

# Radioactive Times



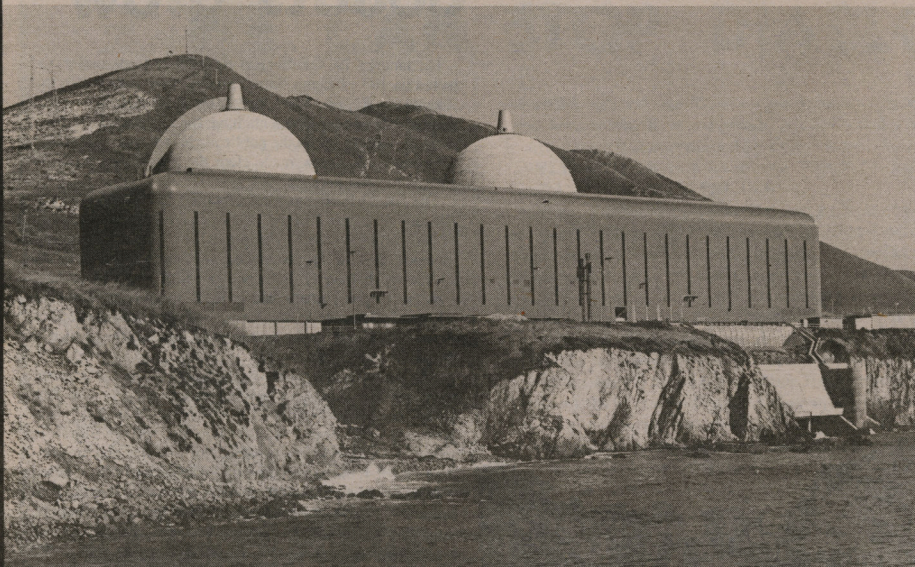
## A NUCLEAR PLANT ON AN EARTHQUAKE FAULT?

**PG&E is making the mistake of our lives.**

**Inside: What they don't tell you about Diablo**



# THE DIABLO CANYON NUCLEAR PLANT



The Diablo Canyon Nuclear Power Plant in San Luis Obispo, California. For 10 years, PG&E ignored warnings of earthquake dangers at the site. It has now been shown that a major active fault—the probable source of a severe 1927 earthquake—lies less than three miles from the plant.

Along a beautiful stretch of coastline 12 miles southwest of San Luis Obispo sits the Pacific Gas & Electric Company's Diablo Canyon nuclear power plant. All that stands in the way of the plant's operation is the lack of a license, which the Nuclear Regulatory Commission is expected to grant this summer. Although the NRC's licensing board has never in its history denied permission to operate a nuclear plant, the Diablo Canyon case is unique because of its location. Diablo is just two and a half miles from a major active earthquake fault, and the plant was designed without taking it into account. "If they can license this one," says one local resident, "then they can license anything."

The site was selected by PG&E, the nation's second largest private utility, in the fall of 1966. Two reactors, totaling 2212 megawatts, were to be finished in the mid-70's at a cost of \$350 million. To date, the utility has spent \$1.4 billion—and when the switch is thrown, much of that price tag will be charged to ratepayers.

What happened to cause a "cost overrun" of more than a billion dollars? PG&E ran into many of the same problems that have plagued the nuclear industry everywhere. Faulty welds and defective electrical cables were discovered, and citizens in the San Luis Obispo area raised such issues as the lack of evacuation plans and general plant security. But PG&E made its big mistake right at the beginning. In the first licensing hearings on Diablo Canyon in 1967, the utility confidently claimed that the nearest important earthquake fault was the San Andreas, 48 miles away. They ignored the warnings of California Polytechnic Institute geologist Ralph Vrana about the possibility of a fault zone just off the coast from the Diablo Canyon site. (For his troubles, Mr. Vrana found himself without a job.) (continued to page seven)

## WHY NOT NUCLEAR ?

## WHAT IS NUCLEAR POWER?

### PG&E : A HISTORY OF CARELESSNESS

In its attempts to promote nuclear power in California, PG&E has consistently disregarded public safety and common sense.

The only commercial nuclear reactor PG&E has operated is the small plant at Humboldt Bay. From the time the plant started up in August 1963 through June 1971, it was forced to shut down 35 times due to malfunctions. It earned the reputation of being the "dirtiest" reactor in the country. An employee at the Humboldt plant, Robert Rowan, was fired by PG&E after he formally complained to the Atomic Energy Commission about continued violations of radiation release standards. In one incident, Rowan discovered that radiation dosimeters near the elementary school just south of the plant were registering contamination levels higher than the instruments could accurately measure.

Active earthquake faults were found near the Humboldt plant about ten years after it opened. Further studies resulted in an NRC order to permanently close the plant. PG&E, however, still wants to reopen it.

In fact, since the late 50's PG&E has tried several times to site nuclear plants near major earthquake faults. Beginning in 1958, the utility tried to build a nuclear plant on Bodega Head, about 50 miles north of San Francisco. A six-year battle ensued before PG&E gave up. Even the Atomic Energy Commission expressed doubts about the earthquake safety of this site, only a *thousand feet* from the San Andreas fault which caused the devastating 1906 San Francisco earthquake. PG&E experts strongly defended the Bodega Head site as being located on solid granite, but a subsequent geological boring showed it to consist of 60 feet of silt, clay and sand. U.S. Geological Survey geologists actually found a "zone of weakness" at the bottom of the plant's excavation site that could undergo movement. At this finding, one highly regarded PG&E consultant became so emotionally involved in the future of the plant that he said he would "make it work if I have to put the thing on ball-bearings."

Almost exactly the same events took place again at Point Arena, 100 miles north of San Francisco. After a furious battle centered on the earthquake issue, PG&E decided in 1972 to abandon plans to site a nuclear reactor there. They had initially pooh-poohed the potential hazard of the nearby faults.

Diablo Canyon is not a mere accident, an isolated but costly oversight. It is the fourth step in an unbroken record of similar conduct by this utility.

### SOME REASONS

A national energy policy relying on nuclear power is an economic catastrophe, providing few jobs and increasing inflation. Investment in nuclear power uses money that could better be spent to develop safe energy sources.

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Nuclear power plants present the continuous possibility of a major accident in which many people could die and billions of dollars of damage could occur. An earthquake could cause such an accident.

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Nuclear power production unavoidably releases low-level radiation into the environment, increasing both cancer and the chance of genetic damage and birth defects.

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Nuclear power makes it possible for terrorists to threaten our lives by stealing radioactive materials or sabotaging nuclear plants. Tightening controls to prevent terrorism threatens our civil liberties.

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Nuclear power is unnecessary. Our energy needs for the future can be met through conservation and other energy sources, such as solar. These alternatives are much less harmful to our society and the environment.

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By adopting nuclear power we are making decisions whose unhappy consequences will be borne by our descendants for generations.

The heart of a nuclear power plant is the reactor core, where uranium fuel pellets in thousands of long, thin metal tubes are surrounded by water. As uranium atoms split apart, they release energy which boils the water. The resulting stream runs a turbine generator to make electricity.

