

cranked generator was the difference between living and dying. Wind power will not replace our present energy sources as a way to run an industrial nation; but it can mean having your stereo instead of a hand-cranked gramophone, and continuing to use an electric typewriter, if things get short otherwise. Large-scale use of tidal power would lead to the uglies along our shorelines, but there are places where limited facilities could be built with present technology and with some impact.

Again: It takes energy to produce energy. If you think of a metal windmill, there is the energy needed to mine the metal, to refine it, to shape it, to ship it (plus the energy needed to produce the means whereby it is mined, refined, shaped and shipped). There is the energy needed to construct it. If that seems obvious, forgive me, but particularly when we speak of individual means, it is a fact much overlooked. The "ecology-minded" dweller in a rural commune who gleefully buys sheets of polyethylene to cover his aluminum-tubing geodesic dome is overlooking it. The trick here, of course, is to use something produced (and already used) for some other purpose. That's energy you can't put back anyway.

- **Garbage:** Garbage being unglamorous, nobody spends much money on research about it, which is too bad. I have clippings on at least two dozen processes for using it as an energy source. Here's one (that takes energy for running hammermills, but in the long run could be worth it).

The garbage is pounded into four-inch chunks and run over a magnet, which takes out ferrous metals. It's then pounded into tiny particles, and an air blast separates them by weight. Dirt and glass are taken out; the rest is pressed into burnable pellets.

Overall, the system recovers 95 percent of the garbage, with an overall 60 percent going into the pellets. The other 35 percent is reusable material, and is sold as such. The pellets (at today's figures; there is a plant that really does this) sell for less than half the price of coal, and burn with slightly more than half the heat energy of coal. Transportation costs would run it up a little, but we wouldn't have to fill holes with 95 percent of our garbage.

- **Waste hot water:** There is a metal called nitinol, that can be bent out of shape but that, when heated, springs back (when allowed to cool, it resumes its bent shape). You bend strips of nitinol along the spokes of a wheel, and lower the wheel, flat, into a round tank. The tank is divided down the middle, and has cold water on one side. Through the other side you run hot water—waste from a nuclear plant or just the hot water that goes down your drain.

When the hot water hits the wheel, the nitinol strips on that side straighten out, exerting a rotating force on the wheel. The wheel spins. When the straightened strip hits the cold water, it bends again. When it hits the hot water again, it straightens again. Around and around we go, and as we all know, that's energy. An experimental 20-inch wheel has kept a small light bulb burning.

There are other, and more obvious, ways to make at least some use of hot water, especially in industry.

- **Shit power:** Anaerobic bacteria go to work and out comes methane; a guy in Britain has been running a Hillman

on chickenshit since 1955. If you've ever gone by a sewage plant, in fact, you may have seen flames burning off waste gas; that's the methane from (mostly human) waste.

You get a tank (say, for your house, a 55-gallon drum). Ideally, you use a "low water" toilet and a garbage disposal (big energy user), and you feed them both into the tank instead of into the sewer. Prime the tank—airtight, of course—with a little chicken manure. From the tank you run a pipe to another airtight tank, which serves as a storage reservoir. Methane rises off the contents of the first tank and goes into the second (rig it so that in the reservoir it's under a little pressure). From the reservoir you run a pipe to your gas stove, or your water heater.

If there are only two of you, it'll run your heater, or give you minimal use of your stove. Needless to say, the principle is adaptable to larger uses. Also needless to say, oil companies and utilities don't like to talk about this too much. It's too easy.

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I will eschew such esoterica as the theoretical use of carbon monoxide as a combustible, attempts to refine electrolysis so that hydrogen can be economically claimed from the ocean as fuel, and the adaptation of the principle of photosynthesis to the construction of pigmented semiconductor. They will not help us, at the moment.

Some of the others—solar power, wind power, the power of running water where it is nearby, and the utilization of animal waste—can help us. We need only a little more technological advancement, to bring them within our reach both financially and in terms of understanding.

But: In September 1973, Dixie Lee Ray, chairperson of the Atomic Energy Commission, said that the government plans to spend \$50 million during the current fiscal year on new ways to exploit coal, and another \$50 million—total—on research in solar power, geothermal power, hydrogen fuels and better ways to transmit electricity.

They are spending \$20 million at Livermore on laser fusion alone. We have spent a billion on breeder reactors. They are spending \$11 billion on North Dakota gasification plants dependent on strip mines. For one-eleventh of that (so say all authorities) we could make solar power readily available to the many, on both a large and a small scale. But we will not spend that.

The oil companies (with their coal and uranium subsidiaries) and the utility companies do not want the research money spent that way, and so it won't be. We will not only have less energy to use (and perhaps most of us could live well enough with that), but we will pay much more for what we do use.

