CHAPTER 37

ENERGY SOURCES

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"Should we become less dependent on oil?"

Hawai'i is unique among states in its level of reliance on oil as an energy source. What Jedd Clampet and J. R. Ewing called "black gold" is used to produce 75 percent of our electricity and close to 100 percent of the transportation fuels used in our cars, boats, and airplanes. Our "lifeline" is uncomfortably long: the nearest supplier is thousands of miles away. And we are concerned about the threat oil poses to the environment. Some would say we are "over a barrel."

Most of us can remember when headlines in the 1970s warned that worldwide oil reserves might run out within fifty years. Industry experts now feel that there are significant domestic oil reserves yet to be discovered, and that foreign reserves won't run out for centuries. By then an inexpensive substitute will have taken its place . . . we hope. Meanwhile, we should have plenty of oil for all our energy needs. And it will probably continue to be relatively cheap.

Externalities. In some people's view, the price of oil should be higher—perhaps *much* higher. Why? Because the market price of oil, like all energy sources, doesn't include many environmental and social costs. If these costs, called "externalities," were fully factored into the

price of fuel, energy derived from oil would be more expensive and alternative fuel sources might be economically competitive.

This is not as simple as it sounds. For example, it is difficult to calculate the cost of thermal waste, air pollution, and potential spills. Furthermore, other energy sources have their own externalities that are equally difficult to pin down. The really big question is, how do we balance our concerns for self-sufficiency and the environment with our expectation of convenience and affordability provided us by energy from oil? You, for example, may have personal concerns about drilling for oil in the untouched wilderness of Alaska, or about possible damage to our scenic shoreline should an oil spill occur here. But what would you pay to protect the planet in general and Hawai'i in particular? Everything you have, or something less than that? How much less?

The oil industry in Hawai'i has committed millions of dollars to preventative programs and response equipment to protect us from oil spills. During the 1993 legislative session, the state enacted a fee to build a local fund that can supplement any amounts available from a $1 billion federal cleanup fund. Most political observers expect more such regulations and therefore higher costs for oil and oil products. All these additional costs will be passed on to consumers, and it is already expensive living in paradise. Consequently, everyone—including the oil industry—is looking to use this resource as efficiently as possible and to find viable alternatives. As an example, synthetic natural gas and propane, both products from the refining process, offer efficient clean-burning fuel for homes, businesses, and vehicles.

Coal makes up almost 90 percent of all known fossil reserves, but like oil it would have to be imported. Surveys taken in 1992 indicate that coal is the public's least favorite alternative to oil, but new technology may eventually change that. The modern Barber's Point plant is currently generating electricity with coal using an advanced technology. Other technologies exist for conversion of coal to liquid fuels. But expanded use of coal would require expensive new boilers, processors, and handling facilities—and so a whole new array of environmental issues, including disposal of solid waste, would have to be addressed.

HPOWER is a good example of Hawai'i finding ways to solve both our energy and land use problems. The HPOWER plant has been

burning our solid waste in a high-temperature furnace since 1989, producing enough electricity for over 50,000 homes. More than two hundred garbage trucks per day deliver fuel to HPOWER, reducing the volume of solid waste going to O'ahu landfills by an amazing 90 percent.

Renewable energy sources. Hawai'i is blessed with an abundance of naturally occurring resources such as wind, sunlight, geothermal heat, flowing water, and ocean resources. But, as of 1993, only 9 percent of our total energy needs were being supplied by such renewable sources, and that was mostly in the form of electricity from biomass combustion.

The current decline of Hawai'i's sugar industry casts doubts on the future availability of bagasse (a remnant of sugar cane processing used for fuel), but we may be able to develop another biomass fuel source.

Ongoing studies are evaluating the potential of different energy crops—including algae from the ocean. The use of such an indigenous source could help free Hawai'i from some of its dependence on oil, and it might offer environmental advantages as well. For example, net carbon dioxide output (which has been associated with global warming) would be zero because the burning of this material would release no more carbon dioxide than had been utilized by the growing crop. Local environmental issues, however, aren't so clear. Air pollution, soil erosion, and nutrient depletion would also have to be considered, as well as the amount of water that might be required.

Twenty hydropower plants owned and operated by the sugar plantations have been providing about 1 percent of our electrical needs. The amount of electricity sold varies with rainfall in these run-of-the-river plants. New hydropower plants have been proposed, but many are encountering delays because of environmental concerns.