In this process, huge amounts of intensely radioactive waste products are produced. A large nuclear reactor may contain several tons of this waste—as much radioactivity as all the fallout from 1000 atomic bombs of the size dropped on Hiroshima.

If a pipe carrying water to the reactor core breaks, emergency cooling systems must begin to work quickly and flawlessly to keep the core from overheating. Should these systems fail, the core would melt and massive amounts of radiation would be released as tons of white-hot fuel burned their way through the bottom of the reactor building. This accident has become known as the "China Syndrome."

The consequences of such a "meltdown" accident would be horrifying. According to a government study released in 1973, 45,000 people could die, 100,000 more could be injured, and an area the size of Pennsylvania could be contaminated by the meltdown of a reactor *smaller* than those now being built. Cancers would begin to show up fifteen or twenty years later, and genetic damage would become apparent in future generations. Eventually, the death toll could reach to hundreds of thousands. A meltdown could be caused by any number of events, ranging from earthquakes to design mistakes to deliberate sabotage. In 1957, the nuclear industry, fearing bankruptcy by lawsuits which would follow an accident, demanded—and got—the Price-Anderson Act. The Act exempted nuclear companies from normal liability laws, and has been quietly renewed twice since its passage. Corporations like PG&E continue to hide behind this financial shield while assuring the public of the safety of nuclear power.

## THE ABALONE ALLIANCE

The Abalone Alliance formed in the spring of 1977 out of the recognition that the Nuclear Regulatory Commission advocates the interests of the nuclear industry and not those of the public. The Alliance consists of concerned citizens from throughout California who joined together to oppose the Diablo Canyon nuclear power plant. We believe that decisions about vital questions like energy policy should be open to everyone, not just the "experts" and bureaucrats, who have their own interests to serve.

Through public education and nonviolent direct action, we are working:

1. To stop construction and operation of all nuclear plants in California
2. To promote the realistic alternatives of safe, clean, and renewable sources of energy
3. To encourage responsible community control of energy production and use
4. To support efforts to eliminate nuclear weapons
5. To build a more loving and responsible world for ourselves, our children, and future generations of all living things on this planet.



# SAFETY: official doubts grow

## Atomized Society

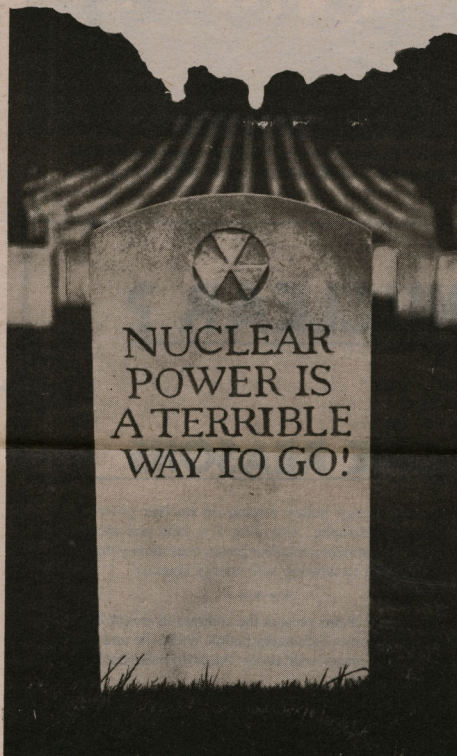
Nuclear technology poses serious threats to the democratic process. The enormity of nuclear projects assures the centralized planning and organization of nuclear power. Moreover, only central governments or large corporations can afford the huge financial investment required by nuclear technology. Such a situation consolidates the power of governments and corporations over our energy future.

The same few multinational corporations that control our oil, gas, and coal resources also dominate the nuclear industry. Atlantic Richfield, Gulf Oil, Getty Oil, and Kerr-McGee are among the top seven U.S. holders of uranium ore. These seven companies alone control 70% of America's uranium deposits. Two giant electrical companies—General Electric and Westinghouse—produce 70% of American nuclear reactors. This pattern is repeated throughout the nuclear industry.

Corporate political influence has made the government an advocate, rather than a regulator, of nuclear power. Most of the Nuclear Regulatory Commission (NRC) staff have had previous jobs in the nuclear industry, and return to the industry after leaving the NRC. This cozy "revolving door" relationship makes it difficult for NRC staffers to decide against their likely future employers. For example, William Anders, NRC Chairman from 1975-1976, is now general manager of nuclear energy projects for General Electric.

Nuclear power is also a serious threat to our civil liberties. Because of the extremely dangerous nature of nuclear materials, the government and private corporations routinely pry into the lives and beliefs of their employees for security reasons. They have a ready-made excuse to fire (or not hire) people whose views disagree with theirs. The "security" issue also "justifies" infiltration of groups of nuclear opponents on the grounds that they might be "terrorists." In one case, the Texas State Police, at the urging of the FBI sent a dossier to Continental Airlines on one of their pilots, Robert Pomeroy, because he openly opposed a nuclear plant near Dallas. Fortunately, airline officials were disgusted by the police conduct and turned the file over to Pomeroy. Undercover police have also participated in anti-nuclear demonstrations. Two of the 47 people arrested for peacefully occupying the Diablo Canyon power plant in August 1977, turned out to be undercover sheriff's deputies.

Unfortunately, it is easy to make atomic bombs with stolen nuclear materials. Several college students have designed bombs so well that their plans were classified by the government and they were forbidden to talk about them. If an incident of nuclear terrorism does occur we may have to choose between a permanent police state and the occasional destruction of a city. Such a choice will become vastly more likely if we allow the nuclear industry to proceed with its plans to ship large amounts of plutonium throughout the country. No energy source is worth the political price that nuclear power demands.



On January 19, the Nuclear Regulatory Commission rejected its 1975 Reactor Safety Study, commonly called the Rasmussen Report. Rep. Morris Udall (D-Arizona), commented "Nuclear proponents have for years used the Rasmussen study to assure the public nuclear power is safe. The Commission has now made clear the Rasmussen report is useless for that purpose."

The NRC's hand was forced by the September 1978 conclusions of its own Review Group, chaired by Harold Lewis of UC Santa Barbara. The group found poor calculation methods, and missing or inadequate treatment of accidents caused by human error, sabotage, fires, or earthquakes. Finally, the group noted that the Report summary "does not adequately indicate the full extent of the consequences of reactor accidents" and "has therefore lent itself to misuse in the discussion of reactor risk."

The Rasmussen Report was the last of a series of government reports concerning nuclear reactor safety. The first study, known as WASH-740, was released in 1957, and predicted 3400 deaths, 43,000 injuries, and \$7 billion in property damage as consequences of a major reactor accident. In 1964, the Atomic Energy Commission (AEC) started a revision of WASH-740, in hopes it would predict less horrendous accident consequences than the original report. Exactly the opposite happened, however and the revised report was suppressed until its forced release in 1973 under the Freedom of Information Act.

