SHAMCHER

A MEMOIR OF BRYN BEORSE
&
HIS STRUGGLE TO INTRODUCE OCEAN ENERGY TO THE UNITED STATES

by Mansur Johnson

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HERE IS A SOLUTION TO THE ENERGY PROBLEM YOU NEED TO KNOW ABOUT, WHICH OIL AND NUCLEAR INTERESTS DON'T WANT YOU TO KNOW ABOUT.

Read how the work of two individuals, working in concert with scores of others, almost changed the direction of energy policy in the United States.

Learn how you can participate to affect a change.

FOREWORD TO THE 2006 EDITION

Today we have corporate media.
That's not all that's corporate.
Government is corporate.
The public will get what business wants, and government will give the public what business wants.

See if you can change it.

- Mansur Johnson

PREFACE – WHAT IS OTEC?

Ocean Thermal Energy Conversion is a way of producing electricity by using the temperature difference between warm surface water and cold deep water in the ocean.
Ocean water, the solar heated fuel, is free, and the environmental effect is mostly benign.

There are two types: the open cycle and the closed cycle. In both types a vapor is produced. The vapor drives a turbine to produce electricity, and the spent vapor is then condensed. With the open cycle the warm surface water is made to boil by bringing it into a vacuum. Fresh water can be the main product or the by—product of the production of electricity with this process.

The closed cycle mechanism resembles the workings of a refrigerator. There is an *enclosed* working fluid which vaporizes when exposed to the warm surface water and condenses when exposed to the colder deeper water.

The problem associated with the closed cycle is the accumulation of algae, called biofouling, on the heat-exchangers, the devices which hold the working fluid.

The problems associated with the open cycle are the size of the turbine required and the removal of non—condensable materials from the vacuum chamber.

For both, the cold water pipe is an interesting challenge.

OTEC HISTORY

By Bryn Beorse and Mansur Johnson

Ocean thermal differences, the temperature difference between surface water and deeper layers in the ocean, has been recognized for more than a century as a source of power.
In 1881 an American engineer, Campbell, two Italians, Dornig and Boggia, and a French physicist, D'Arsonval, proposed a closed cycle ocean thermal device.

The warm surface water would heat and cause evaporation of a working fluid (alternative fluids were suggested) which would pass through a turbine. After spinning the turbine to generate the electricity, the vapor was condensed by cold water pumped up from deep layers and again fed into the evaporator.

The first to build practical plants was a pupil of D'Arsonval, another Frenchman named George Claude, in 1929.

Claude chose the open cycle system in which the ocean surface water itself is evaporated and drives the turbine, and rejected the closed cycle because, "Such a solution is burdened by a number of inconveniences," he told the American Society of Mechanical Engineering, after receiving their 50th anniversary medal, "one of them being the extra equipment and cost for the working fluid, and another, the necessity of transmitting enormous quantities of heat through the inevitably dirty walls of immense boilers."

Claude realized that if he could boil seawater itself, he could get around the "inevitably dirty walls of immense boilers," called biofouling today.

The open cycle is based on the principle that water boils at a lower temperature if you reduce the pressure on it. For example, atmospheric pressure is over a ton per square foot on water in a boiler. In order to produce boiling, the water molecules must be made to run around fast enough to exceed the heavy weight of the atmosphere and produce that ebullience that is the sign of boiling water.

Under normal conditions, heating the water to 212 degrees F. will produce that effect. But if the pressure is lowered by pumping the air out of the boiler, the water molecules no longer require as much heat to boil.

"With a sufficient vacuum," Claude writes, "it is possible to boil ice itself, or at least a mixture of ice and water, and if one happened to fall into such boiling water, instead of being scalded to death, he might only catch a severe cold. And it is a much simpler matter to boil in a vacuum the comparatively very warm water from the surface of a tropical sea."

The verbal description of a principle is one thing. Its demonstration is another. Claude first ran a small experimental device before fellow members of L'Academie des Sciences in Paris. Then Claude built a larger plant at Ougree, Belgium. His turbine, with a wheel 1 meter in diameter, ran at 5000 rpm and generated 60 kilowatts with a temperature difference of 20 degrees C.

This demonstration silenced all those who said it couldn't be done. It proved the thermodynamic viability, so to speak, that electricity could be generated from temperature differences.

What remained were the problems associated with the operations of a plant actually using sea water to boil, and bringing cold water up from the depths.

Some people declared, for example, that it would be impossible to prevent the deep sea water from warming up too much during its ascent. To test this, Claude moved his Belgium plant to Cuba. He only had a small turbine—large turbines to operate under such low pressures had not been built yet—and even though he had a small turbine, a large pipe was necessary. A 2 foot pipe would have been sufficient to supply his small turbine, but it wouldn't have kept the water cold, due to loss of heat during the ascent. Thus he fabricated a pipe better than 6 feet in diameter.

Claude's primary problem was in the installation of the pipeline. Two pipelines were lost in storms at Mantanzas Bay, Cuba.

His entire pipeline 2 kilometers long and weighing more than 400 tons, fully painted and insulated, went down twice, and each time he had to start over again. He succeeded the third time and tells how: "The very day that the pipe connection was made, the powerful Rateau pump of the pit was set working at the rate of 4000 cubic meters per hour; soon after, the water discharged became colder and colder, until finally it reached 13 degrees centigrade—a good result, assuming that the temperature at the lower end of the tube was probably around 11 degrees."

Another unanswered question was whether sea water, owing to its greater viscosity, would produce an abundance of foam when boiled, and break the turbine. He tells us, "Finally, the turbine, that I had hesitated to mount at first for fear of its blowing to pieces because of excessive foam, was installed, and its output progressively increased to 22 kilowatts, a very satisfactory result indeed considering the very small difference of temperature available because of the small depth of the bay."

The plant ran for 11 days and produced 22 kilowatts with a turbine much too small for the other components of the plant, with less than ideal temperature differences; nonetheless, the basic function was proven and, in the opinion of these resourceful pioneers, should have been followed by prototypes and commercial plants.

After Claude

The French government didn't completely overlook Claude's work. In 1941 the French government became involved and created L'Office de L'Energie Thermique des Mers, or Energie des Mers, for short. Andre Nizery, who was Deputy Director of Electricite de France, the huge semi-public corporation which supplies France with electricity and other forms of power, was the first head of Energie des Mers.

Research was conducted for fifteen years in French laboratories and at a site at Abidjan (the Ivory Coast) in west Africa, under the direction of Nizery, and later, after his death, by M. Christian Beau, formerly the head of France's public works.
They considered, for example, the effect on surface layers when huge amounts of cold water were moved from below by pumping. Only the closest layers were found to be involved, when discharges from below were monitored. Mindful that Claude had lost two pipelines, the manufacturing and laying of the cold water pipeline were carefully planned and carried out.

The pipeline was considered the only new and unproved component in the plant and therefore given major attention. It was 2.5 meters in diameter and was composed of metal pipes with flexible joints of rubber. It was left in place for six months for study of corrosion and biofouling. The area between low and high tide was found particularly vulnerable, but for current proposed OTEC ships, where the cold water pipe is entirely under water, this would be irrelevant.

Detailed studies in France and at Dakar, Senegal, of a specially designed turbine and condensers were performed, including air-and-gas removal from sea water under evaporation.

A full-scale plant was designed to be built at Abidjan in 1956. It was never built, because it couldn't compete with a conventional plant powered by inexpensive fossil fuel.

When the French research came to the United States

The University of California built and tested three OTEC plants, guided by Bryn Beorse, who in 1947 and 1948 had studied what the French were doing.
Beorse became involved with the Sea Water Conversion Laboratory, under the direction of Professor Howe, and helped them secure federal funds for OTEC research. State funds were augmented by federal funds when Dr. James Hoffman of the Bureau of Standards, advised by Beorse, demonstrated in Congress two small thermal machines on the pattern of the French.

The University of California's OTEC plants were primarily open cycle, since they were interested in desalination and desalination is obtained at no extra cost with the open cycle.
To put it another way, fresh water is a waste product in an OTEC plant of this type.

A laboratory sized plant was built and tested in the Hesse Hall of the Berkeley campus.
At the Sea Water Conversion Laboratory of the Richmond Field Station was simultaneously built the so—called "first low—temperature difference plant", consisting of an available 4½ foot long by 30 inch diameter cylindrical evaporator plus condenser. After this plant had been tested for a variety of possible conditions, the "second low—temperature difference plant" was designed and built.
Funds had now been made available for suitable hardware. This plant was scheduled to produce 10,000 gallons of desalted water per day, compared to 2,000 for the first.

Tables showing cost, estimated or confirmed, of various desalting methods indicate that the desalting cost for an OTEC plant at that time was lower than for all other methods. At $85, it was lower than the then goal for municipal water—which was $125 per acre foot—but higher than the irrigation goal of $40 per acre foot.

On the basis of testing three plants, The University of California designed a commercial plant which was never built. It lost out to the California Aquaduct project, a $1.5 billion dollar, 600 mile conduit, constructed to bring water from northern California down south. The University of California plant's cost was 6 million dollars.

It was designed for the canyon near La Jolla and the Scripps Oceanographic Institution.
It was scheduled to produce five million gallons of fresh water per day. Firm bids were obtained for all components, including two million dollars for manufacture and installation of the cold water pipeline, later upped to three million to keep the estimates conservative.
People not familiar with the University of California research and estimates chose to spend a billion and a half dollars.

This was fine when the water in northern California was sufficient. It isn't anymore, and the plants can still be built all over southern California.

INTEREST IN OTEC BROADENS

The University of California research continued from the late 40s up to the present: specific research on heat transfer, heat exchangers, de-aeration, evaporator characteristics—preventing carry-over of water droplets into the steam flow—corrosion, and biofouling.

In June, 1957, Professor Everett D. Howe, founder and first director of the Sea Water Conversion Laboratory, reported to ASME (American Society of Mechanical Engineers), just as George Claude had done 27 years before.

OTEC has been ready to build since 1957.

In the 60s a father-son engineering team, J. Hubert and James Anderson, started work on the concept again. They designed a closed cycle plant and demonstrated a small device before Congress in 1977. In the 70s oil prices soared and the National Science Foundation asked for studies. The government spent $1.2 million in 1974 and $2.8 million in 1975.

They received voluminous reports, thousands upon thousands of pages, proposing a multitude of types, beginning with the University of Massachusetts team under the direction of Professor William E. Heronemus, and followed by the Johns Hopkins University, Applied Physics Laboratory, Carnegie-Mellon University, the Universities of Texas, Hawaii, New Orleans and Florida.

Substantial industrial firms also jumped in with supporting reports: Lockheed, Bechtel, TRW, Hydronautics, Batelle, Reynolds Aluminium, as well as Anderson's Sea Solar Power Inc., thousands of pages emphasizing the readiness of the technology and the wholly benign ecological effects.

CHAPTER 1

THE INFAMOUS "ADDRESS ON ENERGY" IN CANADA

You can't imagine the ecstasy I felt when I heard Shamcher speak about OTEC. It was June, 1977. There were lines at the gas pumps. Jimmy Carter was President. Oil was in short supply. The nation had its first sense of dependence on foreigners for their industrial lifeblood and felt their personal freedom threatened when the use of their cars was restricted. The energy that powered their ponies could be denied them if a world crisis or some other freakish scenario developed. It's only now, in 1991, that the oil companies are being fined for artificially creating the oil shortage and driving up prices.

If you were alive then, you remember. Like most at the time, I didn't know what to think. My business was dancing. The airplanes I used to fly from city to city began to charge more for tickets, reflecting the increased fuel costs. Nevertheless, I flew to Canada and went to a farm north of Toronto to lead some dances at a camp for Sufis.

Shamcher [Bryn Beorse] was there. He hadn't been present in my life since the late 6Os. I met him in San Francisco. He was a friend of my Sufi teacher Murshid Samuel L. Lewis. Lewis created—during the Haight-Ashbury hippy period—the dances that I was busy teaching people around the U.S. I had no idea Shamcher was into energy. I don't mean chi. I mean kilowatts.

He wrote in a letter December 31, 1978,

> *Mansur, your testimonies to various Massachusetts councils were received along with your letter to Congressman [Gerry] Studds. Very good, all of it, and useful. When you use the sophisticated term "GIGAWATTS", not one in a hundred understands you, but all pretend, they think they must. I once made a list of all these terms, and now I cannot find it. Reduce all to KILOWATTS which every one understands. And always quote what the US uses today—how much energy in kilowatts, how much as electricity, how much as heating, as cooling, and so on, and send on a copy to me so I can file it. I assume your figures are right—at least as right as the doubtful figures the Energy Department issues.*

He began his talk that evening in Toronto without notes. Just stood and spoke in his heavy Norwegian accent. He was a little over 5 feet tall and, if you looked at him closely, you might say he looked slightly Chinese, round-faced, with flashing eyes, befitting his Sufi name Shamcher, which means "tongues of fire".

You may not get it from the language, the added ingredient in that talk—it was love. The feeling which accompanied the words is part of what contributed to my ecstasy that evening. There was no aggression or anger in the realities he presented. Nor was there any arrogance or superiority implied. The man had lived and worked in 67 countries as an engineer, spoke innumerable languages, yet met you, and presented himself, as an equal, a humble, self—effacing equal. I already knew his heart. I was totally unprepared for the information he presented.

I was so impressed I transcribed a tape of his talk and distributed a transcript of his words from that talk. In deference to Shamcher's reaction to my distribution of his talk, I don't dare present here the beginning of his talk.

Here's how he scolded me in a letter dated July 19, 1977:

> *Since you are in the letter writing mood you might now write the following letter to all to whom you sent my talk, including Governor Brown of California to whom Wali Ali personally gave the talk: "Shaken to my foundation by the true facts about energy given to me in a talk to a closed society in Canada, I rushed my typewritten summary to you un-edited, not showing it to the lecturer.*
>
> *He tells me the beginning remarks about our world's creation was a special view appreciated by researchers in the field, but not agreed on or proven and not suitable for public exposure.*
>
> *Furthermore, he tells me my summary of this particular part is somewhat jumbled.*
>
> *I am revising the story and sending you the corrected version. However, if you haven't been shaken by my first version, like I was, I doubt your value as a public servant..."*
>
> *You revise the story by letting a physicist or engineer look through it and apply your own sharp eye as to language. You may still boast that the author hasn't seen it. It is best so. And no public servant ever looks at a thing until he has at least two letters about it....*

In my naïveté, I hadn't realized that Shamcher might speak differently to the Governor of California than to a collection of mystics, i.e. "a closed society in Canada". Wali Ali was a Sufi from San Francisco to whom I had sent the "unedited" transcript of his talk. As fellow students of Samuel L. Lewis in San Francisco, Wali Ali and I had each been immersed in new age views since the late 60s.

The new age was cooperation, not competition, so when Shamcher presented the present energy situation in terms of monopoly, I was in accord with that. I now quote from Shamcher's talk, leaving

off the objectionable "not agreed on or proven", "jumbled" bit about creation.

