce cancer and genetic harm, in direct proportion to the dose received

During the normal operation of nuclear reactors of the conventional (thermal) variety certain radioactive gases and volatile radioisotopes escape or are released directly into the environment, according to the "standards" for permisable concentrations.

These releases cannot fail to exacerbate the number of deaths caused by radiation.

Dr Irwin Bross of New York State's anti cancer research facility has completed studies showing that low level radiation causes genetic damage to workers at nuclear power plants—preconception damage occurs at dosages inside the NRC's permissable range—a dose workers are exposed to.

What is of concern is the amount of radiation in the ecosphere. Normal functioning of reactors will add significantly to the effects.

The Producers Forum talks of the safety of sitting next to a nuclear power plant but ignores concentration in the food

Even if releases at the perimeter of a reactor were at the AEC permissable value, radionucleides that can go through the forage to cow to milk to humans results in enormous multiplication of radiation dose in humans. Similarly water effluent at release point from a reactor may make the water "drinkable" by NRC standards at 500 millirem, but the fresh water to fish pathway can concentrade radioactivity 1000-fold or more, therefore fish from this water cannot be eaten without grossly exceeding "tolerance" levels.

These dangers do not even take into account (as the NRC doesn't) significant sources of exposure—accidental reactor releases, accidental release during transport, releases and accidental releases at fuel reprocessing plants, releases from low and intermediate level waste releases and burial in the environment, releases from storage, burial or other final disposal of the astronomic level of wastes left after fuel reprocessing and accidental releases through sabotage at any step in the entire fuel and waste cycles.

Radioactivity in the Cycle

Radioactivity is nothing new on this planet. We are constantly being bombarded with natural "background" radiation. There are three different kinds of radiation.

1 Alpha radiation which is emitted from soil and rocks. The most dangerous manufactured sources is the nuclear reactor fuel plutonium. Although these electrically charged radiating particles can't be absorbed through the skin, if they are inhaled or ingested they can cause fatal damage to tissues.

2 Beta radiation, again it is emitted from the earth, from minerals such as uranium, thorium and their radioactive daughters. These rays are also emitted from television monitors and can be stopped by a sheet of metal put in their path.

3 Finally there is gamma radiation, which is by far the most penetrating radiation. It has no problem penetrating the human body. Its major source is the sun, uranium, thorium and their daughter products. People also contribute to their exposure to gamma rays by the use of medical and dental x-rays. However in such cases we have decided that the benefits outweight the risks of exposure.

Humanity's present use of radiation does not negate the fact that ALL RADIATION IS POTENTIALLY DANGEROUS. Of all animals on this earth, humans are the most sensitive to the effects of radioactivity. The human fetus is 50 times more sensitive than its parents.

Radiation does its damage by emitting highly charged particles that tear electrons from other atoms rendering them unstable. Its effect on human cells is that it tears into molecules that make up the DNA which is the genetic material that controls the functions of the cell. In damaging the genes instead of getting two daughter cells when the cell reproduces the cell goes haywire and produces billions of cells which become a tumor. We know this frightening phenomenon as cancer. The mutant cells are extremely virile and the cancerous tumors they form cause very painful deaths.

It has the same effect on the genetic material in the sex cells, the controllers of the creation of a human life. Damaged reproductive cells (ovum and sperm) don't affect you but they produce deformities in your children. Through modern medicine these deformities are preserved to be passed on through the generations, and remain in the gene pool, thus continually increasing the proportion of mutants in the population.

Natural background radiation with its gene mutating potential, along with the "survival of the fittest" principle has been responsible for determining evolution. We have survived in spite of it, not because of it. We have evolved with a tolerance to natural levels of radiation, although it is thought that background radiation is already responsible in whole, or in part, for the majority of non-accidental deaths in the United States (eg leukemia and cancer).

Now we are proposing nuclear power. This poses serious, very serious, threats to tolerable radiation levels. The imminent danger that our TVs, electric can openers and toothbrushes may black out, we demigod human beings have decided to risk our lives and future generations to keep the technological wizardry buzzing. To the crazies who hold the power, the solution lies in the nuclear fuel cycle. I want to now put before you a picture of the fuel cycle and the potential dangers to the environment and ultimately human beings.

Uranium mining

First you dig the uranium out of the ground. This is known as uranium 238 and along with it comes radon gas. If in the normal course of breathing you inhale some radon gas, and a speck lodges in your lung, a microscopic speck is enough, sometime in the next 15-40 years you may surprise yourself by coughing up blood. This is the first you will know that you have lung cancer. The cause lies dormant for 15-40 years.

We know from Hiroshima, something of the pattern. The bomb was dropped and nothing happened to many of those who survived for about five years. Then leukemia began to emerge. Leukemia increased five times over the normal proportion. Doctors now go to Hiroshima to study leukemia and cancer.

Fifteen years later cancer started to appear as solid tumors in breast, bowel and lung. It is now 30 years later and the number of cancer victims is rising year by year. The number still has not peaked. From the time of irradiation we don't know what maximum time is needed to produce the maximum amount of cancers. The incidence of cancer in Hiroshima has doubled and is still growing.

In America some years ago, men were mining uranium underground. Radon gas is heavy and unfilterable and accumulates down mines. Studies showed that one man in five died of cancer.

In a Canadian mine where the concentration was particularly high one man in two died of cancer. Every second man.

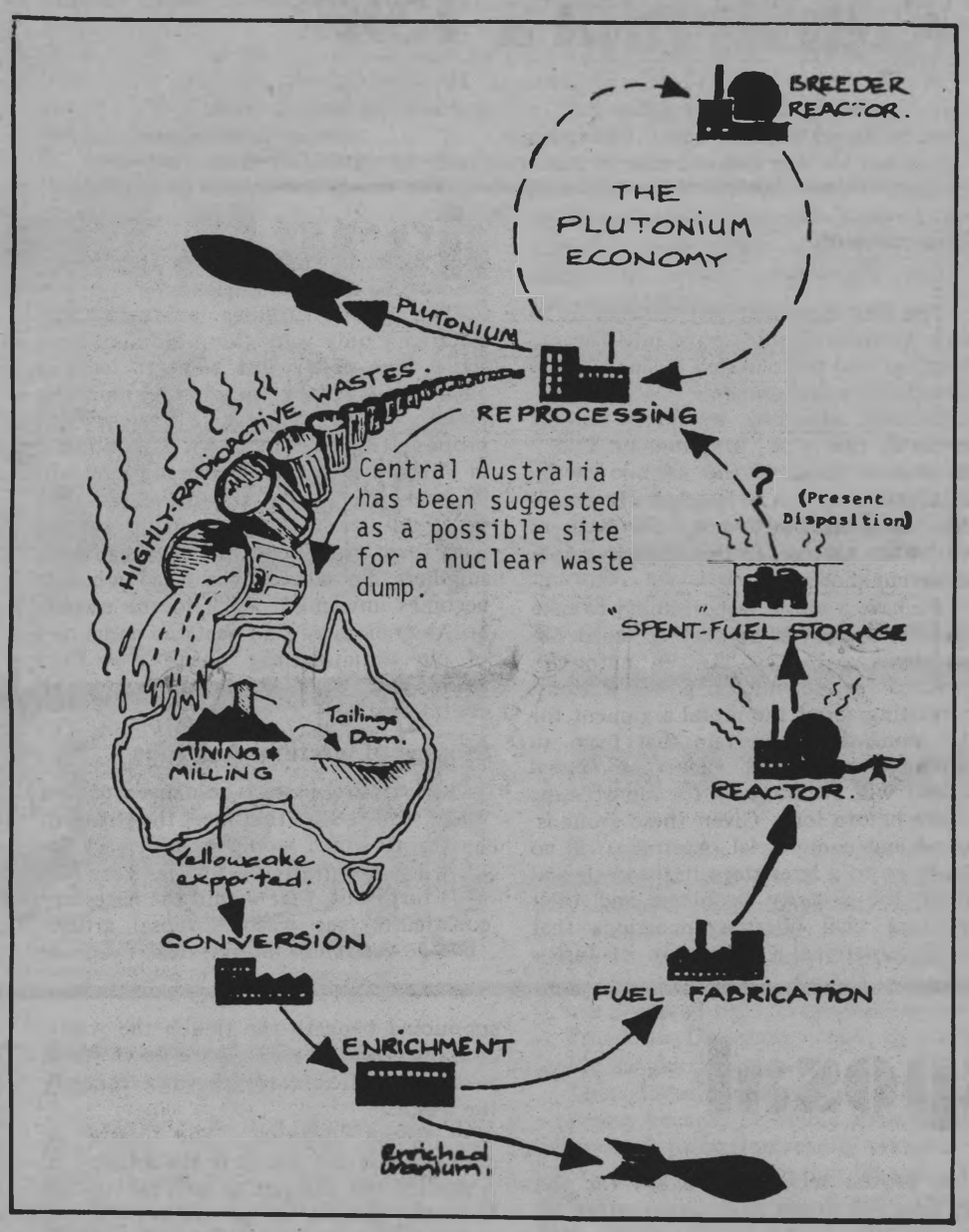
"All miners should wash their hands and faces before eating."

How well does this safety precaution work?

"Ah well it takes a long time to teach the men these things" is the management's reply.

Dr Helen Caldicott, and Australian pediatritian with a special interest in radiation, spoke to the men at Mary Kathleen. At first they were hostile, having never been informed by a doctor as to the potential hazards of radiation. When she had finished speaking miners lined up for two hours to ask questions. Three men resigned, three others discovered that they have high levels of radiation in their urine.

It is farcical to think that by "encouraging miners to wash hands and faces" you are insuring their lives against cancer and leukemia.



In Australia, mining companies such as Con-zinc Riotinto and Ranger Uranium Mining maintain that the open cut uranium mine proposed will be safe from radon gas problem as the wind will disperse it. But radon is heavy and will hang around in the bottom of trenches. You'd have to mine in a cyclone to minimise the danger!

Radon has a half life of 3.8 days. That is to say if you have 1 kg of radium, in 3.8 days you will have .5 kg of radon and in another 3.8 days you will have .25 kg of radon and so on until it becomes negligible. However its potency and damaging potential doesn't alter. Remember even a microscopic amount is carce carcenogenic.

Radium is a radioactive daughter of uranium 238 and settles in the dust raised by mining. It has a half life of 1602 years (do your own sums) and if swallowed can cause leukemia—again only a microscopic speck is needed to set it off.

Leukemia is a disease that causes bone marrow to go berserk and produce excessive white blood cells. The white blood cells invade your blood system, supersaturates it with their presence and you die.

At Mary Kathleen—an open cut mine—there is a government policy to ensure the miners' safety against accidental swallowing of radium:

Milling

This is the second step in the nuclear fuel cycle where the mined uranium is refined and much of the extranious matter is removed. The waste products are a sand like material called tailings, liquid wastes, and a mud like slime. The liquid and slime are disposed of in nearby streams.

Uranium breaks down into:
Thorium with a half life of 76,000 years
Radium with a half life of 1602 years
Radon with a half life of 3.8 days
Lead 212 with a half life of 21 years.

All these elements are present in the tailings. The radium is sometimes 100 times more than is found in ordinary rocks. The tailings are collected in large piles open to the elements.

At first it was thought that tailings were safe. At Grand Junction in 1966 environmental consciences in true recycling style lead them to use tailings as fill. Over 15 years preceding 1966 about 3300 homes had tailings on or around their foundations. The Atomic Energy Commission (AEC) knew and approved of the use of the tailings. The tailing were also made into brick for homes, sheds and hospitals. There has been a 50 per cent increase in cleft lip and palate defects in babies born in the area and 50 per cent increase in congenital anomolies.

It is estimated that at maximum it will cost $35 million dollars to correct the situation. Federal assistance is $5 million.

At Port Pine in South Australia about a year ago it was discovered that dumps of tailings were radioactive. Sixty acres of the stuff. Meanwhile the children in the area saw potential in the area so built themselves a cricket pitch on it. They also had a good game of rolling around inside barrels that had contained thorium.

Enrichment

Uranium as it is mined (yellowcake) is mostly uranium 238. By a process called "enrichment" the concentration of uranium 235 is increased from 0.7 to 3 per cent to make it a usable fuel. After enrichment the remainder of the material is waste and continues to give radon gas for thousands of years.

Reactors

The next step in the nuclear cycle is to pack the fuel into the reactor rods. The rods are surrounded by systems of coolant gas or liquid. The cooling water absorbs the thermal radiation and returns to its river, or ocean. It is estimated that within 30 years the electric power industry will be producing such megawattage of electricity that will require the disposal of about 20 million billion British Thermal Units of waste heat per day. To carry off that heat by way of natural waters would call for a flow through power plants amounting to about a third the daily fresh water runoff in the United States.

The Federal water pollution control administration has declared that waters above 93°F are uninhabitable by all fish in the United States except a few southern species. Therefore the heat expelled from nuclear power stations of the sizes proposed will be such that it will seriously interfere with many aquatic environments making many uninhabitable. The commercial use of this heated water is uneconomical and poses practical problems.

The reactor stage that produces the thermal radiation problem also produces the most toxic carcenogenic lethal substance known—plutonium. The inhalation of even 3 millionths of a gram can cause cancer. It represents an inhalation hazard, weight for weight 100,000 times more lethai than potent chemical carcinogens now known. The fact that it has a half life of 24,000 years makes it one of the deadliest elements on this planet. (It is not a naturally occurring element.)

One pound of plutonium is enough to place a lethal dose in the lung of every man, woman and child on this planet. Each nuclear power plant produces 500 pounds of plutonium.

By the year 2000 the international community will have produced a projected 3 million tons of plutonium.

Plutonium is non-biodegradable. It is active and dangerous for half a million years.

It has to have a container that will remain inert for half a million years. At the present time it is stored in stainless steel and concrete containers, which have leaked. Radiation can escape through the minutest crack.

In the States they openly admit they haven't developed a safe method of storage.

Plutonium with its intensive alpha emissions has another diabolical characteristic in that it concentrates in testicles and ovaries. There it damages genes. Dr Joshua Lederberg, a Nobel laureate in genetics, says that with present federal radiation standards—which are too lenient—genetic defects may increase by 10 per cent.

Enrichment

Queensland's Premier is pushing hard for an enrichment facility in Queensland. The facility would cost $200 million, and it is unclear who would provide the capital. In the US the Federal government owns all enrichment plants and, in effect heavily subsidises the nuclear industry by providing enriched uranium at cost to the industry.

It is a massive investment with a total socially redeemable factor of 150 jobs (see energy and jobs section,)

Enrichment plants are heavy polluters. One problem with enrichment plants is that only a fraction of the uranium that goes into the plant is used as fuel. For every pound of uranium that is fed into an enrichment plant, less than one-fifth comes out as fuel. The rest becomes tailings which are depleted in U-235. These tailings are analogous to the piles around mills, but at the enrichment plants they are stored as solid UF_6 in drums. These tailings will be stored until some "future uses" for them can be found.

The centrifuge process proposed requires about one thenth the energy as the old gaseous diffusion process. However, this still involves a vast amount of energy. Highly polluting coal burning energy facilities will be needed. Further, 1500 acres of land would be required by the plant.

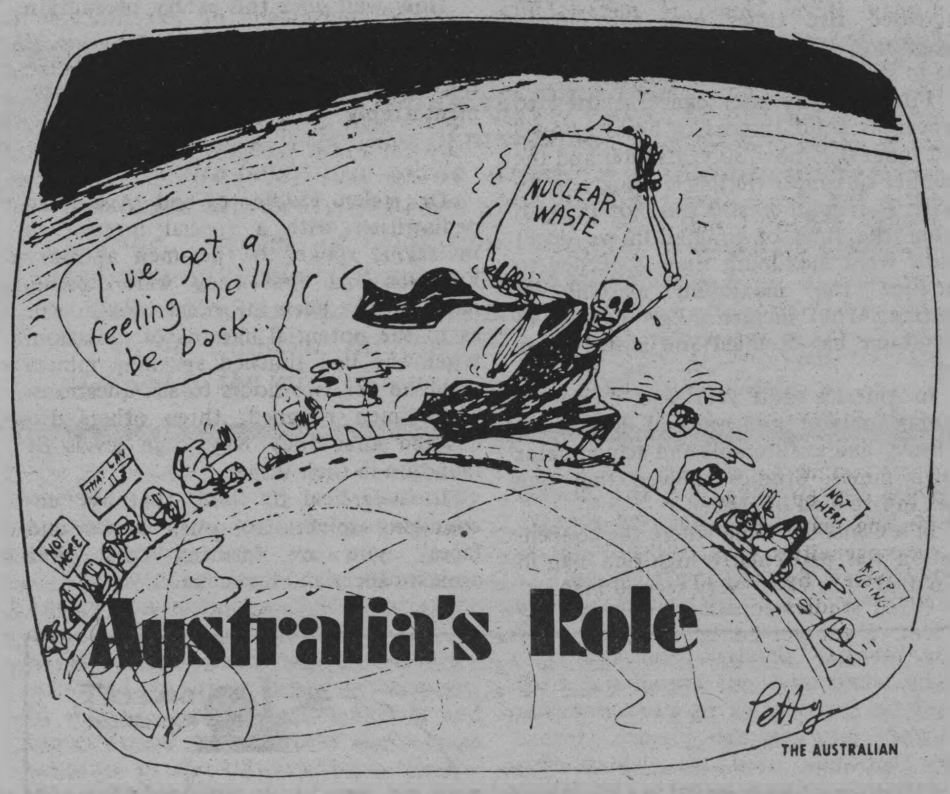
The diffusion enrichment facility in Ohio, for example, consumes 10 per cent of the State's electricity—more than the entire city of Cleveland (which is bigger than Brisbane). Even 10 per cent of this amount is a staggering concept. It is likely that the enrichment facility proposed would be larger in capacity than the Ohio plant—as it would be supplying enriched uranium to a large overseas market.

The race for Australia to enter into enrichment is, of course, not new. It has been reported that the late Rex Connor was seeking his $4000 million loan to finance just such an operation!

Enrichment is the concentration of the U_{235} proportion of yellowcake to 2–3 per cent for fabrication into fuel rods. Weapons grade Uranium 235 can easily be produced by these plants (enabling Australia, potentially, to enter the nuclear weapons game).

After enrichment the uranium is packed into fuel rods, ready for use in nuclear power plants. There has been some intense lobbying for Australia to move further into the nuclear business. (After all we have been investing around $20 million a year in the AEC which equips us with the necessary technocrats.)

Australia is in for almost the entire nuclear fuel cycle. If present trends continue Australia will mine, enrich, and reprocess uranium as well as store nuclear waste. We will, in effect, be into everything but the power produced. We'll have, in effect, everything BUT the energy.



Reprocessing

The first agrument put forward as to why Australia should move into the enrichment and reprocessing business oddly enough is a moral one.

It was advanced by Prof Stewart Butler in the book "Uranium on Trial." He is now Head of the Atomic energy commission at Lucas Heights. He argues that Australia has a moral involvement with what happens to its uranium once it leaves our shores.

We have a moral responsibility to take back the spent fuel and set up reprocessing plants so that we can sell plutonium enriched fuel for nuclear power stations. Forgetting about the moral argument for the moment it is certain that from an economic point of view commercial sectors will be lobbying for reprocessing plants before long. Given these grounds, moral and commercial, Australia will no doubt go to a later stage in the cycle and invite the security problems and their resultant civil liberties incursions that the International Commission of Jurists and National Civil Liberties Committee are worried about in England.

The public utilities producing the electricity only want the plutonium for a short time. They just want to lease it and send it back to the reprocessing plant. British Nuclear Fuels have a proposed reprocessing plant at Windscale in England where Australian uranium will be sent. They have already stated that they will insist that ownership not lie with them in any contract they sign with suppliers. So where does it go when it becomes unwanted? Back to the owner. So Australia may find that the daughters of our uranium may one day be ours again and that it is a matter of contractual law.

Storage of waste in Australia

Radioactive waste is so dangerous that waste storage sites that meet the stringent constraints which would be necessary for anything doubtfully "safe" are very few.

It turns out, that within the necessary constraints (see waste disposal article, below) Australia's interior deserts appear to be the only sites that even approach the necessary geological stability, technological backup, and political stability.

A study performed by Dr Keith Crook, department of geology, Australian National University in Canberra comes to the conclusion that "only three areas on earth appear to meet the specifications for waste disposal: parts of Sahelian Africa, eastern Namibia, and central Australia, and even so their past climates are uncertain. Data in Mabbutt (1967) and Wells (1969) detail this uncertainty. Political problems and lack of technological backup are likely to rule out the African locations, but the Australian area remains a prospect." Crook puts forward the following scenario, in terms of Australia's international responsibilities.

"Australia will not sell its uranium. It will fabricate reactor fuel elements to specifications provided and will lease them to users.

"Australia will supply uranium only to signatories of the Nuclear Weapons Non-Proliferation Treaty, as inspection of civil nuclear installations by IAEA officers is guaranteed under the treaty.

"Spent fuel elements will be returned to Australia for reprocessing, thereby limiting the dispersal of toxic wastes and the possibility of clandestine stripping and stockpiling of plutonium for military purposes.

"Reprocessing wastes will be disposed of in Australia under conditions which ensure their remaining isolated from the biosphere until they are no longer dangerous."

Full nuclear cycle for Australia

The environmental hazards and technological problems involved in the above processes are enormous. As the Australian reported on September 14:

"America has acknowledged it still faces serious problems in the safe disposal of radioactive nuclear waste.

"The acting administrator of the Energy Research and Development Administration, Mr Robert Fri, said storage of such waste 'is truly a national problem with international significance.'

"He told a Congressional hearing in Washington: 'Its solution will depend on co-operative participation by all.' "

We are not only fighting the mining of uranium in Australia—we are up against plans for the entire fuel cycle in massive proportions here in Australia.

After all, it would be silly for Australia to possess all stages of the fuel cycle and not go into nuclear power generation for itself, wouldn't it?

Waste Disposal

The Prime Minister's bland assurance that proven technology exists for the permanent disposal of high level waste is utterly false and almost daily under attack by concerned scientists.

In March 1976 US scientists engaged in the development of this technology indicated that:

1 the development phase of reprocessing technologies would not be completed before 1979.

2 the earliest commercial operation for any reprocessing would be 1983.

3 high level waste storage pilot plants would begin construction in 1984.

In September 1976 the UK Flowers Commission on Nuclear Power and the Environment found that it had not been demonstrated that:

a method exists to ensure the safe containment of long-lived, highly radioactive waste for the indefinite future.

And to quote the Ranger Inquiry,

. . . there is at present no generally accepted means by which high level waste can be permanently isolated from the environment.

Looking into the technological options for disposal of nuclear waste involves severe constraints, and poses difficult and unsolved technological problems.

The constraints on waste disposal options

Kubo (1973), Kubo and Rose (1973) and ERDA (1976) review the various opertions available for waste disposal. Further references may be found in Winograd (1974).

1 Storage in stainless steel tanks under constant surveillance. This is a short-term measure, pending ultimate disposal. An alternative storage method has been proposed by Winograd (1974): canisters of vitrified waste would be packed in gravel at the bottom of holes drilled many metres into dry bed-rock of surficial materials which form zones, unsaturated by water, from 100-600 m thick above the water-table in semi-arid areas; de-actiniding of wastes is required before their emplacement.

2 Melt in situ disposal: Placing the wastes at a deep level in the crust, and their subsequent melting as a result of their inherent heat flux so that the molten material will sink through the crust.

3 Mine disposal: Disposal in a mine constructed in sandstone, shale, salt or crystalline rocks. The disposition of the waste containers is determined by thermal considerations and by the requirements that the waste be inspected and if necessary retrieved.

4 Ocean disposal (see Nielsen et al [1974] for discussion.) The waste is encased in stainless steel or other durable containers and deposited in the deep oceans. One variant of this envisages disposal in deep ocean trenches associated with a Benioff (subduction) Zone. It is assumed that as the oceanic crust is subducted beneath the trench the waste containers will be transported downwards to depth sufficient to prevent escape of the waste.

5 Icecap disposal. The waste is deposited on the icecap in the interior of Antartica and allowed to melt its way to bedrock. Angino et al (1976) discuss some variants of this method.

6 Space disposal: packing the wastes into rockets which are then fired into the sun.

7 Nuclear transmutation. This option requires the treatment of wastes in a nuclear reactor so as to produce shorter-lived isotopes from the actinides. The method is expensive and energy-consuming. It reduces but does not eliminate the toxicity of wastes.

All of these options are earthbound except for the disposal by space rockets; at present this latter cannot be fully assessed and its cost and safety are open to question.

The proposed solution

The present international consensus appears to be that a complete solution can be provided by solidification of the wastes into vitreous ceramic or some other "stable" form (ERDA, 1976) followed by their burial in natural rock-salt bodies well below the surface. I am not satisfied that this solution is proven, for reasons stated below.

Any disposal program that envisages a waste repository on Earth must take account of several factors: the integrity of the repository, the cost of the program, the dynamic nature of the waste, the dynamic nature of the Earth, and the expectable lif time of human institutions.

The first three factors can be stated simply. The waste must remain isolated from the biosphere so long as it is toxic, which may be more than 1 million years. The cost of waste disposal must add no more than a few per cent to the cost per kWh of electricity generation, if nuclear power is to be economic (Kubo, 1973). The heat flux and chemical reactivity of the waste must be accommodated. These facets of waste disposal are well recognised, but one aspect requires discussion.

Present storage/disposal proposals envisage solidification of the radioactive materials in vitreous boro-silicate ceramic contained in stainless steel canisters 30cm diameter by 3 m long. The steel casing is not durable, particularly in the presence of water. Leakage of radioactive components from the ceramic is currently being intensively studied, principally by experimental leaching with water. Categorical assurances that leaching rates will be sufficiently low to cause no hazard cannot now be given (Winograd, 1974; Ewing, 1976).

Devitrification (returning to liquid form) of the ceramic is likely to enhance leaching. What mechanism of devitrification is appropriate as a model to guide research, is controversial. If radiation damage is the cause of devitrification, leaching of intensely irradiated ceramic (equivalent to a 100,000-yr dose) can be used to predict future behavior. If on the other hand, hydration by absorption of water (in liquid form or from air) is the cause, as is the case for natural volcanic glass (Friedman et al, 1966), irradiation alone will be a poor guide.

A further aspect is the propensity of the ceramics to cracking (formation of perlite) because this repeatedly provides

fresh surfaces for hydration during devitrification. Some volcanic glasses, but not all, have this property, for reasons that are not understood. The date of Friedman et al (1966) indicate that, if perlitic cracking occurs, the 30 x 300 cm ceramic rods will totally devitrify in less than 10^6 years by simple hydration. Given that radiation damage will be combined with the hydration, my guess is that total devitrification will occur in 10^3–10^4 years, even in "dry" environments, leaving the material potentially leachable.

The two remaining factors which influence waste-disposal options, geological dynamism and human frailty, are less well appreciated. I regard them as the most critical and! indeed the limiting factors for any disposal program.

Geological stability

The duration of toxicity is greater than the duration of stability of many geological environments. This is well recognised for earthquake-prone regions, where significant change at any point can be expected in less than 10^3 years. But it applies less obviously elsewhere.

Gross climatic changes from peak ice-age conditions to present conditions, and perhaps to total deglaciation, can occur within 10^4 to 10^5 years. This is sufficient to rule out any program of disposal in ice-caps or in permafrost. It also rules out disposal in bed-rock in any situation where ground water now exists or could accumulate under future climates; for one must assume that, if ground water. gains access, the repository will leak.

Metastability of geological environments must also be considered. Salt deposits are particularly unattractive as repositories in this respect, as they display three kinds of metastability. First, they are soluble. Second, they are an economic resource, liable to extraction by man before enclosed wastes are detoxified but after all memory of their use as repositories has been lost. Third, salt beds is are dynamically metastable, being less dense than overlying limestones, sandstones and shales. (This explains their propensity to diapirism, the formation of salt domes.) The introduction into bedded salt of a long-duration heat source of appreciable intensity will tend to upset the metastability of the salt deposit. To rule out future diapirism that would destroy the integrity of the repository, a complete understanding of the stress regime in the salt and overlying strata will be needed. Sufficient understanding may be unattainable because of theterogeneities in the body of the rock. The review by Gera (1975) and Langer's (1976) studies of salt ductility are pertinent. I am yet to be satisfied that the perturbation in stress fields caused by excavation and the emplacement of a heat source will be limited to relatively small volumes within the salt.

Inadequate understanding of Earth dynamics creates further limitations. Thus, it is known that presently essential aseismic continental margins, such as the estern margins of North America and Australia, can be transformed into highly seismic margins like the Andean margin of South America. This change is effected by a change in the direction and rates of relative movement of the lithospheric plates that make up the Earth's crust. But the origin of changes in plate movement patterns and the response time of a previously aseismic continental margin are unknown. Probably the response time is less than 10^6 years, in which case repositories should not be located near continental margins.

Much the same problem applies to repositories located in the downgoing slabs of lithosphere in deep ocean threnches (subduction zones). Subduction of lithosphere may not persist for sufficient time to take the waste to a safe depth. In any case the waste may not be carried to great depth because most of the sediment, in which the waste would be located, may be scraped off the lithosphere as it descends into the trench. This sediment is acreted on to the wall of the ocean trench opposite the descending slab (Karig & Sharman, 1975). The accreting mass is strongly sheared, and disruption of waste canisters would be likely.

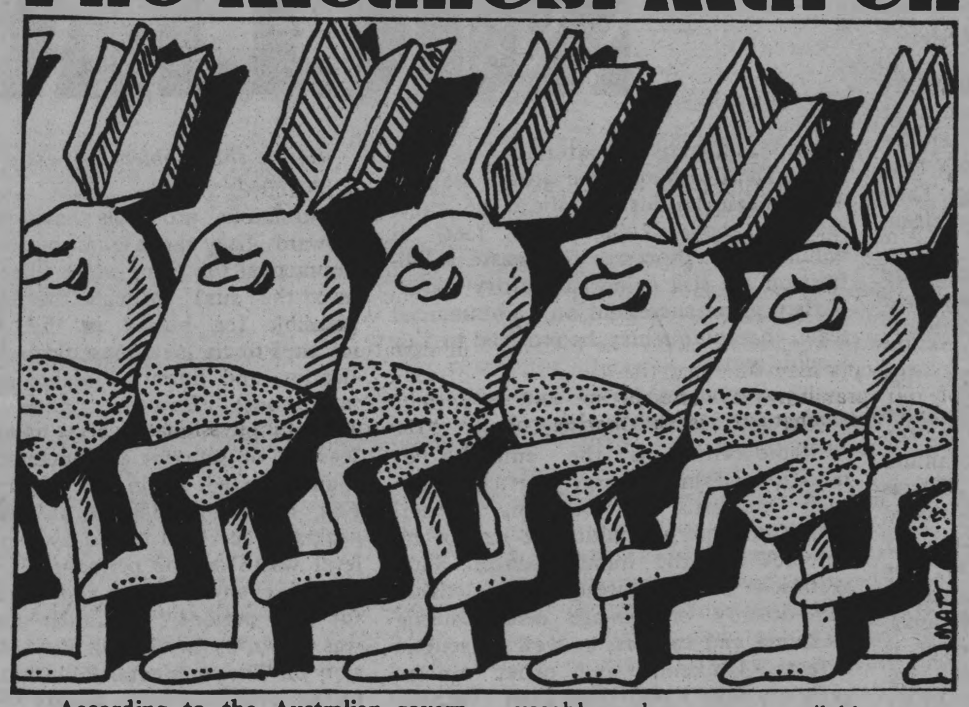
But there is a more important consideration here, which I regard as sufficient to rule out this type of repository. The very existence of lithospheric subduction as a process is disputed by a small but significant school of geodynamicists. Although the growth of oceanic crust by acretion at mid-ocean ridges is almost universally accepted as proven, the loss of crust by subduction involves the assumption that the Earth's radius is substantially constant with time, which is a matter of continuing dispute (Carey, 1975).