As the nuclear power controversy continued to heat up in the early '70s, the AEC became more and more desperate for an official "scientific" document supporting the safety of nuclear power. This time, AEC was taking no chances. In March 1972, the AEC Chairman James Schlesinger appointed MIT professor Norman Rasmussen to head the study.

Rasmussen was hardly the "neutral professor" on nuclear safety issues. He had worked as a consultant to three nuclear engineering firms, had consulted for Reddy Communications (a public relations firm for nuclear utilities), and was an original Director of Americans for Energy Independence, a pro-nuclear lobbying group set up and funded by Westinghouse.

Predictably, the investigators were less than aggressive in focussing on industry problems. One internal memo listed the "disadvantages" of including a comprehensive review of Quality Assurance (Q-A) at nuclear plants as "the facts may not support our predetermined conclusions" and "the more stages of Q-A covered, the more deficiencies and non-conformities will be shown to have been found. This may undermine public confidence in the reliability of plant safety systems, particularly as the nature of repairs and corrections becomes known." In many cases, problems were "solved" simply by omitting them from consideration in the report.

Since the report's release, studies by the Union of Concerned Scientists, the American Physical Society, the Lewis review committee, and other groups have pointed out its numerous errors and unsupported assumptions. The NRC could no longer defend what was so obviously an attempted whitewash of the nuclear safety issue.

## Who Pays?

In the early 1960's, nuclear power was widely seen as a source of electricity "too cheap to meter." But unsolved technical problems and the formation of an OPEC-like uranium cartel have led to soaring construction and fuel costs. Most of these costs are now rising at a much faster rate than inflation.

Since nuclear plants are clearly the most expensive way to generate electricity, and are getting more expensive all the time, it is reasonable to ask why they are still being built. The answer seems to be that the people who profit from nuclear power do not have to pay the costs.

### CUSTOMERS PAY

The cost of building a nuclear plant has risen astronomically. In 1964, construction costs were about \$100 per kilowatt of generating capacity, as compared to over \$1000 today. Diablo Canyon, which was to cost \$350 million, has so far cost over \$1.7 billion. The two reactors being built at San Onofre, near Los Angeles, were originally planned to cost \$820 million. They are now estimated at \$2.5 billion by their completion in the early '80's.

Present laws allow California utilities nearly 10% return on every dollar they invest. Therefore, the more they spend, the more profit they make—and the more we pay.

Since 1971, nuclear fuel costs have risen from \$6 to \$57 per pound. According to a lawsuit filed by Westinghouse in 1976, uranium supply is now controlled by an international cartel. The even higher fuel prices in the future will be passed directly on to electricity customers.

Unexpectedly frequent nuclear plant shutdowns for repairs and maintenance also increase the cost of electricity. The Federal Government originally predicted that nuclear power plants would produce 80% of their full capacity; in reality, they typically deliver only 50-60%.

As a result of this unreliability, plant construction costs are spread over fewer kilowatt hours, so each one costs more. Also, utilities have to pay for back-up sources of electricity when the nuclear plant closes down and this gets passed on to consumers.

Finally, it appears that customers will be asked to pay for plants ruined by nuclear accidents. The owners of the Three Mile Island reactor have requested rate increases to pay for the Harrisburg plant.

### TAXPAYERS PAY

Since the mid-1950's, the federal government has spent over \$20 billion in public funds for nuclear research and development.

In addition, the government has spent more than \$5.5 billion in taxes to subsidize the enrichment of uranium... the nuclear industry's only source of fuel. During 1979 the federal government will spend approximately \$2.85 billion to develop nuclear power. This is approximately five times the amount they will spend to develop safe, clean energy sources such as solar and biomass.

No one has officially said who will pay the huge costs of decommissioning nuclear plants and storing their wastes. But if the past pattern continues, these costly problems will become public property.

### NUCLEAR ACCIDENT VICTIMS PAY

Under Federal law, victims of a major nuclear power plant accident will have to pay for most of the damage themselves. The Price-Anderson Act of 1957 limits the responsibility of utilities to \$560 million, although a government study estimated that a major accident could result in \$17 billion of damage.

### WORKING PEOPLE PAY

For every job created by investment in nuclear three jobs would be created by a similar investment in the solar and energy conservation industries. There is a limited amount of money available for investment. It takes an investment of approximately \$102,000 per year to create one job in the nuclear industry, as compared to \$33,000 per year to create one job in the solar industry.

### REACTOR MAKERS, BANKS PROFIT

The companies that make reactors, of course, don't care who pays the bill. Neither do the banks who loan money for nuclear construction. For example, \$500 million of the Diablo Canyon price tag is interest PG&E owes to banks such as Wells Fargo and Citycorp. These banks are among the top ten stockholders in PG&E, and thus profit from stock dividends as well as from the loans.



# WE CAN STOP DIABLO CANYON

After long and careful consideration, the Abalone Alliance is calling for people across the nation to join in blockading the Diablo Canyon Nuclear Power Plant. The nonviolent blockade will take place if and when the plant is licensed for operation by the Nuclear Regulatory Commission.

Diablo Canyon is a test case for the atomic industry, a national symbol of the struggle between nuclear power and human life. Diablo is only two and a half miles away from the Hosgri fault, which is capable of an earthquake ten times stronger than the plant was designed to withstand. Such a quake could trigger a major nuclear accident, which could kill thousands of people. An accident could also permanently reduce America's food supply by contaminating a large area of fertile central California with radioactivity.

The operation of Diablo Canyon would encourage still more nuclear construction—but if the \$1.4 billion plant is prevented from operating, new investment in domestic nuclear power would almost certainly be halted. The NRC's own internal memos show a reluctance to deny Diablo an operating license "because of the large financial loss involved and the severe impact such action would have on the nuclear industry." Because of rising public opposition, the nuclear industry is in trouble. Harrisburg has awakened the nation. At Diablo Canyon we have the opportunity to stop nuclear power in its tracks.

For 10 years concerned people have worked to stop the Diablo plant through legislative action, public education, demonstrations, and legal intervention in the licensing hearings. These efforts have delayed Diablo's licensing and greatly increased public awareness of its dangers, but at every turn vital concerns about public health and safety have been overruled by the wealth and influence of

powerful corporations. These corporations and the federal government have suppressed the facts and arrogantly ignored grassroots public opposition. THE ESTABLISHED CHANNELS HAVE BEEN CLOSED AND LOCKED FROM THE INSIDE.

We are continuing to oppose the plant by legal means, including a suit against PG&E and an extensive program of public education. We are also urging Governor Brown to intervene to prevent Diablo's operation. However, we must now prepare to blockade the plant if it is licensed. We are setting up an alert system to contact people through their local groups when the plant is licensed. We expect the license will be granted sometime this summer.

The blockade is not merely symbolic, but is intended to prevent PG&E from loading the reactor's fuel core and to obstruct the operation of the plant. All plant entrances will be blockaded, and some people may choose to land by boat at the plant site. Others may place themselves in front of the plant's water intakes to prevent its operation.