Today's windfarms can generate electricity efficiently, but there are problems. Wind systems work only when the wind blows, and connection to the electric grid can cause operating problems. Assuming the best, wind is likely to contribute only a small percentage of our total electric generation needs. Some people, especially close neighbors, complain that windmills are ugly and loud.

Solar technology is commercially available and environmentally friendly. Sunlight can generate electricity directly through devices called photovoltaic cells or it can heat a fluid for conventional electricity generation. Photovoltaics make sense for small systems removed from the utility grid, but the cost of this solar-generated electricity is higher than most are willing to pay. Utility-scale thermal generators like those deployed in the Mojave Desert aren't likely to be cost effective in Hawai'i because of our poorer solar resource (these systems can't use sunlight scattered by moisture in the air) and the smaller systems required for our islands. Even solar technology involves externalities (e.g., the manufacture of solar cells can involve toxic materials), and some people would complain about acres of solar collectors for aesthetic and environmental reasons. Although electricity generation from the sun seems too expensive at this time, solar-heated hot water makes sense.

Given one of the most active volcanoes in the world, one would

expect large-scale attempts in Hawai'i to capture the benefits from geothermal conversion. The technologies are well developed and have proven successful in such countries as New Zealand and Iceland. A commercial plant on the Big Island using hot steam from wells is currently producing enough electricity to meet almost one-fourth of that island's needs. Even conservative studies estimate the capacity for significantly more development, but the costs here entail more than money. Social and spiritual beliefs must be addressed. As anyone who reads the newspaper knows, those costs are way too high for some.

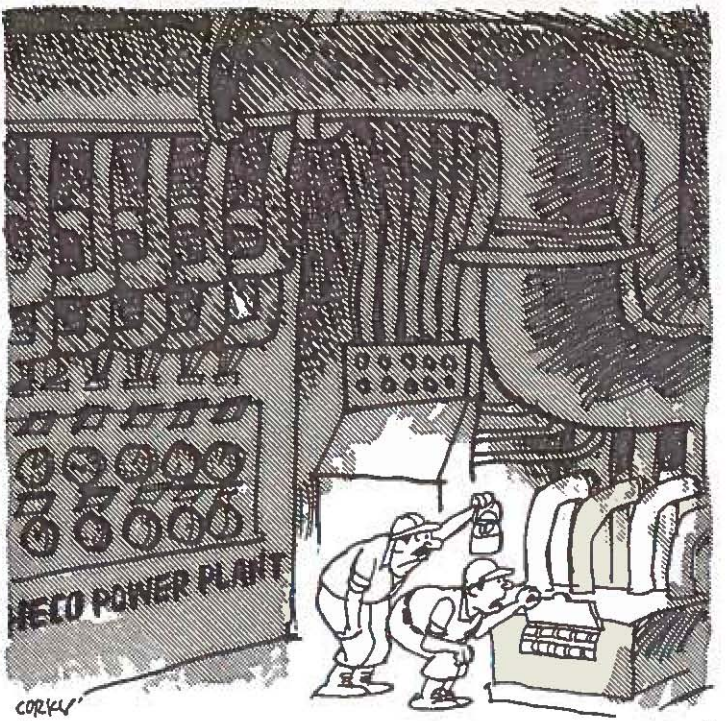
A process called ocean thermal energy conversion (OTEC) uses the temperature difference between the warm surface waters and cold deep waters to drive a turbine to produce electricity. OTEC has been under development in Hawai'i for over a decade, and experiments on the Kona Coast of the Big Island are demonstrating its potential. If costs can be brought down, the potential to meet our electricity needs is great. But many people might be expected to resist the construction of large plants that may have impacts on the shoreline environment.

Special dilemma. Renewables versus oil for electric generation cannot be looked at in isolation: approximately 61 percent of Hawai'i's oil consumption is for liquid fuels to power our cars, buses, airplanes,

and boats. Jet fuel alone accounts for over 37 percent of our consumption. It gets us to where we want to go, but more important it brings us our tourists. With perhaps half of Hawai'i's jobs tied to the visitor industry, the availability and affordability of jet fuel are essential to Hawai'i's economy. There is no substitute today for jet fuel derived from oil.