After that lyrical beginning, he said,

> *The earth produced something that we call energy, and man is so strange that he showed a great interest in the oil that was formed in the interior of the earth as a result of the energy conferred from the sun. Every bit of energy we have today and will have in the future is from the sun and the earth together.*
>
> *Oil was very attractive to the Americans and others, especially because it can be monopolized. You could take this out and say, This is what we have, and we own it, and we will sell it to you. Another energy form is coal which can also be monopolized. It can be burned and so produce energy. Both are rather artificial forms of energy and not the first discovered.*
>
> *One of the first discovered sources of energy was the ocean, but that was forgotten by aggressive people in power, because you can't monopolize the ocean. It is simply too big. In the ocean you have various kinds of energy [waves, tides, etc.].*
>
> *Another form of ocean energy is the temperature difference that the sun has created between surface water and deeper water especially in the semi-tropical and tropical areas. The difference may be about 40 degrees. This was investigated long ago and was found viable. They began to work on it in 1881 and in 1929, they built the first machine in Cuba, and later in Belgium in 1948.*
>
> *This unhumble person became associated with it and studied what the government in France was doing about it, and I brought it here to the U.S.*
>
> *The ocean thermal temperature difference plant is simply an ordinary steam engine. A steam engine is an engine which makes use of two different temperatures. In most of the cases that you know of, they heat water on one side and put the steam through a turbine, and condense it on the other side, the temperature difference being from about 150 to 300 degrees and more.*
>
> *In the ocean, you have temperature differences of about 40 degrees and people said, O that is too little, you cannot get a steam engine from that. Well, we did, and it has a very good effect. It has been designed and estimated in detail. To build such an ocean thermal difference plant costs less per kilowatt than it costs to build a nuclear plant and then, the fuel is free. It is from the ocean. Nobody can take payment for that, and the ecological effect is wholly benign. There is no bad environmental effect....*

When I came from France to this country to introduce the ocean thermal difference—now abbreviated as OTEC, which stands for ocean thermal energy conversion—I went into a Navy Research facility in Washington, D.C. I had to phone up, and they listened to me and said, oh yes, we will send a man down to talk to you. And here came a sort of moon-faced man with a little well-organized beard. He asked strange questions so that I finally asked, what kind of engineer are you? He answered, "You are talking to a psychiatrist." And I ran away fast enough, so that the little men in the white coats couldn't catch me, and went to the Bureau of Standards.

And there were all of these young engineers there, and they said, it won't work, you know, at these low pressures. It won't work, and while they talked, the Head of the Chemical Division was down working and had built something, and soon he had two beautiful little gadgets, one producing energy running a turbine and one producing fresh water from salt water. This thermal difference concept can do both. We hauled him into Congress, which was just discussing establishing a salt water office to help California get fresh water from the sea, and the thing was voted in.

So I was lucky enough to be brought to the University of California in Berkeley [the Sea Water Conversion Laboratory] where I found Professor Everett Howe completely in agreement. He said, oh yes, this sounds wonderful, and they built plants in three different sizes and took tests, and so on.

And there was like in Washington an Austrian physicist who said, oh, this can't work at all. So I said to Professor Howe, Shouldn't we answer this man? No, no, he said, don't answer him. Just show him. And so we built this machine, and we didn't have much money.

We had to have a turbine. So Professor Howe said, I think we buried a turbine down here. We had to dig down into the earth and brought forth an old aircraft turbine and polished it up and put it in our plant.

To protect everyone, we built a barrier of 3 inch planks, and it worked so fast, that one bearing got loose and shot out through the planks, right past the ear of this physicist who said it would never work. He turned around furious and said, you did that on purpose, and he walked home.

And so we hoped that now we had the world by the tail. We had all the energy we wanted—but nothing happened. Professor Howe wrote about it in the

Journal of Mechanical Engineers. And in California, they had the big project of pushing water from the north to the south, [which shows up on the map today as the California aqueduct], over hill and dale in the old fashioned way, and they simply decided to use up 1½ billion dollars and forget about us [forget about using OTEC to produce the needed fresh water].

Then, in the 7Os came rising oil prices, and the National Science Foundation took up OTEC and asked for more studies, and 7 major universities, among which are Johns Hopkins in Baltimore, the University of Massachusetts in Amherst, the University of California, and others. Together they came up with thousands of pages of reports and agreed: Yes, this is the energy of the future.

What does the Administration do? Practically nothing. They have a little research program going. Since people are talking so much about it, they have to do something, so they put in a few million to do research. Meanwhile, the government pays 7 billion a year for atomic energy development which, of course, is entirely unnecessary.

So some of us, Dr. David Mayer, for instance, at the University of New Orleans, have hammered out a proposal and tried to influence everyone to immediately put in ½ billion dollars to design 7 plants and build 3 now, today, and Professor Heronemus of the University of Massachusetts in Amherst goes much further. Build 12 plants now, he says. Build windmills all across North America and, for the rest of the country and the world, build 12 plants, 6 for various countries like Iran, India, the Ivory Coast, etc. and 6 here in the U.S. to start the whole ball rolling. That will cost a few billion, less than ½ of what they spend on nuclear plants. All this could be ready to go into the electric grid in 8 years.

I have a friend, no, an acquaintance, Dr. Edward Teller, who they say is the inventor of the hydrogen bomb. Of course he is a nuclear physicist, and he talks all the time about the necessity for nuclear, so I wrote to him—I had arranged for him to talk in Geneva some years ago, and I thought he would remember me. So I wrote to him and said, you know, we have this ocean thermal difference plant that can do in 8 years what everyone wants. We don't need nuclear power plants anymore. Well, he goes back to Congress and probably says, maybe they have something and maybe they don't, and that is the way communication goes with this.

I was myself in Washington recently, and I talked to a few Congressmen who were really interested, and they said, Maybe we will have our energy experts look

into it. I said an "energy expert!". No such thing exists. There may be an expert in a certain type of oil refinery, or an expert on certain types of coal machinery, or an expert on certain types of nuclear plants. If you know anything about OTEC, you have to hire a man who has worked with it for at least 5 years. We are supposedly living in a very technological nation, but it is the same everywhere. Understanding is at a very low level, and we are children in the way we do things, especially at the government level.

You always used to hear about this or that gadget, that would make autos run more efficiently, that General Motors had bought up so as not to interfere with their plans, like they did with public transportation. The movie Tucker, which was made in 1988, tells such a story. Here in 1977, I was hearing how a challenge to the energy status quo had been similarly frustrated. It was time.

I was excited. I was propelled by the knowledge of a solution to a great many problems that confronted the nation. I heard it from one who had worked already 29 years on it. It was time now for a solution to gas lines, nuclear waste, greenhouse gasses. I resolved that when I got back to Boston, I would tell my Congressman.

I didn't wait until I got back to start to tell people about this thing I thought was so extraordinary. On the airplane flying home I penned a note which I would distribute to around 60 Sufi centers in the U.S.

From that day on, my travels to teach dancing included advocating for OTEC. It was one day at a time, and one day stretched into almost 3 years that I was obsessed with letting others know about this solution to energy, employment, economics and global warming.

What follows is how I was guided and directed by Shamcher, who took me under his wing and worked with me and hundreds of others, to bring OTEC to the attention of the nation.

CHAPTER 2

IDIOT BOY

> *James Anderson is delighted to put on his little show with the big message: A huge energy potential in the world's oceans can be tapped.*
>
> *Using a garden hose, he runs hot water into a tank in an eight-foot-tall contraption next to the desk in his office. The contraption consists of two water tanks, one above the other; they're linked by tubes, and a turbine sits between them. Soon the heat from the water in the hose warms up a liquid refrigerant running through tubes in one of the tanks. Since the liquid boils at relatively low temperatures—78 degrees in this case—it quickly turns into a vapor.*
>
> *The vapor shooshes through a turbine, turning its blades, and the turbine drives a generator that produces more than 120 watts of electricity. Instantly, four automobile spotlights hooked up to the generator throw out a glaring light. Office workers applaud "I get a kick out of this every time I see it," a secretary says.*
>
> [Les Gapay, The Wall Street Journal, November 22, 1976]

In his "Address on Energy", Shamcher said that Dr. David Mayer of the University of New Orleans had "hammered out a proposal and tried to influence everyone to immediately put in half a billion dollars to design 7 plants and build 3 now, today". Mayer, 32 in 1977, saw what the government was doing [nothing], and called for a crash program. I talked to Dr. Mayer on the telephone, and he told me that Mr. J. Hilbert Anderson, in his view, had the best design.

In my letter to Mr. Anderson on July 12, 1977, I told him I was interested in seeing some OTECS get built; that I had spoken recently to Dr. Mayer who referred me to him, because he had the most "viable design". I told him I too, like Mayer, was going to Israel soon, [the Sufis were having a camp there in August], and that if he could send me some information, I might be able to be of some assistance. I also inquired, "What sort of commission would you be prepared to offer should my humble effort somehow produce some contracts for Sea Solar Power, Inc." And, I requested his "immediate response".

Mr. Anderson in his letter of July 18, 1977, said he appreciated my effort, but added,

> *Unfortunately, we are not in a position to offer anyone commissions for such efforts. We have had so many people ask this of us that our attorneys insist that we stay away from making any specific promises, since it is very likely, that should large*

investment funds be forthcoming, that there may be numerous people claiming commissions for their efforts on our behalf.

I hope you understand our position on this, and I'm sure that we will make every effort to treat you fairly, should you be able to develop funds for Sea Solar Power.

I am glad to forward to you one of our brochures; a copy of our paper entitled "Sea Solar Power and the Chemical Industry"; also, an article from The Wall Street Journal.

That Wall Street Journal article of November 22, 1976, which Mr. Anderson sent me, featured a description of an OTEC demonstration device [see inscription above] that Mr. Anderson and his son Jim had developed. I found that the article was a detailed corroboration of what Shamcher had said in Canada: The technology is proven and there is lot of interest. The following are some select passages from the long article.

The Andersons are not alone in pushing this technology, known as ocean thermal energy conversion, or OTEC for short. Growing numbers of scientists, corporate researchers, members of Congress and officials of the government's Energy Research and Development Administration agree that the process works and might be applied on a large scale to ease the nation's energy pinch.

They are talking of putting the process to work in hundreds, perhaps thousands, of giant floating power plants. These facilities would be spotted in ocean areas where surface and deep water temperature differences are great enough—-30 to 40 degrees—to make the operation efficient and economic. The most likely sites, proponents say, are in the Gulf of Mexico, the Gulf Stream off Florida, the Caribbean, and equatorial waters in the Atlantic and the Pacific.

With such prospects in mind, the Andersons' company, giants like Lockheed Aircraft Corporation and TRW Inc., and experts at top universities have already begun designing supertanker—size power plants that would employ the same process.

These plants would suck in vast amounts of warm surface water, perhaps 80 degrees in temperature, to heat a liquid that would boil at relatively low temperatures and turn into a vapor to drive a turbine generator. (Conventional power plants, of course, burn a fuel to heat water to make steam that drives turbine generators.) Then cold water, perhaps 40 degrees in temperature, would be pumped up from thousands of feet below to cool the vapor and condense it into a liquid, so that the process would keep repeating itself. Electricity would be transmitted to shore by underwater cables....

Robert Douglass, manager of TRW's ocean thermal program, says his company figures that the oceangoing electric plants could compete economically with nuclear and coal-fired power plants by

the mid—1980s. (Some scientists claim the process could be competitive right now.) It is rather dramatic, almost revolutionary, Mr. Douglass says, for a new technology to become economically competitive so fast.

William Heronemus, an engineering professor at the University of Massachusetts who has been leading a team of 12 professors studying the concept, emphasizes a big point in its favor: It uses "the largest solar resource"—seas that are warmed by the sun and can be tapped for energy 24 hours a day. Other solar power projects, by contrast, use sunlight only during daytime hours and on clear days.

Mr. Heronemus says his studies show it would be feasible to build 4,500 floating electric power plants of commercial size in a 400 by I5 mile swath of the warm Gulf Stream off Florida and Georgia. He calculates that enough energy could be tapped from the temperature differences between surface and deep waters there to produce continuously at least twice the amount of electricity the U.S. currently needs.

Lockheed has designed an OTEC plant referred to as a spar-buoy, with its tip above water and the rest underneath. A concrete pipe would telescope down 1,500 feet to bring up cold water. TRW'S proposal calls for a huge doughnut-like vessel that would float on the surface and send a 50-foot-diameter pipe to a depth of 4,000 feet.

In contrast, the University of Massachusetts design is a ship-like plant about one-third the size of the TRW and Lockheed designs. Such a project would be much cheaper to build and could be immediately competitive with Power plants on land, Mr. Heronemus claims.

Still another OTEC plant has been designed by researchers at Johns Hopkins University's Applied Physics Laboratory, but with a special purpose uppermost in mind. These researchers figure the earliest, most realistic use of the power generated will be at the sea site for manufacture of ammonia as an ingredient for fertilizer. Ammonia is a compound of hydrogen and nitrogen; hydrogen would be extracted from seawater by an electrolytic process, and air would be liquefied to get at its nitrogen.

Twenty-one such plants in tropical waters, each making 586,000 tons of ammonia a year, could be operating within a decade, says William Avery, who directs the research. He adds that reliance on sea and air for raw materials would significantly relieve the drain on supplies of natural gas, from which ammonia is ordinarily made….

My quick response to this article was a letter to Anderson dated July 20, 1967, which never got acknowledged. It's a wonder that Mr. Anderson ever spoke to me again after that letter. First off I'm unprofessional. I don't refer to Shamcher as the engineer, Bryn Beorse, but by his Sufi name, Shamcher.

Then, and this is the worst, when speaking about The Wall Street Journal article calling the Andersons "recent pioneers of the process" and which has them constructing the "world's only OTEC model", I mention Shamcher's three models he built at Berkeley. I rub it in and say, "I hope this information doesn't ruin your reputation as 'recent pioneers of the process'. There's more that causes me to characterize myself as "idiot boy", but I'll spare the reader.

Before J. Hubert Anderson of Sea Solar Power, Inc. had even responded to my request to represent his company and try to generate funds to build some OTEC plants, I had already falsely asserted in a letter to the Brazilian Embassy in Washington that I represented "an American firm". ("I represent an American firm which can provide the technology to generate electric power, for which your government now proposes to pay West Germany 5 billion dollars to develop nuclear power.") The same day, I wrote the Israelis in Washington, "I would like an appointment with the Prime Minister when he comes to Washington next week, to discuss the development of sea solar power in Israel."

In my letter to Anderson I enclosed copies of 1) my letter to the Brazilian Embassy; 2) my letter to the Israeli Embassy; 3) the letter from President Carter's Office of Energy and Planning, signed by Frank R. Pagnotta, and my response; and 4) Shamcher's so-called "Address on Energy", the talk given in Canada.

During this period, Shamcher was reeling from the damage he feared I had done to his efforts by distributing far and wide his "Address on Energy".