Thus geological dynamism severely restricts the possible sites for disposal on Earth.

Human frailty

The possible sites are further restricted by consideration of human frailty. The life-time of human institutions is, in historical terms, of the order of 10^3 years, as Toynbee showed in his classic work A Study of History. For times longer than this, societal breakdown, loss of records and technological capacity, and consequent cessation of surveillance, must be expected (see Weinberg, 1972). Furthermore, the lifetime of a sophisticated technology, such as generation of electricity by nuclear fission, is probably of the order of 10^2 to 10^3 years. These lifetimes are of the same order as the toxicity lifetime of deactinided wastes. They are three orders of magnitude smaller than the toxicity lifetime of actinide-rich wastes.

The Meanest March



According to the Australian government, uranium exports would be covered by a safeguards policy with four "cornerstones."

But these "cornerstones" are already in ruins. They can not prevent the use of Australian uranium or its byproduct plutonium in the manufacture of nuclear weapons.

The four foundations of the government's strategy to prevent the spread of nuclear weapons are:

1 Non-Proliferation Treaty.

2 International Atomic Energy Agency safeguards.

3 Bilateral agreements.

4 Multilateral efforts to strengthen safeguards.

But, can any of these be relied on?

1 Non-Proliferation Treaty

The obvious weakness of the NPT is that major nations either owning or obtaining nuclear reactors, and in some cases fuel reprocessing plants, are not parties to this Treaty. Such countries include: India, Spain, Pakistan, Argentina, Brazil, China, France, Israel, Egypt, South Africa. Several of these countries have refused to sign the Treaty on the grounds that it is wrong and unsound for a monopoly of nuclear weapons in the the hands of some powers, notably the USA and the USSR, to be maintained by the Treaty.

This criticism draws attention to a second failure of the NPT—the failure of the nuclear powers to disarm. The Treaty calls for nuclear disarmament, but, as the recent US development of the neutron bomb clearly demonstrates, the superpowers are continuing the arms race, unrestrained. A major loophole in the NPT is its provision that signatures may legally withdraw from the Treaty with three months notice. Almost immediately after withdrawing, a nation could have a useable nuclear weapon available.

2 International Atomic Energy Agency safeguards

According to the Ranger Inquiry's first report, defects in the present safeguards arrangements, taken together, "are so serious that existing safeguards may provide only an illusion of protection." (p 147)

Among the weaknesses of these arrangements are the following:

* the fact that many nuclear facilities are not covered by safeguards;

* the existence of loopholes in safeguards agreements regarding their application to "peaceful" nuclear explosions, to materials intended for non-explosive military uses (nuclear submarine power wource) and to the retransfer of materials to a third state;

* the absence, in practice, of safeguards on uranium before it has been processed for use in a reactor (eg "yellowcake");

* the absence of reliable sanctions to deter the diversion of safeguarded material.

3 Bilateral agreements

The first point to be made about bilateral agreements is that they are an attempt to overcome the weaknesses and limitations of IAEA safeguards.

The second point is that these agreements rely on the same kind of goodwill and are subject to the same kinds of weaknesses as NPT and IAEA agreements.

The only way of "effectively" enforcing the bilateral safeguards proposed by the Australian government is that the USA control the flow of uranium by handling its enrichment.

Such a policy would place Australia's uranium marketing under US control. Far from giving Australia a strong voice in the international nuclear industry, uranium sales under these conditions would effectively remove Australia's control over its uranium.

4 Multilateral efforts

There are both immediate and continuing problems with the multilateral efforts announced by US President Jimmy Carter to strengthen safeguards. Whether or not the breeder reactor is used, enough plutonium is produced in a 100 megawatt American built reactor, for example, to make up to 25 nuclear weapons a year. The spread of plutonium and of nuclear weapons capacity will not be stopped by the Carter plan.

As well, Australia's position is weaker than that of the US. The Australian government would allow the extraction of plutonium from used reactor fuels, with the possibility of its recycle into reactors or weapons.

Even if all existing governments supported the Carter plan, how could it be enforced with future governments, as yet unknown?

In summary:

Nuclear safeguards proposed by the government to "protect" Australian uranium, and to prevent the spread of nuclear weapons can not work. They either have a record of past failure, or seem likely to fail in future.

Do it yourself Atomic Bomb

In May 1976 the blueprint for an Atomic Bomb was drawn up. It was not prepared by a nuclear physicist with years of research experience. It was not prepared in secret by a government defence agency with unlimited resources. It was prepared by a 21-year-old student at Princeton University, USA, as a project in his physics course.

This disturbing fact is made more worrying because he found most of the necessary information readily available in books from the university library. The student, John Phillips, bought about $10 worth of publicly available US Government documetns as a supplement.

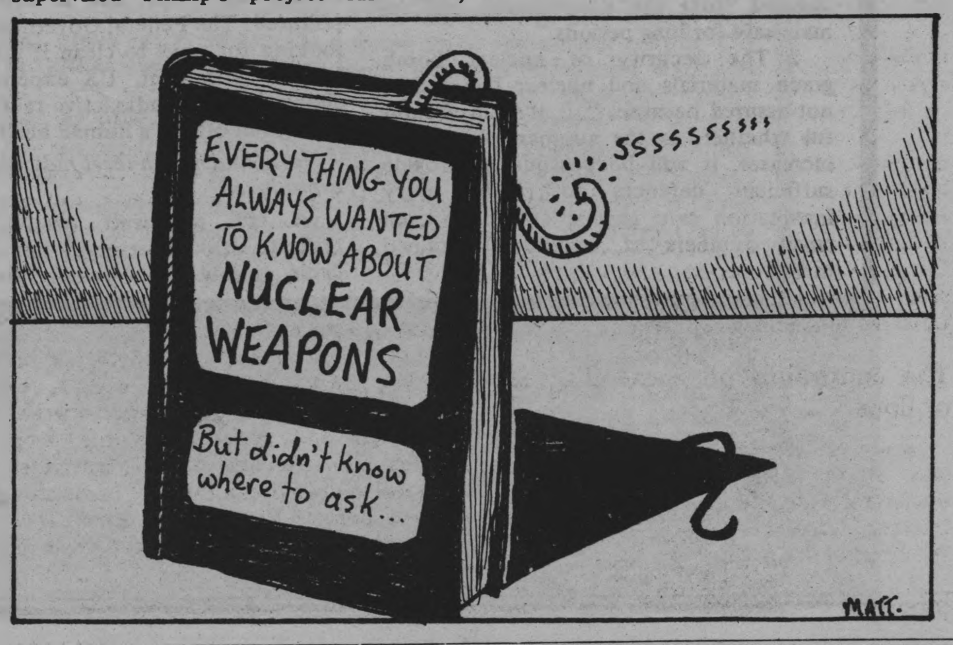
Some essential information was still classified though, and this contained the key to one of his most puzzling problems—which detonator would be most suitable to trigger the A-Bomb's uncontrolled nuclear reaction? He obtained the answer on the telephone from an explosives expert at the Du Pont Company. This information effectively completed his design. It had taken him only four months working alone.

The physicist, Freeman Dyson, who supervised Phillip's project said later, "The important thing to me is how much solid information he could get so easily, and in such a short time."

The case showed that a massive project involving dozens of experts is no longer necessary to build an Atomic Bomb. Given the knowledge explosion and publicly available documents, amateurs CAN design crude but effective atomic bombs.

The first report of the Ranger Uranium Environmental Inquiry, headed by Justice Fox concluded that ". . . a terrorist group could use reactor grade plutonium to make a bomb with good prospects of giving a yield of several hundred tonnes of TNT . . . An explosive yield of a few hundred tonnes of TNT might be sufficient to destroy a very large skyscraper with severe loss of life. The ionising radiation released and the subsequent fall-out would also kill and injure many people." (p 154)

Every nuclear reactor produces about 200 kg of plutonium each year. Only about 8 kg is needed to make a crude but deadly nuclear bomb. (source: The National Times, April 25-30, 1977)



GROUPS SUPPORTING

Opposition to uranium mining now comes from all sections of the Australian community. As more people have learned of the dangers and unsolved problems of nuclear power, and of the effects of uranium mining on the environment and the economy, they have begun to support bans on the mining and export of Australian uranium.

TRADE UNIONS

The Queensland Trades and Labor Council supports:

* a 5 year moratorium on uranium mining;
* full public discussion of all the questions raised by the mining and export of uranium, leading to a decision by all the Australian people;
* a non-nuclear national energy policy.

CHURCHES

The Executive Committee of the Australian Council of Churches has called, "for a five years moratorium on mining and exporting of uranium to allow sufficient time for public debate and for further research into the risks involved and possible alternative energy sources."

The National Commission for Justice and Peace, Caholitc Church in Australia:

"Until the problems and dangers . . . are satisfactorily resolved . . . Australia should not engage in the mining of uranium;

"Australia should refuse to export uranium to those countries engaged in

"a. manufacturing nuclear weapons, and

"b. generating power by the nuclear process."

AUSTRALIAN LABOR PARTY

The ALP policy on uranium:

* "Labor declares a moratorium on uranium mining and treatment in Australia,
* Labor will repudiate any commitment of a non-Labor Government to the mining, processing or export of Australia's uranium, and
* Labor will not permit the mining, processing or export of uranium pursuant to agreements entered into contrary to ALP policy."

This policy is based on:

" . . . the absence of procedures for the storage and disposal of radioactive wastes. . ."

NORTHERN TERRITORY ABORIGINES

Traditional owners of the Ranger uranium deposit site and the Northern Land Council are opposed to uranium mining on the Ranger site.

QUESTIONS & NUCLEAR

What is nuclear power?

Electricity generated using a nuclear reactor as the heat source.

How does it work?

Uranium fuel undergoes a process called "fission" (the splitting of atoms) in a nuclear reactor, thereby generating heat. The heat converts water to steam which in turn drives steam turbines coupled to power generators. (In a conventional power station the heat sources comes from the burning of oil or coal.)

Isn't nuclear power too complicated to understand? Shouldn't the decision be left to the experts?

The technology is complicated but its basics are not beyond the average person. In any case, decisions about its use are most importantly social and ethical ones. As the Fox Inquiry declared "the final decisions should rest with the ordinary man and not be the preserve of any group of scientists or experts, however distinguished."

What is the Fox Inquiry? (ie the Ranger Uranium Environmental Inquiry under the chairmanship of Mr Justice Fox)

An independent judicial inquiry set up by the Australian Government under the Environmental Protection Act. The Inquiry commenced in September 1975 and produced its first report in October 1976, after collecting 13,000 pages of evidence from over 300 witnesses. The First Report weighed the evidence presented to the Inquiry, for and against uranium mining and nuclear power as they affect Australia and the whole world. The Second Report concentrated on the particular issues affecting the Northern Territory, including Aboriginal land rights, the environmental effects of uranium mining and the establishment of the Kakadu National Park. The majority of Australia's reserves are in the Northern Territory.

What are the main dangers associated with the nuclear power industry?

The Fox Inauiry pinpointed three major dangers:

1 "There is at present no generally accepted means by which high-level [radioactive] wastes can be permanently isolated from the environment and remain safe for long periods."

2 The security of nuclear bomb grade materials and nuclear facilities is not assured because, ". . . it seems doubtful whether, as the number of facilities increases, it will be possible to provide sufficient defences to render every installation safe against attack by even small numbers of well-armed, trained men."

3 "The nuclear power industry is unintentionally contributing to an increased risk of nuclear war."

What are radioactive wastes?

During the fission (atom splitting) pricess in a nuclear reactor, the mildly radioactive uranium fuel is converted to a wide range of extremely radioactive materials.

Most of these very toxic wastes are useless and spontaneously boil when kept in liquid form, giving off radioactive gases, for the first century of their long lives. These are the fission products. They must be kept isolated from the environment and human beings.

Ideally, the fission products are separated from the unburnt uranium and the other byproducts (transuranic elements) which include plutonium.

The process of separation (called "fuel reprocessing") is at present not being carried out on an industrial scale for the most common form of fuel (uranium oxide) anywhere in the world. This is because reprocessing plants have proved to be difficult to operate in a technically and economically satisfactory way. The wastes which have been accumulated are now stored temporarily in steel tanks. This method of waste management is inadequate in the long term and has already failed several times (for example —Hanford leaks). The plutonium, once separated, is a suitable fuel for atom bombs as well as being extremely toxic.

In addition to high-level wastes from the reactor fuel, a nuclear power station in operation produces considerable quantities of so-called medium and low-level wastes. These include radioactive gases (released to the atmosphere), radioactively contaminated cooling water (released to rivers or sea) and radioactively contaminated articles such as clothing, tools etc (usually buried or dumped at sea). The reactor becomes radioactive and is a giant pile of radioactive waste once its useful life is over. The decommissioning of a commercial nuclear power reactor has yet to be carried out. Uranium mining and milling also produce radioactive wastes known as "tailings" and constitute a threat to the environment. The Finniss River, downstream from Rum Jungle, NT, was mined for British atom bombs during the 1950s, and is now seriously polluted. The Federal Government is now looking for ways to clean it up. Close to human settlement, US experience now shows that the radioactive radon gas and dust given off are a human health hazard.

How much high-level radioactive waste is produced?

A 100 megawatt reactor (today's typical size) operating for one fuel cycle (about two years) produces as much radioactive materials as one thousand Hiroshima sized atomic bombs. These toxic liquids are about 66 cubic metres (about 1800 cubic feet) in volume. The processes for waste solidification are still being laboratory tested. If they prove successful on a commercial scale, the volume may be reduced to 5 or 6 cubic metres.

What is radioactivity and why is it dangerous?

Radioactivity is the emission or radiation of high energy particles from such materials as uranium, radium, strontium and plutonium. It cannot be detected by the human senses. Such radiation passing through living tissue can destroy or damage cells, causing leukemia and cancers, as well as genetic defects. Leukemia and other cancers generally take 15-30 years after exposure to radiation to show up. Genetic defects show up as abnormalities in subsequent generations. Because of these delays, it is difficult to establish for certain the cause of a cancer or genetic defect.

Are we not already exposed to radiation from natural and man-made sources?

Natural sources of radiation come from naturally occurring deposits of such materials as uranium and radium (plutonium is man-made and does not occur in nature) and from cosmic rays. Medical authorities attest that any radiation (including these natural sources) is harmful in direct proportion to the amount of radiation received. No level of radiation, however low, is considered completely safe.

Man-made sources of radiation include x-rays and other medical techniques administered selectively and only for short exposures. Even x-rays are now no longer routinely administered to pregnant mothers because of the particular danger of radiation to the developing child. Now adding to the natural "background" radiation are the ever-increasing amounts of radiation from fall-out from nuclear explosions (atomic and hydrogen bombs) and waste products from military, commercial and research reactors. All these sources are adding directly to the radioactive contamination of the environment and are a risk to human health.

Hasn't the problem of waste disposal been solved?

Numerous proposals have been put forward. They range from the completely impractical (eg firing waste filled rockets into the sun) through the somewhat plausible (eg buried in the Antarctic ice cap) to the new most favored (solidification and burial in stable geological formations). However, none of the methods proposed has been proved to be feasible or safe for the incredible time spans involved. Again in the words of the Fox Inquiry, "There is at present no generally accepted means by which high-level waste can be permanently isolated from the environment and remaon safe for long periods." A similar conclusion was drawn by the British Royal Commission on Environmental Pollution chaired by Sir Brian Flowers: "There should be no commitment to a large program of nuclear fission power until it has been demonstrated beyond reasonable doubt that a method exists to ensure safe containment of long-lived, highly radioactive waste for the indefinite future." Waste disposal research is still only at the laboratory stage. Wastes are now stored "temporarily" in tanks. This is an unacceptable long-term solution.

Are wastes likely to be stored in Australia?

Several suggestions for the establishment of a reprocessing facility in Australia have been made. It is known that Japan, for one, would like to see reprocessing and waste storage in Australia rather than on her own soil. This could involve the transport and handling of hundreds of thousands of litres of highly radioactive liquids across the seas, through our ports, and over our roads and railways. The West Australian Government held talks about this last year.

Are there real dangers of nuclear theft, sabotage and blackmail?

The possibility is taken very seriously by the Fox Inquiry as well as many other authorities, including the British Royal Commission under Sir Brian Flowers. Theft of nuclear materials has alreayd occurred in the USA and UK and a number of unsuccessful attempts are also

MORATORIUM

STUDENTS

The General Committee of the Australian Student Christian Movement recently resolved:

"We welcome the Government's acknowledgement of the need for safeguards for nuclear materials but we believe that where perfect safeguards are necessary, it is foolhardy to trust them.

"We doubt that the security needs of the nuclear industry are compatible with civil liberties.

"We believe that the energy greeds of this generation are less important than ensuring the health and survival of life on earth.

"We . . . call for the disbanding of the Atomic Energy Commission and the diversion of its funds into research and development of nonviolent and renewable forms of energy."

SCIENTISTS

200 Australian scientists and technologists have declared:

"We believe that the problems associated with the development of nuclear power far outweigh any possible benefits. Therefore, we call on the Australian Government to ban the mining and export of this country's uranium, except for biomedical purposes, and to embark on a comprehensive program of energy conservation and alternative energy development."

AUSTRALIAN CONSERVATION FOUNDATION

"We strongly urge the Australian Government to adopt a policy of exporting uranium for . . . physical and biomedical research only . . . and refusing to export uranium to those countries engaged in researching or manufacturing nuclear weapons or generating power by fission or breeder reactors."

WOMEN

The Women's International League For Peace and Freedom (Q) says:

"The Government decision to mine and export uranium is a short-signted stop-gap measure. It ignores the consequences of mining as well as the reality that renewable energy sources must be fully developed eventually.

"Already the Australian taxpayer has had to fork out over $10 million to prop up the Mary Kathleen uranium mine. But solar energy research in the "Sunshine State" is neglected.

"Public opinion has not yet convinced the political Rip-Van-Winkles. Only the voice of the people opposing uranium mining will eventually stir the politicians from their comfortable stupor."

TEACHERS

Teacher organisation in Victoria and the Northern Territory have both adopted policies in favor of the uranium moratorium.

The Northern Territory teachers will also decline to conduct classes in schools established to serve uranium mining communities.

ANSWERS ON POWER

on record. Several attacks on nuclear installations and facilities have taken place in the USA, France and Argentina. A number of these attacks were accompanied by attempted blackmail. A Commissioner of the U.S.Atomic Energy Commission has stated that the development of a blackmarket in plutonium is likely. Just one kilogram of plutonium has the potential of causing millions of cases of cancer. A few kilograms can be readily fashioned into an atomic bomb. Sabotage of a nuclear power-station or waste storage areas could release enormous amounts of radioactivity.

How can nuclear power stations contribute to the spread of nuclear weapons?

All nuclear reactors produce plutonium, the "explosive" core material for an atomic bomb. Each typical reactor produces about 200 kg of plutonium each year, sufficient for about 20 small atomic bombs. India has already dramatically demonstrated the technique. Using a Canadian supplied "peaceful" power reactor with supposedly stringent safeguards, India produced and exploded an atomic bomb in 1974, thereby becoming the sixth nation known to possess a nuclear weapon capability. Many other countries are certain to follow if nuclear power stations multiply throughout the world. The Fox Inquiry found nine major limitations and weaknesses of the present treaty safeguards. The Report said that "these defects, taken together, are so serious that existing safeguards may provide only an illusion of protection."

Will Australia's uranium mining add significantly to nuclear weapons proliferation?

Australia's uranium deposits account for an estimated 20 per cent of the western world's resources, recoverable at rates presently considered economical. Moreover, they comprise approximately 70 per cent of those reserves not already committed by contract or treaty.

Already economic considerations are slowing the growth of the nuclear power industry world-wide and the withdrawal from the world market of such large reserves must further affect the economic viability of the industry. Conversely, export of our uranium will add impetus to the proliferation of nuclear power stations and consequently to the dangers of nuclear weapons proliferation.

Are safeguards against the misuse of nuclear materials effective?

If Australia mines uranium we can have little control over it after export. We could not effectively regulate the handling or use of its very dangerous byproducts either. The Nuclear Non-proliferation Treaty (NPT) is the major international safeguards arrangement to attempt control of bomb-grade nuclear material.

The First Fox Report (p 147) concluded that, "The main limitations and weaknesses of the present safeguards arrangement can be summarised as follows: the failure of many states to become parties to the NPT; the inability of safeguards to prevent the transfer of nuclear technology from nuclear power production to the acquisition of nuclear weapons competence; the fact that many nuclear facilities are covered by no safeguards; the existence of a number of loopholes in safeguards agreements regarding their application to peaceful nuclear explosions, to materials intended for non-explosive military uses, and to the retransfer of materials to a third state; the absence, in practice, of safeguards for source materials; the practical problems of maintaining effective checks on nuclear inventories; the ease with which states can withdraw from the NPT and from most non-NPT safeguards agreements; deficiencies in accounting and warning procedures; and the absence of reliable sanctions to deter diversion of safeguarded material.

"The Commission recognises that these defects, taken together, are so serious that existing safeguards may provide only an illusion of protection."

Won't the mining and export of Australia's uranium provide thousands of jobs and be of great economic benefit?

The Fox Inquiry found that the Ranger mine would employ up to 600 during the two year construction phase and 250 thereafter. Even a doubling of production to 6000 tonnes of milled uranium oxide (yellowcake) would employ only 400 people.

The inquiry found that the sale of uranium would only add an estimated 0.1 per cent to the national income of 1980-81, rise to 0.5 per cent by 1990-91 and subsequently fall to about 0.2 per cent by the year 2000. If the capital spent on setting up uranium mines were spent in other industries many more jobs and economic benefits would flow to Australians. Moreover, heavy mineral investment is robbing other sectors of the economy of capital and contributing to unemployment there. In other words, we can afford not to mine and export uranium.

What are the dangers from uranium mining?

Uranium mining causes the release of radioactive radon gas which can cause cancer if inhaled into the lungs. This is a possibility in inadequately ventilated mines. Further dangers ensue from the long-term storage of mining and milling wastes (tailings). These are stored in slag heaps and under water behind earth dams. Seepage is inevitable and has already occurred at Mary Kathleen. At times of flood, the waste material can be released into river systems causing a potentially serious problem of radioactive pollution for vegetation, animal and human life downstream. Tailings piles remain dangerously radioactive for tens of thousands of years.

Is nuclear power and associated technology planned for Australia?

No nuclear power production is planned for Australia as far as we know. The planned nuclear power station at Jervis Bay (NSW) was shelved by the McMahon Government in 1972. However, 70 per cent of Australia's energy research budget (some $20 million for 1977) is allocated to nuclear research which would seem to indicate a strong interest by the government in nuclear power or weaponry. Uranium enrichment plants have been proposed for South Australia or Queensland and it is thought that proposals for a complete fuel cycle (enrichment, fuel fabrication, reprocessing and waste storage) have been discussed with Japanese interests by Sir Charles Court, Premier of Western Australia.

Uranium mining would very likely be the first step in further nuclear technology in Australia.

The probabilities of nuclear power reactor accidents are so small as to be insignificant, aren't they?

It is true that theoretical studies have assigned a very low probability to the occurrence of a major accident. Many criticisms have been levelled at the methodology used in these studies. Its predictions underestimated the actual rate of accident in the aerospace industry and has been abandoned. Human error and unforeseen occurrences cannot be

What is a fast breeder reactor?

The fast breeder is a type of reactor now under development. If it works successfully, it will produce slightly more nuclear fuel (in this case, plutonium) than it consumes. (Hence it holds the economic key to nuclear power, since for thermal reactors, fuel will last only another two or three decades.) At present, no breeder of commercial size is operational. All of the small prototype breeders built in the USA, Britain, france and the USSR have suffered serious failures. Only last year the French 250 megawatt Phenix prototype breeder was shut down indefinitely after a massive leak. The breeder could explode like an atomic bomb in the event of a major accident, if the fuel melted. Moreover, the breeder uses liquid sodium as a coolant. This substance is a dangerous chemical which will explode in contact with air or water.

Is nuclear power inevitable?

No. Nuclear power technology is still in many respects unproven and its shortcomings now make it an unacceptable option in many countries. With capital and fuel costs escalating and long construction delays, the economic viability of nuclear power is also much in doubt. Moreover, the increase in demand for electricity has slackened off and in Britain particularly, much generating capacity is standing idle. Fossil fuels will continue to be the predominant means for generating electricity till the end of this century, even in those countries with the most ambitious nuclear programs.

Alternatives to nuclear power and fossil fuels are being rapidly developed and with more adequate research funding progress could be more quickly made. Energy saving will also play a large part in helping avoid the nuclear option. For example, Britain is introducing standards for better building insulation, while Canada and New Zealand are running energy conservation programs. Up to half of all energy produced in the industrialised countries is wasted and it is much cheaper to save a unit of energy than to produce another one.

Why Nuclear Fuel Threatens Civil Liberties

Following are extracts of a talk given gy Geoff Robertson, a former Rhodes Scholar who is Australian born but has been working England for seven years. He is a QC and was council to the British Council of Civil Liberties of which he was an executive member at the Windscale nuclear power station inquiry.

Unfortunately one of the problems of civil liberties around the world is that it can't be confined, can't be seen as purely a fascist state, purely a communist state or Queensland problem. You have to look at civil liberties on a world scale. This is partly because of countries' increasing commitment to nuclear power. One of the aspects of the debate which has not really surfaced in Australia is the consequences of civil liberties once a country goes nuclear. There are civil liberties consequences for Australia even if it doesn't go nuclear, even if it simply does no more than mine uranium.

The debate so far over nuclear power has been shared by people with very expert and very sincere views, nuclear scientists, anthropologists and environmentalists, who have really a sincere point of view, often conflicting. What has a lawyer as I am got to do with a debate which ranges across such cosmic speculation?

Well I think that civil liberties lawyers hold the key, because we are able to look forward and see what the likely scenario is once uranium is put into the nuclear power cycle. If we commit ourselves in any way to the nuclear cycle we may be signing away some of our civil liberties.

This concern is being expressed increasingly by even the most conservative lawyers in Britain and America. It has lead to the international commission of jurists, a group originally funded by the CIA, and by no means a pillar of established protest, being ranked amongst the objecters. at an inquiry as to whether to establish a reprocessing plant at Windscale in England. They were objecting on civil liberties grounds.

Risks

The argument against nuclear commitment based upon the civil liberties angle hangs on three propositions.

1 Any country using and transporting plutonium will have to take precautions against serious terrorist threats.

2 Such precautions will involve substantial erosion of civil liberties of individuals.

3 These precautions will be seen in Australia, even if Australia does no more than mine uranium.

Plutonium, the size of a cricket ball can be incorporated into a terrorist bomb capable of destroying a large city centre. The threat of terrorist access to plutonium is mainly at the reactor stage, or the reprocessing stage of the nuclear cycle during transportation of plutonium waste to disposal areas. What is the risk? Is terrorist activity a credible threat?

Some years ago a 20 year old undergraduate working solely from published materials managed to construct a bomb which according to distinguished scientists would work as soon as plutonium was placed in it.

The Flowers Report, the Royal commission's report into the environment and nuclear power which reported in Britain in October, states that:

"Plutonium offers a unique and terrifying potential for threat and blackmail against society."

The Ranger Report

The Ranger inquiry in Chapter 14 in reference to terrorism states:

"The weight of evidence suggests that a terrorist team could construct a very destructive device from reactor plutonium." Ranger goes on to say that no matter how well guarded a reactor is, given the element of surprise three well armed men would be difficult to thwart.

The nuclear industry takes the view that they can safeguard uranium. This is nonsense. No one can safeguard plutonium. No one can guard against corruption inspired by greed or blackmail within a nuclear power plant.

In 1973 the Director of the Atomic Energy Commission in America was discovered to have a quarter of a million dollars worth of gambling debts—he was immediately sacked.

Twice parts of America have been put on military alert when people have highjacked planes and threatened to crash them into nuclear power stations. In Argentina two years ago, Guerillas actually invaded a nuclear power plant and occupied it for several hours successfully. They painted slogans on the walls then left. Evidence in the States now shows that 1 per cent of plutonium and bomb-grade uranium has gone missing.

Terrorism

Let me quote a news story from the Australian recently.

"The US government admitted that it has no idea what has happened to four tons of closely guarded uranium and plutonium it has used in the past 30 years to make atomic weapons."

Souvenir hunters have already been prosecuted for theft of weapons-grade uranium.

So how can the nuclear industry hope to satisfy us that it can guard against determined political or criminal terrorist attack.

Now we have to consider what the security measures are going to have to be. You can't make plutonium safe, and you can only make it relatively safe by invading civil liberties.

The cost of poor security is hundreds and thousands of people dead or damaged. With that at stake most of us, no matter where we stand on paper would be happy to see the police and security services possess draconian power that in the past they have only possessed in time of war.

In fact in Britain, a special constables act was passed in 1976 which set up a group of 400 armed police officers who were responsible not to the police force but to the British nuclear industry. It has the right of "hot pursuit" which is the right to shoot dead a person suspected of an offence. It is an act that goes right against the English grain of controlling police and not having armed policemen.

The future scenario set out by the Royal Commission for life in the nuclear state concluded that the threats to civil liberties of the nuclear economy were so serious that Britain should not go ahead no matter what the comforts and profits were unless there was no reasonable alternative

Secret Service

An interesting extract from the Flowers Report reads:

"An effective security organisation could not merely be passive, simply reacting to events. It would need to have an active role that is to infiltrate potentially dangerous organisations and monitor the activities of nuclear employees and members of the public and generally carry out clandestine operations. It would need to have powers of search and powers to clear whole areas in an emergency. Such operations might need to be conducted on a scale greatly exceeding what otherwise would be required on grounds of national security in democratic countries."

Monitoring of the employees of nuclear power stations will consist of thorough vetting of the individual and his family and friends before they are employed. But it will go much wider in that scientists who have displayed radical leanings in their university days probably won't get employment. Anyone coming into contact with plutonium, which will involve thousands when you consider the transportation truck drivers, dockworkers, etc, will all have to be vetted. Their union leaders will have to be carefully scrutinised. Strikes will doubtless be outlawed.

The press will not be allowed to report the buildup of plutonium and uranium stocks in any meaningful way for public debate. D Notices and official secrets acts will ensure that doesn't happen.

There is the possibility of police being given general powers of search and an army takeover where there is a suspected terrorist threat.

Informers will be used to infiltrate organisations that are suspected to be potentially dangerous. Often the evidence returned by an informer is tainted with greed, tainted with malice, or tainted with a desire to give his control what he wants.

We are talking about a security service which is impossible to vet. There is no legal remedy for people who have been defamed in dossiers. You can't have legal remedies when the security service is not responsible to anyone in parliament who will answer questions. Time and again when questions have been asked in Parliament the responsible minister says "secret services are secret and therefore I can't answer." So there is no Parliamentary responsibility and there is no legal responsibility.

So if you accept that given the existence of plutonium in a country requires stringent security conrols, what then is the implication for Australia.

Power Junkies

The arguments put forward to pacify the critics by the advocates in the Australian nuclear debate is that we are only mining. The plutonium production happens in other countries which smacks a bit of the morality of the opium poppy grower who knows his product has medicinal value but also knows that most of it will end up as a death inducing substance.

Even if we do no more than mine we still have a potential boomerang affect on our hands with the problem of ownership. The public utilities producing the electricity only want the plutonium for a short time. They just want to lease it and send it back to the reprocessing plant. British Nuclear Fuels have proposed a reprocessing plant at Windscale in England where Australian uranium will be sent. They have already stated that they will insist that ownership not lie with them in any contract they sign with suppliers. So where does it go when it becomes unwanted? Back to the owner. So Australia may find that the daughters of our uranium may one day be ours again and that is a matter of contractual law.