A nonviolent occupation by 26,000 people stopped construction of a nuclear plant in Wyl, Germany. As at Wyl, we have the power to make the Government and PG&E decide never to operate Diablo Canyon.

Participants in this action must have nonviolence training. Trainings are now underway throughout the state. For further information, mail the coupon to

Abalone Alliance  
DIABLO PROJECT OFFICE  
452 Higuera Street  
San Luis Obispo, CA 93401  
(805) 543-6614

## Nonviolence Is Our Strength JOIN THE BLOCKADE

☐ I would like to join the blockade. Please inform me of nonviolence trainings in my area.

☐ Please send more information on the blockade.

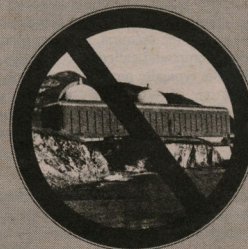
☐ I cannot join the blockade, but would like to help provide support services for those who can.

name

address

city

zip



## HARRISBURG: A Warning?

In the predawn hours of March 28, 1979, a feedwater pump failed at the Three Mile Island nuclear power plant near Harrisburg, Pennsylvania. What followed were a series of equipment malfunctions and operator mistakes that would bring the issue of nuclear power to the front pages of newspapers around the world.

The Nuclear Regulatory Commission and the public were not immediately informed of the accident. Even the plant workers were not told, and some played Frisbee on the front lawn as radiation leaked from the plant. By the third day of the crisis, there was still so much confusion that a frustrated NRC Chairperson Joseph Hendrie revealed, "we are operating almost totally in the blind. His (Pa. Governor Thornburgh's) information is ambiguous, mine is non-existent and—I don't know—it's like a couple of blind men staggering around making decisions."

Since there were no radiation monitoring devices set up in the community surrounding the plant, people's exposures in the first 24 hours of the accident are not known.

Radiological physicist Dr. Ernest Sternglass reports that the accident may have exposed about a million people to up to 130 times more radiation than has been reported. He estimates that 300 to 2500 people could develop lung cancer in the next 10 to 20 years as a result.

Dr. John Gofman, a former director of the Lawrence Livermore Laboratory, commented, "They've goofed the whole job of getting the data of what the doses are and that makes it almost impossible to speculate on what the long range effects are going to be... the whole country is being made guinea pigs for the nuclear experiment."

Official statements were, as always, reassuring. Comparisons were made between Three Mile Island releases and exposure to dental x-rays. But a dental x-ray is confined to a few inches of relatively insensitive area for a few seconds. Releases from TMI will enter people's bodies and expose them internally for long periods of time.

Nevertheless, we were relatively lucky. The feared "meltdown" was averted—this time. But this was not the first nuclear accident, and unless we act, it will not be the last.

## Why Nonviolence?

Nonviolence has been an effective force for social change in America. Nonviolent philosophy and tactics have been used, for example, in civil rights struggles, in building unions and in winning women the right to vote.

Nonviolence has emerged as the chosen method of energy activists. In the past several years, it has been a major contributing factor in the success and growth of the anti-nuclear movement. Nonviolent direct action has been tried after other legal channels were exhausted. Energy activists have learned through experience that government regulatory agencies actively side with the utilities and nuclear business interests. These agencies will only change their pro-nuclear stance when there is massive, organized public opposition.



People, including people in the nuclear industry, do make mistakes. Mechanical parts fail. Inspectors miss some defects. Safety systems are not designed or built perfectly. And so long as these things are true, nuclear technology will pose a constant threat of catastrophe.

Our choice of energy sources must allow human error and imperfect machines. The consequence of a mistake at a nuclear plant could be the death of tens of thousands of people over many generations. The consequences of a mistake in installing a solar collector are a cold shower.

### The Dynamics of Nonviolent Action

The conventional view of power is that it is something some people have and others don't. Power comes from soldiers, authority, ownership of wealth, and institutions. The nonviolent theory of power is different: rather than seeing power as something owned, it argues that power exists in the relationships between people. Power depends on continuing obedience. When people refuse to obey rulers, the rulers' power begins to crumble.

Nonviolent action is a way for people to experience power individually and in groups. It is a means of waging conflict, rather than giving in to injustice. It requires a willingness to take risks and bear suffering.

Nonviolent action takes three main forms: 1) protest and persuasion, 2) noncooperation, and 3) intervention.

The first category includes activities such as speeches, picketing, petitions, vigils, street theater, marches, rallies, and teach-ins. When views expressed are unpopular or controversial, or go against government policy, even these mild methods can have a powerful impact.

The second category involves active noncooperation. In the face of institutional injustice, people may refuse to act in ways which are considered "normal"—to work, buy, or obey. Possible actions in this category include refusal to pay taxes, withholding rent or utility payments, civil disobedience, draft resistance, fasting and many different kinds of boycotts and strikes. Noncooperation can effectively halt the normal functioning of society, depending on the type of action employed and how widespread its use becomes.

Finally, there is nonviolent intervention, the active insertion and disruptive presence of people in the usual activities of social institutions. This can include sit-ins, occupations, obstructions of "business as usual" in offices, the streets, or elsewhere, and the creation of new social and economic institutions. These methods tend to pose a more direct and immediate challenge than those described earlier and bring either a quicker success or sharper repression.

A well-planned nonviolent action allows opportunities for opponents and neutral parties to shift their attitudes, but can generate political strength regardless of the opponents' response.



# THE LEAKY NUCLEAR FUEL CYCLE



## Uranium Mines & Mills

All currently operating nuclear power plants are fueled with uranium, which in the United States is mined largely in Colorado and nearby states. The ore is removed by underground or strip mining, crushed to a fine powder and chemically treated to extract the uranium. The end product of the mill is a uranium compound called "yellowcake."

Since a ton of ore typically produces only four pounds of uranium, a huge pile of radioactive "tailings" in powder form are produced each uranium mine. Over 100 million tons of these tailings are already piled up around the country.

Because uranium ore contains several radioactive elements, miners constantly breathe radioactive gases and dusts and many develop lung cancer years later. 39 out of 100 miners who worked at one now-abandoned New Mexico uranium mine are believed to have lung cancer; 18 have already died from it. This hazard remains in the tailings after the uranium is extracted, so now the entire population is at risk as tailings pollute streams and rivers and are blown around by the wind. Dr. Walter Jordan, retired assistant director of the Government's Oak Ridge National Laboratory, stated that in this and future generations, hundreds of cancer deaths and birth defects caused by genetic damage may result from the radioactivity in the tailings left from mining fuel for a single reactor for one year.

In the Animas River downstream from an Atomic Energy Commission-licensed uranium mill near Durango, Colorado, radioactive radium from the mill was present at 500 times the natural level. Damage to river life due to radioactivity could be traced 50 miles downstream by 1958. Drinking water in towns along the river frequently contained radioactivity exceeding federal limits (which many scientists consider far too permissive.) The mill was eventually forced to reduce its discharges, but tailing piles continue to be eroded by wind and water.