He wrote July 28, 1977,

> *You send me a proposal and I shall review and correct it. <u>At once.</u> Or I have to write Governor Brown and tell him you sent a bum steer. For he promised to come here and see and hear, but hasn't, and Professor Howe (Chairman Emeritus of the Sea Water Conversion Lab) believes it is because of this awful 'Address'. I had to tell him about it. Governor Brown now seems an only hope. He has the public ear, and is not dumb, like Nixon.*

Earlier in the same letter, he said,

> *Mansur, your letter to the Earl of Rutland was beautiful, both in concept and execution. On the other hand, your approach to Schlesinger [President's Carter's Secretary of Energy], President Carter, any administration official, is a waste of time. And worse. You couldn't know that, and may even think differently and act differently.*
>
> *Of great importance is Governor Brown of California, not as governor but as competitor of Carter and company and pusher of Carter and company. But you may*

unwittingly have blown that. For one of your reports on my energy talk may have reached him and turned him away in disgust.

It is always wrong to send off uncritically a mess of words produced for a specific audience. I am of course flattered that you did, but our friendship would be ridiculous if we couldn't be frank.

Such a talk has to be minusculely considered for each recipient. It is true that Governor Brown might be the only type who might appreciate such a talk if properly presented. It wasn't properly presented. The beginning is an awful jumble—this is your fault. The rest is good enough to get a feel of reality, but awkwardly presented. You would know it immediately, if you read through it carefully. I have not had time to re—write it, expected you to do it. Start with....

It was true. The exuberance I felt about OTEC overrode all tact. All the worse considering the guidance Shamcher gave in 1972 when I sent him some letters I had written to some California politicians on the subject of air pollution, which was my interest at the time.

He wrote back on October 3, 1972:

Mansur, thank you for two letter copies. Sending me these means a gentle pronouncement that an answer, while not requested, would be accepted. The answer is: Today most people in positions you are interested in receive such a flood of mail there is little chance he will have a chance to take a look at yours, except if you were his buddy from five on and your name flashes in red on the envelope.

There is of course a statistical possibility, one in a million, that he will see your letter. What then? It must be clear and distinct, physically, a good ribbon. The first sentence must be captivating—for the reader, that is, he must find something <u>inspiring—about himself</u>.

Seven big lawyers had tried in vain to sell our dynamic machine to Gisholt of Madison, Wisconsin. I wrote one letter to the President. In it I quoted his recent crack; then talked for several paragraphs about the splendid products of his company; then in the last paragraph outlined how our balance machine humbly could increase the value of one of his products. He took the next plane for New York and me.

Furthermore: Just talk about <u>one thing</u> in each letter, not three or a million. Have a beginning, tension mounting middle, and happy ending. "Without all these characteristics you are wasting your time and—what is worse—his. "Forget your

own petty thoughts, frustrations, idiosyncrasies. They aren't worth a dust mote anyway.

CHAPTER 3

GUIDANCE FOR IDIOT BOY

On July 17, 1977, Shamcher wrote:

> *Mansur, while I am flattered by your activity and understand your drive, correct your mistakes before it is too late: First, Anderson's plant does not produce fresh water as a by—product. Only the University of California's (mine) and Hydronautics' produce fresh water as a by-product.*
>
> *Anderson's price, 154 million dollars for a 100 MW (megawatt) plant compares to $1 billion 350 million for the twelfth or 25th plant Lockheed builds for 160MW, now lowered to $1 billion 100 million for a 260 MW plant, and the Johns Hopkins University and the University of Massachusetts are cheaper than Lockheed, but far above Anderson's.*
>
> *The three most reliable builders: Lockheed, the University of Massachusetts and Johns Hopkins believe Anderson's estimate is completely immature. Anderson took over from the University of California when no more funds became available at our University, but now told me he had never heard of the Cal research, and constantly talks of himself as the pioneer. Fine, keep yourself as Anderson's boy, but remember what I just told you and make no hint to the Andersons about it. I haven't yet had the heart to tell Mayer, whose paper is excellent…. Now for once be wise like a snake, not just a roaring lion.*

Great advice this last, received too late for idiot boy to be wise.

On July 26, 1977, Shamcher wrote:

> *Mansur, yes, send me all the Anderson material you can spare and any other. OTEC is so big I have so far been nourished amply on what people sent me without my asking. Anderson never sent me anything. Gordon Dugger, Johns Hopkins University's excellent man, sent me summaries of Anderson's things.*
>
> *True, this university publishes little. So what? The published things don't reach policy makers anyway. The University of California was the only university who in 1949 accepted my 0TEC work and went ahead researching. I tried Westinghouse, Harvard, MIT—everything. The National Bureau of Standards, though, did build two plants.*

I have no slightest objection to you joining Anderson, nor to Anderson himself. He may need to feel like a pioneer in order to function. It does not matter at all.

David Mayer is a peach. I am glad to hear he likes Anderson's plan. I will look at it. Actually at this point nobody can say what is the most viable. It will have to be proven.

Lockheed has the most buildable project. Heronemus is more wide-ranging, in a sense the top man. He should be energy czar instead of Schlesinger. We may still make him so. Dugger is the most excellent summary man, and we shall look at Anderson.

This university used the open cycle (along with Hydronautics) meaning water was the driving fluid, not any ammonia or propane or refrigerant (as in Anderson's) and that is the only way we can obtain fresh water from the plant. The problem is the turbine. With water as the working fluid, large turbines are supposed to be required. I have proposed that the University of California investigates this in hardware. I found in the fifties that most of the engineering formulas were exaggerated. They didn't show what they were supposed to show.

Meanwhile, I encourage building any and all plants for which funds are available. That's a way almost topping the excellent Heronemus. I said at the last OTEC conference, "Let's try Anderson's. 154 million dollars means 70 cents per U.S. citizen. Just a cup of coffee. And if we find we need more? Another cup of coffee to complete it, is that so bad?"

Anderson does seem to be a bit afraid of me. He doesn't need to be. Now don't scare him, you bogeyman! I've talked to him once, at the Third OTEC Workshop, in Houston, May, 1975. I said, "Mr. Anderson, did you ever see the University of California plants?" "No." That was all. Just fun.

You understand: You are a free agent, all rights to do what you want. Not even I have any idea or say as to what you should do. Someone is working on this behind the scene, having more ample knowledge than any of us. You are welcome to do whatever you think. Also, I have a right to say whatever I want. It may not be the final truth. Nobody here on earth knows the final truth at this time.

On August 4, 1977, Shamcher wrote:

Mansur, thank you very much for papers on Anderson's device. I see from them that he produces fresh water as a by-product even with his closed cycle by simply adding another complete plant to his power plant. Feasible, of course, but much

more cumbersome and costly than combining the two in one water working—fluid plant as the University of California did.

*Against that, some few engineers (like possibly Anderson) say our turbines (with water vapor) will be too big. Engineers and others are so afraid of saying, "We do not know," or believe in accepted "formula". I spent much time at the University of California when younger [*He is 81 now*] writing papers proving how completely inaccurate many of the accepted formulas were.*

Anderson's general cost estimates are interesting and just as guessing as any other cost estimate for new machinery. His 4 cents for 1,000 gallons to produce fresh water is no worse than MIT claiming 3 cents for the ionics process in 1954. It actually came to four dollars. Apart from that, in Anderson's way of adding all these various side products, one may give any or no value to the part of the machinery devoted to water production (or whatever) and come up with any cost one wants.As to the truth of pressure equalization by building the condenser high and evaporator low, this depends on the type of working fluid used. The Anderson idea in this respect may indeed be good for the fluids he uses.

And I shall do my best to keep him happy and not to frustrate his ambitions. And so must you, Mansur. Not a peep out of you. (You have already peeped a bit you know.) Don't any more! We need Anderson to win. Along with the others. Your letters were fine.

Then, there was the post script in the margin at the top of his July 26, 1977, letter praising my letter of July 12th ("very good letter") and cautioning me against sending letters to the University addressed to "Shamcher". "This was addressed to Shamcher and the office girls had no idea who that was, so opened the letter, or might have returned it."

CHAPTER 4

FAIL TO SELL OTECS TO ISRAEL AND (WITHOUT TRYING) MAKE PEACE WITH EGYPT

The 1977 Jerusalem Camp, to be held in the Judean Hills west of Jerusalem, will host a multi-national, multi-cultural convocation of students, seekers, and lovers of God, who wish to come together in the attitude of brotherhood.

Our purpose in this gathering is to attune to the Divine Will as communicated through the many prophets, known and unknown, of all the worlds traditions, and learn to become channels of mercy, compassion, friendship, and joy, and thus realize our potential for human cooperation and brotherhood.

Together we will experience the land upon which the prophets walked, and become acquainted with the cultures of the present day inhabitants.

We hope that this camp can truly be a shared experience among pilgrims and natives—Arab and Jew—of this holy land.

THEY ARE THE TRUE BENI ISRAEL whose hearts are alive,/ Who respond to Mercy, Compassion and Love,/ Who know how to dance and laugh and have no complaint,/ Which things come neither by blood or inheritance./ Where SHOLOM ALEICHEM and SALAAM ALEIKHUM are united. [from "Saladin" by Murshid Samuel L. Lewis]

The above is from the Jerusalem camp brochure for the Americans.

From the brochure for the Arabs and Jews distributed in Israel [Palestine] in English, Arabic, and Hebrew, the brochure reads,

The Jerusalem camp is a brotherhood camp whose ideal is to provide a space for friends of different paths to come together in celebration.

We hope all those involved in the camp will grow together and draw closer to realizing the unity of God on earth in which cooperation and true peace within may become a living reality.

The camp is under the directorship of Banefsha Gest, Leader of the Jerusalem Sufi Center and coordinator of Hallelujah! The Three Rings activities in Israel. Hallelujah! The Three Rings was formed under the inspiration of the late Samuel L. Lewis, Sufi teacher, Zen master and Rabbi.

This work continues in Jerusalem and San Francisco at the present time

through scientific programs for providing adequate food, housing and clothing; through cultural and economic exchange; and through spiritual drama under the auspices of Pageants of Universal Peace.

Three members of the teaching staff were unable to make the trip, so I filled in, and had to pay my own expenses, which amounted to an airline ticket totaling $770, plus an additional $240. The camp ran from August 18 to August 30, 1977.

On August 31, Shamcher wrote to me at my home near Boston,

Mansur, you are now back from your demanding trip to Israel and I congratulate you on your achievements. Banefsha and you do and did wonders there. I wrote a long letter to Pir Vilayat (the head of the Sufi Order) about it, but now, speaking of letters: You asked me in several communications what I thought about your letters to the Israel embassy, the Brazilians and so on. Well, you know, you have to go through the mill like we all do, and you will find letters hardly ever do much.

Why then do I continue to write them? Partly because they <u>might</u> accidentally hit somebody, and important: They are cheap. Like Bernard Baruch, when he had made his first million: "Dad, I made my first million." "Hum." "Dad, would you like to see it?" "No son. But when you do something important, do come and tell me."

A telegram neither means anything any more. A telephone conversation is in an entirely different league, may create wonders. But far ahead of any telephone conversation, again, is the personal touch and talk. If you have a person. Your lovely Ayesha-Geneve [my wife] wrote me while you were away. See what happens when you leave your love behind?

Flying into Tel Aviv a few short years after the Lod Airport massacre was an unnerving experience. Young, stern-faced, plain-clothed Israeli security agents were everywhere. One had the feeling of being on the front page. Here I am in Israel. And I didn't realize how small it was. In the time I drove from Tel Aviv to Jerusalem, I could drive from Boston to my seaside home in Hull, Massachusetts. And in practically half the time it took to get from the airport to Jerusalem, heading east, I could be out of Israel.

My sympathies were with the Israelis regarding settlements, and buffer zones. They are a small island among hostile Arabs, and to this day [1990], I cannot understand the U.S. government's insistence they stop settling land they grabbed in a war they didn't start and won. [Now in 2005, I want the apartheid state of Israel to integrate, stop building the wall, and give back the land they grabbed in the war. How one changes!]

But politics was not my purpose, nor the purpose of the camp. And OTEC was apolitical. Mr. Anderson and Dr. Mayer were united in their strategy of building an OTEC plant outside the U.S. in order to prod the Americans to get going. I asked Shamcher if it were unpatriotic of me to join them in this.

He replied:

> *Mansur, no, no, it is not at all "unpatriotic" to try to make the Israelis build an OTEC plant first, but you will have no success with the highly developed and brilliantly informed Israelis if you don't know what has gone on before. OTEC is nothing new to the Israelis. Christian Beau, the great French pioneer, visited them repeatedly and discussed among other things OTEC plants in the Red Sea, which has peculiar thermal phenomenae. You can learn from the Israelis more than you can teach them.*

Uncertain that I received his letter written August 18, 1977, and mailed to Jerusalem, Shamcher had my wife cable me:

> *Shamcher says remind Israelis about French Christian Beau's previous visits with them on using the Red Sea. There is a pool of over 200 degrees Fahrenheit water in the Red Sea between Saudi Arabia and Egypt which may be utilized for efficient OTEC plants. Israelis may build them and be forever helping Arabs, or U.S. can build them and have eternal friendship with both Arabs and Israelis.*

I made a trip to Tel Aviv to see Mr. Ofri. His office was supposed to be in Jerusalem; but when I went there, they said he was in Tel Aviv. Our camp was in between Tel Aviv and Jerusalem on the outskirts of a religious commune called Moshav Modi'in. We were camped in a forest.

It was a strange forest we camped in. You could sift the earth next to your tent and find mosaics in among the pine needles, or come upon a deep cistern in the natural forest, or climb out of the forest onto a hill and watch maneuvers by the Israeli tanks.

The Maccabees had been there before us, in the 2nd century B.C. From this place grew a resistance movement. Author Moshe Pearlman in *The Maccabees* (Jerusalem, 1973) says the Maccabees "brought low a powerful empire which sought to crush the Jewish people, restored their desecrated Temple in Jerusalem, and went on to regain sovereignty in their ravaged land, thereby preserving the Jewish faith and the national will for independence."

From Modi'in where Judah the Maccabee organized the resistance movement, I left to find Mr. S. Ofri, the minister of Commerce and Industry, on the 5th floor of the Shalom Tower in Tel Aviv.

Dr. Mayer had been there 3 days before me. Mr. Ofri told me what he told him: Go talk to the big turbine—making company called Ormat, located near the nuclear power installation near Yavne. That meant more bus rides. All the Ormat executives were in the United States, they told me, but their chief, Mr. Boronitski, was available when I called Ormat again. Mr. Boronitski said he had phoned Anderson in the States. We made an appointment. I was so eager to be on time that I got off the bus in Ramla instead of Rehovet and was late.

Mr. Boronitski shook hands with me on his way out and introduced me to Haim Hershman. Mr. Hershman was mostly closed-mouth and courteous, telling me, in fact, nothing. He said they were just waiting to see what would happen somewhere else, that something might happen here in 15 or 20 years. End of meeting.

I called again unannounced on Mr. Ofri in Jerusalem. He was there. He revealed that, in fact, Mr. Boronitski was involved in "pre-feasibility studies", that when they build something, it would be "big", and that it would not be on the American model of temperature differences of only 30 degrees. (How about Christian Beau's 200 degree Fahrenheit solar ponds? He didn't say.)