There is an Atomic Energy Act in Australia, a piece of cold war legislation, which was passed in 1953 when Atomic weaponry was being tested, and classifies as "restricted" any information about uranium, the movement of uranium, the production of uranium, persons involved in the movement of uranium, etc.

Now if you are found to give any of this information to a journalist you can be jailed for 20 years and so can the journalist (maximum sentence). And the police are given complete power in the course of policing this act. They may enter, search and sieze without a warrant. They may take a man and torture him to death under this act, and there is no legal recourse because Section 53 of this Act says that no action either civil or criminal can be brought against a police officer who is doing his duty under the search and siezure powers of the Atomic Energy Act.

It ought not be on the books. It has never been used. But now Australia has begun mining and milling, it is theoretical threat to civil liberties.

One must consider the great increase in dossiers and security surveilance which must come about as a result of portest against uranium mining, and because plutonium is so dangerous.

There has been the greatest co-operation between the police forcse of the world in pooling information on organisa- from ASIO on what steps were being taken to monitor potential subversives!

So the public will never have access to information to enable it to debate the uranium question on civil liberties grounds.

tions and individuals regarded as security threats. The London Group is made up of secret police from several Commonwealth countries who meet to exchange information. If you have a dossier on you in Australia there is no guarantee that it will not go to other countries and affect your fortunes overseas.

The crowning irony of it all is when the Ranger inquiry having pushed strongly for maximum public debate, moved into a closed session to consider terrorist threats so it could receive information

Legal action against Uranium Producers Forum Ads.

Two actions against the Uranium Producers Forum for their advertising in their recent public relations blitzkreig have been taken to the Trade Practices Commission.

We've all seen the ads on TV, and read them in all our newspapers. They've been disguised as educational broadsheets and made up to resemble pages of the various newspapers in which they've appeared, especially in the influential National Times and the Financial Review, right down to the typefaces and headline types used. They cost at least $1000 each and are presented to the public as an educational service.

Last December we learned that the Uranium Producers Forum, a conglomerate of uranium mining companies formed to lobby the Federal and State Governments and to convince the Australian public that uranium mining was a good thing, were gearing up for one of the most intense and expensive advertising campaigns ever seen in Australia. Yet the product was something that no Australian would ever be able to buy in the supermarket, or indeed would probably ever see: uranium. The Forum had already hired a top PR firm, International Public Relations, to design the campaign and had commissioned public opinion polls to discover how effective the ads planned would be. The estimated cost of the drive varied from $500,000 to close to one million dollars, with $600,000 being the most common estimate.

Dark Clouds

By early July, then, the AFR's ad writer Valerie Lawson could report that the UPF was claiming that public opinion was in favor of uranium mining, largely through the ad campaign. But there were dark clouds gathering, for, buried away in a footnote to the July 5 article in the AFR was the note that the ACT branch of the Society for Social Responsibility in Science had taken action against the UPF in the Trade Practices Commission. An innocuous enough note, but one which has enormous implications for the UPF and the entire advertising industry.

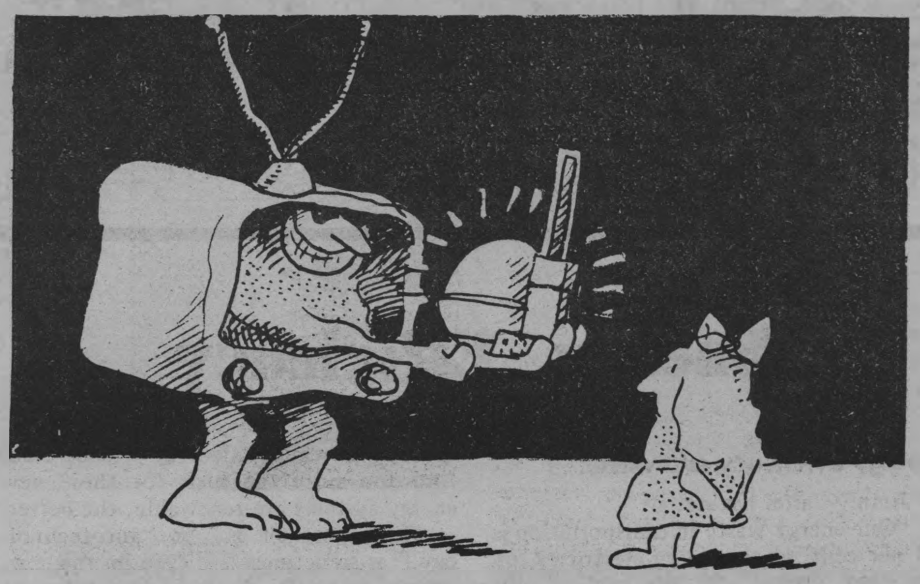
The story remained a sleeper for over a month, until Lawson again writing in the AFR of August 11 reported that the Australian Conservation Foundation had approached the Trade Practices Commission with similar complaints. The story appeared in the Melbourne Age but nowhere else. The next day, I rang the ACT spokesperson for the Society for Social Responsibility in Science, CSIRO scientist Dr Mark Diesendorf.

"Any person selling soap or flyspray can say that their ads are put out as a public service. There's nothing to stop people doing that, but I think that members of the public are somewhat more realistic. They know that people who advertise generally stand to make a lot of money from selling their product. I feel that the Uranium Producers have undermined their own credibility by publishing such grossly misleading information," Dr Diesendorf told me.

The basis of the society's complaint to the TPC was that some of the material in the ads was factually incorrect, other parts of the ads were grossly misleading, and that at least two of the statements were mutually contradictory.

The society picked out four specific statements in the Forum's ads as the basis of their complaint.

"There is a statement which says that, when it's referring to uranium, 'it is an energy rich fuel which does not pollute the atmosphere,." Dr Diesendorf said. "Now, this is an example of an incorrect statement. Uranium, when used for nuclear power, does in fact produce pollutants which are released directly into the atmosphere from normally operating nuclear power plants. Gasses like krypton 85, iodine 131, and argon 41 are radioactive waste gasses which are released directly into the atmosphere from normally operating nuclear power plants. That is an incorrect statement by the producers."



Deaths

"The first statement says that 'in over 2000 years of reactor plant operation, in 19 countries there has not been a single death or injury from nuclear causes. Now, this statement is misleading in its own right, but it's contradicted by another statement which appears in a table which shows a decrease in average lifetime from various causes. Nuclear power plant operation in 1970 gives the decrease in expected lifetime as being less than one minute. For a projection to the year 2000, they give an estimated decrease in lifetime as being less than 30 minutes. If this table were to be consistent with the earlier statement, that there had been no deaths, then there should be a zero decrease in average lifetime."

Dr Diesendorf went on to explain that such statements were misleading in their own right. By saying that the decrease in average lifetime was less than one minute, the UPF are saying that the only risk faced by the public was a minute off one's life. This, he said, was entirely untrue. One of the main risks of radiation is the likelihood of cancer, and if someone gets cancer it may mean years off their life. What the UPF had done, according to Dr Diesendorf, was to pool this figure with the nill decrease in life expectency in the event of no radiation and arrive at the loss of life-time by 2000 at 30 minutes.

That action from the Society for Social Responsibility in Science would have been worrying in itself had it not come with a similar action from the Australian Conservation Foundation. Both actions before the Trade Practices Commission have been downplayed considerably in the press, and the story which interested me on August 11 was buried on page 22 of the AFR for that day. After speaking with Dr Diesendorf in Canberra, I rang Dr Geoff Mosley, the chairperson of the Australian Conservation Foundation in Melbourne. He was interested to learn that the Canberra organisation had similarly contacted the TPC, for my call was the first he'd heard of the Canberra action. What was even more interesting was that the ACF were concerned with four **different** parts of the UPF advertising than the scientists' organisation.

"One of the claims in the advertising is that the spent fuel rods from the reactors will be reprocessed in a particular type of plant. Our information is that there is no such plant in operation in the USA, and the design for that plant is at a standstill," Dr Mosley said.

"There is also a claim that there have been no deaths from nuclear power plants. We have information that there has been a death in the United States. We've also told the TPC that the Australian Atomic Energy Commission has recently accepted responsibility and paid compensation to a widow of a former worker at Lucas Heights who died of Lukemia."

The most important limb of the Prime Minister's case for Uranium mining and export is that there have been found safe places to store transuranic and high-level radioactive waste. Consequently, the UPF ads stressed that there have been found solutions to the waste problem. But the ACF disagreed.

"There's also a claim in the advertisements that radioactive wastes will be stored in salt mines. Scientific opinion is by no means agreed that this can be done satisfactorily and we have pointed out to the TPC that a planned waste depository at Carlsbad in New Mexico, in salt, has not been licensed because of the instability of the salt mine.

"The fourth claim which we think is quite misleading is the claim that Australian uranium will be refined only to the yellowcake stage. This, of course, presupposes a decision by the Commonwealth government which has yet to be announced. It is quite likely that uranium will be exported in the enriched stage."

"The Uranium Producers Forum has pointed out that the ads are presented as a public service. But Mr KcKay, who's the chairman of the Forum pointed out also in a letter to the Melbourne Age that the public has the final protection from misleading and dishonest advertising through the Government Trade Practices Act. And that is the basis on which we've asked the Trade Practices Commission to investigate the matter," Dr Mosley said.

Both organisations had been told by the Trade Practices Commission that the matter was on the thrshold of the jurisdiction of the commission and that a decision would be made on the jurisdiction of the Commission soon. That was early August, and at time of writing, the Commission had not made its decision. But, if the ads are an educational service and not properly advertising, then most advertisers, who regard their work as educational, would probably want to operate under Senator Carrick, the Minister for Education, and not under the Minister for Commerce and Industry, Senator Cotton.

After I called the ACF and the Scientists, I rang the Uranium Producers Forum in Melbourne and Sydney and was told that they would not comment on the action before the TPC.

Inconsistancies

Then there was the launching of an action against them in the Federal Court of Australia.

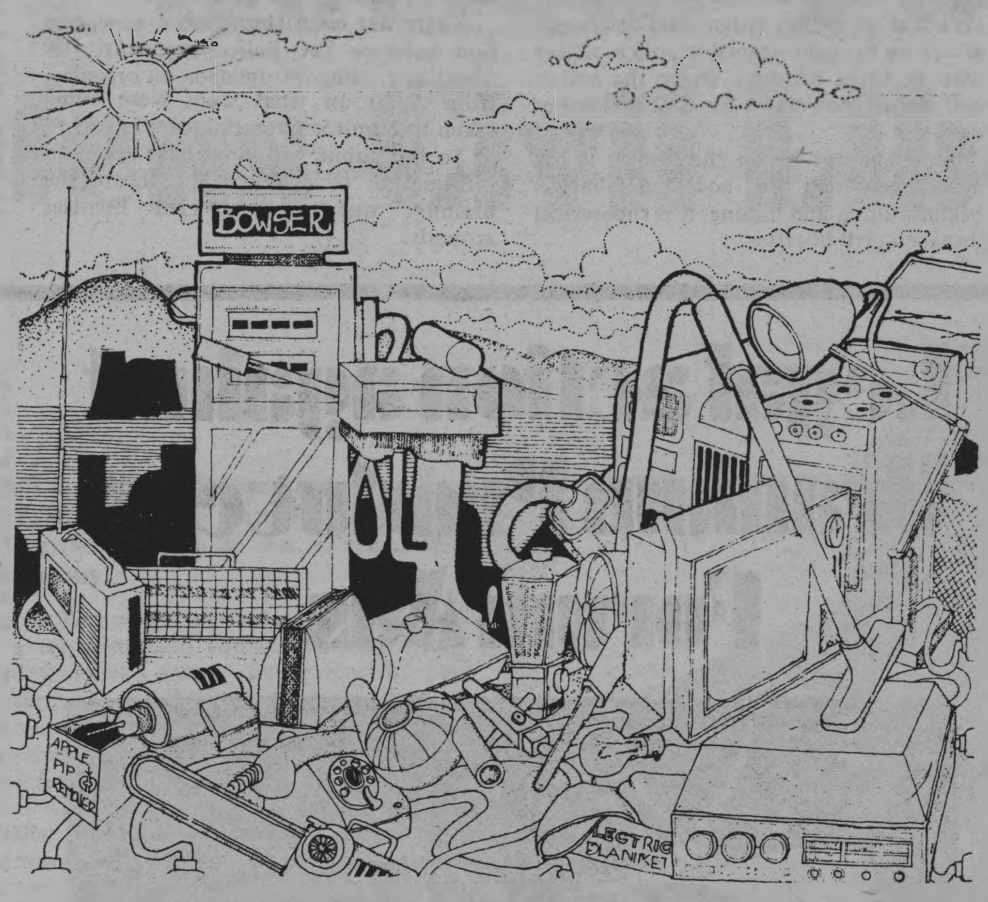
The action was brought on September 26 by Robert Pehlps, the organiser of the Campaign Against Uranium Mining against the Forum seeking an injunction to prevent the Forum from continuing its advertising campaign. He was seeking an order from the court to the Forum asking them to show cause as to why they should not be restrained from continuing the campaign. It was brought under sections 52 and 55 of the Trade Practices Act. The legal situation for this action is complex, and the case, before Mr Justice Franki was adjourned twice for preliminary hearings to decide whether Phelps had locus standi (whether the plaintiff had the appropriate legal standing to bring such an action before the court), and whether the Forum were engaging in trade and commerce under the Act. The legal situation may mean that an individual bringing an action like this may have to show that he has the right to apply for an injunction if he is not directly connected with with the Attorney-General or the Trade Practices Commission.

The hearing proper may not take place until next year, and in the interim, the Forum may relaunch their advertising campaign dependent on the strategy used by the Federal Government to sell the idea of mining to the Australian people. The campaign had been suspended for reasons unconnected with the recent attacks on it by conservation and responsible scientists organisations.

If nothing else is gained by the actions in the courts against the Forum other than experience of using the courts for action against uranium mining, then that experience will be put to good use in future actions. Overseas, the German courts are blocked by anti-nuclear power actions coming from thousands of groups throughout the country. The Americans have had long experience in the courts against nuclear power, and have won some significant victories. Australia is lagging behind the rest of the world in legal action against nuclear power and uranium mining, but if present trends continue, we'll be catching up fast.

Mark D. Hayes

Needs and Wants



Energy Usage

An analysis of the world energy needs leads to the conclusion that there is no need to mine Australian uranium.

World energy use

Energy use in a country like Australia now corresponds to about 6 kilowatts per head continuous. That's equivalent to every man, woman and child continuously driving a mini at 50 mph.

Our whole way of life is dependent on intense use of energy, eg it takes about three times as much energy to wrap, pack and transport a loaf of bread as it does to produce the wheat from which it is made. Our energy use is about 50 times greater per head than that of Third World countries.

The most important abuse of our energy use is the massive scale of the waste. Thirty per cent of the energy we use is lost in the conversion from one form to another. The efficiency with which we use fuel has been getting steadily worse over the last 20 years. eg in the US in 1950 the fuel economy of a car was 13 mpg. Today it is a scarce 8 mpg. The United States wastes more energy than any other nation in the world. US would be able to double its economy in 30 years without increasing the per capita consumption of energy if it became as efficient in its energy usage as Sweden or West Germany are now.

This information has led the American Institute of Architects two years ago that a modest retro-fitting of buildings over the next 20 years would save far more electricity at less investment cost than could be produced by nuclear power.

Use levelling off

The trend has been towards increasing waste of energy up until the 1973 OPEC oil embargo–the price of oil quadrupling overnight. Up till that time world energy use had been doubling every 10-12 years. Since 1973 world energy use has been static. In fact it has dropped a bit since 1973, in fact it's down to about the 1972 level in industrialised countries.

Total energy used in the UK in 1975 was less than it was in 1970. Whether drop in consumption was due to moral qualms or the economic benefits of saving energy (insulation etc) the fact remains that in the UK and subsequently in other industrialised nations energy use has levelled off.

Since the levelling off was mainly due to the increase in the price of oil, and since no one anticipates it will ever decrease in price, we may well be seeing the beginning of a permanent era of stable energy use.

There are serious projections on paper that suggest that energy use is going to continue to double every 10 or 12 years. The potential for expanding people's use of energy in industrialised nations is very limited since 80-90 per cent of people already have their own major energy consuming hardware (washing machines, ovens, etc). There has come a point where people are not using their money to buy superfluous electrical goods (electric toothbrushes etc).

The Third World

Suppose the Third World is going to increase its energy use to something like that of industrialised countries.

There are a number of points against going nuclear to meet this demand.

The scale of nuclear technology is totally inappropriate to the sort of energy or domestic system that exists in a Third World country even if they had the electrical grid to support a nuclear power station and convert to using energy mostly in the form of electricity. The minimum economic size of a commercial reactor system is 500-1000 megawatts–a quarter to half the total generating capacity of Queensland and this is so large compared to the electricity consumption of a typical third world country that it is just not compatible with the sort of system that they have.

The construction and maintenance and operation of nuclear power stations assumes a substructure of very sophisticated technology to produce stainless steel; liquid sodium and control electronic equipment needed to produce and maintain nuclear power systems. It is not at all evident that nuclear power is the answer to the energy problems of the Third World. There are answers (see E.F. Shumaker–intermediate technology) but they must be oriented around the fact that at the moment the scale of technology in the Third World is small. They must be oriented towards the provision of small local sources of energy and not very large centralised systems that would require several times the gross national product of the country simply to build a distribution system to get the energy to where it is wanted.

Energy Efficiency

Energy Efficiency and waste

Jimmy Carter has stated:

"Our energy waste in transportation is 85 per cent; in generating electricity, 65 per cent. Overall, 50 per cent of our energy is wasted."

Energy can be wasted during generation, during transmission and at end use. The process of transforming coal, gas or oil to electricity results in the waste of about two-thirds of the energy in the fuel. Conversion of uranium to electricity is even more wasteful. Using coal to make synthetic fuels involves the waste of about one-third of the coal's energy content.

Energy is wasted when it is sent out over long transmission lines, especially over power lines from nuclear power plants which for danger reasons the government has decided must be located far from large concentrations of people. Energy is wasted when appliances and machines are not built to perform at the best possible efficiency levels. Energy is wasted when heavy automobiles with "high performance" engines guzzle fuel to propel the vehicles a few miles per gallon. And energy is wasted when it is simply allowed to leak–through ceilings, walls, pipes, hot water heaters and industrial processes, due to inadequate insulation and design.

Energy is also wasted when it is not matched in "quality" to the intended task. This occurs, for example, when electricity is used for heating buildings and water, and for cooking. Electricity is a very "high quality" and expensive form of energy, most suited to and most economic for special tasks such as rail transportation and some exacting industrial processes. When water is heated by electricity, for example, it is after water at a power plant has already been boiled by the fuel. This fuel, whether fossil, nuclear or solar, has had to boil water to make steam to turn turbines to generate electricity–and in each stem there is considerable loss of energy. It is quite apparent that there is a wasteful "mismatch" when nuclear fuel is used to achieve a temperature of several thousand degrees in an expensive and complex reactor in order to boil water to create steam–something which occurs at 212 degrees F.

The best approach to energy sufficiency, economic prosperity and jobs is that which combines increasing energy efficiencies with a variety of diverse and safe energy-supplying technologies. Each energy-producing technology should be used to do what it does best, and should be matched in scale and energy quality to the way in which its energy will be used. And the more the fuels for these new energy systems are renewable, the better.

This approach is not "anti-technology," as sometimes is alleged by the large energy interests. In fact, technological innovation will be a key to achieving success with this approach . . . but the technologies involved need to be ones which can be controlled by the American people, not ones so elaborate and complex that people have to be kept far away from them or from decisions concerning them.

And this is not a "no growth" approach, or one which advocates a return to drudge labor. To the energy industry, "growth" has always meant growth in energy production in order to satisfy its own needs, no matter the consequences for the rest of society. But to others, "growth" means a national policy of full employment, improved standards of living, improved job safety and public health, expanded opportunities for leisure activities and the development of rewarding relationships with other people.

Denis Hayes has calculated that for the next quarter century, the United States could meet all its new energy needs "simply by improving the efficiency of existing use."

The American Institute of Architects (AJA) has calculated that by 1990, 12.5 million barrels of petroleum per day (equal to one-third the current national energy use) could be saved just by employing energy-efficient systems in old and new buildings.

An energy study commissioned by the City of Seattle influenced that city not to buy into Oregon's nuclear power plants. The study convinced city officials and Seattle citizens that with appropriate energy efficiency measures, *no new electricity generating capacity would be required for Seattle through 1990.* And the cost per kilowatt hour of electricity would be 1.3 cents *cheaper* without building new energy facilities.

A Dow-Midland study indicated that by using waste industrial steam to generate electricity–as is done in Sweden and West Germany–energy savings equivalent to 680,000 barrels a day of oil could be saved by 1980. By 1985, this "co-generation," as it is called, could replace the equivalent of 50 large nuclear reactors. The Califonria Energy Commission has determined that the potential for co-generation in that State alone could be as much as 140 billion kilowatt hours per year, the equivalent of the total amount of electricity consumed in California in 1975.

Energy Resources

The Australian Academy of Sciences recently published a study of the world's energy resources. The study showed a comparison of energy resources with consumption in 1970.

The known coal reserves provide 100 years of total world use at 1970 rates. The world's known oil reserves are about 20 years of 1970 use. The world's natural gas reserves are just under 20 years of 1970 use. The world's uranium reserves are just under seven years of 1970 use equivalence.

In other words, compared with coal and oil and natural gas, the known reserves of uranium are a quite small energy resource, less than a tenth of the coal.

Indeed you can argue that the coal reserves are likely to be much more. With a hundred years of reserves already known there is very little incentive to go out and look for more coal. But as we've seen there are ample economic incentives to go out and look for uranium, indeed so great that the companies involved are prepared to spend half a million dollars to persuade people that we should mine and export uranium.

In Australia, our coal reserves are equivalent to about 4000 years of total Australian energy use.

There are of course other sources; for example the Academy of Science estimated that solar energy could provide up to 25 per cent of Australia's energy needs by the year 2000.

It is often said when you point out how small the uranium reserves are that the fast breeder reactor will be developed which will be a much more efficient user of uranium and therefore the energy reserves will "spin out" into the distant future.

The Royal Commission on Environmental Pollution in the UK chaired by Sir Brian Flowers (former chief government scientist, part-time member of the board of the UK Atomic Energy Authority) concluded that the fast breeder reactor cannot be a major contributor to a power program until the processes underlying the change of geometry are well understood.

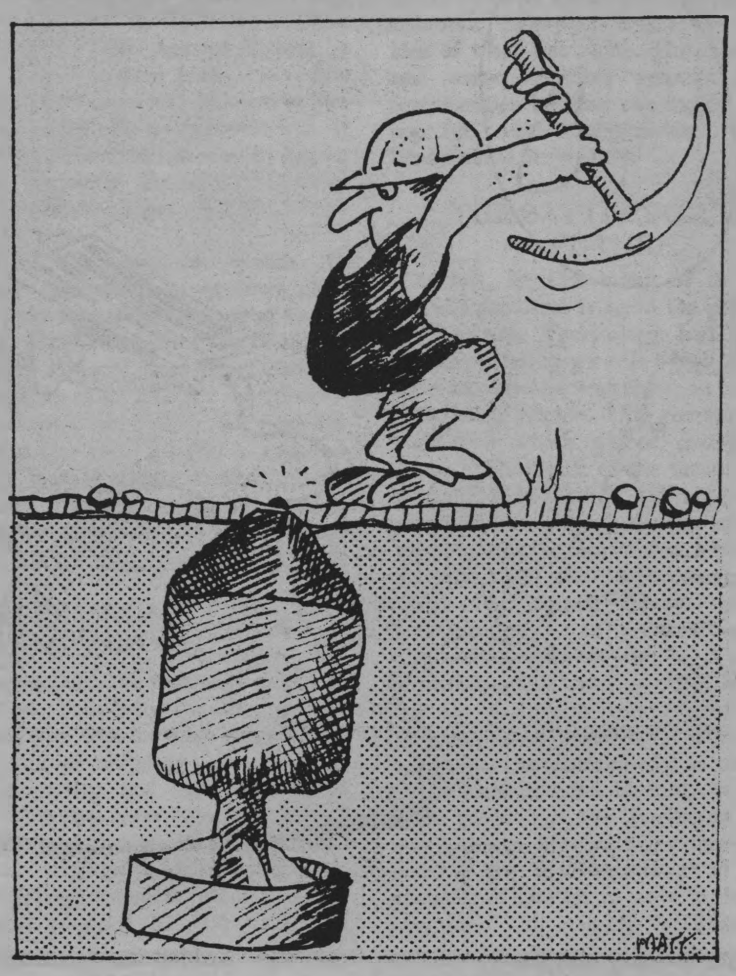
The commission noted that in attempts to build fast breeder reactors there have been two partial meltdowns which luckily were contained. The Flowers report commented that an uncontained meltdown would be incredibly serious in its consequences.

There is an extensive research program in the field, but it is not yet clear whether it will prove possible to design fast breeder reactors as to rule out the possibility of a sudden increase in power that would be so great as to rupture any feasible container.

In other words, the Flowers committee says it is not yet clear whether it is possible, even in principle, let alone in engineering practice, to design a fast breeder reactor that will work. If the proponents of nuclear energy wish to persuade us that uranium is a large energy source, what they need to show is that impartial experts with a background in atomic energy like Sir Brian Flowers, are wrong in their assessment of the probability of breeder reactors coming "on stream."

Jobs and Energy

A move to alternate, decentralized energy systems would boost small business and actually solve the western economic malaise of high unemployment.



Introduction

Corporate energy interests, along with most industrialists and some agencies of the government, are vigorously urging the rapid expansion of energy production. The energy systems they are promoting are large in scale, technologically complex, costly, wasteful, environmentally destructive and dangerous to energy industry employees and the public.

The increased energy efficiency plus solar energy choice can provide sufficient energy for a prosperous economy. In fact, such a solution to the nation's energy problem *actually leads to a more stable economy and to more jobs* than does the large-scale system scenario. It does so with less pollution, less disease, less social disruption, and less interference with community, labor union and individual rights.

Decisions on the nation's economic, energy and employment futures are being made now. Wrong decisions today will be irreversible: if the nation decides to pin its hopes on inefficient, large-scale energy systems, such a vast quantity of resources and money will be consumed and so much havoc will be generated through all levels of society that energy and job options for the future will be choked off.

Energy and the economy

The latest recession is the sixth since World War II. It is the most severe. Total real unemployment is between 8 and 10 per cent. Women, minorities and young people are out of work in even higher percentages. In the last year, incomes of three million additional Americans fell below the "poverty line." Rural poverty has increased. The nation's largest cities have been experiencing severe financial crisis, and have cut back a broad range of vital human services. Industry has been operating at less than full capacity, and inflation has cut deeply into most wage increases of the past decade.

Americans have long been told that ever-increasing energy production was the key to national economic well-being and jobs. It seemed enough to note that as energy production expanded over the years, so did economic growth and total employment. Many in government and industry—in the Energy Research and Development Administration (ERDA), in the Federal Energy Administration (FEA), in Congress, at the Edison Electric Institute, the Atomic Industrial Forum, the oil companies—are therefore advising that unemployment can be ended only by stepping-up energy development to the greatest degree possible, and with the largest systems possible.

Yet, current high unemployment, along with a succession of economic crises, have been taking place *while national energy use has been at an all-time high, and increasing.*

In all, the major energy-producing and energy-using industries consume one third of the nation's energy. Yet they directly provide only about 10 per cent of the nation's jobs.

Energy growth and prosperity: the myth

It is for good reason that the public has been led to believe that energy expansion has been the springboard to economic growth, the "good life," and jobs.

Industry has been able to replace human labor economically with energy purchased at very low rates from an ever-expanding energy industry which has been accumulating ever-increasing profits. The small consumer has been picking up the tab; industries traditionally have paid less than individual consumers for each unit of energy used. In addition, by bearing most of the environmental and disease costs associated with energy, and by permitting substantial government assistance to energy companies, the public has actually been subsidising industrial use of cheap energy to replace human labor.

Solar energy and jobs

"The potential for solar energy seems virtually unlimited. With widespread adoption of solar power, Massachusetts citizens could cut their collective fuel bills by $120 million annually by 1985. Furthermore, solar energy has vast potential for new job opportunities, especially in the plumbing, construction and research and development areas . . . It's safe to say that by 1985 more jobs could be available from solar power (directly and indirectly) than from off-shore oil and new nuclear construction combined."

There would be jobs for sheet metal fabricators, sheet metal installers, asbestos workers, carpenters, plumbers and pipefitters.

The Laborer, a journal of the Laborers International Union (AFL-CIO), found that jobs for its members in the solar energy field "could well mount into the hundreds of thousands." The union has begun a course in San Diego to train laborers in the installation and maintenance of solar and wind systems. Union President Angelo Fosco has said:

"Experts estimate the annual market for installing solar systems and converting existing structures to solar systems has a potential of $77 billion alone . . . not including maintenance. . . . That translates into a goodly number of jobs for construction workers in our jurisdiction."

Energy efficiency and jobs

A Bonneville Power Administration Study has found that:

"High impact conservation programs create more jobs than would be created by building new power plants to generate an equivalent amount of energy."

Amory Lovins has testified to the Senate Select Committee on Small Business that conservation programs which include shifts of investments from energy wasting to social programs create from tens of thousands to nearly a million net jobs per quadrillion BTUs of energy saved.

A preliminary analysis of the FEA provides specific breakdowns of some energy conservation techniques, costs and resulting employment. This report examined the prospects of limited energy efficiency increases in 34,372 private homes. The technical work called for was simply the installation of ceiling insulation and automatic thermostats, and the retrofit or replacement of furnaces.

The analysis concluded:

"By 1985, natural gas supply would be increased because of the saving of 1212 billion cubic feet. This is the equivalent of the gas to be obtained from the major discovery at the Alaskan North Slope. It is also about the equivalent of the output of 39 one-thousand megawatt electrical thermal power plants. Consumers in these 34,372 would save $1.7-$2.3 billion in heating costs.

"The work would cost $7-$10 billion, compared with $17-$20 billion for 39 large fossil fuel power plants; 487,000 jobs over seven years would be created: 122,000 in manufacturing, 366,000 in local installation."

The report also stressed that employment associated with energy conservation techniques is local, low- to moderately-skilled, and concentrated in or near urbanised areas which are experiencing the most acute unemployment problems. In contrast, centralised, expensive energy production complexes usually have to bring in highly-skilled labor from outside the construction area. (These transients create a large amount of disruption: temporary housing and many services must be supplied to meet the problems temporary workers create. In many of the energy "boom towns" of the Western United States, crime, alcoholism, family break-ups are well above average. Serving the needs of transient labor ends up being a drain on the local economies the transients are supposed to be stimulating.

The FEA Project Independence Task Force fount that 3 to 4 million person-years of direct jobs would be needed in solar energy development and operation by 2000. This figure is probably an underestimation, since FEA's 1974 "accelerated" rate of solar development is thought by analysts today to be too conservative. Among other things, it is based on oil selling at $11 per barrel when it is now selling for as high as $16—and going up; also, some of the solar technologies were considered for only certain parts of the county ie the Southwest, which many believe an unnecessary limitation. Dr Jerold Noel, for example, a physicist at Mobil-Tyco solar labs, has stated:

The roof of an average house around Philadelphia could produce enough energy to supply the needs of a home, with enough energy left over, say, to charge an electric car.

The job mix for the various technologies is different. Nuclear energy utilises fewer tradespeople per professional scientist or technician than does solar energy: for nuclear the radio is about 2 to 1; for solar it is 9 to 1. In addition, a broader array of skills are necessary for building and maintaining solar systems than for building and maintaining nuclear plants. And, as an ERDA report stated:

"Solar systems provide much more room for small business and geographically dispersed businesses and workers than do some of the more complex systems."