Since there is no money to be made in reducing the hazards from tailings, many corporations have simply abandoned exhausted mines and left the problem to the government. On October 16, the *San Francisco Chronicle* reported Senate approval of a program to control radiation from uranium mill wastes—at a cost to the taxpayers of \$180 million.

The price of uranium is controlled by an international producers' cartel similar to OPEC, according to a lawsuit filed by Westinghouse in 1976. In the five years from 1972 to 1977, uranium yellowcake prices skyrocketed from \$8 to \$40 a pound.



The process for making nuclear weapons is the same as described above, except that bomb parts are produced instead of reactor fuel. In fact, the entire nuclear power industry was started by military contractors looking for new markets for nuclear weapons technologies.



## Enrichment

Natural uranium contains a mix of two isotopes (or weights) of uranium, U-235 and U-238. In nature, less than 1% of the uranium is U-235, and this proportion must be increased to 3% for the uranium to be useful as fuel in current American nuclear plants. To do this, the "yellowcake" from the uranium mine is chemically converted to a gas, and the gas is run through an expensive, huge and elaborate enrichment plant. The enriched gas is then turned back into solid form for use as reactor fuel.

Enrichment plant workers and people living near the plants constantly breathe and eat radioactive materials. Enrichment plants consume enormous amounts of electrical power which would otherwise be available to consumers.

When uranium is enriched, about 2 ounces of every ton processed is directly released into the environment. Health studies of women in counties bordering the Oak Ridge (Tenn.) enrichment plant have been carried out. These studies, covering the years 1950-1969, show that these women suffer from leukemia and lung cancer at four times the normal rates.

To date, several tons of uranium are unaccounted for at the nation's enrichment plants. Where did it go? No one knows for sure.

Because of the huge investment required and because they are unprofitable, enrichment plants are all government-owned. New plants, if needed for an expanding nuclear power program, will also be paid for by taxpayers—another case where our money subsidizes the profits of the nuclear industry.

*Once a bright hope shared by all mankind, including myself, the rash proliferation of atomic-power plants has become one of the ugliest clouds overhanging America.*

—David Lilienthal  
(First chairman of the AEC)



## Fuel Fabrication

After enrichment, the uranium is usually converted into small cylindrical pellets, which are stacked inside long metal tubes to form "fuel rods" for nuclear reactors. Plutonium, an extremely poisonous element which is a by-product of reactor operation, can also be reused as reactor fuel.

Low-level radiation is a hazard for people who work in or live near fuel fabrication facilities. Plants which handle plutonium are especially dangerous, since inhaling a microscopic particle of plutonium weighing less than one-millionth of an ounce greatly increases your chances of getting lung cancer. Despite the danger, plutonium has often been treated in a shockingly careless way.

Starting in 1970, Kerr-McGee Corporation operated a plutonium fuel fabrication plant near Crescent, Oklahoma. In the six years of the plant's operation, 200 workers were contaminated internally with plutonium and the company consistently ignored federal safety regulations, according to plant manager James Smith. "It was production first and to hell with the rest," Smith recalls. "The whole place was one big leak. Every time you turned around, there was another leak." When the plant was closed down, 60 pounds of plutonium were missing—enough to make at least five atomic bombs. No one has yet figured out where the deadly material went.

Kerr McGee's plant was funded by \$10 million in tax money in order to produce fuel for an experimental "breeder" reactor—a design which is even more dangerous than commercial reactors now being built. At both previous American breeder reactors, near disasters occurred. In November 1955, the core of Idaho's EBR-I melted and was destroyed. A portion of the Enrico Fermi plant's core melted in October 1966, endangering the city of Detroit. The government is ignoring these warnings, and is building an even larger experimental breeder plant, which will cost hundreds of millions of tax dollars—money which could be spent developing cheaper and much safer energy sources.

*On February 2, 1976, we simultaneously resigned our management positions from the General Electric Company.*

*We did so because we could no longer justify devoting our life energies to the continued development and expansion of nuclear fission power—a system we believe to be so dangerous that it now threatens the very existence of life on this planet.*

*We could no longer rationalize away the fact that our daily labor would result in a radioactive legacy for our children and grandchildren for hundreds of thousands of years. We could no longer resolve our continued participation in an industry which will depend upon the production of vast amounts of plutonium, a material known to cause cancer and produce genetic effects, and which facilitates the continued proliferation of atomic weapons throughout the world.*

—Engineers Dale G. Bridenbaugh, Richard C. Hubbard, and Gregory C. Minor  
testifying before the Joint Committee on Atomic Energy, February 18, 1976

## Transportation

Between stages of the fuel cycle, nuclear fuel must travel long distances by train, truck, or ship. In 1975, 328 nuclear transport containers have released radioactivity. These accidents have been on the rise.

So far, all spent nuclear fuel has been stored at the plant. When this fuel begins to decay, it releases radiation that could take thousands of years to dissipate.



# CLE: MONEY IN, RADIATION OUT



**Reactor**

Completed fuel rods are loaded into the reactor at a nuclear power plant. Under the conditions in the reactor, uranium atoms in the fuel split apart, producing heat and radioactive wastes. The heat is used to produce steam which runs turbine-generators to make electricity. However, only  $\frac{1}{3}$  of the heat is converted to electricity. The other  $\frac{2}{3}$ —nearly 5 billion watts in the case of Diablo Canyon—is dumped into the ocean, damaging local marine life. Two million gallons of sea water must be sucked through the plant each minute to get rid of this tremendous waste heat.

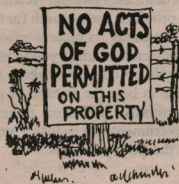
Some of the reactors' radioactive waste products are continually released into the air and water around the plant, and are absorbed into the cells of plants, animals and people. The remainder of the wastes remain inside the reactor unless an accident occurs.

In addition to routine "low level" radiation releases, major catastrophic nuclear plant accidents are possible. By conservative government figures, such an accident could permanently contaminate thousands of square miles with radioactivity. People and other living things within this contaminated area would be killed or injured. Such an accident at Diablo Canyon, for example, could hopelessly contaminate much of California's fertile Central Valley and seriously cut America's food supply. And an accident of this kind could happen at Diablo even without an earthquake.

On March 22, 1975, workmen at the Brown's Ferry nuclear plant in Alabama were using a candle flame to check for air leaks around a foam rubber seal. The foam rubber caught fire and the resulting blaze burned for six hours. As the fire burned through electrical cables controlling the plant's operation, control of all safety systems for one of the reactors was lost. Reactor cooling was maintained only by the use of pumps not designed for this purpose which happened to still be operational. A catastrophic "meltdown" was averted, according to one plant engineer, "by sheer luck."

The Brown's Ferry fire cost over \$100 million, counting repair costs, requiring, and the cost of buying power from other utilities while the plant was closed for repair. These costs, of course, are paid by customers.