I was very humble this time. I said I just wanted to know what was happening right now in Israel, since I had realized that Israel had a lot to teach me. "What do you mean what's happening? I'm playing bridge this afternoon and making love tonight," he said. I told him I was eager to help him, and he said there were technical men who couldn't help him, and since I wasn't a technical man, I would be less help than that. After this conversation, I knew where I stood with Mr. Ofri.

On September 15, 1977, Shamcher wrote:

> *Mansur, Mr. O. in Israel is wrong that you cannot help because you are not a technical man, but was right in seeing you at all.*
>
> *The people who killed OTEC (temporarily) when the University of California had completed research were technical, engineers, scientists, who either were afraid of their jobs, since they hadn't followed (this damned new thing), or just ranted away according to their wonderful technical misinformation.*
>
> *On the whole, from your report and the paper you sent, I am disappointed about the Israelis, whom I thought so much of before.*
>
> *All that is of interest is the temperature conditions in the Mediterranean west of Israel. There are rumors there is no large gradient, not sufficiently cold underneath. I understand they may fix that by solar basins, but huge flows can hardly be promoted that way.*

It seems that in spite of Christian Beau from France, Mayer and Mansur from the U.S., they haven't yet caught on to OTEC. So, no use worrying with them until they come begging.

I may go to India, where I was in 1959, creating deep interest from the Prime Minister Nehru and on down. They do have excellent temperature differences on their West coast.

And then months later, after Anwar Sadat made his historic peace—making trip from Cairo to Jerusalem in November, 1977, and after the Camp David Peace Conference, I read in THE BATTLE FOR PEACE by Ezer Weizman that Sadat got the idea to go to Jerusalem while flying back to Cairo from Romania, sometime during the latter half of August.

I wrote Ezer Weizman, who was in on all the peace talks on the Israeli side:
You know, at that time, there were a number of people gathered in Israel, with the intention of bringing Arabs and Jews together. And ever since I heard when and where Sadat got the idea to go to Jerusalam, it occurred to me that maybe our gathering had something to do with it. Maybe Mr. Sadat passed through that big thought-form of cooperation and brotherhood in his airplane and took it for his own. And, more importantly, did something about it.

Weizman answered my fan letter.
It was well-known that Anwar Sadat smoked hashish, ganja, grass—marijuana in some form.
Can't you imagine him getting high on the way home from Romania and, some time before he landed in Cairo, getting the inspiration to make peace?

Ezer Weizman said the idea came to Sadat at exactly the time when the Sufis were in Israel doing their camp.

CHAPTER 5

OTEC, INC.

Idiot boy needs a job.
What about something with OTEC, Incorporated?

On September 13, 1977, I wrote to Shamcher,
I went to apply for a job substitute teaching (which I didn't carry through with, because I thought the low pay was beneath my dignity), but got a grand inspiration.

Shamcher didn't call me on it. He didn't do the therapist's work. He heard me out. I went on:
As I reported to you, both Gronich [Sigmund Gronich, Chief of the Ocean System Branch, Division of Solar Energy, United States Energy Research and Development Administration] and my congressman, Gerry Studds (D-MA), sent me the document which lists all the OTEC contracts. I jokingly suggested to you that you apply for a few million. Now I wonder, seriously, whether we shouldn't form OTEC, Inc.
And I listed a few ideas I had driving away from my job interview:

> *1) To promote the utilization of alternate energy forms,*
> *2) To research specific locations in all parts of the world and recommend the ideal form,*
> *3) To raise money to build commercial power plants in cooperation with existing governments and local utility companies,*
> *4) To develop industries related to the generation of power, such as chemical production, mareculture and fresh water,*
> *5) To act as a go-between in negotiations between localities, governments, utility companies and the producers of hardware,*
> *6) To provide consulting services for nations and individuals who are interested in developing alternate energy forms.*

There was more, but you get the idea. I continued on selling Shamcher on the make-work project he would have to be the crown jewels for.
Of course, I don't know how these things work, but I'm ready to go through the mill. I was ½ hour on the radio last Friday, and 50 seconds on TV yesterday for OTEC.
Do you have the energy and/or see the need to start OTEC, Inc. to further OTEC and give this person and others a place to work?

Shamcher answered September 16, 1977,

> *Mansur, your proposal for OTEC INC is excellent, but nothing is achieved by just*

proposing it. It is always the proposer himself who must have the guts and patience to do, to realize it.

I have noted an enormous amount of energy in you, whether you are hungry or not (I have often been hungry and none the worse for it, often better). So, go ahead.

Among your confederates: Anderson will be all for it, if you can convince him that you can do it and that nevertheless he, Anderson, will be the king-pin, but shave him down, too; he needs both, both to be raised and lowered, and don't ever consider yourself smaller, because you haven't this or that distinction, such as a PhD or Master of Engineering degree. (And David Mayer, certainly.)

Anderson's design looks good, and that is all that can be said for it at this point. His insistence that he can build it and it can be efficient for the price he quotes is understandable, but entirely in the blue, which every good engineer knows.

But how many are good engineers? A mechanic here at the University of California asked my advice whether he should study to become an engineer. "But you know, I am now a crack mechanic, and perhaps I would be only an average engineer?" Well, says I, if you become just an average engineer, you'll be the best of all of us.

Engineers, like others, are very average, even more so. But with the whole world as your field for "membership", you would quickly collect 166 million (about seventy cents per citizen in the United States alone), and you could actually build an OTEC and stretch out your tongue to the Government and Schlesinger and Carter. Just a nice morning exercise for a less than average Sufi. Yes, I support you fully but can probably do nothing....

Yes, wind energy is also fine, OTEC and wind, a good combination. Even waves, in the British fashion. And tides, a few places.

Maybe you need a job as low-paid teacher while doing and building your OTEC INC. It isn't done in one day. But by attracting the right helpers you might succeed. Maybe try Pat Caddell, Director, Cambridge Reports Inc., I2—14 Mifflin Place, Cambridge, MA 02138. He is President Carter's pollster; was united with the nuclear interests. I wrote him a clarion call to arms, saying his glance shows he can perceive the future and change in time. Pester him. He needs it. He can be changed; would be a good promoter and creator of a worldwide organization that eventually can laugh at presidents and cabinets.

More advice came October 3, 1977, in a letter from Shamcher, which suggested he was taking my

scheme seriously:

> *Mansur, have a bank collect the money for building OTEC plants. Have a group of OTEC and other people "govern" the fund, supplying you with monthly stipend or salary, not a full-time job (no one will give that much quite yet).*
>
> *The group could be, alphabetically, not in sequence of importance: Anderson, Dugger (Johns Hopkins), Heronemus, David Mayer, Lloyd Trimble (Lockheed), Bryn Beorse, and the Vice President of the bank involved.*
>
> *These people decide when money seems sufficient to start building what. There should at least be three, perhaps ten plants built more or less simultaneously.*
>
> *In the paper encouraging inputs it should be stressed this is risk capital, but actually very little risk (except the risk of not collecting enough) for building a new (but really proven, in 1930 already) energy system, which is eternally renewable, cheap, ecologically benign, perhaps the first real move to make the people build what the People want.*
>
> *My latest history [see the preface] along with Heronemus' lecture of April 21, 1977 [see the Chapter on Heronemus] would do for a come-on, a pamphlet. And with David Mayer's three page piece added. Perhaps. If Pat Caddell wants to help do it, he has good precedents. Also, he may try to destroy it, which I think he cannot.*

Pat Caddell I never pestered. OTEC, Inc. never got off the ground. I couldn't get a handle on how to pester Pat Caddell. It wasn't his exalted status as the President's pollster. I wasn't afraid of approaching exalted individuals in the government. It was really the first thing that Shamcher pointed out in his letter of September l6th: It is the proposer of an idea who has to realize it. From the place where I was, feeling deeply the need to do it, to setting up a formal business structure: that was not my cup of tea.

Nevertheless, I put together a pamphlet of quotations from Lockheed's Lloyd Trimble, Heronemus, and Anderson and, of course, Shamcher, and sent it to Shamcher. Then, only 30 days after I had first proposed the idea that "we" do this thing, Shamcher wrote something that blew me out of the water—for one day.

On October 13, 1977, Shamcher wrote in his telegraph style,

> *Mansur, OTEC, Inc. pamphlet proposal is fine. You know not to keep me connected with it at this present time. Being at the University of California as "Research Associate" would conflict with it and make me useless in both capacities. But if you have Heronemus' or Anderson's consent, you could use that in relation to the others.*

I was too crushed to write anything to Shamcher except a postscript in an October 19, 1977, letter, which stated, "Shamcher, your disassociation crushed me for a day. Did you feel it? By the way, what is your work at the University of California?"

Responding October 25, 1977, Shamcher said,

> *Mansur, your one-day shock, because I couldn't be inside OTEC, Inc., was contrasted by the personnel inside Alternative Directions in Energy and Economics just formed here. The purpose of this organization is simply to disseminate information about OTEC* [The organization came into being and I became the east coast representative.] *and promote John H.G. Pierson's Insuring Full Employment (Viking, 1964), as the future economic policy of the United States.*
>
> *To this end 50,000 dollars* [it never happened] *will be had from a foundation for a start. In this organization sit Jelaluddin Boru (you recall from Toronto), Sabira Scott, Tim Axelrod, an astrophysicist now working at Livermore Laboratory, who will be PhD in June, and Saadi, a level-headed publicist at the Khankah* [the name for the Sufi communal house].
>
> *Jelaluddin is President. Sabira is Secretary—Treasurer. And they are all delighted that I showed the sense of having to stay outside.*
>
> *A "Research Associate" (as I am) at a special university working on OTECS would show conflict of interest by belonging to such an organization. Even more by belonging to OTEC, Inc. But you can bet I will really be involved.*
>
> *Apropos the astrophysicist, a physics PhD who is as eager for OTEC as you or I: You should also as soon as possible achieve a "neutral" scientist on your board; one who is hell-bent on OTECS and also has a PhD in physics or electrical, electronic, mechanical, or general engineering. Close to you. So you completely trust him. That's an easy requirement, isn't it?*
>
> *Now, my trek here may not last beyond December 31st. After that I may have a tremendous job in Navy research, which would make my membership in OTEC, Inc. even more devastating, or enclosed job [with EPRI] equally unnecessary.*
>
> *Then again, I may be with the Arab Petro-dollar gang, and then I could very well be a member of OTEC, Inc. So don't fret. We'll get there somehow, and the more careful you are, the better. (This is said to you. To Sabira I would say the opposite: The more careless you are able to become, the better for all of us.)*

Attached to his letter was a copy of a job application letter to EPRI, the Electric Power Research Institute, a group associated with the status quo in electrical power generation. When this copy of his job application came I saw Shamcher was just as much a loose cannon as I was, only he did it with humor and wisdom. The fact that his appointment at the University of California expired in December and that he might be out of work was news to me. He'd said earlier he might be building OTECS in Egypt or India.

I knew he was a free spirit. I wasn't aware of the details of his life, yet I felt he was capable of anything, and I expected nothing, except, perhaps, his support of whatever I was doing.
This EPRI was, basically, a proponent of the nuclear power industry.

One didn't look to them for wisdom or vision concerning renewable energy. In 1977, they were disgustingly conventional. I often wondered how Ms. Larkin Platt responded when she read Bryn Beorse's application for "Project Manager, Thermo-Mechanical Energy Storage." I present below the October 24, 1977, letter to Ms. Larkin Platt, EPRI, in Palo Alto, California:

> *Ms. Larkin Platt, our largest energy storage facility, apart from the globe itself, is the Ocean. Direct and economically competitive utilization of this ocean-stored energy can now, today, be achieved by Ocean Thermal Energy Conversion (OTEC) plants.*
>
> *I know this from my work for the past 29 years on this system. The cost of such utilization varies with the companies and institutions offering it. The Applied Physics Lab of the Johns Hopkins University offers plants built for $700 per KW built, and the fuel (sea water) is free, abundant and pollution free. I have gone through their design and estimate.*
>
> *All critics are ignorant in this field, whether Government men or outsiders. The University of Massachusetts offers plants at $8OO per KW built. Lockheed/Bechtel in 1975 offered plants at $1300 per KW built but are now revising this design and estimate. (Their higher price is partly due to titanium rather than aluminum in their heat exchangers, to combat corrosion.) Sea Solar Power, the Anderson father-son engineering team, offers a 100 megawatt plant for 166 million dollars. This kind of plant must be big to be economical.*
>
> *Our general technical community, let alone the political elite, hasn't yet caught up with the above fact. That is why I apply for this position, to save you from an elaborate research effort that may become unnecessary.*
>
> *I would still support and guide research in other areas, but with the knowledge that the problem has already a fully usable solution.*

The above prospects were known from 1881, when an American, two Italians and a Frenchman developed the idea. The first practical solution happened in 1929, when a Frenchman built a plant in Cuba, producing 22 Kilowatts throughout eleven consecutive days.

In the forties, the French government designed a plant in Abidjan, West Africa, built and laid the cold water pipeline, a critical component, tested it for corrosion and biofouling for six months; then these enthusiastic engineers had the shock of their lives: A nuclear touched government decided to throw all their funds into the nuclear basket. It promised superior weapons.

In the fifties, the University of California (with me in it as research engineer and later consultant) built plants in three sizes. All this before the oil boom, before the nuclear boom—and crash.

Now ERDA, [Energy Research and Development Administration] on the basis of 5% of another 5% of ERDA's budget, is finally going to build a feeble prototype—instead of, as Heronemus of the University of Massachusetts proposes: Build and give away to interested countries twelve plants, plus additional plants here at home, a gesture that would repay us many fold and restore the world to some sanity.

My vitae: I graduated as a "diplomingenieur" at Norway's Institute of Technology in 1919, the thesis being a sea port with protective breakwaters and gadgets. Grade: "Outstanding".

I am registered as a professional engineer in New York State. After toiling in 65 countries in all branches of engineering and in financing and economics, I became involved in World War II; proposed with defected German officers to kidnap Hitler and shorten the war by 14 months.

The German civil service knew of our plans, worked feverishly to prepare for the change. The British cabinet jubilated—Roosevelt turned us down saying, "The Germans must be beaten so they know it."

The OTEC work at the University of California was sporadically funded. During the "unfunded" periods, I worked on the cooling system of the X-15 space crafts, on the Boeing 707, and Bomarc missile, on rockets and launchers at the Hispano—Suiza factories in Geneva, Switzerland, on air pollution and sewer treatment.

I left the University for good in 1961, reaching the age limit 65. The University did its best to keep me, [saying] "This is one man who can keep a research project off the

ground and keep it running." The State did not submit to the pleading.

The Keyport Naval Station near Seattle in Washington took me over then, possibly somewhat ignorant about my age. I worked there for fifteen years when a new assignment with the University of California became possible, again with OTEC research.

I enclose a nice letter from Larry Justason, showing that I was acceptable to the Navy. The "evaluation sheet" following Larry's letter contained three "outstandings", twenty-one "highly satisfactory", and two "meets normal demands" out of twenty-six points.