SOLAR POWER

Poorly funded in Australia

Now that the latest "spate" of publicity of solar energy has dissipated and the promised $10 million injection of funds into Australia's lagging solar energy program, voiced surprisingly by Mr Anthony (April 17) has been well and truly forgotten, it is timely to look at what has been said and done in a critical fashion. What sort of contribution can solar energy ad its renewable non-polluting "natural energy" counterparts make in this forthcoming energy crisis? Is the significant use of these renewable non-polluting energy sources really so far away as to justify the use of nuclear technology as a stopgap measure

Poorly funded

Let us first take a look at the current status of solar energy research in Australia. From being a world leader in this research just over a decade ago Australia now spends less than $2 million on research.

The Australian Research Grants Commission is likely at present to spend a meagre $500,000 in the next three years supporting solar research. Including the $1 million that the NSW government will spend on Messel's project in Sydney we have a grand total of $1.5 million for the next three years.

This compares to over $300 million in the USA, $100 million in Japan and $30 million in foggy france for 1976-77. On the other hand Australia has for 20 years supported—for reasons of national prestige and military preparedness—an Atomic Energy Commission which at a cost of several hundred million dollars is yet to produce a single killawatt of useful power.

Poorly funded, ill-equiped and understaffed research groups are working on more than 20 separate and completely independent solar energy programs in all six capital cities. Scientists in Melbourne know little of the work being done in Sydney. Indeed members of the research group at the University of Sydney know even less about their Sydney colleagues only a few kilometres away (National Times April 11). Australia is not even a party to the recent Solar Co-operation Pact signed by 13 nations.

The anti-nuclear lobby while rightly condemning export of our uranium naively concentrates its energies on a totally negative way by condemning one source of energy and not actively pushing for the acceptable alternative. Australia will run out of oil in 15 years and will face an import bill of $2500 million a year.

Technology exists now

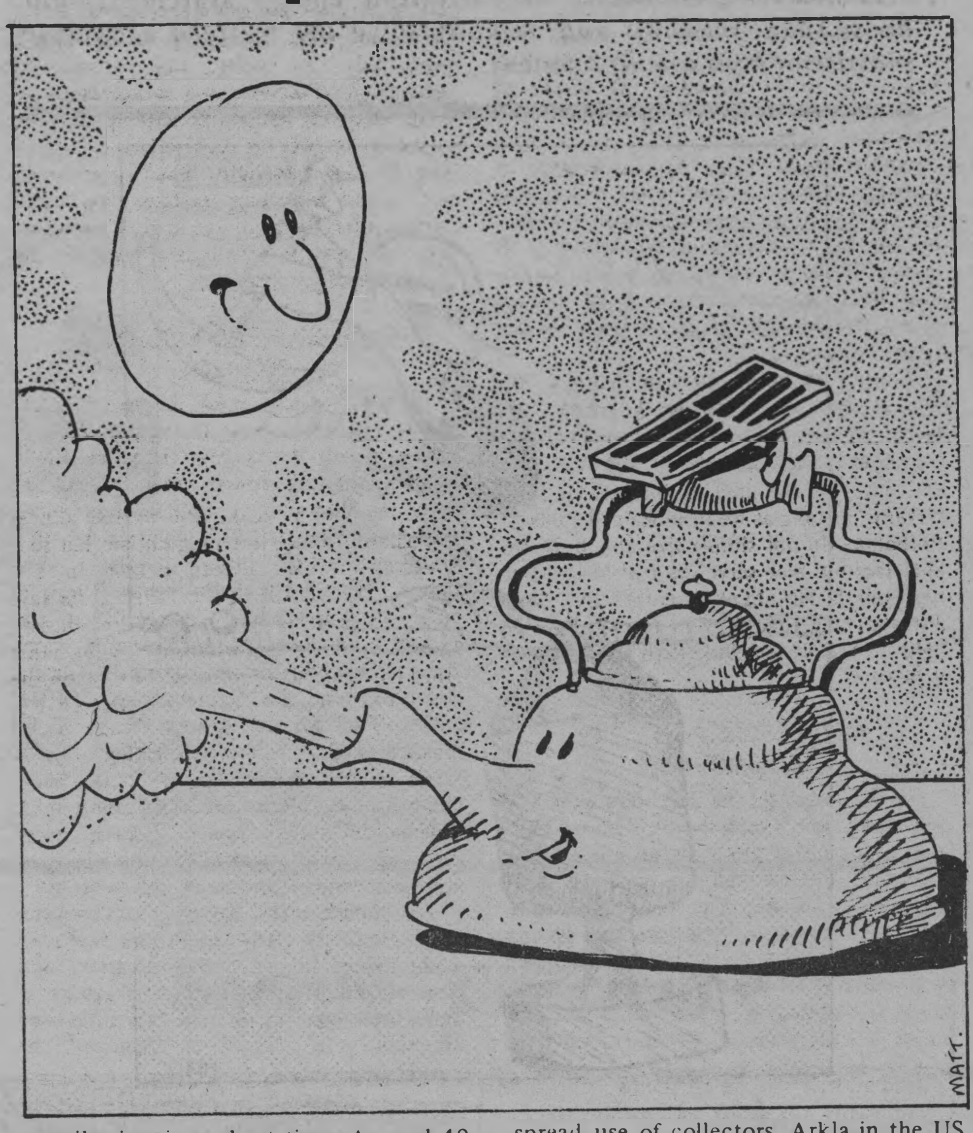
The technology for a solar energy exists now. We are not waiting for some incredible scientific breakthrough.

A look at the patterns of energy use in Australia shows that solar collectors heat water or provide low temperature heat or steam could make a tremendous contribution in a short time. Around 40 per cent of the energy we use is of this low grade heat type, for a wide variety of industrial processes and to heat and cool homes and office buildings. In particular the economics of using solar hot water systems in many parts of Australia are acknowledged, eg. a housing and construction department estimate shows that the total cost of using a solar system in Darwin/Alice Springs over 15 years is about half that of using an electric unit for the same time.

In March last year directors of industry leaders BHP, ICI and Phillips wrote to the Federal Government, with their own conclusion that the use of solar heat applications in industry can make a significant contribution within a reasonably short time but only, they stressed, if some incentives are given to those willing and able to develop a production capacity.

The collectors can easily be manufactured using existing technology. All that is really needed is for some "proof of concept" plants to be established to prove their efficiency and marketability

There are solar cooling and heating devices already on the market which would no doubt profit from the widespread use of collectors. Arkla in the US has just released a new solar air conditioner, and the Japanese firm Yazaki markets a solar cooler available in Australia. There are numerous examples of solar heated and cooled homes throughout the world; in fact an experimental solar air-conditioned house is already operating at Moggill Farm, Brisbane, to provide more than enough "proof of concept." Mass production of solar devices should make them almost immediately cost competitive.



Solar electricity

As well as providing energy for heating and cooling the solar source can also produce electricity. This concept has been used throughout the US space program and is even used for Telecom's remote radio receiver stations. The problems are not technological, although breakthroughs are still occurring, but economic and social.

The most common method of producing solar electricity is with photovoltaic cells. Pure silicon is "grown" in laboratories and sliced into paper thin wafers. The cost for a 5kw cell is $4000 enough for an average Australian household. Bearing in mind energy conservation practices that must be developed soon and the fact that much of the demand for electricity is for hot water household heating and cooling which would be supplied by direct solar devices this figure would decrease. The major factor effecting price is of course production scale. The cost must decrease markedly, eg in the case of silocon transistors the cost per unit decreased by a factor of 100 when the volume of production increased by a factor of 1000.

There are also new methods for making cells which will make them cost competitive, eg a West German firm believes that with development of a new polcrystalline silicon cell it is well on the way to achieving $1 per watt. Another promising breakthrough has been the test production of silicon ribbon which theoretically makes solar cells cost competitive now.

Hydrogen provides one of the means of storing solar energy, a problem which uninformed cynics usually use to dismiss the use of solar power. Solar energy can also be stored in batteries, flywheels, or hydrogen fuel cells which have been tested as 75 per cent efficient and would be virtually non polluting.

SMALL IS BEAUTIFUL

Obituary: E.F.Schumacher

E.F. Schumacher, who died early this month, was to have visited Australia later this year, to lecture and speak in much the same way as he visited the U.S. in March. There, lecture halls across the country overflowed and Newsweek ran a three-quarter page story on his visit. Schumacher met with President Carter, but his visit had no impact on the establishment of American capital. "Fritz" Schumacher was a German by birth, and emigrated to England prior to World War Two. There he studied economics at Oxford University, and was interred as an undesirable alien at the onset of war. He worked as a farm labourer, but continued his studies sufficently to impress John Meymard Keynes, then the guru of international economists. Keynes pronounced Schumacher a genius, and quietly expropriated some of his ideas for himself.

APPROPRIATE TECHNOLOGY

The fifties found Schumacher working for the Bristish National Coal Board, an enormous, burgeoning bureaucracy which crystalised in him some of the ideas of size which later propelled his work on smallness. While an advisor to the Burmese and Indian governments, he developed his ideas on appropriate technology, and intermediate technology. Fritz was an intensely practical man. His own life carried the marks of his conclusions on economics to the extent to which he ground his own wheat, made his own bread, and grew his own organic vegetables on his 4 acre farm 20 kilometres outside London. His health was failing in his later years, and his only concession to technology was an electric wheelbarrow, labled as being appropriate technology for a 66 year old man with a bad back.

His published putput was small, but immeasurably influential. In 1973, his first book "Small is Beautiful: A Study of Economics as if people mattered" was published, followed in 1975 by a little pamphlet titled "The Age of Plenty: A Christian View." A third book, "A Guide for the Perplexed" was just finished before he died in Switzerland on September 5. It was published in London last month. But he also wrote regularly for a little known alternative lifestyle magazine from Wales called "Resurgence".

Writing in this paper in March 76, Schumacher said what he believed, "we have been told that we are expected to use our talents, whether they are few or many, and shall be counted 'good and faithful servants' as long as we produce a surplus — so that we do not simply live and work for ourselves but also serve the rest of creation and even the least of our breatheren . . . and also that 'my yoke is easy and my burden light.'" And he conclude "All this I believe to be true."

THE ECONOMICS OF SURVIVAL

For Schumacher, the rich were called to serve the poor. Simplicity was his message, and he presented that message simply also. The absurdity of shipping biscuits from Glasgow to London and from London to Glasgow, so that the trucks passed eachother on the M1, was to him so obvious that it should be clear to all. What was the point of building a cement plant in Delhi which would produce 100,000 tonnes of cement a day, when small plants all over India producing perhaps one tonne a day would be of much more use to the people who used the stuff. The logical follow on from those ideas was to put them into practice.

So he and some collegues formed the Intermediate Technology Group, based in London. From there they helped poorer nations develop appropriate technologies for their local needs. He was not Luddite about technology, but called and worked for technology to become once more responsive to the needs of the people and not to some economic theory or centralised planner's idea of what was right. Thus solar energy and waste recycling systems for small communities became the logical outworkings of what Schumacher called the Economic of Survival.

THE BATTLE FOR THE FUTURE

At bas, he saw many of the Western World's problems lying in the phenomenon of Giantism. Technology had become a self-perpetuating growth which placed the stress on human technique to the almost exclusion of people. This giantism led to a world-view which placed people in tow camps. "The battle of the future," he said in "Small is Beautiful", will be between two groups of innovators whom we might name 'the people of the foreward stampede' on the one side, and the 'homecomers' on the other. The former always talk about breakthroughs — a breakthrough a day keeps the crisis at bay — and those breakthroughs almost invaribly imply more violence to nature and a greater, more constant, more inescapable subjugation of man under the requirements of 'the system'.

The Homecomers, he said, "will require more creativity. Any intelligent fool can make things bigger, more complex, and more violent. It takes a touch of genius — and a lot of courage to move in the opposite direction." In 'Small is Beautiful' he developed the idea of the homecomer to its logical conclusion. "The case for hpe rests on the fact that ordinary people are often able to take a wider view, and a more 'humanistic' view, than is normally being taken be experts. The power of ordinary people who today feel utterly powerless does not lie in starting new forms of action but in placing their sympathy and support with minority groups which have already started."

Critics of Schumacher, like the British Government spokeman who dismissed his ideas ten years ago as being "up the creek" argued that he did not provide detailed plans for the implementation of his ideas.

Schumacher said, in typical rye fashion, that he didn't bother his head about it." He had faith in the vitality of the people to strive for smallness and appropriateness for themselves to meet their own needs in their own situation. That faith has made his ideas some of the most powerfully subversive in out time. That President Carter has taken him seriously enough to want to meet him is some indication of the interest felt at high government level. Govenor Gerry Brown of California, a long time fan of his, has established an Office of Appropriate Technology in the most profligate, affluent state of the Union. His visit created enormous interest in his ideas, as people searching for guidance out of the emptiness of consumerism and the world of bigger, better, brighter, looked to him for a way. But he is no guru.

At the Conference for Appropriate Technology held in the Bali Beach Hotel in August this year, he came over as being arrogant. In the midst of the airconditioned and plastic splendor, surrounded by the South-East Asian technocrats who has come to hear him, all he could think of was his children and his organic vegetables in London so far away. Just a month later he was dead, taken by a heart attack on a Swiss train.

MARK HAYES

what you can do

1. **Join a group** organised to fight uranium mining and related issues.

POSSIBLE SUGGESTIONS

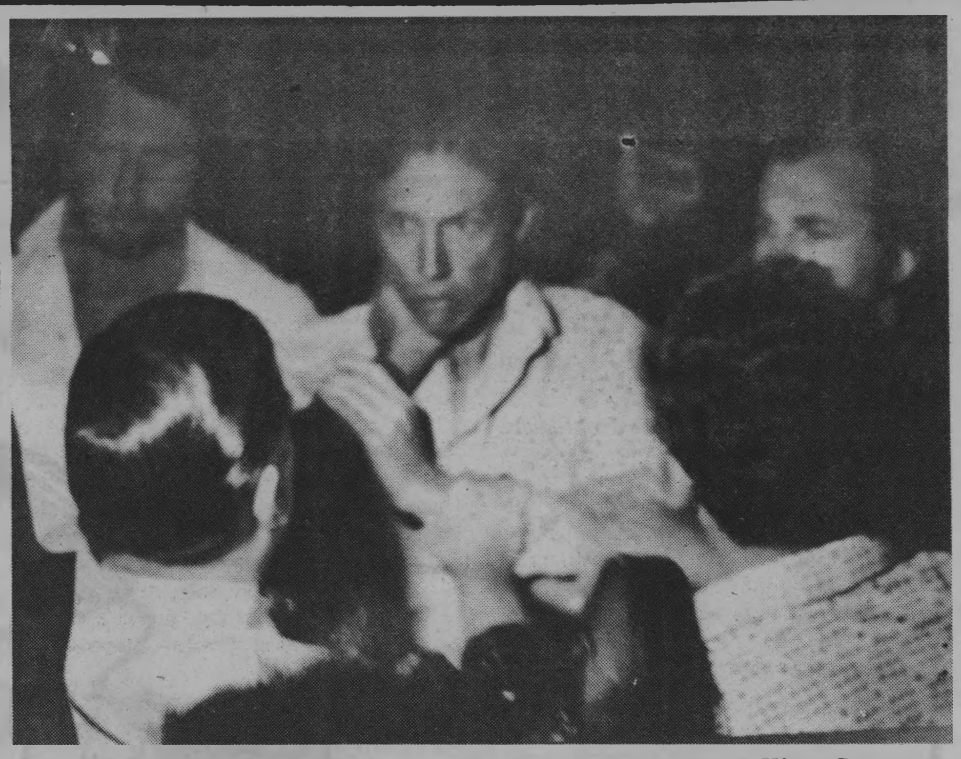
- Friends of the Earth
  235 Boundary St.,
  West End. Ph. 44 1766
- C.A.N.P. (Toowoomba)
  C/o Hans Schwabe
  MS 224
  Withcott via Helidon
- C.A.N.P. (Gold Coast)
  Penambler Court,
  Benowa
  Gold Coast
  P.O. Box 5115
  Townsville. Ph. 71 6226
- C.A.N.P.
  147 Ann St.,
  Brisbane Ph. 221 0188
- C.A.N.P. (Rockhampton)
  Sean Mitchell
  P.O. Box 795
  Rockhampton
- C.A.N.P. (Sunshine Coast)
  P.O. Box 104
  Maroochydore. 4558

  C/o Debbie Otto
  5 Schuman Lane
  Gympie. 4570.

There are also a series of groups — at least 60 who give their support to a uranium moratorium. It's often more effective to join an existing group because you have a network of contacts already built-up — and more plans can be carried out — with extra person power. This does not negate other suggestions.

2. • **Ring and harass** your local member of parliament.
- **Try to get articles** on the issue in your local paper, and write letters to the editors of the main newspapers.
- **Set up displays** for the local library. A good suggestion for this is to do it on big cardboard boxes — so they can easily be taken places.
- **Encourage** the local library to buy good books on nuclear power and energy issues.
  WORLD ENERGY STRATEGIS
  by Amory Lovins
  RED LIGHT FOR YELLOWCAKE
  by Falk, Barrett, Hayes.
  NUCLEAR POWER
  by Walter Patterson
  GIVE ME WATER
  by residents of Hiroshima
  NUCLEAR ENERGY
  by Ralph Nader
- **Try and get** a discussion group going at your work place or school.
- **Support** Union uranium bans — write to the Anti-Uranium Lobby.
  Trades Hall, Upper Edward St.,
  Brisbane.
- **Read** the Fox Report on uranium mining — find out what the media didn't mention.
- **Tell** others about the danger of uranium — its social, political, environmental effects — sell stickers — obtainable from F.O.E. or C.A.N.P.
- **Explain** to people about the implications of working for major uranium mining Co's. C.R.A. and Mary Kathleen are the main ones.
- **Leaks:** If you hear of any information that may be regarded as at all useful by the anti-uranium campaigners — especially incriminating information — spread it around. Let F.O.E. know about it.
- Write songs, leaflets, slogans, posters. DO STREET THEATRE. Some of these types of actions will probably get lost in the pipeline, some won't; the more joy you get from an action the more effective it's likely to be!

3. **CAMP CONCERN [Darwin] and THE ATOM FREE EMBASSY [Lucas Heights, Sydney]** are tow groups of people who have set up residental protest at strategic places — to bring attention to the uranium issue. They also keep the proponents of uranium under surveillance$



Conflict between special branch police and demonstater at King George Square on October 12th 1977

Those people who want uranium mining to go ahead at any cost, the government and the uranium companies, also want to prevent the expression of public opinion that October 22 stands for.

The Queensland premier has attacked uranium protesters. He has refused the normal democratic right ot hold rallies and marches. He has used parliamentary privilege to launch personal attacks on people who have even dared to apply for a march permit.

The Australian Prime Minister has openly stated that dossiers are being compiled on opponents of uranium mining. He has called on the state police to give information to the Commonwealth police on demonstrators.

The Australian Government wants to use the Atomic Energy Act to control any opposition to uranium exploitation. Under this Act, heavy fines and prison sentences will apply to any workers refusing to handle uranium, and to any people who criticise uranium mining. This act is a step towards a police state.

say NO to a nuclear world

NATIONAL MOBILISATION

OCTOBER 22

RALLY, MARCH

10 am

KING GEORGE SQUARE

Atom Plants Spread...

... Fallout

Edited by **Mark Wolff** Published by Planet Press 188 Barry Pde., Valley. Phone 52 7828

Printed by Warick Daily News Special artwork by Matt Mawson More than assisted by Gerard Lee, John Jiggens, Mark Hayes, Nick Lindsley, David Brier, Bob Phelps Learning Exchange, C.A.N.P.

The CANE TOAD TIMES Presents

ENERGY ISSUES

10c

- **AUSTRALIA'S NUCLEAR FUTURE**
  Nuclear Dump of the World
- **WHY THE NUCLEAR FUEL CYCLE THREATENS OUR CIVIL LIBERTIES**
- **LEGAL ACTION BEGINS AGAINST THE URANIUM PRODUCERS FORUM ADS**
- **SOLAR ENERGY AND JOBS**
  Solution to Unemployment?

Editorial

This special edition of The Cane Toad Times is being published, as the Uranium Producers' forum would say, in the public interest. The articles in it contain the most up-to-date and wide ranging information on the perils of a committment ot the mining and export of uranium. It also contains information on energy alternatives.

We regard the Fraser Government's decision to export uranium as being hasty. The document published to justify this decision, "Uranium -Australia's Decision" is , in our view, a remarkably unimpressive pastiche of flimsy arguments . (Read the article below, written by a former Research Officer to the Ranger Enquiry.)

The Fox Report proposed two strategies to the Government. Either to procede with the gradual and careful development of uranium mining, or a moratorium on mining until the nuclear industry is more able to solve the vast technical and social problems it creates -the disposal of radioactive waste, the threat of nuclear proliferation, the threat of nuclear terrorism, the problem of reactor failure and the environmental release of radioactivity. We support the Moratorium, but believe as well that the development of alternative energy sources is an urgent priority.

The publishers would like to thank all the members of the collective who produced this issue. It was a truly altruistic production.

Opinion Poll

The Uranium Producers Forum has again sought to mislead the Australian people.

They claim that two thirds of the community are in favor of uranium mining but they rigged the questions to show an upswing of support for their attitude.

The conservative weekly, the Bulletin, reported poll findings which refute the Forum claims. On August 10 the journal said:

Public support for the mining of uranium is falling. Now only 47% of people are still in favor of mining, a drop of 3% compared with the result obtained from the same question asked just prior to the ALP national conference in Perth.

The Morgan Gallup Poll referred to recorded the following results:

	1975 JUNE	1976 JUNE	1977 JUNE	1977 JULY
Develop uranium	62	58	50	47
Leave uranium in the ground	25	29	33	36
Undecided	13	13	17	17

Contents

FRASER MISREPRESENTS FOX REPORT

The former research officer to the Ranger Uranium Environmental Inquiry, Dr Hugh Saddler, discusses the government's misrepresentation of the state of the nuclear industry and the findings of the Ranger Inquiry in supporting its decision to mine and export uranium.

Dr Saddler was research officer to the Ranger Inquiry from November 1975 till May 1977. He is now a Research Fellow in the Centre for Resource and Environmental Studies at the Australian National University.

There are two general reasons for concern about the Government's decision to proceed immediately with mining and export of Australia's uranium. Firstly, in arguing that Australia must start to export as soon as possible in order to help prevent the spread of nuclear weapons and to meet urgent energy needs, the government has gravely misrepresented the state of the international nuclear power industry and ignored several key findings of the Ranger Inquiry. Secondly, with respect to control over the uranium industry in order to protect the natural and social environment of the Alligator Rivers region, the Government has claimed that it has either adopted the recommendations of the Ranger Inquiry or adopted alternatives that will achieve the objectives of the Inquiry; I believe this latter claim to be incorrect in respect of several crucial decisions.

Weapons proliferation

Turning first to the international aspects and the question of controlling nuclear weapons proliferation, the Government's argument that this objective would be furthered by the export of Australian uranium seems to depend chiefly on the fact that this is in accord with the policy announced by President Carter on April 7 last. The aim of this policy is to discourage countries from turning to reprocessing of spent fuel and the fast breeder reactor, that is to the plutonium economy, by providing adequate and timely supplies of uranium. So far this policy has been notably unsuccessful. None of the countries with a commitment to achieving reprocessing and fast breeder technology have said they would consider renouncing it; most have said quite plainly that they will press ahead regardless. In any case, the policy is seriously flawed in that once a country has obtained spent reactor fuel, containing plutonium, it does not need a commercial reprocessing plant, costing hundreds of millions of dollars to extract the plutonium to make bombs, but can do it with a laboratory scale plant costing a few tens of millions of dollars.

The question of reprocessing also exposes a very serious contradiction in the Government's whole position on waste disposal, which I would be happy to amplify later.

The Prime Minister has also stated that an immediate commitment to export uranium is essential if Australia's voice is to be heard in international discussion on preventing nuclear proliferation. I find it hard to believe that, if the Governments of potential customer countries need Australian uranium as urgently as the Prime Minister and Mr Anthony claim, those Governments would not welcome Australian participation in discussions with the aim of improving the situation to the point where Australia felt justified in exporting.

That such a situation has not yet been reached can readily be demonstrated. In his statement Mr Sinclair referred to Australian obligations under the Non-Proliferation Treaty and stated that "it would . . . be a fundamental error to suppose that uranium export and the objective of non-proliferation are incompatible." However, in its first Report the Ranger Inquiry stated that there were real conflicts in the aims of the Treaty and were "a serious threat to the viability of IAEA and NPT safeguards." Nothing has happened since those words were written to alter the situation.

In formulating its safeguards policy as explained in the Prime Minister's statement of May 24 and again last Thursday, the Government has seriously misrepresented another crucial finding in the First Report of the Ranger Inquiry. The Government's proposed system of bilateral and multilateral treaties to prevent the misuse of Australian uranium will only be effective to the extent that IAEA procedures to detect diversions of nuclear material are effective. Mr Sinclair called these procedures "the second cornerstone of the Government's policy." Yet the Ranger Inquiry found that they were gravely defective (see First report pp 148-49) and the IAEA itself has made similar admissions on many occasions during the last two yearr, including one as recently as last May.

Urgent need?

I now want to say something very briefly about the second reason given by the Prime Minister in his policy speech for his Government's decision—the supposed need of other countries for Australia's uranium. This is in complete contradiction to the finding of the Ranger Inquiry "that it is incorrect to suggest that there are energy impoverished nations which need Australian uranium for survival" (p 164). Since that was written, about 12 months ago, there have been dramatic downward revisions of the capacity of nuclear power stations likely to be operating in 1985 throughout the world (excluding the Communist countries) from about 440,000 megawatts to about 240,000 megawatts, ie to little more than half.

Those few countries which do not already have firm contracts for all the uranium they will need up to that time should have no difficulty at all in obtaining it without turning to Australia. Nobody would suffer if Australia delayed its decision to export a few years.

To summarise my points so far.

Both in the Ministerial statement on August 4 and in the Prime Minister's speech August 28 the Government has tried to present the options as either immediate mining or a permanent refusal to supply. I believe that a third option, a moratorium for several years, which was extensively discussed in the Ranger Inquiry Reports, would be far more likely to achieve the objectives of reducing the risk of nuclear weapons proliferation, without causing any hardship to countries which may wish to buy Australian uranium.

Sequential development

The Inquiry recommended that mines in the Alligator River region should be started sequentially. There were a number of reasons for this—to ameliorate the effect on the aboriginals by controlling the build-up of white people in the region to a slow rate; to avoid excessive pressures on the very limited social and economic resources of the Northern Territory; to reduce cumulative environmental impact. Clearly, to be effective in achieving these aims, the sequential development would have to be spread over some years. The Government has completely overturned this recommendation. The unplanned type of sequence it has referred to might involve intervals of only a few months, and this certainly seems to be the view of the mining companies according to press reports I have seen.

The Inquiry also recommended that the Noranda project at Koongarra not be allowed to proceed at least for the time being and stressed repeatedly the need to confine mining for some time to come to the Magela Creek catchment, thereby excluding Koongarra, the site of which would become part of the National Park. The Government's policy completely overturns this very important recommendation by excising Koongarra from the Park and placing it on the same basis as the other proposals, with simply a slight handicap.

Two other areas where I believe the Government has seriously misrepresented the findings and recommendations of the Inquiry concern the employment generated by a uranium mining industry and the use of the Atomic Energy Act for the grant of an authority to the Ranger Company to mine uranium.

Technological Paradise vs the Real World

The Australian Atomic Energy Commission has confirmed that a former employee died in April this year from leukemia. The Commission admitted liability, and compensation has been granted to the man's family. The man's name has been withheld. A Sydney newspaper rerpoted that the man had died of leukemia after being accidently exposed to radiation at the Commission's nuclear reactor site at Lucas Heights, south of Sydney. The general manager of the Commission said the employee's job "involved exposure to low levels of radiation," but denied that any accidental exposure had occurred. Professor D.W. George, the Commission's chairman, claimed he had not been told of the compensation payments.

At least two cases of genetic abnormality have occurred in children of Lucas Heights workers, writes Dr R. Peers of Brunswick (Age, July 27, 1977).

A man who worked at the Mary Kathleen Uranium (MKU) mine for 12 months in 1976-77 now has terminal lung cancer, Labor MP Barnett told the WA parliament. In a statutory declaration, Mr Bill Webb said his work involved sorting uranium and working in the yellowcake drier. He became ill on the job, and lost more than six kilograms in weight. An Inland Medical Service doctor, who was summoned by the company, diagnosed "bronchitis bordering on pneumonia," but said he was well enough to continue work. The illness continued. When Mr Webb left MKU in March this year, he had a final medical examination and x-ray and was passed as fit. But tests carried out on Mr Webb at the Royal Perth Hospital in July showed he had cancer. Doctors told him he has three months to live. In the declaration, Mr Webb said the company had repeatedly refused to return his medical records to him.

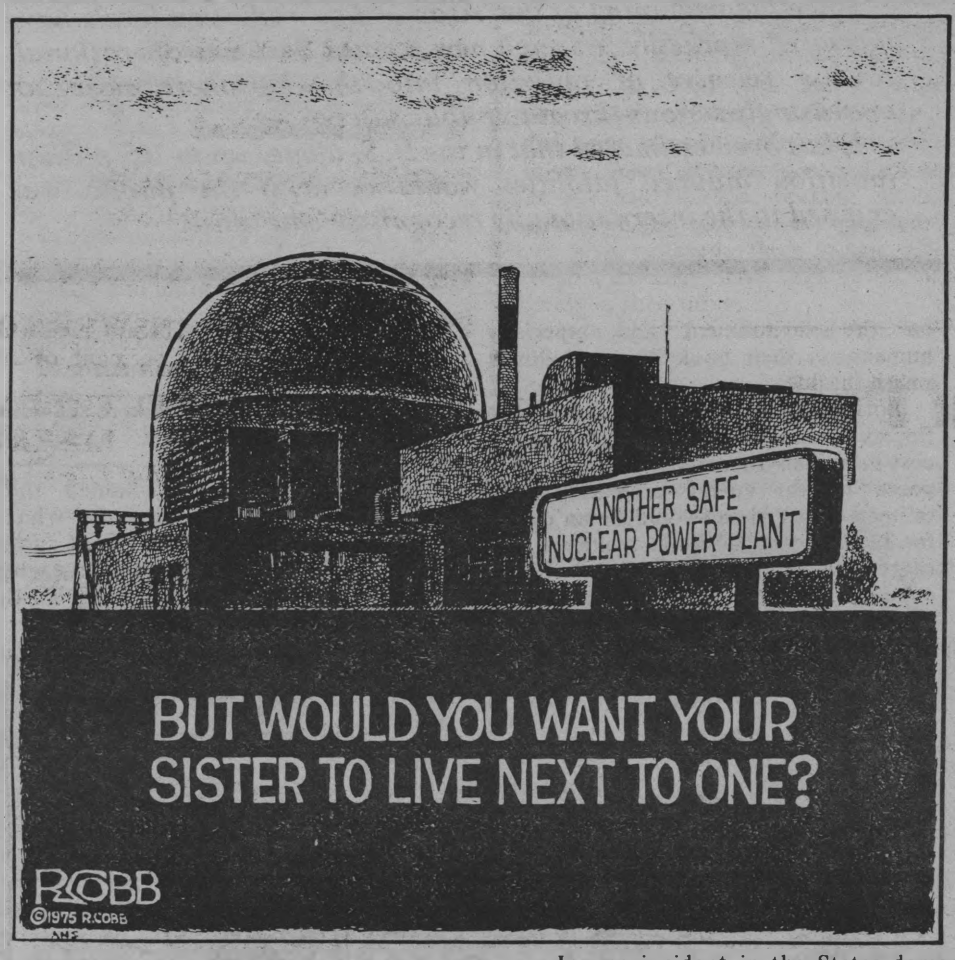
The biggest disposal area in the world is at Hanford, Washington. It encloses a stretch of the Columbia River and a tract of country covering 650 square miles.