Even without accidents, the costs of nuclear plants are astronomically higher than was predicted by their promoters. Diablo Canyon, for example, was to cost \$350 million and be finished by 1973. Instead, \$1.4 billion has been spent so far. If the plant is allowed to operate, we will pay for PG&E's billion-dollar goof.



## Transportation

Fuel cycle, radioactive materials by truck and rail. In the past five years, transportation accidents have occurred, spilling radioactive materials into the environment. 87% of the accidents occurred on public highways.

Radioactive fuel has remained at the generating plants. In the past five years, accidents will be responsible for thousands of lives through poisoning.



**Reprocessing**

As waste products build up in a nuclear reactor's fuel, they begin to decrease its usefulness. After about a year, part of the reactor's fuel is removed by remote control and stored in a nearby cooling pool so that some of the radioactivity can decay.

At present, the fuel cycle ends here. No one has figured out how to economically and practically separate the large amounts of unused uranium, or the newly made plutonium, from the intensely radioactive spent fuel. For years, spent fuel has been piling up at reactors across the country, a situation the industry humorously refers to as "nuclear constipation."

The only commercial reprocessing attempt to date ended in total failure. But reprocessing is essential to the nuclear industry's future plans, since they plan to use recovered plutonium to stretch limited uranium supplies. If they have their way, in twenty years several hundred tons of plutonium will be processed and moved around the United States annually. Diablo Canyon alone will produce about a ton a year. Less than one millionth of an ounce of plutonium will cause lung cancer if inhaled, and a softball-sized lump is enough to make an atomic bomb.

Reprocessing is probably the "dirtiest" part of the fuel cycle, unavoidably releasing radioactive gases and liquids outside the plant.

The intense radioactivity inside the plant makes equipment repair almost impossible. It is so expensive that reprocessing may cost more than the value of the recovered fuel. General Electric abandoned a \$64 million plant in Illinois before it ever operated, conceding that the proposed process was unworkable. In October, 1976, the *Wall Street Journal* reported that the corporation which owned an almost completed North Carolina plant were hoping that the government would take it over.

From 1966 to 1972, Nuclear Fuel Service, Inc., owned by Getty Oil, ran the country's only commercial plant at West Valley, New York. Although small, the facility was an ecological disaster. Radioactive waste dumped into open lagoons and ran off into streams; the bodies of fish, deer and other animals in the area contained large amounts of Strontium-90 and other radioactive substances. Air samples showed detectable levels of plutonium and tritium from the plant. Average radiation exposures to plant workers were the highest in the industry. The plant was permanently closed in 1972.

When the West Valley plant closed, the state of New York was stuck with the costs of cleaning up. It appealed to the federal government for help, and in February of 1979, you and I became the proud owners of 600,000 gallons of radioactive wastes—which will cost us an estimated \$1.1 billion to get rid of.

"I am increasingly worried that the current blossoming of the nuclear power industry will be an irreversible calamity for the human race. Particularly scary is the thought that we shall senselessly march into wide-scale employment of breeder produced plutonium, the most dangerous atom man has yet tried to assimilate into his industrial life. Only the tiniest of traces of plutonium are needed to induce cancer and if its use becomes widespread, the possibility must be faced, of awful incidents, either accidental or deliberate, that will cause wide regions of our earth to become forever uninhabitable."

—James D. Watson, Harvard professor and Laureate in Biology



**Fuel Storage**

The deadly byproducts of nuclear reactor operation are presently stored at nuclear plants all over the country. No permanent means of disposal has been found. As reprocessing is not now taking place, these wastes are still in reactor fuel assemblies, sitting in cooling pools, waiting.

And waiting. After thirty years of research, a solution to the problem is no closer than before. The problem, actually, cannot be "solved", because there can be no way of knowing that the wastes have been permanently isolated from the biosphere. We can afford no mistakes, uncertainties, or sabotage with materials that must be kept isolated for hundreds of thousands of years. Do we have the right to endanger our children, and their children, by creating ever more of these wastes?

Once radioactive forms of elements are created, they cannot practically be "unmade." Instead we must wait. The time required for each radioactive element to become stable depends upon the element, and can range from fractions of a second to billions of years. The longer-lived materials are produced in vast quantities in nuclear power plants, and will continue to be produced until we insist that nuclear power facilities, and the whole nuclear fuel cycle, are shut down.

In the 50's, waste disposal was a simple matter: stick the stuff in barrels, sail out the the Farallone Islands, (a few miles north of San Francisco Bay), and dump them overboard. These barrels are now leaking. We are told not to worry.

High level wastes are not treated much more carefully. At West Valley, New York; Hanford, Washington; Rocky Flats, Colorado, and other sites throughout the country, very toxic materials have escaped into the air and water through tank leaks, operator errors, or simple lack of concern. A disposal trench at Hanford became so contaminated with plutonium that officials feared that an atomic mud volcano would erupt, spewing plutonium into the air. The trench has been dug up and the dirt reprocessed.

Waste disposal costs are unknown. Estimates range from millions to billions. There is no question, however, who will pay. An interesting calculation: One security guard @ \$15,000/yr., times 250,000 years = \$3.75 billion.

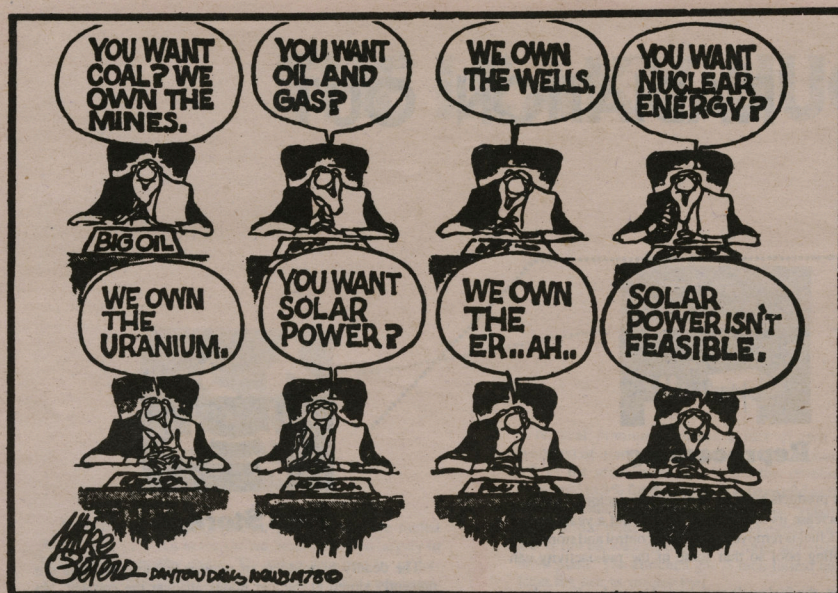
**CAN ONE**  
GENERATION  
BIND ANOTHER  
AND ALL OTHERS  
IN SUCCESSION  
forever?