I got a boost from Commanding Officer Captain Garrett, when I managed to put the station's first "Value Engineering" proposal through the Navy accountants.

This was caused by my previous experience as a bank Managing Director and advisor to Sarajouglu Shukri Bey, the Turkish Finance Minister under Kemal Attaturk, who was building up a new nation's financial pattern.

You need, of course, a person of at least 81 years of age for this demanding position. He has ten more years of very active service at your disposition, barring accidents.

I am a "fellow" of Centre International de Recherche in Paris and Geneva.

Dr. Henri Coanda, physics professor at the Sorbonne, is one of the members. When he had invented the jet and crashed against a barn door in his first effort to show it, the superstitious Americans went to their high ideal, Van Evaar Bush, who said, "Jet propulsion will have no significance, neither in military nor in civilian aviation." He was known lovingly as "our greatest scientist". Today our "greatest scientists" say the same kind of thing about another system they know nothing about: OTEC.

Since the "we" in my OTEC, Inc. proposal involved me and Shamcher, and since he was obligated to bow out for the reasons outlined above, OTEC, Inc. was doomed to failure. I was interested, however, when almost two years later the idea re-appeared. Someone came to Shamcher with a grander idea than mine, and he got me involved.

A packet of letters arrived from Shamcher in April, 1979. At the top of one from Shamcher to Mr. James Smith, President of Innovation Associates, Inc., were Shamcher's instructions,

Mansur: Please furnish James Smith with a list of 20 US shipyards eager to build OTECS, and include the New Orleans shipyards (by name) and Scottish shipyards—and send me a copy.

Shipyards were dear to my heart, since I lived right down the road from the General Dynamics shipyard in Weymouth, Massachusetts. I had addressed their President, as well as the head of Pemex in Mexico regarding OTEC.

There is no particular reason to I lump these two presidents together, except for OTEC. The argument in each case was slanted to the individual addressed. To the shipbuilder, the talk centered on the Johns Hopkins idea to build tropical grazing OTEC plant ships; to the Mexicans, as to the Saudis and the Sultan of Brunei, it involved the wisdom of developing alternative sources of energy to conserve their petroleum.

Neither president would respond to my vision for their companies. Their focus was on their personal larcenies. Both the Presidents of General Dynamics in Massachusetts and Pemex in Mexico were later exposed, and toppled, for graft and corruption.

Entrepreneur James Smith's letter to Shamcher, which was also enclosed, wondered how "one of the great French aquanauts" [Shamcher] learned of his work? Was it, he asked, because he knew his "acquaintance, Professor Melvin Calvin, at the Biochemical Lab at Berkeley?"

Smith's letter included an organizational diagram. It stated,
My first OTEC organization will be located in the Marianas Trench. He said*, Mitsubishi Heavy Industries is going to begin a $5 billion building program for us in Japan.* An organization—not a plant—located in the Marianas Trench? 5 billion dollars from Mitsubishi? I grew skeptical.

As a way of introducing excerpts of Shamcher's reply, let me say, I never heard anything more from Mr. Smith, nor did he acknowledge the list of shipyards I sent to him.

On April 5, 1979, Shamcher, both sympathetic and disarming, said,

> *Mr. Smith, your welcome letter of March 24 with enclosures indicate that you are further along than anyone else I know in implementing OTEC and may I congratulate you.*
>
> *I am taking the liberty of forwarding a copy of your letter and enclosure to Mr. William Seary of the Bruce Loan Referral Center at 388 Rosewood Terrace, Rochester, New York 14609, who has received a loan package from you, via a Texas broker.*
>
> *Mr. Seary and I work together on OTEC financing. It is to him I owe my acquaintance with you. He asked me for advice regarding your loan application. If you are still interested in a loan from him, it would help if you would send me some further indication of what place he would have in your "Corporate Structure" system, and*

some additional information about the state of development of the associated parts, ideologically, financially, and so on.

An interested friend here, Dr. Cal Herrmann [by then a member of the newly formed—in 1977--ADEE, Alternative Directions in Energy and Economics], *remarked that, if the M.E.C. shall be the "sole beneficiary" of the enterprise, it might be difficult to find capital outside of the Marianas. But this may be based on a misunderstanding of the chart.*

It would be best to reproduce the chart. But since I am not clear about the liability of such a sharing, I'll leave that to my editor.

At the bottom of the chart there was an "explanation of above", the first several sentences of which read,

The Marianas Energy Corporation (MEC) shall lease a master offshore tax haven trust from International Dynamics Corp., for a renewable term of 25 years.
The master trust shall be the sole beneficiary of all sub-trusts of MEC that both build the plant and equipment of the company in Japan and own and operate the plants in the Marianas Trench.

To return to Shamcher's letter, Shamcher continued,

Mr. William Seary has connection with very large resources. The latter would be particularly interested in knowing the extent of commitment already from Governments, banks and substantial enterprises, either in Japan, the USA, or elsewhere....

As you see I phoned your acquaintance Professor Melvin Calvin and after a short shouting match we came together in an interesting discussion. Melvin only slightly remembers you as a "promoter, an in-between man, and I don't need them"; whereas, I told him that is exactly what OTEC, the USA, and the world now needs worse than anything else; that we technicians have been a failure, knowing all about what to do and never getting a chance to do it.

Well, I am really as much (or more) a financial expert as a technical one, and somehow convinced him that the United States is falling behind in technology—not because we have no more geniuses, but because our Government has increasingly failed us and "promoters" are the only kind that can overcome the dragon. (A dragon it has become.) Hoping to hear from you in some detail,

Yours sincerely, Bryn Beorse.

This chapter began with my grand inspiration to build some OTECS myself so I could have a job. Dear, sweet Shamcher had mercy on me and offered to give me $10 if I got really desperate.

Writing November 23, 1977, he said,

> *Now, Mansur, I have always had a suspicion that you sometimes starve in your great work. I have sometimes starved and it pleased and suited me, but it may not suit you. Presently I have not much to offer, in fact, zero, but this may improve in the near future. Anyway, concentrate your brilliant mind on food, good healthy grains, vegetables, whatever juicy steaks you need (I need none now but Murshida Goodenough [a disciple of the Sufi Inayat Khan] needed them), chocolate, cream puffs, Hungarian wines, eggs, petite fours, butter, swallows nests (Thrown up from sick swallows stomachs) and so on. If you need a tenner, scream. You are just in the right frame to provide two billion for OTECS.*

CHAPTER 6

HERONEMUS, THE PROFESSOR WITH A VISION

> *I'll be blunt. The only proper thing for this country to do is to create a national energy plan that weans us away from everything other than solar energy. And we should arrive at that point just as soon as we can, not put it off to beyond the year 2000. Since the Industrial Revolution, our energy practices have whittled away in a great way at the fuel resources of the earth, at our clean air and clean water resources, at the ability of the oceans to do the things nature intended them to do. And I fear that we've whittled away at the weather and the climate and maybe already have created irreversible effects.*
>
> *I haven't found anybody who denies that we shouldn't one day, be (nationally) energized by solar energy. ERDA's "The Plan", and the much skinnier document put out by the Schlesinger crowd, all talk about going all—solar. But (the energy corporations) say not now, boy, don't bother me now. I've made plans to sell all that remains of that oil, and that gas, and that coal—that uranium and plutonium. That's really the heart and soul of the whole problem.*
>
> [Professor William Heronemus, UMASS Amherst in the Boston Sunday Globe, October 30, 1977]

The cleverest American tycoons—Rockefeller, Carnegie, Mellon—succeeded, because they monopolized their product, by hook or by crook [see How the Great American Fortunes Were Made]. Their heirs, stockholders in the energy corporations, for example, help perpetuate the process, hoping for a return on their investment. They can't stop. These corporations have a life of their own. And their success has brought us to the brink of disaster.

The culture, our society, our civilization has brought us to the brink of disaster. Yes, everything is wrong, because there is no respect.

Can we learn to live in a sustainable way like the Indians? They unwillingly gave us a pure land. Millions of them lived in America and survived for millennia. Everywhere the settlers looked, what they saw was pristine pure. The Indians burned dead wood. They didn't chop trees. In a respectful way, they slaughtered the buffalo for food and clothing. That's the past. We can't go back. But anybody with eyes to see can see that if we continue the way we are going, we are lost. What does it take to wake up those who can change things?

Heronemus was one of those Shamcher is talking about [in Chapter 3] when he says, "Do you see, Mansur, how our best and most hardworking men and institutions are frustrated, handicapped, killed and tortured by the impossible system through which good ideas become known to the 'decision makers' (Ha, what a bunch!) and really built?"

Or, again from the Boston Sunday Globe article wherefrom the above inscription is drawn,

> *It is one of the major scandals of the energy crisis that even test development of these possibilities has been stifled by official indifference (or worse)——and that information about them has been kept from the public because government funders appear more interested in letting the private utility establishments carry the ball.*
>
> *For years now, a group of civil engineers at the University of Massachusetts in Amherst, headed by Prof. William Heronemus, has been investigating regional—and national—scale electric power potentials of the sun, as manifest in the wind and sea.*
>
> *Their work has been excitingly successful—on paper. But governmental indifference, and the near-total lack of preparatory public information which that indifference has caused, have immobilized the UMass work where it is—on paper.*
>
> *Compared to the wide-spread acquaintance with nuclear and fossil fuel systems, sources and uses, the public remains largely unaware that solar energy can yield anything more than home heat and hot water. But it can....*
>
> *Heronemus and colleagues (and others around the country) offer solidly buttressed evidence that wind dynamos and ocean-thermal generating equipment could begin to go into service within a decade—and could produce massive amounts of current, dependably available on demand, at prices competitive with existing methods, and without pollution of any sort.*
>
> *But so far as national policies and development funding are concerned, they might as well have been playing Parcheesi.*

When I met Heronemus in 1977, it was two years since his proposal for large scale testing of the U Mass OTEC design was ignored by federal planners. His regional wind generation plan for large scale installation of wind generators at sea to take advantage of westerly winds off the coast of New England was also largely ignored.

Before we met in person, I addressed him by letter September 14, 1977, as follows:
Prof. Heronemus, you are my choice for Energy Czar. I have read your "Toward a National Solar Energy Policy," April, 1977, as well as your "A Gulf Stream Based Ocean Thermal Differences Power Plant."

Why "Energy Czar?
Because he had a vision for the future.

My first letter to Heronemus went on,
Since I learned about OTECs from that ancient engineer who first brought word of it to these shores, Mr. Bryn Beorse, I have started a crusade. Without summarizing at this time the details of this one man crusade, let me just say that the last thing I did was get interviewed for ½ hour on WCOZ radio and make a 50 second ACCESS pitch on channel 7 in Boston. If your mail has increased recently, it's because I am telling people to write you for more information.

My congressman, Gerry Studds, finally acknowledged my letter and says he has been in contact with you on several occasions. He says you have made some great contributions and pledges to do all he can to get ERDA to accelerate their efforts.

I feel at this present time that my next step is to form a company and apply for government money. I am a non-technical man willing to join with technical men in an effort to promote the building of commercial OTECs.

I am familiar with the contemporary government attitude, more research, little by little, a 400 MW commercial plant way down the road, and I am willing to help them spend money to add to the weight of research, fully cognizant, or at least believing, that the proper approach is to go into hardware immediately.

So, what slant should my little company, not yet established, take? What work needs to be done to further the development of OTEC? What can this writer do for you?

Heronemus answered me September 28, 1977,

> *Mr. Johnson, I fear that there is little chance that I or anyone else really dedicated to Solar Energy is going to be our Energy Czar. I have personally decided to try a new approach, and will now spend a year in industry trying to get OTEC off the ground.*

A two-inch article from the Boston Globe, September 17, 1977, was already in my file. It said,

> *A Swedish-based firm is opening a research and design center in Deerfield, Mass. in an effort to develop equipment for producing electricity by tapping solar energy in ocean water. "This is an important international attempt to get solar energy where it should be," said William Heronemus, a UMass-Amherst professor who has been hired as the center's technical director. "Well over 45 percent of all solar energy goes into oceans, so it has tremendous potential," he said.*

The article didn't mention the firm was Alfa-Laval. I learned this while visiting Prof. Heronemus with Jelaleddin, the President of ADEE.

To continue Prof. Heronemus' letter to me, he said,

> *I can really give you no useful advice as far as your desire to form a company and apply for government money is concerned. I was able to obtain the first OTEC grant in 1973, only because of the extensive technical work I had accomplished during the preceding 3 or 4 years.*
>
> *OTEC hardware requires development, but that development must be based on solid scientific and engineering experience and background knowledge. I really don't know what a non-technical man could do at this point. You might consider contacting J. Hubert Anderson at Sea Solar Power in York, PA. He may have some ideas for you.*
>
> *I am sorry that this is so negative, but one of the more unpleasant parts of my life these past few years has been the repeated necessity to tell folks who want to help that I don't have the resources to permit them to help. I will probably be able to employ as many as eight professionals before this year is over, but beyond that I see very little for anyone else. Thank you for your offer.*

I responded October 5, 1977,

Professor Heronemus, thank you for your letter of September 28. It is true there is little chance you will be named Energy Czar in this administration, but next time, perhaps, if somebody like Brown of California gets in, it will be a different story. So until then you remain my choice.

It was Heronemus' vision and breadth of understanding that impressed me. His papers were not only technical; they addressed the energy issue with vision; he had a comprehensive plan.

It was truly inspiring, because the entire nation would be mobilized with his plan. He had seen what a national mobilization produced during the Second World War when we built lots of ships. He was 27 years in the navy.

Heronemus referred to this in his March, 1975, report:

> *Large-scale development, acquisition, and deployment of OTECS would be almost identical to the World War II shipbuilding effort. The world has never seen another industrial effort so easy to get started and so capable of producing prodigious numbers of high-class products. This economy could flood the world with OTECS if there were simply a desire to do so, and the effort would spread from waterfront back into every portion of the industrialized hinterland like the wildfire of prosperity, if we so desire.*

He wrote that in 1975. The vision of a national mobilization building benign solar energy contraptions inspired me. It also made me angry that those in power ignored it. I was dumbfounded. How could they?

It is very appropriate, I continued in my letter of October 5th, *that you suggested that I contact Mr. Anderson in York, PA. We had, in fact, been in communication, and when I learned from him over the phone that he was attending [September 23, 1977] a small OTEC conference in Puerto Rico, I joined him there. [see Chapter 8]*

It was valuable for me, because I got a picture of what the government was doing close up from Mr. Robert Cohen [Head, Solar Programs, Division of Solar Energy, ERDA] and, I confess, that if I'd had this view before I wrote you, I would not have written what I did. In short, I was impressed with the government's cynicism that OTEC is really feasible.

Second, I got the impression that they are the manager of a program which does not take into consideration work done 20 years ago, or the experience and advice of their investigators.
I not only mean your vision, but also work at the University of California 20 years ago, where they were ready to build an OTEC desalinization plant. The duplicate research, as the government is doing, to inform themselves of actualities which have already been proven, seems the greatest waste.