The radioactive liquid wastes are kept in tanks constructed of carbon steel resting in a steel saucer to catch any leakage. They are enclosed in reinforced concrete and the whole construction is buried in the ground, with only the vents showing. Each tank has a million gallon capacity.

The liquid boils from its own radioactivity so there must be a continuously maintained cooling system in each tank. In addition, the vapors generated in the tanks have to be condensed and scrubbed; otherwise, radioactive gas would escape from the vents.

More than half a million gallons have leaked from the storage tanks at Hanford, with the more recent leaks being the larger ones—70,000 gallons three years ago and 115,000 gallons last July.

The tanks themselves are 20 to 30 years old, and a report from their civilian contractors in conjunction with the Illinois Institute of Technology states that "the self-boiling tank structures are being stressed well beyond accepted design limits."



They also postulate the life span of the tanks at 30 to 40 years at the outside.

The 500,000 gallon leak, nearly one-third of the 29-year old tank's contents—was not discovered for several days and released plutonium, strontium-90 and cesium directly into the ground.

Despite the AEC's assurances to the contrary, there has been contamination of the Columbia River partially resulting from Hanford's practice of dumping diluted waste directly into the water. A 1969 study showed that eating half a pound of duck from the Hanford reservation would result in an exposure three times the present permissible federal limit.

People who swim, sunbathe or waterski on the Columbia could obtain a dose of 53 millirems—10 times the dose the AEC says it will put into effect as a standard for nuclear power plant workers sometimes this year.

Edward J. Gleason was a dock worker living in Cliffwood Beach, New Jersey. On January 8, 1963, while he was handling a shipment at the Eazor Express Trucking Terminal in Jersey City, Gleason noticed that one of the boxes in the shipment was leaking. He had handled leaky shipments before, so without thought he simply tilted the box onto a handcart and took it to the loading dock. When the leak began forming a puddle, Gleason turned the box over; as he grabbed it with his bare left hand, the liquid came into contact with his skin. The dripping ceased and, at the suggestion of the terminal manager, Gleason covered the puddle with sawdust. The shipment, originating from the Nuclear Materials and Equipment Corporation (NUMEC) plant in Apollo, Pennsylvania, had been improperly packaged, improperly transported, and improperly labeled. It was not until much later that Gleason learned that the box he had handled contained a glass jug of a solution of chemicals contaminated with plutonium.

Three years later Edward Gleason developed cancer on his left hand, which finally required amputation. Doctors then had to amputate his arm and shoulder in successive attempts to arrest the cancer. Cobalt treatments were initiated, but the cancer continued to spread, and in February 1973 he died. The medical evidence is "overwhelming" that Edward Gleason was killed by plutonium.

In one incident in the States damage to fauna from radium could be traced 50 miles down river from the Durango uranium mill, Colorado. The radium had come from the liquid and slime milling wastes. Radiation levels were 500 times greater than the background level. 30,000 people live along the banks of this river there and use the water primarily for drinking and irrigating their farms. Radiation accumulates in the food chain and flora and fauna in the area were found to contain uranium concentrated 100 to 10,000 times that found in the water. The farmers crops which were irrigated with the radioactive waters of the Animas river were found to have radium concentrated in the order of 100-fold and this is passed on to lifestock, then inevitably to us as we have the honored end of the food chain.

You can't smell it, see it, or taste it, and it has no qualms about entering the food chain.

* The Japanese government spent nine years and $50 million on a prototype nuclear powered cargo vessel. She was christened Mutsu after her home port.

Local fishermen were deeply suspicious, and afraid that radioactive discharge from the Mutsu would damage their fisheries.

Although the Mutsu was ready for sea trials in 1972, public opposition prevented her sailing. For two years the opposition stopped the Mutsu's trial.

On August 25 a typhoon forced the blockade of 250 small fishing craft that were keeping her prisoner to run for shelter, and the Mutsu was able to slip out into the bay under auxiliary power. Once on the high seas, the reactor was brought to criticality; but as power was increased a radiation leak was detected, relatively minor, but nevertheless a leak, and it occurred when it was operating at only 2 per cent of its capacity. Efforts were made to plug the leak firstly with boiled rice mixed with boron and when that was unsuccessful, old socks came to the rescue and were used in the repair attempt. Because of public opinion the crew feared for their safety if they attempted to return to port with the leaking reactor housing. It was 45 days before they were allowed to return to an isolated northern harbor. Government attempts to sell the ship have failed. They are now considering giving the ship away, most likely to Saudi Arabia or Brazil.

* In January 1961, three young servicemen John Byrnes, Richard McKinley, and Richard Legg had been detailed to reassemble the control rod drives after the reactor had been shut down for some work on instrumentation. The function of the control rods are to either shut down or reduce the rate of nuclear fission. Later investigations into the accident suggest that the control rods got stuck and Legg and Byrnes tried to heave them up manually, and they came too far out of the reactor core. The result was catastrophic. The reactor core went supercritical, the fuel fried itself, and the resulting steam explosion blasted a virtually solid plug of water at the roof of the reactor. The reactor vessel rose three metres, right through the pile cap.

Legg and McKinley were killed instantly. McKinley's body was impaled in the ceiling structure. Byrnes was cut down by a withering dose of radiation. The radiation dose metres were reading off scale. Recovery of the bodies was carried out with remote handling gear. All three bodies remained so radioactive that 20 days elapsed before they could be handled for burial. They were buried in leadlined caskets in leadlined vaults.

Meanwhile back at the accident site it was to be many months before radiation levels were low enough to allow investigation into what had happened.

On March 22, 1975 a meltdown was barely averted at the Browns Ferry twin nuclear reactor in Alabama.

An electrician and his assistant were checking air flow through wall penetrations for cables, by holding a candle next to the penetration. The candle ignited some foam plastic packing. The electricians could not extinguish the fire but the plant operator noticed the temperature rise and flooded the room with carbon dioxide. It didn't help. The fire was spreading along the cables into the reactor building. When erratic readings began to appear on the controls the plant operator pressed the manual scram button which shuts down the fission reaction in the reactor. The fire raged for seven hours and knocked out all five emergency cooling systems on unit one. It was potentially the most serious incident in the industry's history.

* The Fermi plant 30 miles from Detroit suffered a "partial core melt" in the last '60s. "A month followed during which no one knew whether Detroit would have to be evacuated." It took more than a year to dismantle the core.

* In the first four months of 1976 there were 56 accidental releases of radioactive material from commercial reactors.

On October 5 1977 a road accident in Colarado USA scattered 19 tonnes of powdered uranium oxide along the highway. Two truck drivers were taken to hospital to see whether thye had been contaminated.

The Nuclear Regulatory Commission said the uranium had been in 50 steel drums that were pierced or crushed in the accident. Emergency steps were taken around the scene of the accident to prevent dispersion of the uranium.

The team removing the uranium powder with hand shovels had to wear protective clothing. Mechanical shovels could not be used for fear of spreading contamination. The material belongs to the Exxon Corporation and was being shipped for processing.

Is any radiation safe ?

An increasing body of scientific thought believes there is no such thing as a 'safe' dose of radiation.

Since the beginning of the 'Atomic Age' radiation levels have increased markedly. As each new reactor becomes operational, routine releases of radiation into the biosphere pose an increasingly serious threat to public safety.

It has been estimated that in the U.S. alone, up to 1.5 million radiation induced fatalities would occur if the public was exposed to the internationally recognised 'safe' dose.

Originally "acceptable" radiation safety limits were set up by the US Federal Radiation Council in 1959 with little experience and without adequate well-developed statistical data.

Studies of the survivors of the atom bomb blasts at Hiroshima and Nagasaki have raised doubts about radiation safety standards adopted throughout the world.

Survivors now show a much lower incidence of diseases of all kinds than the population of Japan as a whole. This indicates that they are genetically tougher than the average—the reason they survived the holocausts.

Health studies of these people have been the major source of information about radiation effects on humans and are the yardstick by which standards of safety are set.

If the survivors turn out to be more resistant to the effects of radiation than the average person it means that what have been regarded as acceptable levels are set too high and the health impact of radiation has been seriously underestimated.

Prof. J. Rotblat, a leading radiation physicist, compared the survivors with rescue workers who entered Hiroshima and Nagasak after the blasts. They were exposed to lower levels of radiation left in the areas—induced radiation and radioactive dust.

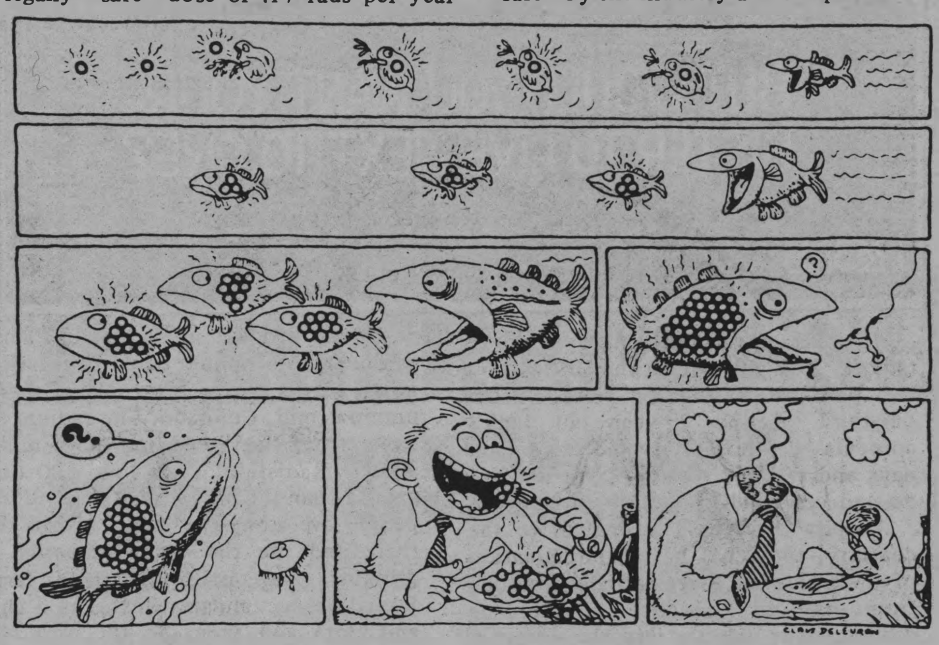
His findings strongly suggest the higher incidence of leukemia in this group compared to the survivors of the direct dose.

The results imply a sensitivity in the general population five times that of the bomb survivors on whom the exposure standards are based.

The whole concept of a "safe" level of radiation is in doubt. No one has ever produced evidence that any specific dose of radiation will be without harm. The nuclear manufacturing industry, the electric utility industry and government agencies lead us to believe there is a safe dose of radiation.

Dr Gofman (inventor of processes of plutonium separation) and Dr Tamplin both internationally known for their research into the effects of radioactivity on the environment and especially humans, in their book Poisoned Power smash this idea.

Both were assigned by the US Atomic Energy Commission in 1963 to assess the cost in human disease and death for proposed nuclear energy programs. They estimated that there would be an excess fo 32,000 cases of fatal leukemia and cancer (each) every year if the average exposure of the US population was the legally "safe" dose of .17 rads per year



average (the US Federal Radiation Council guideline).

The Gofman-Tamplin estimate of genetic deaths from exposure to "allowable" doses of radiation is 150,000 to 1,500,000 extra deaths per year for a population of 300 million people.

Since the standards were set it has been discovered that most of the major killing diseases of humans have a genetic component. Originally when radiation hazard levels were set the kinds of genetic injury that cause death were though to be only the single gene diseases such as hemophilia, gactosemia and other rare diseases. It is now known that most major killing diseases of humans have a multigene component, eg coronary heart disease. The real genetic hazard problem extends between 50-100 per cent of all causes of death.

Thus radiation standards were set with an under-estimation of genetic hazard by 50 to 100 times.

It has been wrongly assumed that there is a hazard threshold under which radiation levels are safe, ie will not cause cancer, genetic damage, etc. "Legally permissable" has been confused with "safe" by the industry and the public.

The linear theory of radiation hazard is generally accepted by scientists concerned with radiation—ie if 100 rad produces 10 cancer deaths then 10 rads will produce one death.

Because radiation concentrates in the food chain and is cumulative any increase in the amount of radiation to which we are exposed is dangerous. The human population already receives .130 rads from natural background radiation and .118 rad from artificial sources (especially medical equipment), and this estimate ignores radioactive fallout from atmospheric testing.

Natural and medical radiation produce cancer and genetic harm, in direct proportion to the dose received

During the normal operation of nuclear reactors of the conventional (thermal) variety certain radioactive gases and volatile radioisotopes escape or are released directly into the environment, according to the "standards" for permisable concentrations.

These releases cannot fail to exacerbate the number of deaths caused by radiation.

Dr Irwin Bross of New York State's anti cancer research facility has completed studies showing that low level radiation causes genetic damage to workers at nuclear power plants—preconception damage occurs at dosages inside the NRC's permissable range—a dose workers are exposed to.

What is of concern is the amount of radiation in the ecosphere. Normal functioning of reactors will add significantly to the effects.

The Producers Forum talks of the safety of sitting next to a nuclear power plant but ignores concentration in the food

Even if releases at the perimeter of a reactor were at the AEC permissable value, radionucleides that can go through the forage to cow to milk to humans results in enormous multiplication of radiation dose in humans. Similarly water effluent at release point from a reactor may make the water "drinkable" by NRC standards at 500 millirem, but the fresh water to fish pathway can concentrade radioactivity 1000-fold or more, therefore fish from this water cannot be eaten without grossly exceeding "tolerance" levels.

These dangers do not even take into account (as the NRC doesn't) significant sources of exposure—accidental reactor releases, accidental release during transport, releases and accidental releases at fuel reprocessing plants, releases from low and intermediate level waste releases and burial in the environment, releases from storage, burial or other final disposal of the astronomic level of wastes left after fuel reprocessing and accidental releases through sabotage at any step in the entire fuel and waste cycles.

Radioactivity in the Cycle

Radioactivity is nothing new on this planet. We are constantly being bombarded with natural "background" radiation. There are three different kinds of radiation.

1 Alpha radiation which is emitted from soil and rocks. The most dangerous manufactured sources is the nuclear reactor fuel plutonium. Although these electrically charged radiating particles can't be absorbed through the skin, if they are inhaled or ingested they can cause fatal damage to tissues.

2 Beta radiation, again it is emitted from the earth, from minerals such as uranium, thorium and their radioactive daughters. These rays are also emitted from television monitors and can be stopped by a sheet of metal put in their path.

3 Finally there is gamma radiation, which is by far the most penetrating radiation. It has no problem penetrating the human body. Its major source is the sun, uranium, thorium and their daughter products. People also contribute to their exposure to gamma rays by the use of medical and dental x-rays. However in such cases we have decided that the benefits outweight the risks of exposure.

Humanity's present use of radiation does not negate the fact that ALL RADIATION IS POTENTIALLY DANGEROUS. Of all animals on this earth, humans are the most sensitive to the effects of radioactivity. The human fetus is 50 times more sensitive than its parents.

Radiation does its damage by emitting highly charged particles that tear electrons from other atoms rendering them unstable. Its effect on human cells is that it tears into molecules that make up the DNA which is the genetic material that controls the functions of the cell. In damaging the genes instead of getting two daughter cells when the cell reproduces the cell goes haywire and produces billions of cells which become a tumor. We know this frightening phenomenon as cancer. The mutant cells are extremely virile and the cancerous tumors they form cause very painful deaths.

It has the same effect on the genetic material in the sex cells, the controllers of the creation of a human life. Damaged reproductive cells (ovum and sperm) don't affect you but they produce deformities in your children. Through modern medicine these deformities are preserved to be passed on through the generations, and remain in the gene pool, thus continually increasing the proportion of mutants in the population.

Natural background radiation with its gene mutating potential, along with the "survival of the fittest" principle has been responsible for determining evolution. We have survived in spite of it, not because of it. We have evolved with a tolerance to natural levels of radiation, although it is thought that background radiation is already responsible in whole, or in part, for the majority of non-accidental deaths in the United States (eg leukemia and cancer).

Now we are proposing nuclear power. This poses serious, very serious, threats to tolerable radiation levels. The imminent danger that our TVs, electric can openers and toothbrushes may black out, we demigod human beings have decided to risk our lives and future generations to keep the technological wizardry buzzing. To the crazies who hold the power, the solution lies in the nuclear fuel cycle. I want to now put before you a picture of the fuel cycle and the potential dangers to the environment and ultimately human beings.

Uranium mining

First you dig the uranium out of the ground. This is known as uranium 238 and along with it comes radon gas. If in the normal course of breathing you inhale some radon gas, and a speck lodges in your lung, a microscopic speck is enough, sometime in the next 15-40 years you may surprise yourself by coughing up blood. This is the first you will know that you have lung cancer. The cause lies dormant for 15-40 years.

We know from Hiroshima, something of the pattern. The bomb was dropped and nothing happened to many of those who survived for about five years. Then leukemia began to emerge. Leukemia increased five times over the normal proportion. Doctors now go to Hiroshima to study leukemia and cancer.

Fifteen years later cancer started to appear as solid tumors in breast, bowel and lung. It is now 30 years later and the number of cancer victims is rising year by year. The number still has not peaked. From the time of irradiation we don't know what maximum time is needed to produce the maximum amount of cancers. The incidence of cancer in Hiroshima has doubled and is still growing.

In America some years ago, men were mining uranium underground. Radon gas is heavy and unfilterable and accumulates down mines. Studies showed that one man in five died of cancer.

In a Canadian mine where the concentration was particularly high one man in two died of cancer. Every second man.

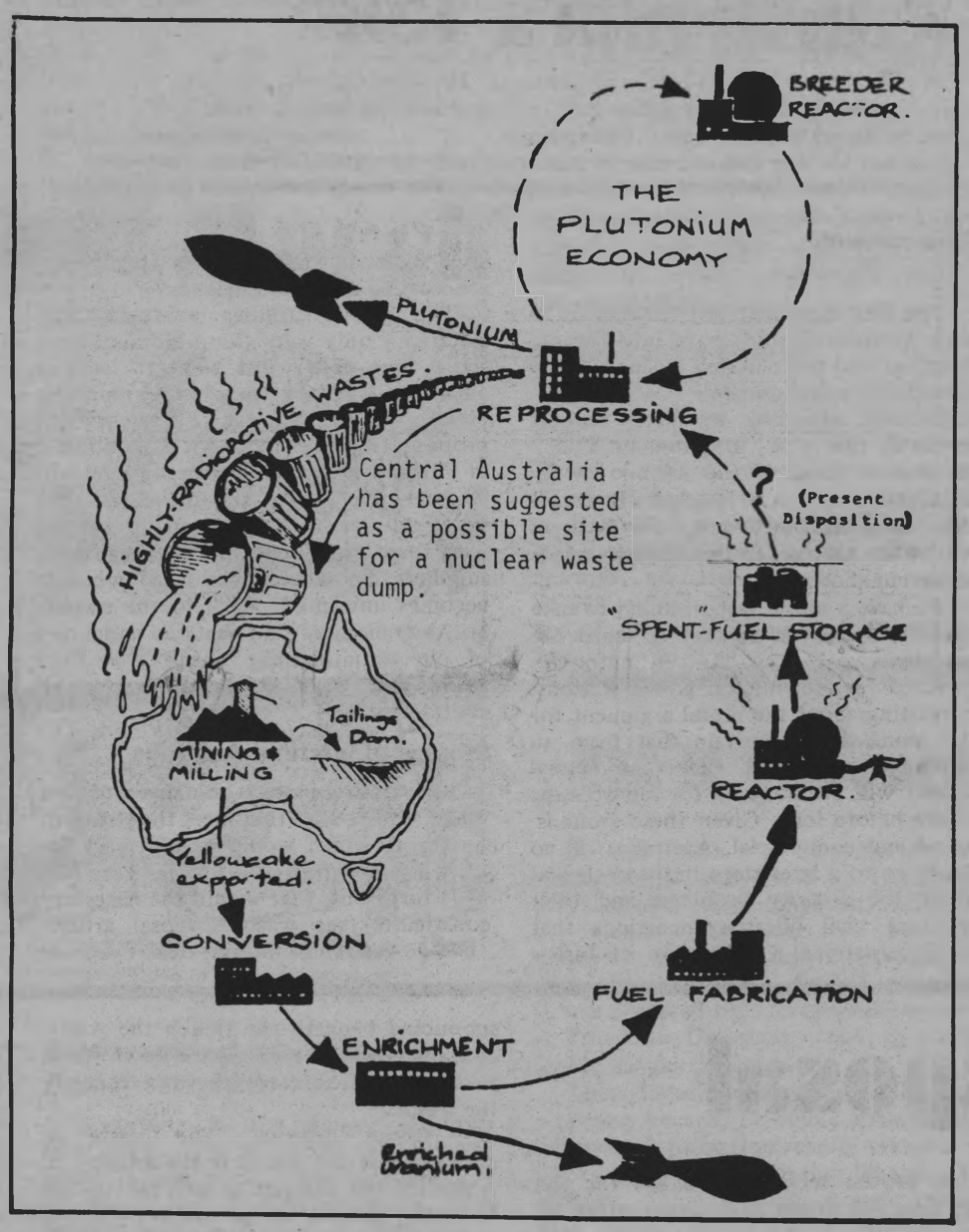
"All miners should wash their hands and faces before eating."

How well does this safety precaution work?

"Ah well it takes a long time to teach the men these things" is the management's reply.

Dr Helen Caldicott, and Australian pediatritian with a special interest in radiation, spoke to the men at Mary Kathleen. At first they were hostile, having never been informed by a doctor as to the potential hazards of radiation. When she had finished speaking miners lined up for two hours to ask questions. Three men resigned, three others discovered that they have high levels of radiation in their urine.

It is farcical to think that by "encouraging miners to wash hands and faces" you are insuring their lives against cancer and leukemia.



In Australia, mining companies such as Con-zinc Riotinto and Ranger Uranium Mining maintain that the open cut uranium mine proposed will be safe from radon gas problem as the wind will disperse it. But radon is heavy and will hang around in the bottom of trenches. You'd have to mine in a cyclone to minimise the danger!

Radon has a half life of 3.8 days. That is to say if you have 1 kg of radium, in 3.8 days you will have .5 kg of radon and in another 3.8 days you will have .25 kg of radon and so on until it becomes negligible. However its potency and damaging potential doesn't alter. Remember even a microscopic amount is carce carcenogenic.

Radium is a radioactive daughter of uranium 238 and settles in the dust raised by mining. It has a half life of 1602 years (do your own sums) and if swallowed can cause leukemia—again only a microscopic speck is needed to set it off.

Leukemia is a disease that causes bone marrow to go berserk and produce excessive white blood cells. The white blood cells invade your blood system, supersaturates it with their presence and you die.

At Mary Kathleen—an open cut mine—there is a government policy to ensure the miners' safety against accidental swallowing of radium:

Milling

This is the second step in the nuclear fuel cycle where the mined uranium is refined and much of the extranious matter is removed. The waste products are a sand like material called tailings, liquid wastes, and a mud like slime. The liquid and slime are disposed of in nearby streams.

Uranium breaks down into:
Thorium with a half life of 76,000 years
Radium with a half life of 1602 years
Radon with a half life of 3.8 days
Lead 212 with a half life of 21 years.

All these elements are present in the tailings. The radium is sometimes 100 times more than is found in ordinary rocks. The tailings are collected in large piles open to the elements.

At first it was thought that tailings were safe. At Grand Junction in 1966 environmental consciences in true recycling style lead them to use tailings as fill. Over 15 years preceding 1966 about 3300 homes had tailings on or around their foundations. The Atomic Energy Commission (AEC) knew and approved of the use of the tailings. The tailing were also made into brick for homes, sheds and hospitals. There has been a 50 per cent increase in cleft lip and palate defects in babies born in the area and 50 per cent increase in congenital anomolies.

It is estimated that at maximum it will cost $35 million dollars to correct the situation. Federal assistance is $5 million.

At Port Pine in South Australia about a year ago it was discovered that dumps of tailings were radioactive. Sixty acres of the stuff. Meanwhile the children in the area saw potential in the area so built themselves a cricket pitch on it. They also had a good game of rolling around inside barrels that had contained thorium.

Enrichment

Uranium as it is mined (yellowcake) is mostly uranium 238. By a process called "enrichment" the concentration of uranium 235 is increased from 0.7 to 3 per cent to make it a usable fuel. After enrichment the remainder of the material is waste and continues to give radon gas for thousands of years.

Reactors

The next step in the nuclear cycle is to pack the fuel into the reactor rods. The rods are surrounded by systems of coolant gas or liquid. The cooling water absorbs the thermal radiation and returns to its river, or ocean. It is estimated that within 30 years the electric power industry will be producing such megawattage of electricity that will require the disposal of about 20 million billion British Thermal Units of waste heat per day. To carry off that heat by way of natural waters would call for a flow through power plants amounting to about a third the daily fresh water runoff in the United States.

The Federal water pollution control administration has declared that waters above 93°F are uninhabitable by all fish in the United States except a few southern species. Therefore the heat expelled from nuclear power stations of the sizes proposed will be such that it will seriously interfere with many aquatic environments making many uninhabitable. The commercial use of this heated water is uneconomical and poses practical problems.

The reactor stage that produces the thermal radiation problem also produces the most toxic carcenogenic lethal substance known—plutonium. The inhalation of even 3 millionths of a gram can cause cancer. It represents an inhalation hazard, weight for weight 100,000 times more lethai than potent chemical carcinogens now known. The fact that it has a half life of 24,000 years makes it one of the deadliest elements on this planet. (It is not a naturally occurring element.)

One pound of plutonium is enough to place a lethal dose in the lung of every man, woman and child on this planet. Each nuclear power plant produces 500 pounds of plutonium.

By the year 2000 the international community will have produced a projected 3 million tons of plutonium.

Plutonium is non-biodegradable. It is active and dangerous for half a million years.

It has to have a container that will remain inert for half a million years. At the present time it is stored in stainless steel and concrete containers, which have leaked. Radiation can escape through the minutest crack.

In the States they openly admit they haven't developed a safe method of storage.

Plutonium with its intensive alpha emissions has another diabolical characteristic in that it concentrates in testicles and ovaries. There it damages genes. Dr Joshua Lederberg, a Nobel laureate in genetics, says that with present federal radiation standards—which are too lenient—genetic defects may increase by 10 per cent.

Enrichment

Queensland's Premier is pushing hard for an enrichment facility in Queensland. The facility would cost $200 million, and it is unclear who would provide the capital. In the US the Federal government owns all enrichment plants and, in effect heavily subsidises the nuclear industry by providing enriched uranium at cost to the industry.

It is a massive investment with a total socially redeemable factor of 150 jobs (see energy and jobs section,)

Enrichment plants are heavy polluters. One problem with enrichment plants is that only a fraction of the uranium that goes into the plant is used as fuel. For every pound of uranium that is fed into an enrichment plant, less than one-fifth comes out as fuel. The rest becomes tailings which are depleted in U-235. These tailings are analogous to the piles around mills, but at the enrichment plants they are stored as solid UF_6 in drums. These tailings will be stored until some "future uses" for them can be found.

The centrifuge process proposed requires about one thenth the energy as the old gaseous diffusion process. However, this still involves a vast amount of energy. Highly polluting coal burning energy facilities will be needed. Further, 1500 acres of land would be required by the plant.

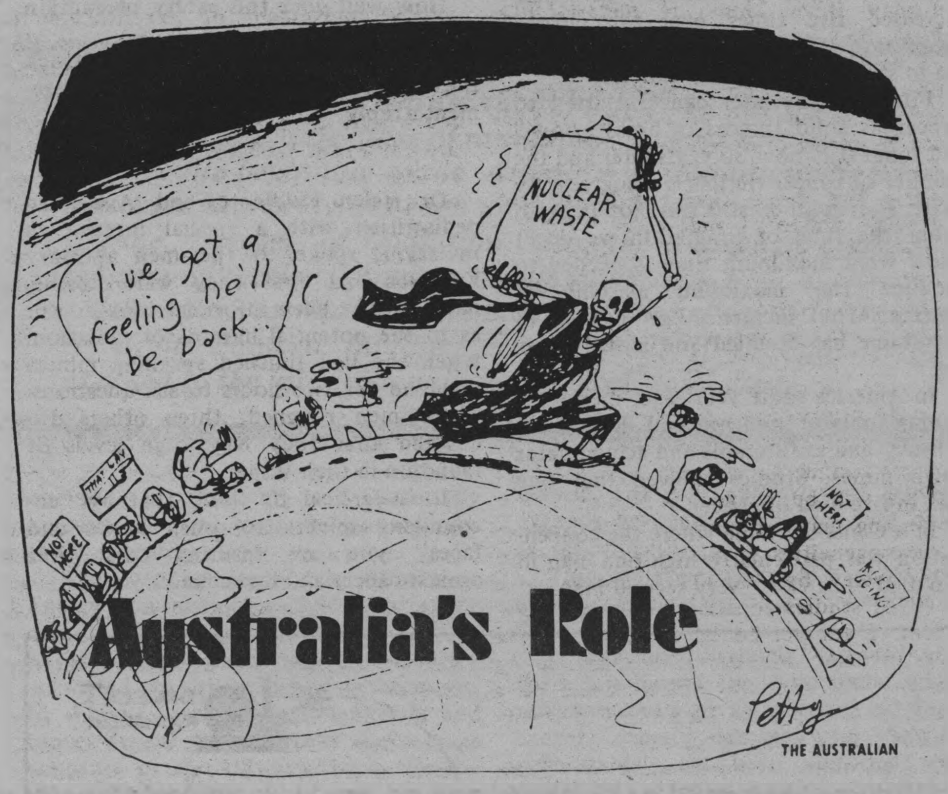
The diffusion enrichment facility in Ohio, for example, consumes 10 per cent of the State's electricity—more than the entire city of Cleveland (which is bigger than Brisbane). Even 10 per cent of this amount is a staggering concept. It is likely that the enrichment facility proposed would be larger in capacity than the Ohio plant—as it would be supplying enriched uranium to a large overseas market.

The race for Australia to enter into enrichment is, of course, not new. It has been reported that the late Rex Connor was seeking his $4000 million loan to finance just such an operation!

Enrichment is the concentration of the U_{235} proportion of yellowcake to 2–3 per cent for fabrication into fuel rods. Weapons grade Uranium 235 can easily be produced by these plants (enabling Australia, potentially, to enter the nuclear weapons game).

After enrichment the uranium is packed into fuel rods, ready for use in nuclear power plants. There has been some intense lobbying for Australia to move further into the nuclear business. (After all we have been investing around $20 million a year in the AEC which equips us with the necessary technocrats.)

Australia is in for almost the entire nuclear fuel cycle. If present trends continue Australia will mine, enrich, and reprocess uranium as well as store nuclear waste. We will, in effect, be into everything but the power produced. We'll have, in effect, everything BUT the energy.



Reprocessing

The first agrument put forward as to why Australia should move into the enrichment and reprocessing business oddly enough is a moral one.

It was advanced by Prof Stewart Butler in the book "Uranium on Trial." He is now Head of the Atomic energy commission at Lucas Heights. He argues that Australia has a moral involvement with what happens to its uranium once it leaves our shores.

We have a moral responsibility to take back the spent fuel and set up reprocessing plants so that we can sell plutonium enriched fuel for nuclear power stations. Forgetting about the moral argument for the moment it is certain that from an economic point of view commercial sectors will be lobbying for reprocessing plants before long. Given these grounds, moral and commercial, Australia will no doubt go to a later stage in the cycle and invite the security problems and their resultant civil liberties incursions that the International Commission of Jurists and National Civil Liberties Committee are worried about in England.