I THINK NOT.  
the creator  
made the earth  
FOR THE LIVING

NOT THE DEAD.

—THOMAS  
JEFFERSON  
1781





## ALTERNATIVES TO NUKES

The energy corporations do their best to convince us we don't have any energy choices. They paint a dismal picture of cold houses and mass unemployment unless we let them build nuclear or coal generating plants. In reality, however, there are many sources of energy they rarely tell us about, which are more reliable, safer, and cheaper than nuclear or coal plants. These energy sources include conservation, cogeneration, solar, wind, and biomass conversion.

ENERGY CONSERVATION is our best "source" of energy. Energy conservation does not mean shivering in the dark. It means a common-sense approach to reducing energy waste by such simple measures as better insulation and more efficient appliances and machines. These measures are not difficult technically; in the 1940's, the Jacobs Electric Company made a home freezer which used one-fifth of the energy of the average freezer today. It is not difficult to see why General Electric and Westinghouse, which make both nuclear plants and home freezers, might not be too interested in energy-efficient design.

Because of the inefficiency of electrical generation, every unit of electricity saved conserves three units of fuel for other uses.

CO-GENERATION, a form of energy conservation, is the process by which the waste heat from industries is converted into electricity or rechanneled for direct space heating. In many cases there is excess electricity that could be sold back to the power company. A study by Dow Chemical reports that by 1985, U.S. industry could meet half its electrical needs by cogeneration.

THE AMOUNT OF SOLAR ENERGY that reaches the United States in twelve hours is equal to the nation's yearly energy consumption. Solar heating and cooling involves the use of collectors which absorb the sun's energy. This method of heating buildings and water is not new. In fact, it has been employed in this and other countries for many years. Over 2 million solar collectors are operating today in Japan.

Solar cells are devices that convert sunlight directly into electricity. In the past, these devices have been expensive because mass production techniques were not fully developed. Very encouraging progress has been made over the last decade: prices have dropped from \$100/watt in 1970 to under \$10 watt today. It now appears that they will sell for under 50¢/watt by the mid-80's.—much lower than the cost of a nuclear plant.

BIOMASS CONVERSION involves the changing of organic matter into useful fuels, or directly into heat. The various biomass techniques include utilizing urban and industrial wastes, agricultural and forest residues, along with farming on land or in the ocean.

About 80% of the total annual municipal waste is combustible and could be used to generate energy equivalent to more than half the 1970 oil imports from the Middle East.

Harvest and bioconversion of ocean kelp into methane gas would generate 23 trillion cubic feet of gas per year. (This is equal to the current national annual gas demand.) Land plantations could generate 8-11 trillion cubic feet of gas per year. As with all renewable energy sources, biomass conversion has a minimal impact on the environment.

Solar energy has many advantages over nuclear or fossil fuels: it's safe, reliable, simple, and doesn't harm people or the environment. New developments in solar heating have also made it economically competitive with other means of heating.

Because of some simple innovations and architectural savvy, we can now heat our homes and buildings simply and cheaply with "passive solar systems" such as attached south-facing greenhouses, sunrooms, and the like. Many of these passive systems have some kind of heat storage, such as a concrete wall which absorbs sunlight during the day and releases the heat at night. In summer, the wall can cool off at night and keep temperatures down during the day.

An exciting possibility which has barely been explored is the economy of scale involved in an entire community cooperatively "going solar" with large-scale purchase of solar heating equipment, neighborhood-scale solar hot water storage, or even a community-owned solar utility. These possibilities are being explored today in Davis, San Bernardino and Berkeley.

In San Bernardino, the Westside Development Corporation, a self-help group of low-income people, has designed, built and installed a neighborhood solar heating system which is so reliable that they removed their back-up gas heater. Westside's reason for choosing solar was simple—they couldn't afford their gas bills.

Converting existing buildings to solar heat is currently more expensive. Unlike our monthly PG&E bills, a solar heating system requires a lot of money up front. Most solar hot water heaters, which include solar panels, a tank to store the hot water, and circulation equipment, cost about \$1000 to \$2000. A system which would also provide space heat would run somewhat more. However, a study by the U.S. Department of Commerce recently showed that solar systems pay for themselves in electric bill savings in twelve of the thirteen cities they examined across the country. The even better news is that the State of California permits a state tax credit of up to 55% of the cost of a solar heating system, making solar equipment a very sensible investment in the face of five to fifteen percent escalation of gas, oil, and electricity costs each year.

### MORE JOBS FROM SOLAR

Assuming solar heating systems are practical for individuals, is the solar industry beneficial to California's economy as a whole? Will we lose construction jobs by replacing nuclear and fossil fuel power plants with solar panels?

The staff of the California Energy Commission noted in a recent report entitled "Solar Energy In California: Residential Thermal Applications" that "... for every trillion BTUs used by consumers each year solar energy provides 25 to 50 more permanent jobs than oil, coal, or nuclear power." The California Public Policy Center reported in their study *Jobs From The Sun* that 376,000 jobs could be created by a program to "solarize" California by 1990. These jobs originate from the small-scale, practical nature of solar heating technology which requires mostly skills at the trades' level such as plumbing, carpentry, and metal-working. The high-technology nuclear industry needs a far greater percentage of highly trained specialists.

## Radiation and Health

The Nuclear Regulatory Commission tells us that nuclear facilities will release only tiny amounts of radioactive materials to the environment. We are assured that these releases are so small and will cause so little harm that they pose an acceptable risk in view of the electricity we will get in return. Not that *no* harm will result, mind you, because all parties apparently agree with Dr. Karl Morgan, recognized as the "father of health physics," that "... an overwhelming amount of data has been accumulated that show there is no safe level of exposure, and there is no dose of radiation so low that the risk of cancer is zero."

Geneticists believe that a constant stream of background radiation from natural sources such as cosmic rays causes some of the present-day cancers and genetic disorders. But human-made radiation is increasing, especially from medical X-rays and nuclear sources, such as the five metric tons of plutonium now dispersed over the entire earth from above-ground weapons testing. And cancer continues to increase faster than other causes of death in the U.S.

Pediatrician Helen Caldicott says, "By virtue of the nature of the biological damage done by radiation, it takes only one radioactive atom, one cell, and one gene to initiate the cancer or mutation cycle. Any exposure at all therefore constitutes a serious gamble with the mechanisms of life." Dr. Caldicott points out that any human-made radiation adds to the background level, increasing the risk.

Because their body cells are growing and dividing rapidly, it is the unborn, babies and young children who are most sensitive to the effects of radiation. British doctor Alice Stewart found that a single X-ray to the abdomen of a pregnant woman increases her child's risk of leukemia by 40%. A study in the February 22 *New England Journal of Medicine* found that children born in southern Utah during bomb testing in the early 50's had 2½ times the normal rates of leukemia. The government has always maintained that the "low level" fallout in the area was harmless.