This same month, October, 1977, my Congressman Gerry Studds (D-MA), held one of his frequent town meetings in my town. When I talked about OTEC at the town meeting, considerable interest was aroused. Mr. Studds' had the largesse to direct constituents' questions about OTEC to me. I was flattered and did my best to answer them.

On October 16, 1977, I hand—delivered a letter to Congressman Studds asking him to promote "direct funding" for Heronemus, and reported the same to Mr. Heronemus on October 17th. On October 5th, October 17th, October 19th, I wrote Heronemus, saying I heard in Puerto Rico that he had testified on Capitol Hill. I asked him questions:

- Did you get the message of OTEC through to any senators?
- Do you approve of my attempt to promote direct funding for you? If you do, it might be helpful for me to know how much you need to manifest any one of the various magnitudes of your projects.
- Why doesn't the government feel that they have a mandate to go the next step with you and let you actualize your plans?
- Why is the government going ahead heavily with Lockheed and TRW, even though your design seems to float and Lockheed's seems to be so heavy?

Notice the word "mandate" above. The thing about well-crafted government letters or statements by

government officials is that when you parse them carefully, you can discover language, no doubt, agreed upon by a committee. Statements by the State Department spokesman, for example. The key I heard at the OTEC conference in Puerto Rico was Cohen's use of the word mandate. When my beef was not enough government interest, he dodged the bullet by saying, "We don't have a mandate to go faster."

My correspondence with the government is lost. I remember tossing out a folder about two inches thick when I left Massachusetts in 1982, thinking this is all bullshit anyway. I wish I had it now, but I do have a log of my correspondence. I see that June 28, 1977, was my first correspondence with Energy Secretary Schlesinger. It went back and forth. Schlesinger referred me to Frank R. Pagnotta, Executive Office of the President for Energy Policy and Planning, whom I wrote.
He answered me July 11th.
I answered him July 14th.
On July 29, 1977, I addressed Schlesinger again. He handed my letter to Sigmund Gronich, Chief, Ocean Systems Branch, ERDA, who answered me August 9th.
I answered him September 5th.
He answered me October 12th.
I answered him October 21st.
My letters were hammers: What's going on here? Why aren't you going faster? Don't you know thus and so?

Heronemus came back at me October 24, 1977,

> *Mr. Johnson, your letter of October 24th, and the copy of the letter of 21 October to Sigmund Gronich refer.*
>
> *I would prefer that you not thrust me and our past work into the buzz saw like that. I am again trying to do business with Gronich—he is the OTEC Program Manager, and my efforts might be a bit more successful if he weren't baited about past inactions.*
>
> *We now have a chance to get OTEC rolling, and I think we will. But it has become a corporate effort requiring some biting of the tongue upon occasion—"civility" and all that sort of thing, you know.*
>
> *So please, let me play it alone for a year or so. Then, hopefully, you'll see something you can applaud.*

Taken down a notch, I now sought Shamcher's approval about getting my congressman to give the government a mandate. Writing October 27, 1977, I asked Shamcher, "Is it worth pushing my congressman to back a bill to fund A, B, C directly to mandate the construction of various designs?"

On October 31, 1977, Shamcher answered,

> *Yes, Mansur, get your congressman to bat for immediate budgeting of building full-scale OTEC prototype plants of the Applied Physics Lab, Johns Hopkins University (Dr. Gordon Dugger) first, that is the cheapest and best, or most thoroughly planned ships by our most prestigious university, and the University of Massachusetts-Amherst, (William E. Heronemus) and Sea Solar Power (Anderson) and Lockheed and TRW.*
>
> *I wouldn't name one as the best necessarily, but certainly Johns Hopkins is a first rate organization, by many considered the best. Anderson's plant may be as good, though he has more often talked through his hat than the Johns Hopkins University has—which does not necessarily mean that his plant is not better, but it does mean that he is more apt to be criticized and turned down.*

CHAPTER 7

THE SUFI CONNECTION

The word "Sufi" comes up from time to time in this book. It came up for me September 27, 1977, around the time I was considering who might be of assistance financing OTEC plants. "Shamcher, do you know Hendrikus Witteveen of the International Monetary Fund? At the right moment I'd like to talk to him."

I had in my possession an article, "Saudi Arabia may get seat on IMF executive", from The Jerusalem Post, [August 29, 1977, by Hobart Rowen]. It began,

> *The kingdom of Saudi Arabia, which has become the second largest creditor of the International Monetary Fund, is likely to acquire its own seat on the IMF executive board late next year....*
>
> *With the introduction of the so-called "oil facility"—a special pot of money loaned to the IMF since 1974-—Saudi Arabia replaced West Germany as the second largest creditor.*
>
> *Last month, the Saudis further entrenched their position as lender second only to the U.S. by committing themselves to a loan of $2.4 billion, out of a total of $10 billion, to a brand new fund to relieve balance of payments deficits.*
>
> *"This latter fund is called the 'Witteveen facility, after H.J. Witteveen, IMF managing-director, who put the aid package together..."*

I asked Shamcher for an introduction to Witteveen [see Inscription above]. He answered,

> *Mansur, Hendrikus Jonnaes Witteveen is a Sufi initiated by Ali Khan [brother of Inayat Khan] and for a long time was not too friendly with either Pir Vilayat [son of Inayat Khan] or me. He recently wrote me a nice letter. He is a closed, not too happy man. You may easily offend him and break all chance of future communication. His position is awe-inspiring high. And he knows that but appears modest.*

When I was in Israel, included with Shamcher's letter was a copy of a letter he had written August 12, 1977, to Time magazine, concerning an article they published about Mr. Witteveen:

> *Time, some Sufis have asked me to comment on your piece, "An Austere Mystic", in your August 15, 1977, issue, page 53.*

The writer was probably concerned with Hendrikus Johannes Witteveen, the managing director of the International Fund, rather than with his philosophy, so you may not want any such comment, but a Sufi always tries to respond to a request, and I seem to be the oldest such in the Western world, and of the same general category of Sufi as Hendrikus.

You are right that the term "SUFI" is obscure, particularly as to origin. Sufis have no common denominator, no common belief, except LOVE. So what I am going to say is my own concept only, though generally shared by some.

The origin of Sufism cannot be placed at any point in time. Neither, for that matter, can the history of the world.

Human habitation on this globe has increased from 6,000 to millions during my life time—in the book of archeologists.

To me, an old Sufi, this is all speculation. We know nothing of the origin of either the material or spiritual world. Except that, by gently directing your mind at these matters, you may get impressions that indicate no beginning at all. Modern astronomers tend to lean in that same direction.

When did man first begin to think of what he was, why he was here, how to behave to assure happiness and continued existence?

Such thoughts tended toward a planetary concept. We live on this limited globe and should try to get along, and even try to find out things.

These thoughts have been with us as far back as humans existed, a Sufi feels, and were called, according to location, Sufism, in the Middle East, sprouting into Zoroastrianism, Hebrew, Christianity, Islam and many other "religions" or philosophies of life.

In the Far East the yogis performed the same function. I was a yogi from childhood, a Sufi from 27 years on. Later I saw the same trends in Zen, in Lao Tzu's philosophy. I am sure at one time all these things were one.

To me there is no difference between religions except what fanciful people make or "believe". Meditation helps us get rid of beliefs and be more clear about what we know and don't know.

When, at the British Intelligence Service in World War II, I met German officers telling us about the confusion at Hitler's war headquarters, they and I devised a plan for kidnapping Hitler and ending the war—in 1944. It would have saved millions of lives and established comfortable borders. I now consider this a result of my Sufi affiliation

(or yoga ditto) and meditation. Better remove one man than killing millions. Roosevelt turned us down, "The Germans must be beaten so they know it."

When as an engineer I visited Paris in 1948, I became aware of the ingenious French research on energy-production on the basis of the thermal differences in the oceans. I remained and studied this—again, I felt, as a result of my Sufi trends.

Now today this energy solution is enthusiastically promoted by top industrial firms and seven major universities.

It may save us from energy-collapse.

In Jerusalem two Sufis are building greenhouses, and singing, dancing, and talking with Israelis, Arabs and Palestinians, easing tension, possibly preventing continued animosity. Such are the expressions of Sufism.

There is a difference between a yogi and a Sufi: A Sufi doesn't renounce the "world". The Sufi connection that brought me to OTEC went back 50 years.

Samuel L. Lewis, who introduced me to Shamcher, met the Sufi Inayat Khan in 1925 in San Francisco. Shamcher met Khan in Oslo in 1927.

Lewis and Shamcher were introduced in 1939 by Luther Whiteman. Whiteman co-*authored Glory Roads: The Psychological State of California* (Crowell, New York, 1936) with Lewis.

In 1964, Lewis was writing letters about Shamcher's idea of salt-water conversion plants in the Red Sea.

In 1967, I met Lewis and Shamcher, but didn't learn about OTEC until Shamcher's Canada talk, 10 years later in 1977.

CHAPTER 8

OTEC CONFERENCE IN PUERTO RICO

Out of the blue, Shamcher sent me $20. We had a conversation. I told him, "I spent $14 of the 20 dollars you sent on a haircut to go with the suit I'm going to wear for the conference in Puerto Rico." [OTEC Conference, Puerto Rico, September 23, 1977, airline ticket, $241; 2 nights hotel, 2 breakfasts, cabs, and conference, $105.75.]
"Haircuts cost me from $2 to $3," Shamcher said. "You obviously have a better or more costly head. If you build OTECS, this does not matter."

Puerto Rico is, in fact, an ideal location for a land-based OTEC plant. The place called Punta Tuna on the south side of the island had all the necessary characteristics for a land-based plant; namely, the necessary temperature differences between a source of cold deep water close to shore and warm surface water.

Puerto Rico came up in a telephone conversation with Anderson. The possibility of going there to meet Mr. Anderson and Mr. Gronich, who was Chief of Ocean Systems, obsessed me, so I went. I needed some hard input.

You notice I used the word "obsess" regarding this trip. I had to know more than I was getting from letters and telephone calls. Puerto Rico was that opportunity.

I had an audience with Mr. Anderson the night before the conference in his hotel room. The first thing I noticed about him were his wild eyebrows. They were thick, black, turned up, and not symmetrical. I knew he was a genius.

Mr. Anderson, along with Fred Naef, the Lockheed representative, and the government man, Robert Cohen were the featured speakers. Mr. Gronich didn't come.

As it happened, I rode in the same taxi with the featured speakers from the hotel to the conference. Mr. Anderson's son, Jim, also an engineer, was in there too. When Mr. Cohen said he was Program Manager, twice I asked him, "Which program?" He hadn't given me his card at that point.
Finally, he answered, "The one in charge of commercialization," and added, "Trying to get the government out of the business."

Mr. Anderson believed the government was trying to prove OTEC didn't work.
Mr. Cohen chatted me up in the car and determined that I was nothing more than an OTEC advocate. He was a jolly fellow and joked that I'd just heard about OTEC yesterday.
Mr. Anderson spoke up, saying we'd been in touch for some time.

Mr. Cohen asked me if I represented anyone.
No, not yet, I said, but implied I might make up something to represent like OTEC, Inc.

Robert Cohen used to be Chief of ERDA's Ocean Systems Branch, according to Mr. Anderson. Anderson says Cohen talks to a lot of people but doesn't get anything done. He was replaced this year by Sigmund Gronich, apparently a better manager, and now Cohen's business card had "Chief" crossed out with "Program Manager" handwritten instead. He was demoted. Chief of Ocean Systems was higher than Program Manager.

No, Cohen wasn't replaced by Gronich to get something more done, but because he was suspected of getting more done himself, so Gronich, of "higher" civil service rank, was put up above him. [Shamcher, September 30, 1977]

Mr. Cohen delivered his entire talk in Spanish. I followed it, having lived in Mexico City for one year. He learned Spanish from 6 years in Peru he said, and he had been gone for 3 months talking about solar energy in South America for the State Department.

Lockheed's representative was Fred Naef. He was a large, somewhat harried, young man built like a football player. He said he was a navy man and had spent time on nuclear submarines. He revealed this when answering a question about possible ammonia contamination if the heat exchangers of the Lockheed OTEC plant leaked.

The Lockheed design was a buoy-shaped plant of such leviathan proportions and with such demanding construction requirements that I was overwhelmed. For example, it would have to be built near large supplies of gravel and would require vast support units just to construct the cold water pipe, which had a diameter as big as a football field, with walls 5 feet thick. It seemed Puerto Rico would sink if they mined that much gravel there. Developing a Lockheed OTEC in a developed but remote place like Puerto Rico seemed out of the question.

Mr. Naef apologized for all aspects of his presentation, starting with the showing of the Lockheed film, which I had requested in the cab. He said it was made for laymen. Also, the version he had began with the sound and picture out of sync.

After the film presentation, he admitted that the summary he would give was obsolete. A new formulation was coming out in December, and the model he was presenting was only used to make estimates from, he said. The Lockheed presentation compared to the Anderson presentation was heavy. Mr. Naef left at a near run before lunch never to return.

Now as to Lockheed: They are working on an extremely interesting approach. Naef in Puerto Rico said the right thing: All he was saying there was obsolete. He

hadn't yet the right to say more. More will come. Anderson's impatience with Lockheed will not pay off—for him. But don't try to seem great or knowledgeable by telling him that. This would hurt you both.

OTEC today is like a rumbling volcano, and ERDA is the least little bug in this rumbling. Don't spoil your chances by premature loose talk. Keep silent about what you don't know. Come to think of it, what do you know? You've caught on to a tremendous thing. It may provide you with all the riches—or a shameful demise, however you play the game. Never pronounce a snap judgment about anything or anyone. That may be the first rule. When you write anything, be careful.

[Shamcher, October 25, 1977]

The Anderson's OTEC demonstration was scheduled for the afternoon. It was the same device featured in the article from the Wall Street Journal article that Anderson sent me in our first communication back in July. [see Inscription Chapter 2] Jim worked all morning preparing the demonstration. There were no direct hook-ups to hot and cold water. He had to get a lot of ice to make the water cold, and he was boiling buckets of water on several hot plates. A helper was on a ladder stirring the ice. When the guy on the ladder stopped stirring the ice, the light, which indicated they were producing electricity, went out.

Backstage chatting up Jim while he was preparing his OTEC gadget, I wondered to myself, "Where is Cohen? I'd like to talk to him." I poked my head out the stage curtains and saw him and Neaf in the far corner of the auditorium talking. This seemed so appropriate, because Mr. Anderson had explained to me that Lockheed and TRW were practically extensions of the government. If he told me once, he told me 3 times that TRW had 100 lobbyists in Washington—all angling for more business.

As soon as Cohen saw me, he made his way back stage and started making jokes about the model. "Have you got the wires hidden?" he asked Anderson.
"*Cohen is an excellent man and is telling the truth*," Shamcher wrote October 19, 1977.

When I got his attention, Mr. Cohen explained succinctly that ERDA didn't have a goal. He said they didn't have a mandate from the President or Congress—only some money to continue work apace—and that was what they were doing. This "mandate" business was new to me. It seemed like Cohen was passing the buck, but then what did I know?