The public utilities producing the electricity only want the plutonium for a short time. They just want to lease it and send it back to the reprocessing plant. British Nuclear Fuels have a proposed reprocessing plant at Windscale in England where Australian uranium will be sent. They have already stated that they will insist that ownership not lie with them in any contract they sign with suppliers. So where does it go when it becomes unwanted? Back to the owner. So Australia may find that the daughters of our uranium may one day be ours again and that it is a matter of contractual law.

Storage of waste in Australia

Radioactive waste is so dangerous that waste storage sites that meet the stringent constraints which would be necessary for anything doubtfully "safe" are very few.

It turns out, that within the necessary constraints (see waste disposal article, below) Australia's interior deserts appear to be the only sites that even approach the necessary geological stability, technological backup, and political stability.

A study performed by Dr Keith Crook, department of geology, Australian National University in Canberra comes to the conclusion that "only three areas on earth appear to meet the specifications for waste disposal: parts of Sahelian Africa, eastern Namibia, and central Australia, and even so their past climates are uncertain. Data in Mabbutt (1967) and Wells (1969) detail this uncertainty. Political problems and lack of technological backup are likely to rule out the African locations, but the Australian area remains a prospect." Crook puts forward the following scenario, in terms of Australia's international responsibilities.

"Australia will not sell its uranium. It will fabricate reactor fuel elements to specifications provided and will lease them to users.

"Australia will supply uranium only to signatories of the Nuclear Weapons Non-Proliferation Treaty, as inspection of civil nuclear installations by IAEA officers is guaranteed under the treaty.

"Spent fuel elements will be returned to Australia for reprocessing, thereby limiting the dispersal of toxic wastes and the possibility of clandestine stripping and stockpiling of plutonium for military purposes.

"Reprocessing wastes will be disposed of in Australia under conditions which ensure their remaining isolated from the biosphere until they are no longer dangerous."

Full nuclear cycle for Australia

The environmental hazards and technological problems involved in the above processes are enormous. As the Australian reported on September 14:

"America has acknowledged it still faces serious problems in the safe disposal of radioactive nuclear waste.

"The acting administrator of the Energy Research and Development Administration, Mr Robert Fri, said storage of such waste 'is truly a national problem with international significance.'

"He told a Congressional hearing in Washington: 'Its solution will depend on co-operative participation by all.' "

We are not only fighting the mining of uranium in Australia—we are up against plans for the entire fuel cycle in massive proportions here in Australia.

After all, it would be silly for Australia to possess all stages of the fuel cycle and not go into nuclear power generation for itself, wouldn't it?

Waste Disposal

The Prime Minister's bland assurance that proven technology exists for the permanent disposal of high level waste is utterly false and almost daily under attack by concerned scientists.

In March 1976 US scientists engaged in the development of this technology indicated that:

1 the development phase of reprocessing technologies would not be completed before 1979.

2 the earliest commercial operation for any reprocessing would be 1983.

3 high level waste storage pilot plants would begin construction in 1984.

In September 1976 the UK Flowers Commission on Nuclear Power and the Environment found that it had not been demonstrated that:

a method exists to ensure the safe containment of long-lived, highly radioactive waste for the indefinite future.

And to quote the Ranger Inquiry,

. . . there is at present no generally accepted means by which high level waste can be permanently isolated from the environment.

Looking into the technological options for disposal of nuclear waste involves severe constraints, and poses difficult and unsolved technological problems.

The constraints on waste disposal options

Kubo (1973), Kubo and Rose (1973) and ERDA (1976) review the various opertions available for waste disposal. Further references may be found in Winograd (1974).

1 Storage in stainless steel tanks under constant surveillance. This is a short-term measure, pending ultimate disposal. An alternative storage method has been proposed by Winograd (1974): canisters of vitrified waste would be packed in gravel at the bottom of holes drilled many metres into dry bed-rock of surficial materials which form zones, unsaturated by water, from 100-600 m thick above the water-table in semi-arid areas; de-actiniding of wastes is required before their emplacement.

2 Melt in situ disposal: Placing the wastes at a deep level in the crust, and their subsequent melting as a result of their inherent heat flux so that the molten material will sink through the crust.

3 Mine disposal: Disposal in a mine constructed in sandstone, shale, salt or crystalline rocks. The disposition of the waste containers is determined by thermal considerations and by the requirements that the waste be inspected and if necessary retrieved.

4 Ocean disposal (see Nielsen et al [1974] for discussion.) The waste is encased in stainless steel or other durable containers and deposited in the deep oceans. One variant of this envisages disposal in deep ocean trenches associated with a Benioff (subduction) Zone. It is assumed that as the oceanic crust is subducted beneath the trench the waste containers will be transported downwards to depth sufficient to prevent escape of the waste.

5 Icecap disposal. The waste is deposited on the icecap in the interior of Antartica and allowed to melt its way to bedrock. Angino et al (1976) discuss some variants of this method.

6 Space disposal: packing the wastes into rockets which are then fired into the sun.

7 Nuclear transmutation. This option requires the treatment of wastes in a nuclear reactor so as to produce shorter-lived isotopes from the actinides. The method is expensive and energy-consuming. It reduces but does not eliminate the toxicity of wastes.

All of these options are earthbound except for the disposal by space rockets; at present this latter cannot be fully assessed and its cost and safety are open to question.

The proposed solution

The present international consensus appears to be that a complete solution can be provided by solidification of the wastes into vitreous ceramic or some other "stable" form (ERDA, 1976) followed by their burial in natural rock-salt bodies well below the surface. I am not satisfied that this solution is proven, for reasons stated below.

Any disposal program that envisages a waste repository on Earth must take account of several factors: the integrity of the repository, the cost of the program, the dynamic nature of the waste, the dynamic nature of the Earth, and the expectable lif time of human institutions.

The first three factors can be stated simply. The waste must remain isolated from the biosphere so long as it is toxic, which may be more than 1 million years. The cost of waste disposal must add no more than a few per cent to the cost per kWh of electricity generation, if nuclear power is to be economic (Kubo, 1973). The heat flux and chemical reactivity of the waste must be accommodated. These facets of waste disposal are well recognised, but one aspect requires discussion.

Present storage/disposal proposals envisage solidification of the radioactive materials in vitreous boro-silicate ceramic contained in stainless steel canisters 30cm diameter by 3 m long. The steel casing is not durable, particularly in the presence of water. Leakage of radioactive components from the ceramic is currently being intensively studied, principally by experimental leaching with water. Categorical assurances that leaching rates will be sufficiently low to cause no hazard cannot now be given (Winograd, 1974; Ewing, 1976).

Devitrification (returning to liquid form) of the ceramic is likely to enhance leaching. What mechanism of devitrification is appropriate as a model to guide research, is controversial. If radiation damage is the cause of devitrification, leaching of intensely irradiated ceramic (equivalent to a 100,000-yr dose) can be used to predict future behavior. If on the other hand, hydration by absorption of water (in liquid form or from air) is the cause, as is the case for natural volcanic glass (Friedman et al, 1966), irradiation alone will be a poor guide.

A further aspect is the propensity of the ceramics to cracking (formation of perlite) because this repeatedly provides

fresh surfaces for hydration during devitrification. Some volcanic glasses, but not all, have this property, for reasons that are not understood. The date of Friedman et al (1966) indicate that, if perlitic cracking occurs, the 30 x 300 cm ceramic rods will totally devitrify in less than 10^6 years by simple hydration. Given that radiation damage will be combined with the hydration, my guess is that total devitrification will occur in 10^3–10^4 years, even in "dry" environments, leaving the material potentially leachable.

The two remaining factors which influence waste-disposal options, geological dynamism and human frailty, are less well appreciated. I regard them as the most critical and! indeed the limiting factors for any disposal program.

Geological stability

The duration of toxicity is greater than the duration of stability of many geological environments. This is well recognised for earthquake-prone regions, where significant change at any point can be expected in less than 10^3 years. But it applies less obviously elsewhere.

Gross climatic changes from peak ice-age conditions to present conditions, and perhaps to total deglaciation, can occur within 10^4 to 10^5 years. This is sufficient to rule out any program of disposal in ice-caps or in permafrost. It also rules out disposal in bed-rock in any situation where ground water now exists or could accumulate under future climates; for one must assume that, if ground water. gains access, the repository will leak.

Metastability of geological environments must also be considered. Salt deposits are particularly unattractive as repositories in this respect, as they display three kinds of metastability. First, they are soluble. Second, they are an economic resource, liable to extraction by man before enclosed wastes are detoxified but after all memory of their use as repositories has been lost. Third, salt beds is are dynamically metastable, being less dense than overlying limestones, sandstones and shales. (This explains their propensity to diapirism, the formation of salt domes.) The introduction into bedded salt of a long-duration heat source of appreciable intensity will tend to upset the metastability of the salt deposit. To rule out future diapirism that would destroy the integrity of the repository, a complete understanding of the stress regime in the salt and overlying strata will be needed. Sufficient understanding may be unattainable because of theterogeneities in the body of the rock. The review by Gera (1975) and Langer's (1976) studies of salt ductility are pertinent. I am yet to be satisfied that the perturbation in stress fields caused by excavation and the emplacement of a heat source will be limited to relatively small volumes within the salt.

Inadequate understanding of Earth dynamics creates further limitations. Thus, it is known that presently essential aseismic continental margins, such as the estern margins of North America and Australia, can be transformed into highly seismic margins like the Andean margin of South America. This change is effected by a change in the direction and rates of relative movement of the lithospheric plates that make up the Earth's crust. But the origin of changes in plate movement patterns and the response time of a previously aseismic continental margin are unknown. Probably the response time is less than 10^6 years, in which case repositories should not be located near continental margins.

Much the same problem applies to repositories located in the downgoing slabs of lithosphere in deep ocean threnches (subduction zones). Subduction of lithosphere may not persist for sufficient time to take the waste to a safe depth. In any case the waste may not be carried to great depth because most of the sediment, in which the waste would be located, may be scraped off the lithosphere as it descends into the trench. This sediment is acreted on to the wall of the ocean trench opposite the descending slab (Karig & Sharman, 1975). The accreting mass is strongly sheared, and disruption of waste canisters would be likely.

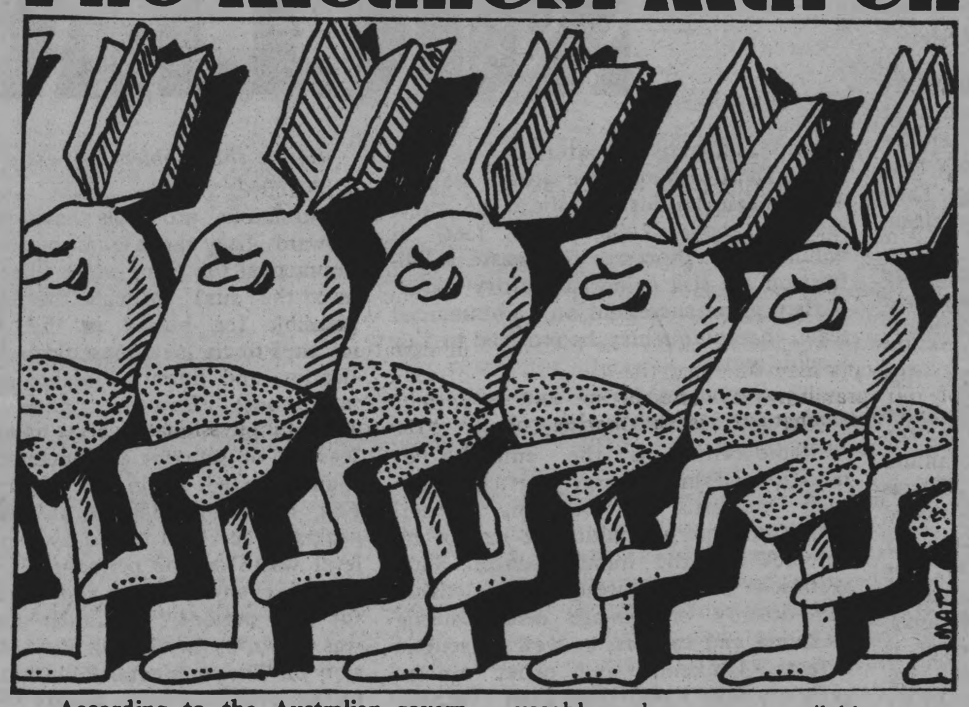
But there is a more important consideration here, which I regard as sufficient to rule out this type of repository. The very existence of lithospheric subduction as a process is disputed by a small but significant school of geodynamicists. Although the growth of oceanic crust by acretion at mid-ocean ridges is almost universally accepted as proven, the loss of crust by subduction involves the assumption that the Earth's radius is substantially constant with time, which is a matter of continuing dispute (Carey, 1975).

Thus geological dynamism severely restricts the possible sites for disposal on Earth.

Human frailty

The possible sites are further restricted by consideration of human frailty. The life-time of human institutions is, in historical terms, of the order of 10^3 years, as Toynbee showed in his classic work A Study of History. For times longer than this, societal breakdown, loss of records and technological capacity, and consequent cessation of surveillance, must be expected (see Weinberg, 1972). Furthermore, the lifetime of a sophisticated technology, such as generation of electricity by nuclear fission, is probably of the order of 10^2 to 10^3 years. These lifetimes are of the same order as the toxicity lifetime of deactinided wastes. They are three orders of magnitude smaller than the toxicity lifetime of actinide-rich wastes.

The Meanest March



According to the Australian government, uranium exports would be covered by a safeguards policy with four "cornerstones."

But these "cornerstones" are already in ruins. They can not prevent the use of Australian uranium or its byproduct plutonium in the manufacture of nuclear weapons.

The four foundations of the government's strategy to prevent the spread of nuclear weapons are:

1 Non-Proliferation Treaty.

2 International Atomic Energy Agency safeguards.

3 Bilateral agreements.

4 Multilateral efforts to strengthen safeguards.

But, can any of these be relied on?

1 Non-Proliferation Treaty

The obvious weakness of the NPT is that major nations either owning or obtaining nuclear reactors, and in some cases fuel reprocessing plants, are not parties to this Treaty. Such countries include: India, Spain, Pakistan, Argentina, Brazil, China, France, Israel, Egypt, South Africa. Several of these countries have refused to sign the Treaty on the grounds that it is wrong and unsound for a monopoly of nuclear weapons in the the hands of some powers, notably the USA and the USSR, to be maintained by the Treaty.

This criticism draws attention to a second failure of the NPT—the failure of the nuclear powers to disarm. The Treaty calls for nuclear disarmament, but, as the recent US development of the neutron bomb clearly demonstrates, the superpowers are continuing the arms race, unrestrained. A major loophole in the NPT is its provision that signatures may legally withdraw from the Treaty with three months notice. Almost immediately after withdrawing, a nation could have a useable nuclear weapon available.

2 International Atomic Energy Agency safeguards

According to the Ranger Inquiry's first report, defects in the present safeguards arrangements, taken together, "are so serious that existing safeguards may provide only an illusion of protection." (p 147)

Among the weaknesses of these arrangements are the following:

* the fact that many nuclear facilities are not covered by safeguards;

* the existence of loopholes in safeguards agreements regarding their application to "peaceful" nuclear explosions, to materials intended for non-explosive military uses (nuclear submarine power wource) and to the retransfer of materials to a third state;

* the absence, in practice, of safeguards on uranium before it has been processed for use in a reactor (eg "yellowcake");

* the absence of reliable sanctions to deter the diversion of safeguarded material.

3 Bilateral agreements

The first point to be made about bilateral agreements is that they are an attempt to overcome the weaknesses and limitations of IAEA safeguards.

The second point is that these agreements rely on the same kind of goodwill and are subject to the same kinds of weaknesses as NPT and IAEA agreements.

The only way of "effectively" enforcing the bilateral safeguards proposed by the Australian government is that the USA control the flow of uranium by handling its enrichment.

Such a policy would place Australia's uranium marketing under US control. Far from giving Australia a strong voice in the international nuclear industry, uranium sales under these conditions would effectively remove Australia's control over its uranium.

4 Multilateral efforts

There are both immediate and continuing problems with the multilateral efforts announced by US President Jimmy Carter to strengthen safeguards. Whether or not the breeder reactor is used, enough plutonium is produced in a 100 megawatt American built reactor, for example, to make up to 25 nuclear weapons a year. The spread of plutonium and of nuclear weapons capacity will not be stopped by the Carter plan.

As well, Australia's position is weaker than that of the US. The Australian government would allow the extraction of plutonium from used reactor fuels, with the possibility of its recycle into reactors or weapons.

Even if all existing governments supported the Carter plan, how could it be enforced with future governments, as yet unknown?

In summary:

Nuclear safeguards proposed by the government to "protect" Australian uranium, and to prevent the spread of nuclear weapons can not work. They either have a record of past failure, or seem likely to fail in future.

Do it yourself Atomic Bomb

In May 1976 the blueprint for an Atomic Bomb was drawn up. It was not prepared by a nuclear physicist with years of research experience. It was not prepared in secret by a government defence agency with unlimited resources. It was prepared by a 21-year-old student at Princeton University, USA, as a project in his physics course.

This disturbing fact is made more worrying because he found most of the necessary information readily available in books from the university library. The student, John Phillips, bought about $10 worth of publicly available US Government documetns as a supplement.

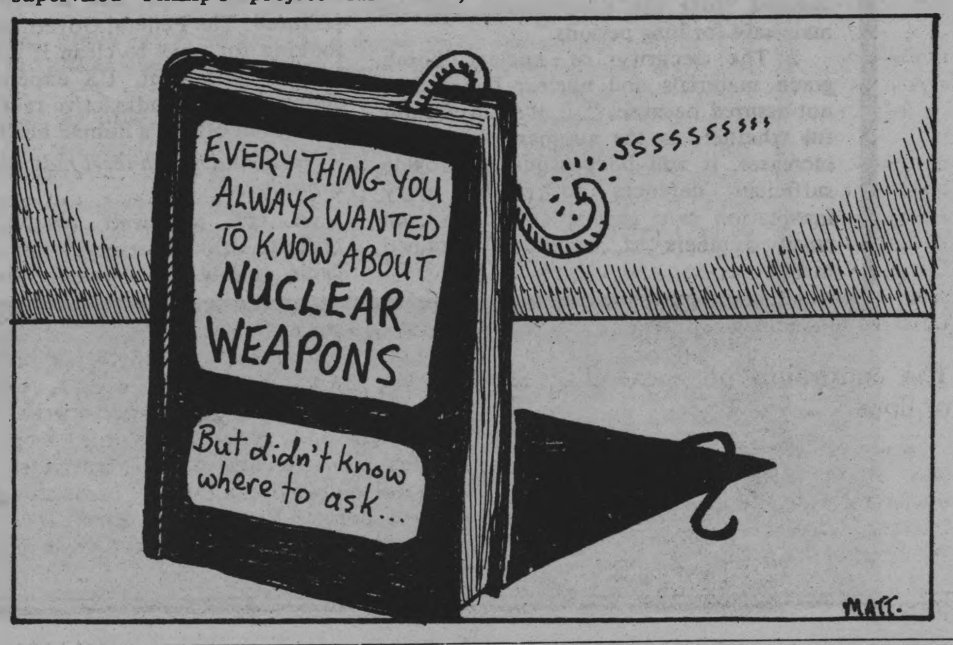
Some essential information was still classified though, and this contained the key to one of his most puzzling problems—which detonator would be most suitable to trigger the A-Bomb's uncontrolled nuclear reaction? He obtained the answer on the telephone from an explosives expert at the Du Pont Company. This information effectively completed his design. It had taken him only four months working alone.

The physicist, Freeman Dyson, who supervised Phillip's project said later, "The important thing to me is how much solid information he could get so easily, and in such a short time."

The case showed that a massive project involving dozens of experts is no longer necessary to build an Atomic Bomb. Given the knowledge explosion and publicly available documents, amateurs CAN design crude but effective atomic bombs.

The first report of the Ranger Uranium Environmental Inquiry, headed by Justice Fox concluded that ". . . a terrorist group could use reactor grade plutonium to make a bomb with good prospects of giving a yield of several hundred tonnes of TNT . . . An explosive yield of a few hundred tonnes of TNT might be sufficient to destroy a very large skyscraper with severe loss of life. The ionising radiation released and the subsequent fall-out would also kill and injure many people." (p 154)

Every nuclear reactor produces about 200 kg of plutonium each year. Only about 8 kg is needed to make a crude but deadly nuclear bomb. (source: The National Times, April 25-30, 1977)



GROUPS SUPPORTING

Opposition to uranium mining now comes from all sections of the Australian community. As more people have learned of the dangers and unsolved problems of nuclear power, and of the effects of uranium mining on the environment and the economy, they have begun to support bans on the mining and export of Australian uranium.

TRADE UNIONS

The Queensland Trades and Labor Council supports:

* a 5 year moratorium on uranium mining;

* full public discussion of all the questions raised by the mining and export of uranium, leading to a decision by all the Australian people;

* a non-nuclear national energy policy.

CHURCHES

The Executive Committee of the Australian Council of Churches has called, "for a five years moratorium on mining and exporting of uranium to allow sufficient time for public debate and for further research into the risks involved and possible alternative energy sources."

The National Commission for Justice and Peace, Caholitc Church in Australia:

"Until the problems and dangers . . . are satisfactorily resolved . . . Australia should not engage in the mining of uranium;

"Australia should refuse to export uranium to those countries engaged in

"a. manufacturing nuclear weapons, and

"b. generating power by the nuclear process."

AUSTRALIAN LABOR PARTY

The ALP policy on uranium:

* "Labor declares a moratorium on uranium mining and treatment in Australia,

* Labor will repudiate any commitment of a non-Labor Government to the mining, processing or export of Australia's uranium, and

* Labor will not permit the mining, processing or export of uranium pursuant to agreements entered into contrary to ALP policy."

This policy is based on:

" . . . the absence of procedures for the storage and disposal of radioactive wastes. . ."

NORTHERN TERRITORY ABORIGINES

Traditional owners of the Ranger uranium deposit site and the Northern Land Council are opposed to uranium mining on the Ranger site.

QUESTIONS & NUCLEAR

What is nuclear power?

Electricity generated using a nuclear reactor as the heat source.

How does it work?

Uranium fuel undergoes a process called "fission" (the splitting of atoms) in a nuclear reactor, thereby generating heat. The heat converts water to steam which in turn drives steam turbines coupled to power generators. (In a conventional power station the heat sources comes from the burning of oil or coal.)

Isn't nuclear power too complicated to understand? Shouldn't the decision be left to the experts?

The technology is complicated but its basics are not beyond the average person. In any case, decisions about its use are most importantly social and ethical ones. As the Fox Inquiry declared "the final decisions should rest with the ordinary man and not be the preserve of any group of scientists or experts, however distinguished."

What is the Fox Inquiry? (ie the Ranger Uranium Environmental Inquiry under the chairmanship of Mr Justice Fox)

An independent judicial inquiry set up by the Australian Government under the Environmental Protection Act. The Inquiry commenced in September 1975 and produced its first report in October 1976, after collecting 13,000 pages of evidence from over 300 witnesses. The First Report weighed the evidence presented to the Inquiry, for and against uranium mining and nuclear power as they affect Australia and the whole world. The Second Report concentrated on the particular issues affecting the Northern Territory, including Aboriginal land rights, the environmental effects of uranium mining and the establishment of the Kakadu National Park. The majority of Australia's reserves are in the Northern Territory.

What are the main dangers associated with the nuclear power industry?

The Fox Inauiry pinpointed three major dangers:

1 "There is at present no generally accepted means by which high-level [radioactive] wastes can be permanently isolated from the environment and remain safe for long periods."

2 The security of nuclear bomb grade materials and nuclear facilities is not assured because, ". . . it seems doubtful whether, as the number of facilities increases, it will be possible to provide sufficient defences to render every installation safe against attack by even small numbers of well-armed, trained men."

3 "The nuclear power industry is unintentionally contributing to an increased risk of nuclear war."

What are radioactive wastes?

During the fission (atom splitting) pricess in a nuclear reactor, the mildly radioactive uranium fuel is converted to a wide range of extremely radioactive materials.

Most of these very toxic wastes are useless and spontaneously boil when kept in liquid form, giving off radioactive gases, for the first century of their long lives. These are the fission products. They must be kept isolated from the environment and human beings.

Ideally, the fission products are separated from the unburnt uranium and the other byproducts (transuranic elements) which include plutonium.

The process of separation (called "fuel reprocessing") is at present not being carried out on an industrial scale for the most common form of fuel (uranium oxide) anywhere in the world. This is because reprocessing plants have proved to be difficult to operate in a technically and economically satisfactory way. The wastes which have been accumulated are now stored temporarily in steel tanks. This method of waste management is inadequate in the long term and has already failed several times (for example —Hanford leaks). The plutonium, once separated, is a suitable fuel for atom bombs as well as being extremely toxic.

In addition to high-level wastes from the reactor fuel, a nuclear power station in operation produces considerable quantities of so-called medium and low-level wastes. These include radioactive gases (released to the atmosphere), radioactively contaminated cooling water (released to rivers or sea) and radioactively contaminated articles such as clothing, tools etc (usually buried or dumped at sea). The reactor becomes radioactive and is a giant pile of radioactive waste once its useful life is over. The decommissioning of a commercial nuclear power reactor has yet to be carried out. Uranium mining and milling also produce radioactive wastes known as "tailings" and constitute a threat to the environment. The Finniss River, downstream from Rum Jungle, NT, was mined for British atom bombs during the 1950s, and is now seriously polluted. The Federal Government is now looking for ways to clean it up. Close to human settlement, US experience now shows that the radioactive radon gas and dust given off are a human health hazard.

How much high-level radioactive waste is produced?

A 100 megawatt reactor (today's typical size) operating for one fuel cycle (about two years) produces as much radioactive materials as one thousand Hiroshima sized atomic bombs. These toxic liquids are about 66 cubic metres (about 1800 cubic feet) in volume. The processes for waste solidification are still being laboratory tested. If they prove successful on a commercial scale, the volume may be reduced to 5 or 6 cubic metres.

What is radioactivity and why is it dangerous?

Radioactivity is the emission or radiation of high energy particles from such materials as uranium, radium, strontium and plutonium. It cannot be detected by the human senses. Such radiation passing through living tissue can destroy or damage cells, causing leukemia and cancers, as well as genetic defects. Leukemia and other cancers generally take 15-30 years after exposure to radiation to show up. Genetic defects show up as abnormalities in subsequent generations. Because of these delays, it is difficult to establish for certain the cause of a cancer or genetic defect.

Are we not already exposed to radiation from natural and man-made sources?

Natural sources of radiation come from naturally occurring deposits of such materials as uranium and radium (plutonium is man-made and does not occur in nature) and from cosmic rays. Medical authorities attest that any radiation (including these natural sources) is harmful in direct proportion to the amount of radiation received. No level of radiation, however low, is considered completely safe.

Man-made sources of radiation include x-rays and other medical techniques administered selectively and only for short exposures. Even x-rays are now no longer routinely administered to pregnant mothers because of the particular danger of radiation to the developing child. Now adding to the natural "background" radiation are the ever-increasing amounts of radiation from fall-out from nuclear explosions (atomic and hydrogen bombs) and waste products from military, commercial and research reactors. All these sources are adding directly to the radioactive contamination of the environment and are a risk to human health.

Hasn't the problem of waste disposal been solved?

Numerous proposals have been put forward. They range from the completely impractical (eg firing waste filled rockets into the sun) through the somewhat plausible (eg buried in the Antarctic ice cap) to the new most favored (solidification and burial in stable geological formations). However, none of the methods proposed has been proved to be feasible or safe for the incredible time spans involved. Again in the words of the Fox Inquiry, "There is at present no generally accepted means by which high-level waste can be permanently isolated from the environment and remaon safe for long periods." A similar conclusion was drawn by the British Royal Commission on Environmental Pollution chaired by Sir Brian Flowers: "There should be no commitment to a large program of nuclear fission power until it has been demonstrated beyond reasonable doubt that a method exists to ensure safe containment of long-lived, highly radioactive waste for the indefinite future." Waste disposal research is still only at the laboratory stage. Wastes are now stored "temporarily" in tanks. This is an unacceptable long-term solution.

Are wastes likely to be stored in Australia?

Several suggestions for the establishment of a reprocessing facility in Australia have been made. It is known that Japan, for one, would like to see reprocessing and waste storage in Australia rather than on her own soil. This could involve the transport and handling of hundreds of thousands of litres of highly radioactive liquids across the seas, through our ports, and over our roads and railways. The West Australian Government held talks about this last year.

Are there real dangers of nuclear theft, sabotage and blackmail?

The possibility is taken very seriously by the Fox Inquiry as well as many other authorities, including the British Royal Commission under Sir Brian Flowers. Theft of nuclear materials has alreayd occurred in the USA and UK and a number of unsuccessful attempts are also

MORATORIUM

STUDENTS

The General Committee of the Australian Student Christian Movement recently resolved:

"We welcome the Government's acknowledgement of the need for safeguards for nuclear materials but we believe that where perfect safeguards are necessary, it is foolhardy to trust them.

"We doubt that the security needs of the nuclear industry are compatible with civil liberties.

"We believe that the energy greeds of this generation are less important than ensuring the health and survival of life on earth.

"We . . . call for the disbanding of the Atomic Energy Commission and the diversion of its funds into research and development of nonviolent and renewable forms of energy."

SCIENTISTS

200 Australian scientists and technologists have declared:

"We believe that the problems associated with the development of nuclear power far outweigh any possible benefits. Therefore, we call on the Australian Government to ban the mining and export of this country's uranium, except for biomedical purposes, and to embark on a comprehensive program of energy conservation and alternative energy development."

AUSTRALIAN CONSERVATION FOUNDATION

"We strongly urge the Australian Government to adopt a policy of exporting uranium for . . . physical and biomedical research only . . . and refusing to export uranium to those countries engaged in researching or manufacturing nuclear weapons or generating power by fission or breeder reactors."

WOMEN

The Women's International League For Peace and Freedom (Q) says:

"The Government decision to mine and export uranium is a short-signted stop-gap measure. It ignores the consequences of mining as well as the reality that renewable energy sources must be fully developed eventually.

"Already the Australian taxpayer has had to fork out over $10 million to prop up the Mary Kathleen uranium mine. But solar energy research in the "Sunshine State" is neglected.

"Public opinion has not yet convinced the political Rip-Van-Winkles. Only the voice of the people opposing uranium mining will eventually stir the politicians from their comfortable stupor."

TEACHERS

Teacher organisation in Victoria and the Northern Territory have both adopted policies in favor of the uranium moratorium.

The Northern Territory teachers will also decline to conduct classes in schools established to serve uranium mining communities.

ANSWERS ON POWER

on record. Several attacks on nuclear installations and facilities have taken place in the USA, France and Argentina. A number of these attacks were accompanied by attempted blackmail. A Commissioner of the U.S.Atomic Energy Commission has stated that the development of a blackmarket in plutonium is likely. Just one kilogram of plutonium has the potential of causing millions of cases of cancer. A few kilograms can be readily fashioned into an atomic bomb. Sabotage of a nuclear power-station or waste storage areas could release enormous amounts of radioactivity.

How can nuclear power stations contribute to the spread of nuclear weapons?

All nuclear reactors produce plutonium, the "explosive" core material for an atomic bomb. Each typical reactor produces about 200 kg of plutonium each year, sufficient for about 20 small atomic bombs. India has already dramatically demonstrated the technique. Using a Canadian supplied "peaceful" power reactor with supposedly stringent safeguards, India produced and exploded an atomic bomb in 1974, thereby becoming the sixth nation known to possess a nuclear weapon capability. Many other countries are certain to follow if nuclear power stations multiply throughout the world. The Fox Inquiry found nine major limitations and weaknesses of the present treaty safeguards. The Report said that "these defects, taken together, are so serious that existing safeguards may provide only an illusion of protection."

Will Australia's uranium mining add significantly to nuclear weapons proliferation?