Throughout this "energy crisis," public discussion is being conducted as though energy *must* come to us from some large central source—as it does now in the three forms in which we know it best. Yet even with today's technology, it may be just as efficient and far cheaper for an apartment building, or a small group of homes, to provide for itself the energy it needs through a combination of simple methods. For a small town with an imaginative citizenry, able wisely to measure immediate against long-range cost, it would be a cinch.

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Elk Hills: The Return of Teapot Dome



Dick Smith/News-Press

Pipelines leading to refinery at Elk Hills Petroleum Reserve No. 1

Long before Watergate made front pages across the country, bursting the bubble of Nixon's Great Mandate, a scandal called Teapot Dome made a shambles of Warren Harding's presidency. The script of that earlier scandal was basically an old-fashioned morality play with considerable pathos and a few tragic flourishes—depending on where you were sitting. The Secretary of the Interior in Harding's cabinet got caught with his pockets stuffed with oil money, while Sinclair Oil gleefully watched new wells coming in every day. Unfortunately for all concerned the land and the oil belonged to the government, because, by law, it was a Naval Petroleum Reserve. The cast of characters in today's version is somewhat larger, the disguises they wear more refined, but the plot remains much the same. The story goes something like this.

In 1912 the Taft Administration issued an executive order which set up Federal reserves of oil for use in case of national emergency, i.e., war. There are now four Federal Naval Petroleum Reserves: Teapot Dome, Wyoming; Buena Vista, California; the North Slope of Alaska; and Elk Hills, California. Teapot Dome, while instructive as a model of oil industry/government machinations, is really small game compared to Elk Hills and the North Slope. Elk Hills, located about 60 miles northeast of Santa Barbara, comprises 72 square miles of rolling hills containing 1,050 wells which, until recently, produced roughly 2,500 barrels daily for test and maintenance purposes. The potential reserves, according to estimates by the General Accounting Office, are a minimum of 1.3 billion barrels (possibly even as much as 10 billion) of low-sulfur, easily reached petroleum.

When the reserve at Elk Hills was first established, the government recognized prior private holdings in the area, including land and mineral rights owned by Standard of California (SoCal) and other oil companies. But in the 1940s, the Navy, in an attempt to regain much of the SoCal-owned land, precipitated a struggle which resulted in a government-imposed settlement. The upshot was a complicated legal arrangement known as the Unit Plan, which

established that the Navy and SoCal would jointly operate the land. If commercial development came, both parties presumably would profit in proportion to their percentage of holdings, which in SoCal's case came to about 22 percent.

Last November, in his Emergency Energy Address, Nixon called for the official opening up of Elk Hills. Acting on the findings of the Secretary of the Navy, using the justification of national defense needs, Nixon estimated that in the not-too-distant future Elk Hills could produce 160,000 barrels of oil daily—approximately 8 percent of current shortages.

At present, SoCal and Shell hold three separate but overlapping contracts with the Navy for operations there. The original Unit Plan contract, entered into in June 1944 and amended in December 1948, contemplated that both the Navy and SoCal would eventually receive an amount of Elk Hills oil equal to the amount of oil underlying its land holdings, irrespective of well location. Similarly, each party was expected to pay its pro rata share of costs necessary to get the oil out of the ground.

However, the Navy took an extremely generous view of SoCal's responsibilities, rationalizing that, since it was not a time of war and because there was no guarantee of any immediate returns, it would be unfair to ask SoCal to pay its share. By some leap of faith, the Navy decided to foot the bill for all costs incurred by SoCal "currently" and to defer SoCal's obligation to pay its share until it actually received oil. The contract both allows SoCal to build up a deficit in costs and obligates them to wipe out the deficit by paying more than their share of costs when they actually start production. The deficit now stands at \$10.5 million.

But the plot grows thicker. As consideration for its agreement to give the Navy control over production, SoCal has received some 25 million barrels of oil. This not only amounts to *more* than the Navy has received to date, but is also, SoCal admits, a percentage from the Reserve greater than SoCal's total percentage of oil in Elk Hills. Thus the production balance it now owes taxpayers is \$13.5 million, for a grand debt total of \$24 million. Ironically, if Elk Hills is opened up in the name of a national emergency other than war, which may soon be the case, SoCal could go to court, argue that the Navy unilaterally breached the contract, and seek forgiveness for the debt.

A second contract between the Navy and Shell, one of the eight major oil companies dominating the world energy scene, was signed in May 1970. Under the five-year agreement, Shell was to be the *sole* purchaser of the Navy's share of any production from the unitized area of Elk Hills, which at that time meant that Shell would only dispose of routine, relatively minor (2,200 bbls per day) test and maintenance production. But in fact there's a catch. The wording of the contract provides that Shell can legally claim *any and all* increased output from the reserves. Under the terms of the President's message and in bills introduced in Congress, whose approval is necessary to open the reserves, this indeed would have been the case. But Rep. John

Moss of California blew the whistle.