Adults are also affected by radiation. An 18-month government study has confirmed that twice as many leukemia cases as expected have developed in ex-GIs exposed to low-level radiation while participating in a 1957 nuclear weapons test nicknamed Smoky. In Utah and Arizona, more than 100 individual court cases have been filed by people suffering leukemia which they say was caused by fallout from the Nevada nuclear tests. A 1977 investigation by Boston blood specialist Thomas Najarian found that workers at the Portsmouth, N.H. Naval Shipyard who deal with nuclear projects are dying of leukemia at a rate four to six times higher than workers in non-nuclear projects.

Dr. Thomas Mancuso published the most exhaustive of all low-level radiation studies in 1977. Mancuso found that nuclear workers in Hanford, Washington were exposed to enough radiation in 7½ years on the job to double their chance of getting cancer.

Mancuso also found that the average victim of cancer at Hanford was exposed to a radiation level much smaller than that which is allowed around nuclear facilities. This means that nearby communities may be receiving five times the amount of radiation that has been demonstrated to be one of the causes of industrial cancer.

These and other studies led Dr. Edward Radford to testify that present exposure limits appear to be ten times too high. Dr. Radford chairs the National Academy of Sciences committee which provided the research for the present standards. But the NRC, as usual, is more worried about the effects of tighter standards on the industry than about the effects of the present standards on nuclear workers and the public.

We continue to bear the burden of proving that the government's permissive radiation policy is dangerous and deadly, as government and industry are under no obligation to prove that the policy is safe.

*First priority in any long-range energy policy must go to conservation, to reducing the demand side of the energy equation by eliminating wasteful practices and improving the efficiency with which energy is produced, delivered and employed. Study after study has shown conservation of existing energy resources to be the most effective and readily available "new source" of supply to meet urgent needs.*

—The New York Times



# Safe Energy Groups

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DIABLO PROJECT OFFICE: 452 Higuera St., San Luis Obispo, CA 93401, 805-543-6614

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MOTHERS FOR PEACE  
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San Luis Obispo, CA 93401

MOUNTAIN PEOPLE FOR NUCLEAR  
FREE LIFE  
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Felton, CA 95018

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Ventura, CA 93003  
805-643-2317



## Diablo

cont'd. from p. 1

In 1970, citizen intervenors asked that a thorough study of the area be done before construction of the plant proceeded. PG&E and the regulatory agencies turned down the request, and the work went ahead.

By 1973, the presence of a large active offshore fault—just two and a half miles from the Diablo site—was confirmed by the United States Geological Survey (USGS). It turned out that the Hosgri fault had actually been discovered back in 1969 by two Shell Oil geologists who had been surveying off the coast in a search for oil deposits. PG&E claims that it learned of the fault in a magazine article.

Independent geologists such as Dr. Clarence Hall of UCLA, as well as the USGS, found that the Hosgri fault is linked to the San Andreas and that it is capable of a 7.5 Richter scale quake—ten times the force Diablo was designed to withstand. San Luis Obispo again asked that construction be halted until a full investigation was done, and again the request was turned down. At this point, PG&E could have done its own study of the Hosgri fault at a cost of about \$100,000. Instead, the company spent \$400,000 promoting nuclear power through advertisements in 1974.

The battle over the nuclear plant on an earthquake fault is still raging. The performances of PG&E and the regulatory agencies make it clear that the controversy is something more than a scientific squabble. According to a 1976 NRC memo made public by the *Los Angeles Times*, the NRC was reluctant to deny an operating license for Diablo "because of the large financial loss involved and the severe impact such action would have on the nuclear industry." The NRC proceeded to look for earthquake specialists who would make the USGS reduce its estimation of the earthquake danger, but the USGS wouldn't budge.

In July, 1978, an NRC advisory committee admitted that it would have applied tougher standards if the plant were being designed now, with knowledge of the Hosgri fault's existence. But the committee went on to say that Diablo could be operated without "undue risk to the health and safety of the public"—especially since population density near Diablo Canyon is "low." Twelve miles away in San Luis Obispo there are 45,000 people.

The damning evidence keeps piling up. At the recent, final round of licensing hearings, seismologists testified that the Hosgri fault may be capable of producing an earthquake of magnitude 8.0 on the Richter scale. PG&E now claims that it has modified the plant so that it can withstand a 7.5 quake (three and a half times less powerful than one which measures 8.0.) These after-the-fact modifications do not satisfy many experts. Engineer Richard Hubbard, who left General Electric over the nuclear power issue in 1976, says that "what they have done is figure out a way to mathematically make the problem go away, by one assumption after another." Some of the factors used by PG&E to reduce their estimate of the earthquake's effects seem to have been "formulated especially for Diablo Canyon."

The NRC seems only too willing to protect PG&E's investment in Diablo Canyon rather than the health and safety of the public. Unless we speak up, we will be the losers of PG&E's nuclear gamble.

### FOR FURTHER READING

These books are a partial list of those used in compiling this tabloid.

*Nuclear Power*, Patterson (Pelican, \$3.50)  
*The Silent Bomb*, Faulkner, ed (Vintage, \$3.95)  
*Nuclear Madness*, Caldicott (Autumn Press, \$3.95)  
*The Nuclear Fuel Cycle*, Union of Concerned Scientists, \$5

*A Reivew of WASH-1400*, Union of Concerned Scientists, \$4

*Non-Nuclear Futures*, Lovins, (Harper and Row, \$5.95)

*No Nukes*, Gyorgy et al, (South End Press, \$8)  
*Shutdown*, The Farm, (The Book Publishing Co., \$4.95)

## WE NEED YOUR HELP

The Abalone Alliance needs your help in building a nuclear-free future. The utilities and nuclear industry have millions of dollars to promote their costly and dangerous energy source. Our grassroots movement has people and their resources. These 50,000 copies of *Radioactive Times* cost about \$2000 to produce, and we need your contributions to help finance this and other Abalone Alliance projects. Please make checks payable to the Abalone Alliance. Checks over \$15 are tax deductible if made payable to the Agape foundation. Please fill out this sheet as soon as possible and mail to: Abalone Alliance, 944 Market Street, Rm. 307, San Francisco, CA 94102.

I want to be a sponsor of the Abalone Alliance.

Enclosed is:

\$15 (includes *Its About Times*, the Abalone Alliance Newsletter)

\$25 (includes the newsletter and Dr. Helen Caldicott's book *Nuclear Madness: What You Can Do About It*).

\$35 (includes all of the above plus *Decision at Diablo*, and *The Silent Bomb*, edited by Peter Faulkner)

I can contribute \$ \_\_\_\_\_ to help the Abalone Alliance continue its work

name \_\_\_\_\_

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☐ I would like to join a safe energy group in my area.

thank you for your concern, and your help.





# STOP IT.

**RALLY**  
WRITE LETTERS, SIGN PETITIONS  
HELP ORGANIZE JULY 1st CANVASSING.



## JOIN US JUNE 30th SAN LUIS OBISPO

### **SPEAKERS**

David Brower  
Daniel Ellsberg  
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### **FOR MORE INFORMATION...**

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