Australia's uranium deposits account for an estimated 20 per cent of the western world's resources, recoverable at rates presently considered economical. Moreover, they comprise approximately 70 per cent of those reserves not already committed by contract or treaty.

Already economic considerations are slowing the growth of the nuclear power industry world-wide and the withdrawal from the world market of such large reserves must further affect the economic viability of the industry. Conversely, export of our uranium will add impetus to the proliferation of nuclear power stations and consequently to the dangers of nuclear weapons proliferation.

Are safeguards against the misuse of nuclear materials effective?

If Australia mines uranium we can have little control over it after export. We could not effectively regulate the handling or use of its very dangerous byproducts either. The Nuclear Non-proliferation Treaty (NPT) is the major international safeguards arrangement to attempt control of bomb-grade nuclear material.

The First Fox Report (p 147) concluded that, "The main limitations and weaknesses of the present safeguards arrangement can be summarised as follows: the failure of many states to become parties to the NPT; the inability of safeguards to prevent the transfer of nuclear technology from nuclear power production to the acquisition of nuclear weapons competence; the fact that many nuclear facilities are covered by no safeguards; the existence of a number of loopholes in safeguards agreements regarding their application to peaceful nuclear explosions, to materials intended for non-explosive military uses, and to the retransfer of materials to a third state; the absence, in practice, of safeguards for source materials; the practical problems of maintaining effective checks on nuclear inventories; the ease with which states can withdraw from the NPT and from most non-NPT safeguards agreements; deficiencies in accounting and warning procedures; and the absence of reliable sanctions to deter diversion of safeguarded material.

"The Commission recognises that these defects, taken together, are so serious that existing safeguards may provide only an illusion of protection."

Won't the mining and export of Australia's uranium provide thousands of jobs and be of great economic benefit?

The Fox Inquiry found that the Ranger mine would employ up to 600 during the two year construction phase and 250 thereafter. Even a doubling of production to 6000 tonnes of milled uranium oxide (yellowcake) would employ only 400 people.

The inquiry found that the sale of uranium would only add an estimated 0.1 per cent to the national income of 1980-81, rise to 0.5 per cent by 1990-91 and subsequently fall to about 0.2 per cent by the year 2000. If the capital spent on setting up uranium mines were spent in other industries many more jobs and economic benefits would flow to Australians. Moreover, heavy mineral investment is robbing other sectors of the economy of capital and contributing to unemployment there. In other words, we can afford not to mine and export uranium.

What are the dangers from uranium mining?

Uranium mining causes the release of radioactive radon gas which can cause cancer if inhaled into the lungs. This is a possibility in inadequately ventilated mines. Further dangers ensue from the long-term storage of mining and milling wastes (tailings). These are stored in slag heaps and under water behind earth dams. Seepage is inevitable and has already occurred at Mary Kathleen. At times of flood, the waste material can be released into river systems causing a potentially serious problem of radioactive pollution for vegetation, animal and human life downstream. Tailings piles remain dangerously radioactive for tens of thousands of years.

Is nuclear power and associated technology planned for Australia?

No nuclear power production is planned for Australia as far as we know. The planned nuclear power station at Jervis Bay (NSW) was shelved by the McMahon Government in 1972. However, 70 per cent of Australia's energy research budget (some $20 million for 1977) is allocated to nuclear research which would seem to indicate a strong interest by the government in nuclear power or weaponry. Uranium enrichment plants have been proposed for South Australia or Queensland and it is thought that proposals for a complete fuel cycle (enrichment, fuel fabrication, reprocessing and waste storage) have been discussed with Japanese interests by Sir Charles Court, Premier of Western Australia.

Uranium mining would very likely be the first step in further nuclear technology in Australia.

The probabilities of nuclear power reactor accidents are so small as to be insignificant, aren't they?

It is true that theoretical studies have assigned a very low probability to the occurrence of a major accident. Many criticisms have been levelled at the methodology used in these studies. Its predictions underestimated the actual rate of accident in the aerospace industry and has been abandoned. Human error and unforeseen occurrences cannot be

What is a fast breeder reactor?

The fast breeder is a type of reactor now under development. If it works successfully, it will produce slightly more nuclear fuel (in this case, plutonium) than it consumes. (Hence it holds the economic key to nuclear power, since for thermal reactors, fuel will last only another two or three decades.) At present, no breeder of commercial size is operational. All of the small prototype breeders built in the USA, Britain, france and the USSR have suffered serious failures. Only last year the French 250 megawatt Phenix prototype breeder was shut down indefinitely after a massive leak. The breeder could explode like an atomic bomb in the event of a major accident, if the fuel melted. Moreover, the breeder uses liquid sodium as a coolant. This substance is a dangerous chemical which will explode in contact with air or water.

Is nuclear power inevitable?

No. Nuclear power technology is still in many respects unproven and its shortcomings now make it an unacceptable option in many countries. With capital and fuel costs escalating and long construction delays, the economic viability of nuclear power is also much in doubt. Moreover, the increase in demand for electricity has slackened off and in Britain particularly, much generating capacity is standing idle. Fossil fuels will continue to be the predominant means for generating electricity till the end of this century, even in those countries with the most ambitious nuclear programs.

Alternatives to nuclear power and fossil fuels are being rapidly developed and with more adequate research funding progress could be more quickly made. Energy saving will also play a large part in helping avoid the nuclear option. For example, Britain is introducing standards for better building insulation, while Canada and New Zealand are running energy conservation programs. Up to half of all energy produced in the industrialised countries is wasted and it is much cheaper to save a unit of energy than to produce another one.

Why Nuclear Fuel Threatens Civil Liberties

Following are extracts of a talk given gy Geoff Robertson, a former Rhodes Scholar who is Australian born but has been working England for seven years. He is a QC and was council to the British Council of Civil Liberties of which he was an executive member at the Windscale nuclear power station inquiry.

Unfortunately one of the problems of civil liberties around the world is that it can't be confined, can't be seen as purely a fascist state, purely a communist state or Queensland problem. You have to look at civil liberties on a world scale. This is partly because of countries' increasing commitment to nuclear power. One of the aspects of the debate which has not really surfaced in Australia is the consequences of civil liberties once a country goes nuclear. There are civil liberties consequences for Australia even if it doesn't go nuclear, even if it simply does no more than mine uranium.

The debate so far over nuclear power has been shared by people with very expert and very sincere views, nuclear scientists, anthropologists and environmentalists, who have really a sincere point of view, often conflicting. What has a lawyer as I am got to do with a debate which ranges across such cosmic speculation?

Well I think that civil liberties lawyers hold the key, because we are able to look forward and see what the likely scenario is once uranium is put into the nuclear power cycle. If we commit ourselves in any way to the nuclear cycle we may be signing away some of our civil liberties.

This concern is being expressed increasingly by even the most conservative lawyers in Britain and America. It has lead to the international commission of jurists, a group originally funded by the CIA, and by no means a pillar of established protest, being ranked amongst the objecters. at an inquiry as to whether to establish a reprocessing plant at Windscale in England. They were objecting on civil liberties grounds.

Risks

The argument against nuclear commitment based upon the civil liberties angle hangs on three propositions.

1 Any country using and transporting plutonium will have to take precautions against serious terrorist threats.

2 Such precautions will involve substantial erosion of civil liberties of individuals.

3 These precautions will be seen in Australia, even if Australia does no more than mine uranium.

Plutonium, the size of a cricket ball can be incorporated into a terrorist bomb capable of destroying a large city centre. The threat of terrorist access to plutonium is mainly at the reactor stage, or the reprocessing stage of the nuclear cycle during transportation of plutonium waste to disposal areas. What is the risk? Is terrorist activity a credible threat?

Some years ago a 20 year old undergraduate working solely from published materials managed to construct a bomb which according to distinguished scientists would work as soon as plutonium was placed in it.

The Flowers Report, the Royal commission's report into the environment and nuclear power which reported in Britain in October, states that:

"Plutonium offers a unique and terrifying potential for threat and blackmail against society."

The Ranger Report

The Ranger inquiry in Chapter 14 in reference to terrorism states:

"The weight of evidence suggests that a terrorist team could construct a very destructive device from reactor plutonium." Ranger goes on to say that no matter how well guarded a reactor is, given the element of surprise three well armed men would be difficult to thwart.

The nuclear industry takes the view that they can safeguard uranium. This is nonsense. No one can safeguard plutonium. No one can guard against corruption inspired by greed or blackmail within a nuclear power plant.

In 1973 the Director of the Atomic Energy Commission in America was discovered to have a quarter of a million dollars worth of gambling debts—he was immediately sacked.

Twice parts of America have been put on military alert when people have highjacked planes and threatened to crash them into nuclear power stations. In Argentina two years ago, Guerillas actually invaded a nuclear power plant and occupied it for several hours successfully. They painted slogans on the walls then left. Evidence in the States now shows that 1 per cent of plutonium and bomb-grade uranium has gone missing.

Terrorism

Let me quote a news story from the Australian recently.

"The US government admitted that it has no idea what has happened to four tons of closely guarded uranium and plutonium it has used in the past 30 years to make atomic weapons."

Souvenir hunters have already been prosecuted for theft of weapons-grade uranium.

So how can the nuclear industry hope to satisfy us that it can guard against determined political or criminal terrorist attack.

Now we have to consider what the security measures are going to have to be. You can't make plutonium safe, and you can only make it relatively safe by invading civil liberties.

The cost of poor security is hundreds and thousands of people dead or damaged. With that at stake most of us, no matter where we stand on paper would be happy to see the police and security services possess draconian power that in the past they have only possessed in time of war.

In fact in Britain, a special constables act was passed in 1976 which set up a group of 400 armed police officers who were responsible not to the police force but to the British nuclear industry. It has the right of "hot pursuit" which is the right to shoot dead a person suspected of an offence. It is an act that goes right against the English grain of controlling police and not having armed policemen.

The future scenario set out by the Royal Commission for life in the nuclear state concluded that the threats to civil liberties of the nuclear economy were so serious that Britain should not go ahead no matter what the comforts and profits were unless there was no reasonable alternative

Secret Service

An interesting extract from the Flowers Report reads:

"An effective security organisation could not merely be passive, simply reacting to events. It would need to have an active role that is to infiltrate potentially dangerous organisations and monitor the activities of nuclear employees and members of the public and generally carry out clandestine operations. It would need to have powers of search and powers to clear whole areas in an emergency. Such operations might need to be conducted on a scale greatly exceeding what otherwise would be required on grounds of national security in democratic countries."

Monitoring of the employees of nuclear power stations will consist of thorough vetting of the individual and his family and friends before they are employed. But it will go much wider in that scientists who have displayed radical leanings in their university days probably won't get employment. Anyone coming into contact with plutonium, which will involve thousands when you consider the transportation truck drivers, dockworkers, etc, will all have to be vetted. Their union leaders will have to be carefully scrutinised. Strikes will doubtless be outlawed.

The press will not be allowed to report the buildup of plutonium and uranium stocks in any meaningful way for public debate. D Notices and official secrets acts will ensure that doesn't happen.

There is the possibility of police being given general powers of search and an army takeover where there is a suspected terrorist threat.

Informers will be used to infiltrate organisations that are suspected to be potentially dangerous. Often the evidence returned by an informer is tainted with greed, tainted with malice, or tainted with a desire to give his control what he wants.

We are talking about a security service which is impossible to vet. There is no legal remedy for people who have been defamed in dossiers. You can't have legal remedies when the security service is not responsible to anyone in parliament who will answer questions. Time and again when questions have been asked in Parliament the responsible minister says "secret services are secret and therefore I can't answer." So there is no Parliamentary responsibility and there is no legal responsibility.

So if you accept that given the existence of plutonium in a country requires stringent security conrols, what then is the implication for Australia.

Power Junkies

The arguments put forward to pacify the critics by the advocates in the Australian nuclear debate is that we are only mining. The plutonium production happens in other countries which smacks a bit of the morality of the opium poppy grower who knows his product has medicinal value but also knows that most of it will end up as a death inducing substance.

Even if we do no more than mine we still have a potential boomerang affect on our hands with the problem of ownership. The public utilities producing the electricity only want the plutonium for a short time. They just want to lease it and send it back to the reprocessing plant. British Nuclear Fuels have proposed a reprocessing plant at Windscale in England where Australian uranium will be sent. They have already stated that they will insist that ownership not lie with them in any contract they sign with suppliers. So where does it go when it becomes unwanted? Back to the owner. So Australia may find that the daughters of our uranium may one day be ours again and that is a matter of contractual law.

There is an Atomic Energy Act in Australia, a piece of cold war legislation, which was passed in 1953 when Atomic weaponry was being tested, and classifies as "restricted" any information about uranium, the movement of uranium, the production of uranium, persons involved in the movement of uranium, etc.

Now if you are found to give any of this information to a journalist you can be jailed for 20 years and so can the journalist (maximum sentence). And the police are given complete power in the course of policing this act. They may enter, search and sieze without a warrant. They may take a man and torture him to death under this act, and there is no legal recourse because Section 53 of this Act says that no action either civil or criminal can be brought against a police officer who is doing his duty under the search and siezure powers of the Atomic Energy Act.

It ought not be on the books. It has never been used. But now Australia has begun mining and milling, it is theoretical threat to civil liberties.

One must consider the great increase in dossiers and security surveilance which must come about as a result of portest against uranium mining, and because plutonium is so dangerous.

There has been the greatest co-operation between the police forcse of the world in pooling information on organisa- from ASIO on what steps were being taken to monitor potential subversives!

So the public will never have access to information to enable it to debate the uranium question on civil liberties grounds.

tions and individuals regarded as security threats. The London Group is made up of secret police from several Commonwealth countries who meet to exchange information. If you have a dossier on you in Australia there is no guarantee that it will not go to other countries and affect your fortunes overseas.

The crowning irony of it all is when the Ranger inquiry having pushed strongly for maximum public debate, moved into a closed session to consider terrorist threats so it could receive information

Legal action against Uranium Producers Forum Ads.

Two actions against the Uranium Producers Forum for their advertising in their recent public relations blitzkreig have been taken to the Trade Practices Commission.

We've all seen the ads on TV, and read them in all our newspapers. They've been disguised as educational broadsheets and made up to resemble pages of the various newspapers in which they've appeared, especially in the influential National Times and the Financial Review, right down to the typefaces and headline types used. They cost at least $1000 each and are presented to the public as an educational service.

Last December we learned that the Uranium Producers Forum, a conglomerate of uranium mining companies formed to lobby the Federal and State Governments and to convince the Australian public that uranium mining was a good thing, were gearing up for one of the most intense and expensive advertising campaigns ever seen in Australia. Yet the product was something that no Australian would ever be able to buy in the supermarket, or indeed would probably ever see: uranium. The Forum had already hired a top PR firm, International Public Relations, to design the campaign and had commissioned public opinion polls to discover how effective the ads planned would be. The estimated cost of the drive varied from $500,000 to close to one million dollars, with $600,000 being the most common estimate.

Dark Clouds

By early July, then, the AFR's ad writer Valerie Lawson could report that the UPF was claiming that public opinion was in favor of uranium mining, largely through the ad campaign. But there were dark clouds gathering, for, buried away in a footnote to the July 5 article in the AFR was the note that the ACT branch of the Society for Social Responsibility in Science had taken action against the UPF in the Trade Practices Commission. An innocuous enough note, but one which has enormous implications for the UPF and the entire advertising industry.

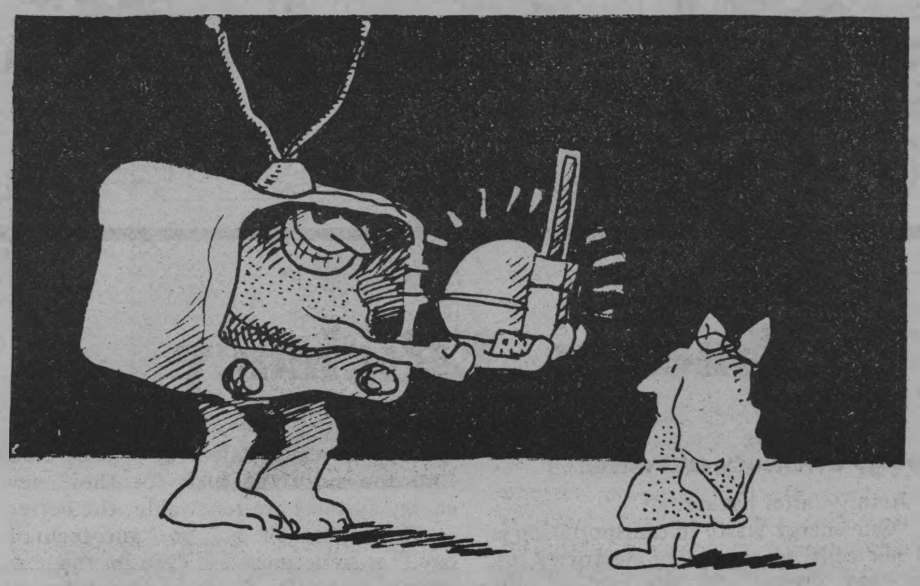
The story remained a sleeper for over a month, until Lawson again writing in the AFR of August 11 reported that the Australian Conservation Foundation had approached the Trade Practices Commission with similar complaints. The story appeared in the Melbourne Age but nowhere else. The next day, I rang the ACT spokesperson for the Society for Social Responsibility in Science, CSIRO scientist Dr Mark Diesendorf.

"Any person selling soap or flyspray can say that their ads are put out as a public service. There's nothing to stop people doing that, but I think that members of the public are somewhat more realistic. They know that people who advertise generally stand to make a lot of money from selling their product. I feel that the Uranium Producers have undermined their own credibility by publishing such grossly misleading information," Dr Diesendorf told me.

The basis of the society's complaint to the TPC was that some of the material in the ads was factually incorrect, other parts of the ads were grossly misleading, and that at least two of the statements were mutually contradictory.

The society picked out four specific statements in the Forum's ads as the basis of their complaint.

"There is a statement which says that, when it's referring to uranium, 'it is an energy rich fuel which does not pollute the atmosphere,." Dr Diesendorf said. "Now, this is an example of an incorrect statement. Uranium, when used for nuclear power, does in fact produce pollutants which are released directly into the atmosphere from normally operating nuclear power plants. Gasses like krypton 85, iodine 131, and argon 41 are radioactive waste gasses which are released directly into the atmosphere from normally operating nuclear power plants. That is an incorrect statement by the producers."



Deaths

"The first statement says that 'in over 2000 years of reactor plant operation, in 19 countries there has not been a single death or injury from nuclear causes. Now, this statement is misleading in its own right, but it's contradicted by another statement which appears in a table which shows a decrease in average lifetime from various causes. Nuclear power plant operation in 1970 gives the decrease in expected lifetime as being less than one minute. For a projection to the year 2000, they give an estimated decrease in lifetime as being less than 30 minutes. If this table were to be consistent with the earlier statement, that there had been no deaths, then there should be a zero decrease in average lifetime."

Dr Diesendorf went on to explain that such statements were misleading in their own right. By saying that the decrease in average lifetime was less than one minute, the UPF are saying that the only risk faced by the public was a minute off one's life. This, he said, was entirely untrue. One of the main risks of radiation is the likelihood of cancer, and if someone gets cancer it may mean years off their life. What the UPF had done, according to Dr Diesendorf, was to pool this figure with the nill decrease in life expectency in the event of no radiation and arrive at the loss of life-time by 2000 at 30 minutes.

That action from the Society for Social Responsibility in Science would have been worrying in itself had it not come with a similar action from the Australian Conservation Foundation. Both actions before the Trade Practices Commission have been downplayed considerably in the press, and the story which interested me on August 11 was buried on page 22 of the AFR for that day. After speaking with Dr Diesendorf in Canberra, I rang Dr Geoff Mosley, the chairperson of the Australian Conservation Foundation in Melbourne. He was interested to learn that the Canberra organisation had similarly contacted the TPC, for my call was the first he'd heard of the Canberra action. What was even more interesting was that the ACF were concerned with four **different** parts of the UPF advertising than the scientists' organisation.

"One of the claims in the advertising is that the spent fuel rods from the reactors will be reprocessed in a particular type of plant. Our information is that there is no such plant in operation in the USA, and the design for that plant is at a standstill," Dr Mosley said.

"There is also a claim that there have been no deaths from nuclear power plants. We have information that there has been a death in the United States. We've also told the TPC that the Australian Atomic Energy Commission has recently accepted responsibility and paid compensation to a widow of a former worker at Lucas Heights who died of Lukemia."

The most important limb of the Prime Minister's case for Uranium mining and export is that there have been found safe places to store transuranic and high-level radioactive waste. Consequently, the UPF ads stressed that there have been found solutions to the waste problem. But the ACF disagreed.

"There's also a claim in the advertisements that radioactive wastes will be stored in salt mines. Scientific opinion is by no means agreed that this can be done satisfactorily and we have pointed out to the TPC that a planned waste depository at Carlsbad in New Mexico, in salt, has not been licensed because of the instability of the salt mine.

"The fourth claim which we think is quite misleading is the claim that Australian uranium will be refined only to the yellowcake stage. This, of course, presupposes a decision by the Commonwealth government which has yet to be announced. It is quite likely that uranium will be exported in the enriched stage."

"The Uranium Producers Forum has pointed out that the ads are presented as a public service. But Mr KcKay, who's the chairman of the Forum pointed out also in a letter to the Melbourne Age that the public has the final protection from misleading and dishonest advertising through the Government Trade Practices Act. And that is the basis on which we've asked the Trade Practices Commission to investigate the matter," Dr Mosley said.

Both organisations had been told by the Trade Practices Commission that the matter was on the thrshold of the jurisdiction of the commission and that a decision would be made on the jurisdiction of the Commission soon. That was early August, and at time of writing, the Commission had not made its decision. But, if the ads are an educational service and not properly advertising, then most advertisers, who regard their work as educational, would probably want to operate under Senator Carrick, the Minister for Education, and not under the Minister for Commerce and Industry, Senator Cotton.

After I called the ACF and the Scientists, I rang the Uranium Producers Forum in Melbourne and Sydney and was told that they would not comment on the action before the TPC.

Inconsistancies

Then there was the launching of an action against them in the Federal Court of Australia.

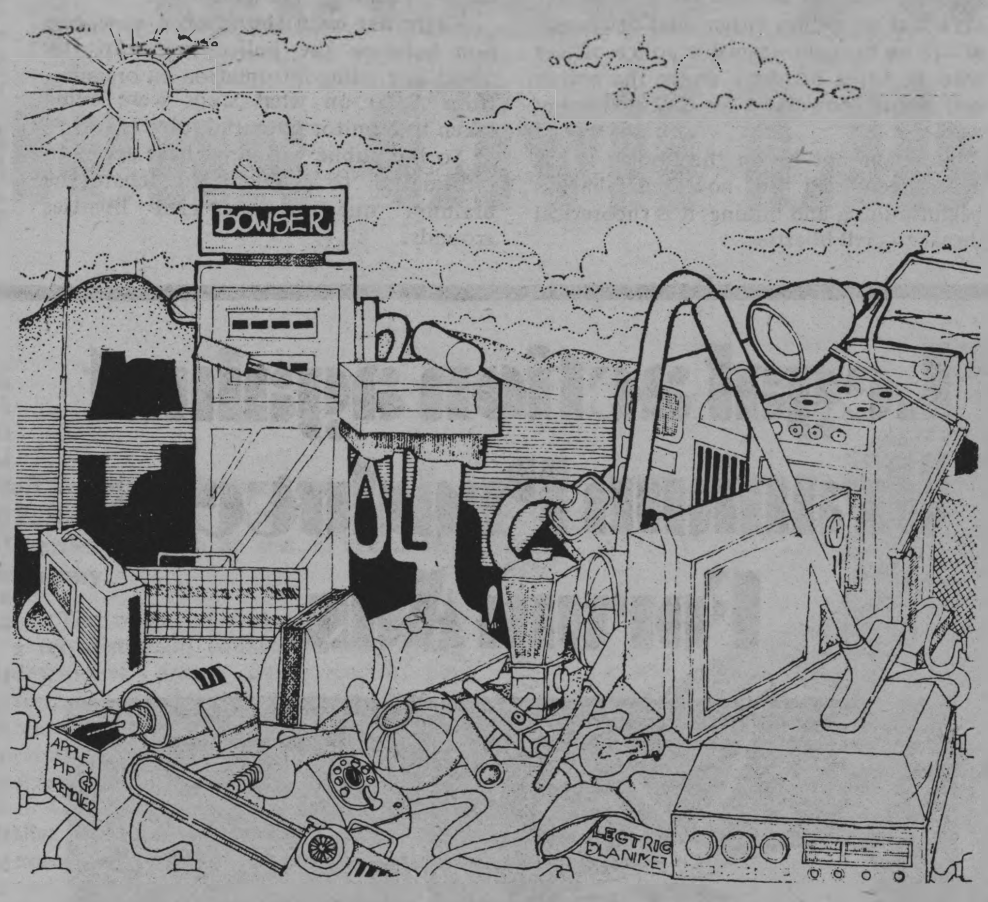
The action was brought on September 26 by Robert Pehlps, the organiser of the Campaign Against Uranium Mining against the Forum seeking an injunction to prevent the Forum from continuing its advertising campaign. He was seeking an order from the court to the Forum asking them to show cause as to why they should not be restrained from continuing the campaign. It was brought under sections 52 and 55 of the Trade Practices Act. The legal situation for this action is complex, and the case, before Mr Justice Franki was adjourned twice for preliminary hearings to decide whether Phelps had locus standi (whether the plaintiff had the appropriate legal standing to bring such an action before the court), and whether the Forum were engaging in trade and commerce under the Act. The legal situation may mean that an individual bringing an action like this may have to show that he has the right to apply for an injunction if he is not directly connected with with the Attorney-General or the Trade Practices Commission.

The hearing proper may not take place until next year, and in the interim, the Forum may relaunch their advertising campaign dependent on the strategy used by the Federal Government to sell the idea of mining to the Australian people. The campaign had been suspended for reasons unconnected with the recent attacks on it by conservation and responsible scientists organisations.

If nothing else is gained by the actions in the courts against the Forum other than experience of using the courts for action against uranium mining, then that experience will be put to good use in future actions. Overseas, the German courts are blocked by anti-nuclear power actions coming from thousands of groups throughout the country. The Americans have had long experience in the courts against nuclear power, and have won some significant victories. Australia is lagging behind the rest of the world in legal action against nuclear power and uranium mining, but if present trends continue, we'll be catching up fast.

Mark D. Hayes

Needs and Wants



Energy Usage

An analysis of the world energy needs leads to the conclusion that there is no need to mine Australian uranium.

World energy use

Energy use in a country like Australia now corresponds to about 6 kilowatts per head continuous. That's equivalent to every man, woman and child continuously driving a mini at 50 mph.

Our whole way of life is dependent on intense use of energy, eg it takes about three times as much energy to wrap, pack and transport a loaf of bread as it does to produce the wheat from which it is made. Our energy use is about 50 times greater per head than that of Third World countries.

The most important abuse of our energy use is the massive scale of the waste. Thirty per cent of the energy we use is lost in the conversion from one form to another. The efficiency with which we use fuel has been getting steadily worse over the last 20 years. eg in the US in 1950 the fuel economy of a car was 13 mpg. Today it is a scarce 8 mpg. The United States wastes more energy than any other nation in the world. US would be able to double its economy in 30 years without increasing the per capita consumption of energy if it became as efficient in its energy usage as Sweden or West Germany are now.

This information has led the American Institute of Architects two years ago that a modest retro-fitting of buildings over the next 20 years would save far more electricity at less investment cost than could be produced by nuclear power.

Use levelling off

The trend has been towards increasing waste of energy up until the 1973 OPEC oil embargo–the price of oil quadrupling overnight. Up till that time world energy use had been doubling every 10-12 years. Since 1973 world energy use has been static. In fact it has dropped a bit since 1973, in fact it's down to about the 1972 level in industrialised countries.

Total energy used in the UK in 1975 was less than it was in 1970. Whether drop in consumption was due to moral qualms or the economic benefits of saving energy (insulation etc) the fact remains that in the UK and subsequently in other industrialised nations energy use has levelled off.

Since the levelling off was mainly due to the increase in the price of oil, and since no one anticipates it will ever decrease in price, we may well be seeing the beginning of a permanent era of stable energy use.

There are serious projections on paper that suggest that energy use is going to continue to double every 10 or 12 years. The potential for expanding people's use of energy in industrialised nations is very limited since 80-90 per cent of people already have their own major energy consuming hardware (washing machines, ovens, etc). There has come a point where people are not using their money to buy superfluous electrical goods (electric toothbrushes etc).

The Third World

Suppose the Third World is going to increase its energy use to something like that of industrialised countries.

There are a number of points against going nuclear to meet this demand.

The scale of nuclear technology is totally inappropriate to the sort of energy or domestic system that exists in a Third World country even if they had the electrical grid to support a nuclear power station and convert to using energy mostly in the form of electricity. The minimum economic size of a commercial reactor system is 500-1000 megawatts–a quarter to half the total generating capacity of Queensland and this is so large compared to the electricity consumption of a typical third world country that it is just not compatible with the sort of system that they have.

The construction and maintenance and operation of nuclear power stations assumes a substructure of very sophisticated technology to produce stainless steel; liquid sodium and control electronic equipment needed to produce and maintain nuclear power systems. It is not at all evident that nuclear power is the answer to the energy problems of the Third World. There are answers (see E.F. Shumaker–intermediate technology) but they must be oriented around the fact that at the moment the scale of technology in the Third World is small. They must be oriented towards the provision of small local sources of energy and not very large centralised systems that would require several times the gross national product of the country simply to build a distribution system to get the energy to where it is wanted.

Energy Efficiency

Energy Efficiency and waste

Jimmy Carter has stated:

"Our energy waste in transportation is 85 per cent; in generating electricity, 65 per cent. Overall, 50 per cent of our energy is wasted."

Energy can be wasted during generation, during transmission and at end use. The process of transforming coal, gas or oil to electricity results in the waste of about two-thirds of the energy in the fuel. Conversion of uranium to electricity is even more wasteful. Using coal to make synthetic fuels involves the waste of about one-third of the coal's energy content.

Energy is wasted when it is sent out over long transmission lines, especially over power lines from nuclear power plants which for danger reasons the government has decided must be located far from large concentrations of people. Energy is wasted when appliances and machines are not built to perform at the best possible efficiency levels. Energy is wasted when heavy automobiles with "high performance" engines guzzle fuel to propel the vehicles a few miles per gallon. And energy is wasted when it is simply allowed to leak–through ceilings, walls, pipes, hot water heaters and industrial processes, due to inadequate insulation and design.

Energy is also wasted when it is not matched in "quality" to the intended task. This occurs, for example, when electricity is used for heating buildings and water, and for cooking. Electricity is a very "high quality" and expensive form of energy, most suited to and most economic for special tasks such as rail transportation and some exacting industrial processes. When water is heated by electricity, for example, it is after water at a power plant has already been boiled by the fuel. This fuel, whether fossil, nuclear or solar, has had to boil water to make steam to turn turbines to generate electricity–and in each stem there is considerable loss of energy. It is quite apparent that there is a wasteful "mismatch" when nuclear fuel is used to achieve a temperature of several thousand degrees in an expensive and complex reactor in order to boil water to create steam–something which occurs at 212 degrees F.

The best approach to energy sufficiency, economic prosperity and jobs is that which combines increasing energy efficiencies with a variety of diverse and safe energy-supplying technologies. Each energy-producing technology should be used to do what it does best, and should be matched in scale and energy quality to the way in which its energy will be used. And the more the fuels for these new energy systems are renewable, the better.

This approach is not "anti-technology," as sometimes is alleged by the large energy interests. In fact, technological innovation will be a key to achieving success with this approach . . . but the technologies involved need to be ones which can be controlled by the American people, not ones so elaborate and complex that people have to be kept far away from them or from decisions concerning them.