For gasoline and diesel fuels, there are a few alternatives. Biomass crops can be converted to methanol or ethanol, but the availability of the land to grow these crops depends on the future of the sugar industry and the land it now dominates. And it's likely that the cost of our fuel, already the highest in the nation, would be even higher. Electric vehicles might be ideal in the future for Hawai'i's limited driving needs, but they would reduce our dependence on oil only if we change the way we generate our electricity.

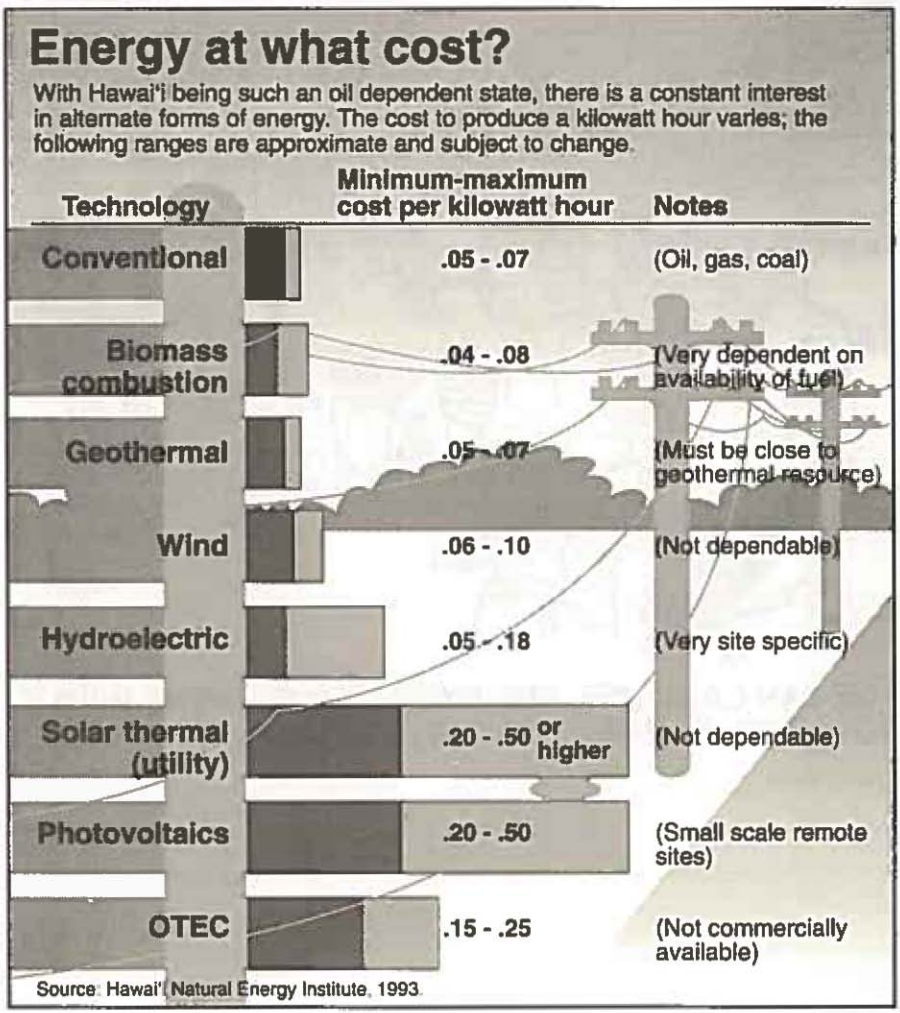
What can be done? The energy industry must find ways to be energy efficient, and it must be willing to consider alternatives. Government must work with industry to assure that policy roadblocks are torn down



"HERE IT IS-OH, SHUCKS. WE'RE OUT OF C-BATTERIES..."

and must provide incentives to find solutions. And consumers need to be aware of conservation efforts in their homes and places of work.

The state government is working on an energy policy that would lessen our energy dependence. It relies heavily on Hawai'i's utilities to evaluate alternative fuels and to consider energy conservation and efficiency (demand-side management). In the meantime, we must realize that oil does serve a large demand in the state in a cost-effective manner. We must use all our energy efficiently in order to give us the time needed to build the best technologies for the future. If we don't pursue the technology of the future today, will it be there when we need it?



"WE CAN CALL OFF THE EXERCISE, SIR - THE WHOLE TOWN OF WAHIAWA IS SURRENDERING..."