I didn't know anything, except that there was an OTEC Program, which was part of a Solar Division, in a bigger entity that had to do with energy. I began to see that, yes, it all originated either with the President and his policies, or the Congress, which had to fund programs.

Something else I learned about that was new to me concerned "letters of intent". The way OTEC plants get built is that a builder gets a "letter of intent" from say, the power authority in Puerto Rico—a letter of intent to purchase power if a source of power is made available.
Mr. Anderson hoped to obtain such a letter from Puerto Rico, and a man from Jamaica's Ministry of Mining was there and talked in my presence of his country's willingness to "buy the second plant" and Jamaica's willingness to give a letter of intent.

When I mentioned my effort to get my Congressman Gerry Studds to introduce legislation to fund some OTEC plants, Donald Sasscer, who had joined us, piped up. He was Associate Director of the College Station at Malaguez's Center for Energy and Environment Research (CEER) in Puerto Rico. Sasscer told of a conversation he had with H.H. Marvin, ERDA's Head of the Solar Division, the man above Gronich.

The conversation was about lobbying done by the Applied Physics Laboratory (APL) at Johns Hopkins University in Baltimore. APL, he said, got something through Congress to their benefit for 10 million dollars. When Sasscer mentioned this to Marvin, Marvin said he was going to sink it through OMB [the Office of Management and Budget] by demanding a feasibility study, since he thought their design stunk.

> *Marvin—don't you see his game: The Johns Hopkins University plants are the best made (designed) yet* **...** *I am very grateful for your information about your Marvin, for this may open the sluices for my war against the bureaucrats, which I have long prepared for.* [Shamcher, October 19, 1977]

The amazing thing for me that came out of this OTEC Conference was the impression I received that OTEC just couldn't be done. This was shocking to me. I knew [see OTEC History] that the University of California had proposed with firm bids, based on their research and the historical precedents, to build an OTEC desalting plant in southern California.

On the positive side, I heard first hand from the government their need for a "mandate" from Congress to increase their budget to fund OTEC research. This would encourage me to continue talking to members of Congress.

"Mandate" and knowledge about the instrument known as a "letter of intent" were useful learnings.

But perhaps the most important thing to come out of this conference was the information that Donald Sasscer shared about his conversation with Marvin. For one thing, it infuriated Shamcher.

CHAPTER 9

WAR AGAINST THE BUREAUCRATS

Head of the Solar Division H.H. Marvin was Sigmund Gronich's boss. The go-slow position of the United States energy administration vis-à-vis OTEC was articulated by Mr. Gronich in a letter to Shamcher that Shamcher sent me in October, 1977.

Mr. Gronich used a talk by David Jopling of the Florida Light and Power Company to support the government's cautious development attitude toward OTEC.

As was true with the development of nuclear power, all involved realized that the government had to be a major player. The government traditionally funds the costly research necessary to bring a new technology to market.

What follows is first the voice of the government. Then, Shamcher's response.

August 12, 1977, [from Sigmund Gronich, Chief, Ocean Systems Branch, Division of Solar Energy, United States Energy Research and Development Administration, Washington, D.C. 20545]

Mr. Beorse: as you know the Secretary of the Treasury (Michael Blumenthal) has called to our attention your exchange of correspondence with the Department of the Treasury regarding the development of Ocean Thermal Energy Conversion Technology.

We appreciate your good intentions in promulgating your enthusiasm for OTEC. In as much as this office is responsible for conducting the Federal OTEC program, we interact with other Federal Agencies that have related missions.

The OTEC program continues to become better defined, and additional information is emerging rapidly from the cumulative studies that have been conducted to date.
We believe that the OTEC program plan described in the enclosed program summary is an accelerated, vigorous and optimum program to provide for early OTEC demonstration and commercialization at minimal risk.

On the other hand, there is considerable opinion that we are advancing, in some respects, too rapidly and considerable opinion that perhaps we could advance more rapidly, in other respects.

For example, a recent talk (copy enclosed) was given by Mr. David Jopling of the Florida Power and Light Company providing his perspectives on implementing OTEC power. Although his utility is quite favorable toward utilizing OTEC power when it becomes available, Mr. Jopling is questioning how close OTEC is to commercialization,

in view of certain key problems whose solutions must all [emphasis Gronich's] be achieved.

In the light of opinion such as that expressed by Mr. Jopling and others, and even if such opinion were absent, we need to provide concrete technical facts and firm physical evidence that we are indeed progressing toward viable OTEC systems.

Our program plan, although accelerated and tentatively scheduled, assumes at each stage that we have achieved success in meeting certain program evaluation criteria that are associated with each program review point.

Thank you for your interest in and advocacy of the OTEC component of the National solar energy program."

Shamcher answered Gronich on August 18, 1977 [from Bryn Beorse, with a notation at the top of the page,

"I write this on my private stationary, since I cannot commit the University where I work to all I say in this letter."

Mr. Gronich, thank you for your good letter of 12 August, which makes it possible for me to summarize various not generally known aspects and effects of OTEC and the reasons for my stand.

First, I am deeply thankful to ERDA and its predecessor the National Science Foundation that, in the seventies, picked up again the almost dead OTEC matter and so skillfully has guided this system despite non—interest in higher political circles.

All present OTEC workers feel ERDA should go ahead much faster, but I tell them within the present political-educational climate that would be impossible—for ERDA. I know that people in your branch agree with this and would personally want to go faster. The slow-down trend—represented by Joplin, whom I was familiar with from the San Francisco energy conference 2-4 August, which I visited—is all from people who don't know much about OTEC, but more than that: Our entire present civilization, its education, is based on debate and criticism, and the negative stand is always rewarded best.

All who for some time have worked on OTEC become more and more eager to go faster, and not merely I, who in 1948 studied this matter in France and brought it to the US, where the University of California built plants in three sizes, the last one producing power in addition to desalting.

In a letter to Wilson Clark, Energy man with Governor Brown of California, I wrote about Joplin, "Many of his noted 'problems' have been solved decades ago. Others are

solvable only through building large prototypes, and some only after long—time hook-up with the grids. His talk shows lack of understanding of how problems are solved and when."

OTEC, contrary to fusion or space satellites with solar cells, is labor intensive and would beautifully meet our employment situation. (It is "capital intensive" only in the sense that large investment is required, but the building is labor intensive.) Also, the technology is all current. Many of the things your coming equipment hopes to solve were already solved by Claude, whose incredible work is completely misunderstood and jumbled in some of the present OTEC papers.

I have a second hat: Economics, and am working with Yale and Harvard economists on a full employment policy for the United States, against incredible superstition among many US economists.

If OTECS aren't built now, today, in many already worked-out configurations, we may become so weak that the expanding Russian orbit will determine our ways and those of the rest of humanity, infusing their form of tyrannical capitalism against our own much more free and smooth form of economics and organization.

This is why I approached Werner Michael Blumenthal, who has wide foreign experience, like myself, and was head of [the] technical firm, Bendix, whose vice-president in charge of technology is deeply interested in OTEC. Blumenthal correctly wrote you about it, and gave me a chance to reply.

Forgive me, please.

In my report to Shamcher on the Puerto Rico conference I had used a phrase borrowed from Samuel L. Lewis, "The thing about the American government and journalists is that they refuse to accept a man's experience as fact."

Curious, wasn't it, that there was no open-cycle development program run by the government? That was the development thrust that had been going on for almost 100 years. Both Lockheed and TRW were open to it. At the 1975 conference, both Lloyd Trimble of Lockheed and Robert Douglass of TRW had no problem with it.

Trimble said, "Because more data was available, from Zener et. al. and Heronemus et. al. on the closed cycle, we elected to pursue the latter on the NSF (National Science Foundation) contract. However, we think the open cycle system is surprisingly attractive...

Douglass said, "I can do little more than echo what Lloyd has said... [and] That does not mean that open—cycle systems do not show promise.

If you can get rid of those closed-cycle heat exchangers, a great saving could result...."

Quite clearly, the University of California publication—there was at least one article—was overlooked in favor of more recent and more voluminous documentation about closed cycle ocean thermal plants.

All this aside, the government's fragmented support of research was tantamount to asking Boeing to design the wings and tail, Lockheed to design the engines and landing gear and Northrup to design the body of an aircraft.

For Shamcher, OTEC was the thing. He felt several companies had credible designs. Both open and closed cycle deserved support. The Marvin rumor was enough to declare war on the bureaucrats. The Gronich exchange above was the opening salvo in the war.

Shamcher's strategy was to support Dr. Dugger by agitating for a Congressional hearing.
To Gordon Dugger, the leader of the Applied Physics Laboratory team, which had lobbied for funds to support their design efforts, Shamcher wrote as follows on October 19, 1977:

> *Dr. Dugger, rumours are that ERDA's solar boss "Marvin" has said he will "drown" the ten million allotted by Congress to begin building your ship.*
> *If this is true I will do all with three devoted Congressmen and I hope you will do your part to have a hearing at which I will be glad to fire some questions at this Marvin, about his qualifications to judge your excellent design and, in general, the habit by bureaucrats to "evaluate" what a major portion of the nation's academic and practical people (at least all of those who have sniffed at this thing) have to say about it.*
>
> *I can say whatever I want to say, whatever I feel the truth, since I need no consideration to my own future.*
>
> *And at this time, I am very anxious to put the bureaucracy in its proper place. I was inside it for 15 years. In fact, our system of communication and action, or lack of system, may become our death.*
>
> *Hoping to hear from you.*

Shamcher followed this up with a letter October 25, 1977, to his Congressman Ron Dellums:

> *Congressman Dellums, I am an engineer besides being concerned with Economics. In 1948, I studied OTECS (Ocean Thermal Energy Conversion) in France, brought it to this country and built, with other faculty members, plants in three sizes at the University of California. In the seventies, the National Science Foundation took it up and asked for extended studies.*

A large number of companies and universities have now made their contributions and recommendations, all agreeing that this energy system is ready to be built now, today, for competitive prices, but meets a howl of unprofessional protests from the heavy investments in nuclear and oil.

We are playing a dangerous game with our future. The administration seems completely unaware despite hundreds of letters and wires from universities and companies. In Congress, however, there are at least two who fully realize the matter: Lindy Boggs of New Orleans and Norm Dicks of Washington State (my former congressman, whom I have informed).

The design of this kind of plant made by the Applied Physics Lab of the Johns Hopkins University in Baltimore got 10 million dollars by special Congressional action to build a plant (begin to build it).

I have been told that a man within the administration who, of course, has no ability to judge Johns Hopkins OTEC design has sworn that he will "drown it".

The sum was granted outside the administration channels you see. Will we get a Congressional hearing on this matter, so we can ask any administration man what qualification he has to "judge" the Johns Hopkins' design?

On November 2, 1977, I called Dr. Dugger to find out more. There was some additional information in my Puerto Rico report to Shamcher that wasn't included in the last chapter: the reason Marvin was angered by the APL success. It came out when I asked Sasscer why Marvin was going to sink the APL 10 million that it was because Marvin resented being pressured by Maryland's congressmen.

In a call back Dr. Dugger gave me this: The House Science and Technology Committee in HR 6796 stipulated 10.1 million dollars to use initiating a parallel [to the existing government] program to provide the direct transmission of electricity to shore of a 5 megawatt OTEC tropical grazing plant, which happens to be the APL design favorite.

The House report said ERDA should commence detailed system and sub—system engineering for a tropical grazing plant based on the results of the Johns Hopkins University, Applied Physics Laboratory study, with Dr. Dugger, along with Evans J. (Bud) Francis, and William Avery, as the principal investigators.

Also to be funded was "long lead procurement for equipment, which requires preliminary design work for pilot plant conditions".

The appropriation bill that came out, HR 7553, was a public works bill, which included the ERDA budget. The bill said that 8 million of the additional funds were to accelerate the development of near term OTEC technology, which had as its objective the development of a seaborne plant, which would produce materials such as ammonia, utilizing OTEC as a power source.

Two million of the increase was for longer range OTEC programs. It was signed by President Carter August 8, 1977. The authorization bill was not yet signed, he said. The Applied Physics Lab was not mentioned in the bill that came out of committee; it was mentioned by name going in. That, of course, meant there was no mandate to spend the money exactly as APL wished.

Marvin did and didn't succeed. Although the OTEC development program got the money, there was no guarantee APL would get an opportunity to demonstrate their design. The budget for OTEC doubled from $14.5 million in FY [fiscal year] 1977 to $31.2 million in FY 1978, mostly, I would guess, as a result of the Johns Hopkins initiative.

Yet even with more money, the government managers would continue to fund research on closed-cycle hardware details and avoid funding either a complete plant using the APL design or the open-cycle option which had fewer pitfalls.

Nevertheless, the ball was rolling a little more now.

CHAPTER 10

BETWEEN PUERTO RICO AND MIAMI, SEPTEMBER TO FEBRUARY

> *Mansur, this tedious French story* [The French Institute Report of meetings at the Science Academy, October 28, 1929] *about George Claude and Abidjan—why the hell do you waste time translating that?* [Shamcher, October 19, 1977]

Somehow this thing in French came my way, and some French-Canadian friends had been translating it for me, and the above was Shamchers's reaction.

Shamcher continued,

> *In my 'History'* [see OTEC History*] all that matters has correctly been reported. Claude talked to ASME* [American Society of Mechanical Engineers] *and a much more thorough report by him personally is in ASME* Journal [Mechanical Engineering, December, 1930, volume 52, number 12]. *All your text says about U.S. work is woefully inaccurate. I am certainly not going to waste time translating that mish—mash, although French is my language.*

I marked the time since Shamcher's Canada talk by the intervals between his letters to me.
In the four months between Puerto Rico and the 5th OTEC Conference in Miami, I suffered quite a few jolts: He set me straight about publicly calling him OTEC Commissioner at the same time he sent me an article [see piece from the OTEC Liaison below] which he said was "actually such a step".

He blasted me for insulting the Egyptians in my November 16, 1977 letter. [see below]

He cautioned me January 3, 1978, about bringing his name into my advocacy and complimented me on a piece I wrote entitled "OTEC is Solar".

He complimented me again on the "OTEC is Solar" piece before he urged me to correct its factual inaccuracy and, again, demanded that I stop referring to him as the "spearhead of ADEE", ADEE being the Alternative Directions in Energy and Economics organization.

In that period from September to February, 1978, 25 letters were exchanged between me and Shamcher. In addition I wrote and sometimes received answers from: Johns Hopkins (6), Boston Edison (3), Governor Brown (1), Israel (5), Governor Dukakis (2), India (2), Stone and Webster (2),

Congressman Studds (6), J. Hubert Anderson (8), and The Department of Energy, a new agency which assimilated ERDA (a lot).

Reading November 2, 1977, about football commissioner Pete Roselle, I got an inspiration: Let there be a Commissioner of OTEC!

This person would be like the commissioner of baseball or football. They would arbitrate and oversee, supervise and regulate. The position would be occupied by one all could subscribe to. They would work for the good of all. Let it be Shamcher!