There are several other catches to this boondoggle. Curiously, the Navy awarded Shell the contract by "lot." Of the three bids submitted, the first and smallest, Pima Refining, was immediately ruled out because it could not guarantee transport of the oil. (This is common treatment for the little guys in the oil industry, who lack the proper vertical integration or monopoly of resources.) Coincidentally, the other two, Shell and SoCal, submitted identical bids. The Navy maintains that it considered the possibility of collusion, but concluded that the bids "were not indicative per se of anything more than coincidence."

Kenneth Cory, chairman of California's Joint Committee on Public Domain, thinks otherwise. Cory's investigation has thus far yielded the possibility that Shell and SoCal conspired to deprive Californians of legitimate royalties on oil produced from state-owned lands; that they have cheated the people of California out of \$1.27 for every barrel of oil extracted; and, because they dominate the market, that they are able to rig bidding.

In November 1971 the Navy entered into a third contract, this time with SoCal for the actual operation of Elk Hills. To give perspective, SoCal's sales for 1972 totaled almost \$6 billion, with a net profit after taxes of \$547 million. At the end of the third quarter of 1973, SoCal already had profits of \$561 million, or an 80 percent leap over the equivalent period of the previous year.

Here then was SoCal, a company which already owned 20 percent of the land and oil within the Reserve, which had submitted an identical bid with Shell, and which now

was being accused of conspiring to rig prices against the State of California. Yet the Navy saw nothing wrong in allowing this company to obtain the contract, valued at a minimum of some \$10 billion (and rising in value as world oil prices grew ever higher), for actual operation of the most valuable oil resource in the lower 48 states.

The moral of the story might be that the oil industry has become much more sophisticated in getting what it wants. A report recently released by Representative Lee Aspin shows that the oil industry contributed over \$5 million to Nixon's re-election in 1972, making it the biggest corporate contributor of them all. Notable contributors among Nixon's friends were David Packard, formerly Secretary of Defense and a member in good standing of the board of SoCal, who coughed up \$50,000; and David Miller, also a board member of SoCal, who gave an equivalent sum.

All of this, however, is but a prelude to the bigger and better prize—Petroleum Reserve 4 on the North Slope of Alaska. Pet-4, as it is affectionately called, totally uninhabited except for an occasional small band of roving Eskimos and caribou, contains as much oil as all the rest of the United States' "proven reserves," at least 33 billion, and possibly as much as 100 billion, barrels.

Whether Moss and Cory, or even the Navy, will succeed in checking oil company incursions is unclear. But it is clear that the oil industry must be carefully watched, for it has consistently ignored the public interest and bent the laws to suit its grand designs. Teapot Dome is not just a passage in a history book, but continues to haunt us. And this time the stakes are enormous.

... and in the Mountains of Colorado

If I'd seen the depths of this problem," said John Love last November, "I would have stayed as governor of Colorado, developed our oil shale, seceded from the Union, and become the King Faisal of North America." The former Colorado governor and federal energy czar is not alone in seeing a welcome relief from the energy crunch beneath the good earth of his home state. It has been no secret that the world's largest oilfield exists in the 16,500-square-mile rectangle known as the Green River Formation: a field containing between 600 billion and 3 trillion barrels of oil. This is two or three times the reserves of the rest of the globe, and makes the holdings of Middle East sheikdoms goldfish-pond sized in comparison.

The only problem, in fact, has been the adjective that lay portentously in front of this oil—shale. For this is not another Oklahoma or even a North Slope where wildcatters can come in and crudely penetrate the ground and siphon off the oil. Shale oil is borne in dense organic rocks called marlstones. It must be extracted by mining and then heating the rocks to 900 degrees. The process of cooking out the shale oil has been too cumbersome and expensive for boom times of plentiful and relatively cheap supplies of crude. There has also been a natural reluctance to strip mine the Rockies and leave one of the most beautiful mountain ranges in the world a giant Appalachian moon-scape pocked with tailings and slag. But the hysteria over

restrictions in energy has killed off whatever remained of the environmental movement. In January the Interior Department leased the first tract of this fertile land, and the same companies which have successfully orchestrated the "energy crisis" for their own ends will begin production.

There is the same obfuscation about shale as about other aspects of the current talk of energy. Facts and figures from different sources hang in the charged air doing dizzying dogfights with each other. Secretary of the Interior Rogers Morton has said that it will take eight years at minimum to get a viable shale industry going; while Harry Johnson, deputy coordinator of an Interior Department study commissioned last spring, has said that shale is "three years away." The oil industry says early shale production will be quite expensive; Interior says it will be "competitive at today's prices" (which may be the same thing).

What is clear is that even though the energy crisis has been making headlines only during the past two or three years, the oil industry has been long aware that the days of abundant crude were coming to an end. "The oil industry wants to avoid the mistakes of the railroads," says Richard J. Gonzalez, former chief economist with Exxon and now a Houston petroleum consultant. "The railroads thought their business was only hauling passengers and freight by rail. They forgot there were many other ways of doing this, such as airplanes. They weren't smart enough to realize