And this is not a "no growth" approach, or one which advocates a return to drudge labor. To the energy industry, "growth" has always meant growth in energy production in order to satisfy its own needs, no matter the consequences for the rest of society. But to others, "growth" means a national policy of full employment, improved standards of living, improved job safety and public health, expanded opportunities for leisure activities and the development of rewarding relationships with other people.

Denis Hayes has calculated that for the next quarter century, the United States could meet all its new energy needs "simply by improving the efficiency of existing use."

The American Institute of Architects (AJA) has calculated that by 1990, 12.5 million barrels of petroleum per day (equal to one-third the current national energy use) could be saved just by employing energy-efficient systems in old and new buildings.

An energy study commissioned by the City of Seattle influenced that city not to buy into Oregon's nuclear power plants. The study convinced city officials and Seattle citizens that with appropriate energy efficiency measures, *no new electricity generating capacity would be required for Seattle through 1990.* And the cost per kilowatt hour of electricity would be 1.3 cents *cheaper* without building new energy facilities.

A Dow-Midland study indicated that by using waste industrial steam to generate electricity–as is done in Sweden and West Germany–energy savings equivalent to 680,000 barrels a day of oil could be saved by 1980. By 1985, this "co-generation," as it is called, could replace the equivalent of 50 large nuclear reactors. The Califonria Energy Commission has determined that the potential for co-generation in that State alone could be as much as 140 billion kilowatt hours per year, the equivalent of the total amount of electricity consumed in California in 1975.

Energy Resources

The Australian Academy of Sciences recently published a study of the world's energy resources. The study showed a comparison of energy resources with consumption in 1970.

The known coal reserves provide 100 years of total world use at 1970 rates. The world's known oil reserves are about 20 years of 1970 use. The world's natural gas reserves are just under 20 years of 1970 use. The world's uranium reserves are just under seven years of 1970 use equivalence.

In other words, compared with coal and oil and natural gas, the known reserves of uranium are a quite small energy resource, less than a tenth of the coal.

Indeed you can argue that the coal reserves are likely to be much more. With a hundred years of reserves already known there is very little incentive to go out and look for more coal. But as we've seen there are ample economic incentives to go out and look for uranium, indeed so great that the companies involved are prepared to spend half a million dollars to persuade people that we should mine and export uranium.

In Australia, our coal reserves are equivalent to about 4000 years of total Australian energy use.

There are of course other sources; for example the Academy of Science estimated that solar energy could provide up to 25 per cent of Australia's energy needs by the year 2000.

It is often said when you point out how small the uranium reserves are that the fast breeder reactor will be developed which will be a much more efficient user of uranium and therefore the energy reserves will "spin out" into the distant future.

The Royal Commission on Environmental Pollution in the UK chaired by Sir Brian Flowers (former chief government scientist, part-time member of the board of the UK Atomic Energy Authority) concluded that the fast breeder reactor cannot be a major contributor to a power program until the processes underlying the change of geometry are well understood.

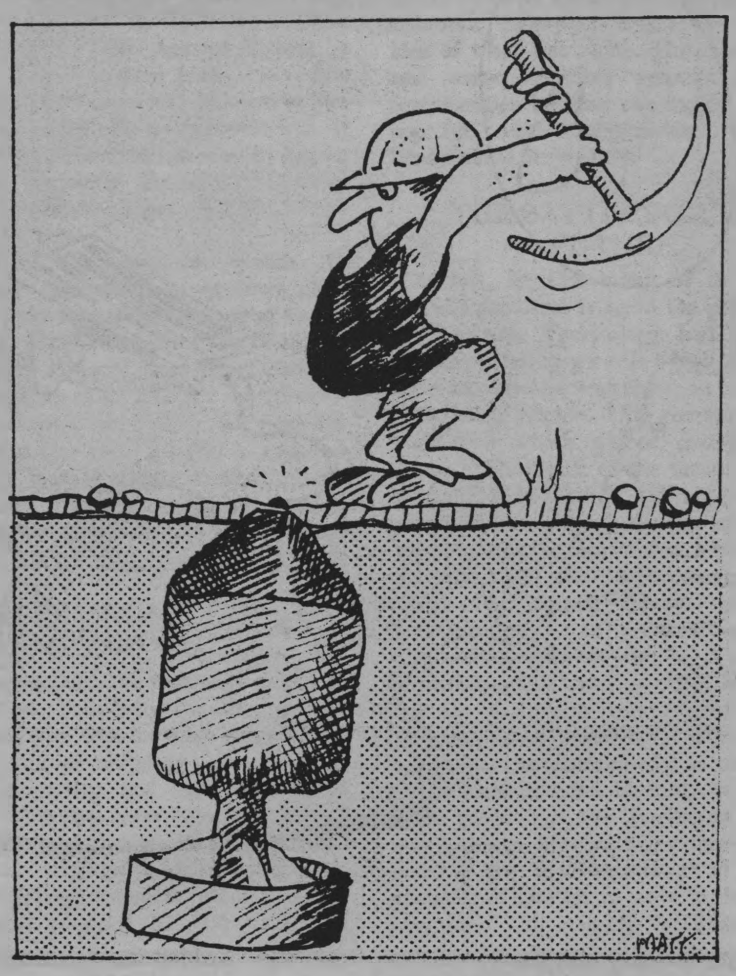
The commission noted that in attempts to build fast breeder reactors there have been two partial meltdowns which luckily were contained. The Flowers report commented that an uncontained meltdown would be incredibly serious in its consequences.

There is an extensive research program in the field, but it is not yet clear whether it will prove possible to design fast breeder reactors as to rule out the possibility of a sudden increase in power that would be so great as to rupture any feasible container.

In other words, the Flowers committee says it is not yet clear whether it is possible, even in principle, let alone in engineering practice, to design a fast breeder reactor that will work. If the proponents of nuclear energy wish to persuade us that uranium is a large energy source, what they need to show is that impartial experts with a background in atomic energy like Sir Brian Flowers, are wrong in their assessment of the probability of breeder reactors coming "on stream."

Jobs and Energy

A move to alternate, decentralized energy systems would boost small business and actually solve the western economic malaise of high unemployment.



Introduction

Corporate energy interests, along with most industrialists and some agencies of the government, are vigorously urging the rapid expansion of energy production. The energy systems they are promoting are large in scale, technologically complex, costly, wasteful, environmentally destructive and dangerous to energy industry employees and the public.

The increased energy efficiency plus solar energy choice can provide sufficient energy for a prosperous economy. In fact, such a solution to the nation's energy problem *actually leads to a more stable economy and to more jobs* than does the large-scale system scenario. It does so with less pollution, less disease, less social disruption, and less interference with community, labor union and individual rights.

Decisions on the nation's economic, energy and employment futures are being made now. Wrong decisions today will be irreversible: if the nation decides to pin its hopes on inefficient, large-scale energy systems, such a vast quantity of resources and money will be consumed and so much havoc will be generated through all levels of society that energy and job options for the future will be choked off.

Energy and the economy

The latest recession is the sixth since World War II. It is the most severe. Total real unemployment is between 8 and 10 per cent. Women, minorities and young people are out of work in even higher percentages. In the last year, incomes of three million additional Americans fell below the "poverty line." Rural poverty has increased. The nation's largest cities have been experiencing severe financial crisis, and have cut back a broad range of vital human services. Industry has been operating at less than full capacity, and inflation has cut deeply into most wage increases of the past decade.

Americans have long been told that ever-increasing energy production was the key to national economic well-being and jobs. It seemed enough to note that as energy production expanded over the years, so did economic growth and total employment. Many in government and industry—in the Energy Research and Development Administration (ERDA), in the Federal Energy Administration (FEA), in Congress, at the Edison Electric Institute, the Atomic Industrial Forum, the oil companies—are therefore advising that unemployment can be ended only by stepping-up energy development to the greatest degree possible, and with the largest systems possible.

Yet, current high unemployment, along with a succession of economic crises, have been taking place *while national energy use has been at an all-time high, and increasing.*

In all, the major energy-producing and energy-using industries consume one third of the nation's energy. Yet they directly provide only about 10 per cent of the nation's jobs.

Energy growth and prosperity: the myth

It is for good reason that the public has been led to believe that energy expansion has been the springboard to economic growth, the "good life," and jobs.

Industry has been able to replace human labor economically with energy purchased at very low rates from an ever-expanding energy industry which has been accumulating ever-increasing profits. The small consumer has been picking up the tab; industries traditionally have paid less than individual consumers for each unit of energy used. In addition, by bearing most of the environmental and disease costs associated with energy, and by permitting substantial government assistance to energy companies, the public has actually been subsidising industrial use of cheap energy to replace human labor.

Solar energy and jobs

"The potential for solar energy seems virtually unlimited. With widespread adoption of solar power, Massachusetts citizens could cut their collective fuel bills by $120 million annually by 1985. Furthermore, solar energy has vast potential for new job opportunities, especially in the plumbing, construction and research and development areas . . . It's safe to say that by 1985 more jobs could be available from solar power (directly and indirectly) than from off-shore oil and new nuclear construction combined."

There would be jobs for sheet metal fabricators, sheet metal installers, asbestos workers, carpenters, plumbers and pipefitters.

The Laborer, a journal of the Laborers International Union (AFL-CIO), found that jobs for its members in the solar energy field "could well mount into the hundreds of thousands." The union has begun a course in San Diego to train laborers in the installation and maintenance of solar and wind systems. Union President Angelo Fosco has said:

"Experts estimate the annual market for installing solar systems and converting existing structures to solar systems has a potential of $77 billion alone . . . not including maintenance. . . . That translates into a goodly number of jobs for construction workers in our jurisdiction."

Energy efficiency and jobs

A Bonneville Power Administration Study has found that:

"High impact conservation programs create more jobs than would be created by building new power plants to generate an equivalent amount of energy."

Amory Lovins has testified to the Senate Select Committee on Small Business that conservation programs which include shifts of investments from energy wasting to social programs create from tens of thousands to nearly a million net jobs per quadrillion BTUs of energy saved.

A preliminary analysis of the FEA provides specific breakdowns of some energy conservation techniques, costs and resulting employment. This report examined the prospects of limited energy efficiency increases in 34,372 private homes. The technical work called for was simply the installation of ceiling insulation and automatic thermostats, and the retrofit or replacement of furnaces.

The analysis concluded:

"By 1985, natural gas supply would be increased because of the saving of 1212 billion cubic feet. This is the equivalent of the gas to be obtained from the major discovery at the Alaskan North Slope. It is also about the equivalent of the output of 39 one-thousand megawatt electrical thermal power plants. Consumers in these 34,372 would save $1.7-$2.3 billion in heating costs.

"The work would cost $7-$10 billion, compared with $17-$20 billion for 39 large fossil fuel power plants; 487,000 jobs over seven years would be created: 122,000 in manufacturing, 366,000 in local installation."

The report also stressed that employment associated with energy conservation techniques is local, low- to moderately-skilled, and concentrated in or near urbanised areas which are experiencing the most acute unemployment problems. In contrast, centralised, expensive energy production complexes usually have to bring in highly-skilled labor from outside the construction area. (These transients create a large amount of disruption: temporary housing and many services must be supplied to meet the problems temporary workers create. In many of the energy "boom towns" of the Western United States, crime, alcoholism, family break-ups are well above average. Serving the needs of transient labor ends up being a drain on the local economies the transients are supposed to be stimulating.

The FEA Project Independence Task Force fount that 3 to 4 million person-years of direct jobs would be needed in solar energy development and operation by 2000. This figure is probably an underestimation, since FEA's 1974 "accelerated" rate of solar development is thought by analysts today to be too conservative. Among other things, it is based on oil selling at $11 per barrel when it is now selling for as high as $16—and going up; also, some of the solar technologies were considered for only certain parts of the county ie the Southwest, which many believe an unnecessary limitation. Dr Jerold Noel, for example, a physicist at Mobil-Tyco solar labs, has stated:

The roof of an average house around Philadelphia could produce enough energy to supply the needs of a home, with enough energy left over, say, to charge an electric car.

The job mix for the various technologies is different. Nuclear energy utilises fewer tradespeople per professional scientist or technician than does solar energy: for nuclear the radio is about 2 to 1; for solar it is 9 to 1. In addition, a broader array of skills are necessary for building and maintaining solar systems than for building and maintaining nuclear plants. And, as an ERDA report stated:

"Solar systems provide much more room for small business and geographically dispersed businesses and workers than do some of the more complex systems."

SOLAR POWER

Poorly funded in Australia

Now that the latest "spate" of publicity of solar energy has dissipated and the promised $10 million injection of funds into Australia's lagging solar energy program, voiced surprisingly by Mr Anthony (April 17) has been well and truly forgotten, it is timely to look at what has been said and done in a critical fashion. What sort of contribution can solar energy ad its renewable non-polluting "natural energy" counterparts make in this forthcoming energy crisis? Is the significant use of these renewable non-polluting energy sources really so far away as to justify the use of nuclear technology as a stopgap measure

Poorly funded

Let us first take a look at the current status of solar energy research in Australia. From being a world leader in this research just over a decade ago Australia now spends less than $2 million on research.

The Australian Research Grants Commission is likely at present to spend a meagre $500,000 in the next three years supporting solar research. Including the $1 million that the NSW government will spend on Messel's project in Sydney we have a grand total of $1.5 million for the next three years.

This compares to over $300 million in the USA, $100 million in Japan and $30 million in foggy france for 1976-77. On the other hand Australia has for 20 years supported—for reasons of national prestige and military preparedness—an Atomic Energy Commission which at a cost of several hundred million dollars is yet to produce a single killawatt of useful power.

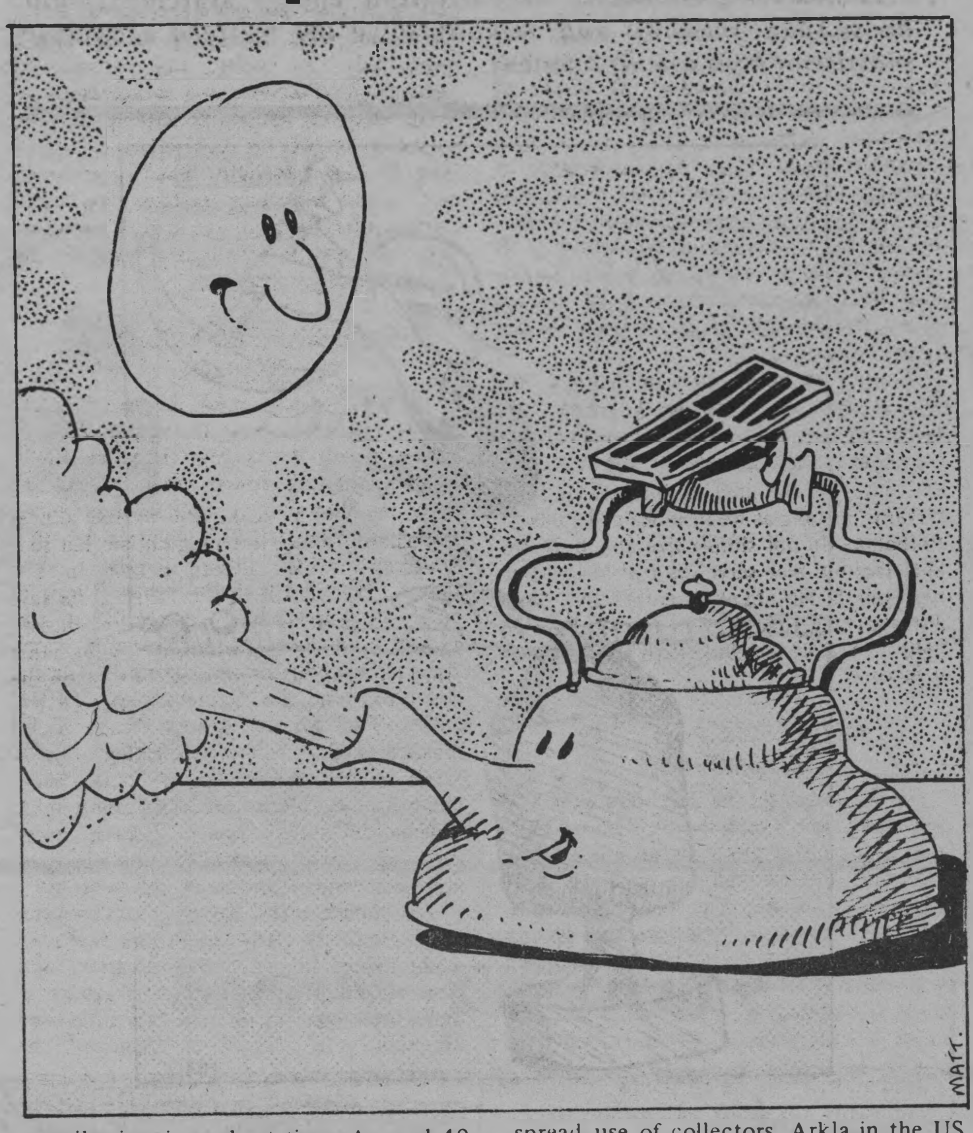
Poorly funded, ill-equiped and understaffed research groups are working on more than 20 separate and completely independent solar energy programs in all six capital cities. Scientists in Melbourne know little of the work being done in Sydney. Indeed members of the research group at the University of Sydney know even less about their Sydney colleagues only a few kilometres away (National Times April 11). Australia is not even a party to the recent Solar Co-operation Pact signed by 13 nations.

The anti-nuclear lobby while rightly condemning export of our uranium naively concentrates its energies on a totally negative way by condemning one source of energy and not actively pushing for the acceptable alternative. Australia will run out of oil in 15 years and will face an import bill of $2500 million a year.

Technology exists now

The technology for a solar energy exists now. We are not waiting for some incredible scientific breakthrough.

A look at the patterns of energy use in Australia shows that solar collectors heat water or provide low temperature heat or steam could make a tremendous



contribution in a short time. Around 40 per cent of the energy we use is of this low grade heat type, for a wide variety of industrial processes and to heat and cool homes and office buildings. In particular the economics of using solar hot water systems in many parts of Australia are acknowledged, eg. a housing and construction department estimate shows that the total cost of using a solar system in Darwin/Alice Springs over 15 years is about half that of using an electric unit for the same time.

In March last year directors of industry leaders BHP, ICI and Phillips wrote to the Federal Government, with their own conclusion that the use of solar heat applications in industry can make a significant contribution within a reasonably short time but only, they stressed, if some incentives are given to those willing and able to develop a production capacity.

The collectors can easily be manufactured using existing technology. All that is really needed is for some "proof of concept" plants to be established to prove their efficiency and marketability

There are solar cooling and heating devices already on the market which would no doubt profit from the widespread use of collectors. Arkla in the US has just released a new solar air conditioner, and the Japanese firm Yazaki markets a solar cooler available in Australia. There are numerous examples of solar heated and cooled homes throughout the world; in fact an experimental solar air-conditioned house is already operating at Moggill Farm, Brisbane, to provide more than enough "proof of concept." Mass production of solar devices should make them almost immediately cost competitive.

Solar electricity

As well as providing energy for heating and cooling the solar source can also produce electricity. This concept has been used throughout the US space program and is even used for Telecom's remote radio receiver stations. The problems are not technological, although breakthroughs are still occurring, but economic and social.

The most common method of producing solar electricity is with photovoltaic cells. Pure silicon is "grown" in laboratories and sliced into paper thin wafers. The cost for a 5kw cell is $4000 enough for an average Australian household. Bearing in mind energy conservation practices that must be developed soon and the fact that much of the demand for electricity is for hot water household heating and cooling which would be supplied by direct solar devices this figure would decrease. The major factor effecting price is of course production scale. The cost must decrease markedly, eg in the case of silocon transistors the cost per unit decreased by a factor of 100 when the volume of production increased by a factor of 1000.

There are also new methods for making cells which will make them cost competitive, eg a West German firm believes that with development of a new polcrystalline silicon cell it is well on the way to achieving $1 per watt. Another promising breakthrough has been the test production of silicon ribbon which theoretically makes solar cells cost competitive now.

Hydrogen provides one of the means of storing solar energy, a problem which uninformed cynics usually use to dismiss the use of solar power. Solar energy can also be stored in batteries, flywheels, or hydrogen fuel cells which have been tested as 75 per cent efficient and would be virtually non polluting.

SMALL IS BEAUTIFUL

Obituary: E.F.Schumacher

E.F. Schumacher, who died early this month, was to have visited Australia later this year, to lecture and speak in much the same way as he visited the U.S. in March. There, lecture halls across the country overflowed and Newsweek ran a three-quarter page story on his visit. Schumacher met with President Carter, but his visit had no impact on the establishment of American capital. "Fritz" Schumacher was a German by birth, and emigrated to England prior to World War Two. There he studied economics at Oxford University, and was interred as an undesirable alien at the onset of war. He worked as a farm labourer, but continued his studies sufficently to impress John Meymard Keynes, then the guru of international economists. Keynes pronounced Schumacher a genius, and quietly expropriated some of his ideas for himself.

APPROPRIATE TECHNOLOGY

The fifties found Schumacher working for the Bristish National Coal Board, an enormous, burgeoning bureaucracy which crystalised in him some of the ideas of size which later propelled his work on smallness. While an advisor to the Burmese and Indian governments, he developed his ideas on appropriate technology, and intermediate technology. Fritz was an intensely practical man. His own life carried the marks of his conclusions on economics to the extent to which he ground his own wheat, made his own bread, and grew his own organic vegetables on his 4 acre farm 20 kilometres outside London. His health was failing in his later years, and his only concession to technology was an electric wheelbarrow, labled as being appropriate technology for a 66 year old man with a bad back.

His published putput was small, but immeasurably influential. In 1973, his first book "Small is Beautiful: A Study of Economics as if people mattered" was published, followed in 1975 by a little pamphlet titled "The Age of Plenty: A Christian View." A third book, "A Guide for the Perplexed" was just finished before he died in Switzerland on September 5. It was published in London last month. But he also wrote regularly for a little known alternative lifestyle magazine from Wales called "Resurgence".

Writing in this paper in March 76, Schumacher said what he believed, "we have been told that we are expected to use our talents, whether they are few or many, and shall be counted 'good and faithful servants' as long as we produce a surplus — so that we do not simply live and work for ourselves but also serve the rest of creation and even the least of our breatheren . . . and also that 'my yoke is easy and my burden light.'" And he conclude "All this I believe to be true."

THE ECONOMICS OF SURVIVAL

For Schumacher, the rich were called to serve the poor. Simplicity was his message, and he presented that message simply also. The absurdity of shipping biscuits from Glasgow to London and from London to Glasgow, so that the trucks passed eachother on the M1, was to him so obvious that it should be clear to all. What was the point of building a cement plant in Delhi which would produce 100,000 tonnes of cement a day, when small plants all over India producing perhaps one tonne a day would be of much more use to the people who used the stuff. The logical follow on from those ideas was to put them into practice.

So he and some collegues formed the Intermediate Technology Group, based in London. From there they helped poorer nations develop appropriate technologies for their local needs. He was not Luddite about technology, but called and worked for technology to become once more responsive to the needs of the people and not to some economic theory or centralised planner's idea of what was right. Thus solar energy and waste recycling systems for small communities became the logical outworkings of what Schumacher called the Economic of Survival.

THE BATTLE FOR THE FUTURE

At bas, he saw many of the Western World's problems lying in the phenomenon of Giantism. Technology had become a self-perpetuating growth which placed the stress on human technique to the almost exclusion of people. This giantism led to a world-view which placed people in tow camps. "The battle of the future," he said in "Small is Beautiful", will be between two groups of innovators whom we might name 'the people of the foreward stampede' on the one side, and the 'homecomers' on the other. The former always talk about breakthroughs — a breakthrough a day keeps the crisis at bay — and those breakthroughs almost invaribly imply more violence to nature and a greater, more constant, more inescapable subjugation of man under the requirements of 'the system'.

The Homecomers, he said, "will require more creativity. Any intelligent fool can make things bigger, more complex, and more violent. It takes a touch of genius — and a lot of courage to move in the opposite direction." In 'Small is Beautiful' he developed the idea of the homecomer to its logical conclusion. "The case for hpe rests on the fact that ordinary people are often able to take a wider view, and a more 'humanistic' view, than is normally being taken be experts. The power of ordinary people who today feel utterly powerless does not lie in starting new forms of action but in placing their sympathy and support with minority groups which have already started."

Critics of Schumacher, like the British Government spokeman who dismissed his ideas ten years ago as being "up the creek" argued that he did not provide detailed plans for the implementation of his ideas.

Schumacher said, in typical rye fashion, that he didn't bother his head about it." He had faith in the vitality of the people to strive for smallness and appropriateness for themselves to meet their own needs in their own situation. That faith has made his ideas some of the most powerfully subversive in out time. That President Carter has taken him seriously enough to want to meet him is some indication of the interest felt at high government level. Govenor Gerry Brown of California, a long time fan of his, has established an Office of Appropriate Technology in the most profligate, affluent state of the Union. His visit created enormous interest in his ideas, as people searching for guidance out of the emptiness of consumerism and the world of bigger, better, brighter, looked to him for a way. But he is no guru.

At the Conference for Appropriate Technology held in the Bali Beach Hotel in August this year, he came over as being arrogant. In the midst of the airconditioned and plastic splendor, surrounded by the South-East Asian technocrats who has come to hear him, all he could think of was his children and his organic vegetables in London so far away. Just a month later he was dead, taken by a heart attack on a Swiss train.

MARK HAYES

what you can do

1. **Join a group** organised to fight uranium mining and related issues.

POSSIBLE SUGGESTIONS

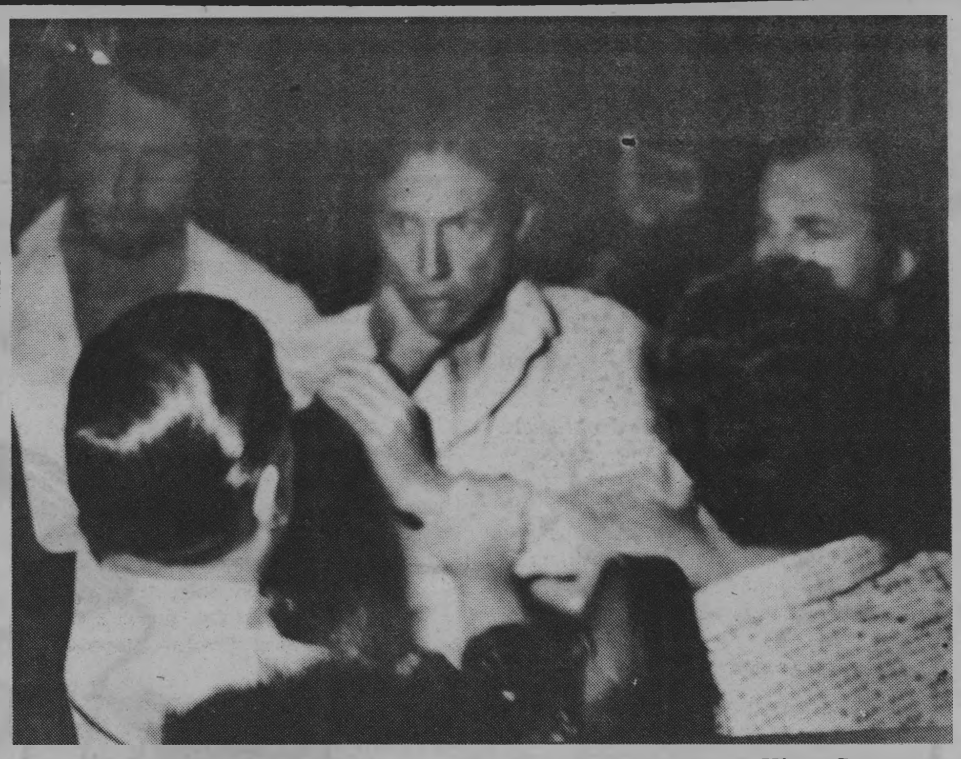
- Friends of the Earth
  235 Boundary St.,
  West End. Ph. 44 1766
- C.A.N.P. (Toowoomba)
  C/o Hans Schwabe
  MS 224
  Withcott via Helidon
- C.A.N.P. (Gold Coast)
  Penambler Court,
  Benowa
  Gold Coast
  P.O. Box 5115
  Townsville. Ph. 71 6226
- C.A.N.P.
  147 Ann St.,
  Brisbane Ph. 221 0188
- C.A.N.P. (Rockhampton)
  Sean Mitchell
  P.O. Box 795
  Rockhampton
- C.A.N.P. (Sunshine Coast)
  P.O. Box 104
  Maroochydore. 4558

  C/o Debbie Otto
  5 Schuman Lane
  Gympie. 4570.

There are also a series of groups — at least 60 who give their support to a uranium moratorium. It's often more effective to join an existing group because you have a network of contacts already built-up — and more plans can be carried out — with extra person power. This does not negate other suggestions.

2. • **Ring and harass** your local member of parliament.
- **Try to get articles** on the issue in your local paper, and write letters to the editors of the main newspapers.
- **Set up displays** for the local library. A good suggestion for this is to do it on big cardboard boxes — so they can easily be taken places.
- **Encourage** the local library to buy good books on nuclear power and energy issues.
  WORLD ENERGY STRATEGIS
  by Amory Lovins
  RED LIGHT FOR YELLOWCAKE
  by Falk, Barrett, Hayes.
  NUCLEAR POWER
  by Walter Patterson
  GIVE ME WATER
  by residents of Hiroshima
  NUCLEAR ENERGY
  by Ralph Nader
- **Try and get** a discussion group going at your work place or school.
- **Support** Union uranium bans — write to the Anti-Uranium Lobby.
  Trades Hall, Upper Edward St.,
  Brisbane.
- **Read** the Fox Report on uranium mining — find out what the media didn't mention.
- **Tell** others about the danger of uranium — its social, political, environmental effects — sell stickers — obtainable from F.O.E. or C.A.N.P.
- **Explain** to people about the implications of working for major uranium mining Co's. C.R.A. and Mary Kathleen are the main ones.
- **Leaks:** If you hear of any information that may be regarded as at all useful by the anti-uranium campaigners — especially incriminating information — spread it around. Let F.O.E. know about it.
- Write songs, leaflets, slogans, posters. DO STREET THEATRE. Some of these types of actions will probably get lost in the pipeline, some won't; the more joy you get from an action the more effective it's likely to be!

3. **CAMP CONCERN [Darwin] and THE ATOM FREE EMBASSY [Lucas Heights, Sydney]** are tow groups of people who have set up residental protest at strategic places — to bring attention to the uranium issue. They also keep the proponents of uranium under surveillance$



Conflict between special branch police and demonstater at King George Square on October 12th 1977

Those people who want uranium mining to go ahead at any cost, the government and the uranium companies, also want to prevent the expression of public opinion that October 22 stands for.

The Queensland premier has attacked uranium protesters. He has refused the normal democratic right ot hold rallies and marches. He has used parliamentary privilege to launch personal attacks on people who have even dared to apply for a march permit.

The Australian Prime Minister has openly stated that dossiers are being compiled on opponents of uranium mining. He has called on the state police to give information to the Commonwealth police on demonstrators.

The Australian Government wants to use the Atomic Energy Act to control any opposition to uranium exploitation. Under this Act, heavy fines and prison sentences will apply to any workers refusing to handle uranium, and to any people who criticise uranium mining. This act is a step towards a police state.

say NO to a nuclear world

NATIONAL MOBILISATION

OCTOBER 22

RALLY, MARCH

10 am

KING GEORGE SQUARE

Atom Plants Spread...

... Fallout

Edited by **Mark Wolff** Published by Planet Press
188 Barry Pde., Valley. Phone 52 7828

Printed by Warick Daily News Special artwork by Matt Mawson More than assisted by Gerard Lee, John Jiggens, Mark Hayes, Nick Lindsley, David Brier, Bob Phelps Learning Exchange, C.A.N.P.