Shamcher wrote November 8, 1977,

> *Mansur, your idea of a baseball-OTEC commissioner is very good and flattering to me. Surely you know that in technology this can only function if there is no, absolutely no official word about it. Soon as one steams forward and proclaims such a status, he is DEAD.*
>
> *But my enclosed letter to The OTEC Liaison which will be published in the next issue (said the editor enthused) is actually such a step, but it must remain devilishly cleverly hidden that this feller BR* [Bryn Beorse] *is a real commissioner.*
>
> *Meanwhile I will build demonstration plants in Egypt. But no publicity about that yet. We first have to measure temperature differences.*

Build OTEC demonstration plants in Egypt! Forget OTEC, Inc., the idea that Shamcher didn't want anything to do with. Then he tells me he's going to "build demonstrations plants in Egypt". Then he flatters me by supporting the conclusion I was impressed with in Puerto Rico about getting congress to initiate funding for OTEC.

In the same vein:

> *Yes, excellent to have congress fund OTECS when the administration is dilly-dallying. That is fine not merely for OTECS but for the nation in general. David Mayer is so right that we have lost the ability to make right decisions. Especially the administration, with a funny man seeking "polls" instead of a program on top of the heap. What can a man running on "popularity polls" ever understand? Let alone achieve? So Congress, God forgive its shortcomings, may at least do somewhat better.*

I turned eagerly to the enclosures to find the letter published in The OTEC Liaison, (Volume 1, Number 3, October, 1977). It was just like Shamcher said: without proclaiming any special office, his point of view demonstrated his grasp of the big picture.

He began:

For your coming issue, may I comment on William D. Metz's OTEC report in the October 14th issue of Science?

The undersigned "OTEC Advocate" couldn't agree more with this statement in the report: "There has not been sufficient evaluation of alternative types of OTEC systems to justify the present program direction."

We need to build and test several complete plants, at least on the scale of Claude's Cuba plant, before we can have any "program direction". It is doubtful that we need such an animal at all.

Meanwhile, I am stumbling over the words "OTEC Advocate" [used by the Marine Board Commission and Joplin]. *According to both the Marine Board Commission and Mr. Joplin of Florida Light and Power, this "OTEC Advocate" appears to be one single gruesome monster, lacking experience and of sinister intent.*

To me, "OTEC Advocates" range from people who for the past 29 years have worked on OTEC and are well aware of its 100—year history—to engineers who have worked on it for 17, 10, 5, 3 years and even non—engineers. How can all these be so completely unable to evaluate the system? Why does the Marine Board Commission or Mr. Joplin rate so much higher in their evaluating efforts? Did they secretly steal from their employers time to keep abreast of OTEC technology for more than 29 years?

So far, everyone who has-worked on OTECs has become an "OTEC Advocate". Is this sinister? Or is it because OTEC is after all rewarding when you know it? The commission and Mr. Joplin even discuss cost.

Which cost?

Lockheed's $2500 per KW built, moving down to $1300 and on down and down as more plants are built?

TRW's $2100, also moving down and down?

The Applied Physics Lab of the Johns Hopkins University's $700 per KW?

The University of Massachusetts' $800 per KW?

Solar Sea Power's $166 million for a 100—megawatt plant?

Why these large discrepancies?

Have the Commission or Mr. Joplin studied the reason?

Reasons are: Heat exchanger surface prices vary from $1.50 to $9 per square foot, all firm bids. Heat transfer coefficients vary from less than 400 to 1000, all verified by tests. Temperature differences in the oceans mean even more.

"Bryn," said Lockheed's Trimble to me, "The first plant will cost a lot. If we have the guts to build a second anyway, we will build thousands."

That is the problem in a nutshell. We have never achieved anything without taking chances. There is nothing wrong about the "miscalculations" referred to about nuclear plants—except if they scare us into not risking OTEC tryouts.

We are now in a downward spiral in our technology as well as our economy, thanks to the fear of taking chances.

The present proposal by Professor Heronemus of the University of Massachusetts to spend two billion this year and more later marks a cheap way to determine our energy future.

Or we may go down as a well-intentioned but too weak and wobbly entity.

My wife was 5 months pregnant with our third child in November, 1977. She subtly suggested that maybe I had done all that needed to be done for OTEC. It seemed to be moving as a result of my little effort. I didn't agree. In fact, I couldn't stop. I was obsessed. Shamcher was going to build in Egypt! I wanted to go with him.

Included with the enclosures from the huge packet Shamcher sent to me November 8th was a copy of his letter to Professor Heronemus. Shamcher was inviting Heronemus to assist him in building a demonstration plant in Egypt with money from Saudi Arabia.

Bill, the Egypt-Saudi OTEC is different ... (from Heronemus' Alfa-Laval connection to make heat exchangers) in that full-size "demonstration-plants" will be built now on the basis of already completed research and be used to produce needed water and power while serving as forerunners of better plants.

A friend-citizen of both countries who is involved in the policies of both insists there is a thermal difference of 20 degrees Centigrade in the Red Sea. He has that information from a 90-year old engineer-friend living on the Red Sea and loving it so much he never departs. We are having more formal measurements done to support this claim.

The detail-design and building will be done by Egyptian-Saudi firms and money. They may prefer the open cycle and land-based, which produce water and power for the same cost as power alone. This, however, will be discussed. The only US help will be system design and consultation.

What we would want from you, depending on your schedule, would be consultation by correspondence or phone if you like or, preferably, meetings, or perhaps travel to

Egypt-Saudi. Please give us your phone and schedule if you like. We'll act as soon as thermal conditions are firm.

For two months I was excited about Shamcher teaming up with the visionary professor Heronemus. Then when Jelaleddin of the west coast ADEE office and I visited Heronemus in January, 1978, *he said he never got this letter*!

Heronemus said if Shamcher were interested in power for Egypt he should consider digging a trench from the Mediterranean Sea to the Qattara Depression, west of Alexandria, and install a hydro-electric dam, which would produce power from water draining through the dam from the Sea into the Depression.

Jelaleddin told Heronemus that since he hadn't responded to his invitation, Shamcher had gone to the Frank Mathews group at the Colorado School of Mines in Golden, Colorado. As a result, the Colorado group was preparing a paper entitled "A Preliminary Engineering Evaluation" for presentation at Miami in February.

Heronemus also revealed that [Abe] Lavi and Gronich at the Department of Energy told him they couldn't accept his unsolicited proposal to deliver a heat exchanger for a fixed price. They told him, "We're interested in research and development, not hardware."

This information confirmed my impression that the government was either dragging its feet or lacked Shamcher's conviction that each contractor should be supported to build a demonstration plant of their unique design. More study was the government's way to drag its feet.

The most bizarre revelation from Heronemus was that he was responsible for Marvin's anti-APL attitude. I reported to Shamcher:
Jelaluddin and I visited and talked with Heronemus for 3 hours yesterday. [January 5, 1978] Not by direct admission but without doubt Heronemus is the reason Marvin was trying to sabotage APL's plant ship design concept. Heronemus said he doesn't like the APL design; he says they are busy redesigning, and that Marvin, of all except one unnamed one above him, <u>wants</u> solar energy.

So after cautioning me about overtly promoting him as OTEC commissioner and sharing the mind-blowing news that he would build a demonstration OTEC plant in Egypt, Shamcher concluded his November 8, 1977, letter with,

Your letters are mainly good. But don't expect too much from them. If you enjoy writing them, do. But if you expect results—ah.

I fired back, November 16, 1977,

Shamcher, I wrote with a bit of sarcasm, is what you mean by "results" Heronemus calling you, or Dugger calling me? [Heronemus didn't call Shamcher; Dugger returned my call.]

Or perhaps you were referring to my respective letters to the Governors Brown and Dukakis. Dukakis made a perfunctory reply, but since I handed it to him outside the State House in Boston, I'm sure he read it and that accomplished my purpose which was to inform him.

I'm still waiting to hear that Governor Brown visited you. I did expect results from that, because Stewart Brand (whom I also wrote) says he visits the Governor weekly as his New Age consultant. I hoped at the very least S.B. himself would check you out and you would woo him. [In my huffiness, I didn't remember what Shamcher reported early on: that it might have been my forwarding the "Address on Energy" to Governor Brown that quashed Brown's visit.]

I notified Mr. Ofri in Israel today that he could now ask America to help Israel build an OTEC plant in the Red Sea so they could forever be helping the Egyptians; and I wrote Mr. Hodding Carter III at the State Department and told him now was the time for America to offer to help Israel build an OTEC plant in the Red Sea, so the Israelis can be forever helping the Egyptians, who will be eternally grateful to us for that.

On November 23, 1977, Shamcher torpedoed my idea, because he said it would be insulting to the Egyptians:

> *Mansur, while it is touching that Israelis want to build OTEC plants "for the Egyptians", the Egyptians themselves think they have just as fine engineers as the Israelis and access to much more money to build those OTEC plants.*
>
> *And so think American (incidentally also University of California) engineers who have worked in Egypt. So the idea that the Israelis should build OTEC plants "for the Egyptians" seems either a laugh or an insult to the Egyptians.*
>
> *The only reason might be that the Egyptian part of the Red Sea offers fewer sites than the Israelis'. This, however, appears to be not so, but rather the opposite.*
>
> *What the Israelis should do is perfect the system of solar ponds as the source of warm water, a thing that is certainly difficult and would require entirely different OTEC plants than the ones we work on here [in the United States], even different from the University of California plants, but I believe the Israeli engineers are very good and may solve this problem, to the benefit of us and others.*
>
> *PS: The news clipping you sent me of a "Revolutionary New Desalination Method" in Israel was either a newspaper big flop or an engineering idiocy.*

The article Shamcher referred to appeared in The Jerusalem Post, August 29, 1977, the day I was leaving Israel. It began, "Prof. Abraham Kogan of Technion's aeronautical engineering faculty has completed work on a revolutionary invention in the field after more than a decade's effort."

I contacted Prof. Abraham Kogan by telephone from the airport. I didn't know how to use the phone. He kept saying hello each time I rang, but since I didn't load the phone with money after he answered, he couldn't hear me.

The newspaper said, "The Kogan process works through direct contact heat transfer in a flash evaporation system."
That sounded like open-cycle OTEC to me.
"It eliminates the need for the miles of expensive copper pipes that are the base for conventional desalination systems, and thus lowers the plant costs as well as operation costs."

When I got home I wrote Kogan. Kogan responded in January.

Yet Shamcher said, continuing on,

> *No information was contained in that article to even indicate anything worthwhile at all. It didn't even arouse the curiosity of an old desalting hand like myself.*

OK, maybe my letters didn't produce results but the result of my involvement with the Israelis was that both Prof. Kogan of Technion in Haifa, and Senior Engineer Haim Hershman of Ormat Turbines Ltd. in Yavne, Israel, where I visited, attended the Miami OTEC conference. I would say they attended the Miami OTEC conference as a result of my efforts.

And then there's the result which came from my letter to Congressman Gerry Studds. I asked him whether a Parallel Program Manager was going to be appointed by the Department of Energy to direct the 10 million dollar Congressional appropriation for a parallel program.

I wish I could say I planned it this way: Studds forwarded my letter to the DOE for comment. Marvin answered Studds February 2, 1978. Shamcher said the fact that Marvin answered Studds so carefully showed he had been kicked by someone upstairs. I found out at the OTEC conference in Miami that there were only 3 people between Marvin and President Carter:

- Eric Willis, Acting Deputy Assistant Secretary for Energy Technology,
- R.T. Thorne, Assistant Secretary of Energy Technology, and
- James Schlesinger, Secretary of Energy.

On January 3, 1978, Shamcher wrote and cautioned me again about bringing him into my advocacy:

> *Mansur, you produced a good and interesting piece for Sabira: ("OTEC is Solar"), except, do not bring my name in as pushing the superior ADEE (Alternative Directions in*

Energy and Economics) types; they are pushing themselves.

I had characterized Shamcher as the "spearhead" of ADEE; subsequently I changed it to "consultant".

Continuing on, Shamcher said,

Sabira [the Secretary/Treasurer of ADEE] used an unfortunate expression about your ["OTEC is Solar"] article. She called it "editing" of my history. [For Shamcher's "OTEC History", see the front papers]. There is no such thing as editing, of course, especially of my things. My novel A State of Almost Happiness was tried [to be edited] *by "editors". Had to change the whole thing back again. Yours was your own article and as such to be signed by you. Sabira had the wrong idea that your "editing" still should have my name. Yours was an original article about OTEC and the more such we have, the better.*

My name needs no promotion. I am superb, all by myself, and too well known and too well unknown, and too full of silly mistakes and too swelled with the knowledge of genius. I am a crystal that has to be veiled, not to blind the masses. And I have no money but hope to have, and then we shall share a bit. And ADEE too. Your letters are generally good and apparently effective. Thank you very much.

Shamcher wrote again January 6, 1978 but was exercised about his OTEC history which I had adapted:

Mansur, the copy of your 12 page ["OTEC is Solar"] article, sent to Sabira, is good, and do we understand you have sent this off to one or several outlets? We need this sort of thing, the more the better. The other piece you sent Sabira, which starts off with two pages copied directly from my "OTEC History", is this also sent to some papers for publication?

It has a few weaknesses. Ice does not boil, molecules don't boil. Some crazy ditch-digger or scientist may say that, but it is against the semantics of our society. Ice, oceans evaporate constantly, but do not boil. Boiling is when at a certain temperature big blubbers begin to stir and move. This causes molecules to rush, but the molecules themselves don't boil.

Worse, perhaps, is the statement that Shamcher is the spearhead behind ADEE. I had nothing to do with the creation, the name, or the running of ADEE. That is the strength. An entirely different philosophy is behind Anderson and myself. He thinks the Anderson name must be blazoned from the sky to promote OTEC, even to the extent of calling himself an OTEC pioneer.

Shamcher knows from experience that the more he can hide his own work and contribution from the world, the more will his unseen influence spread, and the better will OTEC fare.

An Arab friend, Kassem Hassan, who may build OTEC plants in three foreign countries (with me) first understood it, telling me nothing must be said about it until the plants are built. Then he switched and wrote to Dr. Frank Mathews calling me the "founder". When I severely talked to him, he said, "But you founded this work in the United States, and thereby in the world—after the French had not botched it."

"Hassan, the French had not botched it. I happened to bring the work here. If I hadn't, someone else, much more worthy, would..."

So Mansur, please respect my well grounded path of progress: BEORSE does not exist,OTEC does. Even Mansur does, partly because he still has ambitions, partly because he needs money for groceries. Charge whatever you can for all you do, but first get your feet in the door.

And, note: I, Beorse, didn't build plants here at the U., the U. did. The Faculty and staff did. I humbly assisted. Sufi Mansur, don't you see how infinitely stronger this approach is than the silly blazing of silly names and persons? The latter only causes envy and eyebrows and slows the pace.

For some reason that escapes me now, I hoped to be visited in Boston by Shamcher, so on January 31, 1978, I sent Shamcher my schedule: "February 18—19, a [Sufi] workshop in Miami; February 20-22 OTEC Conference in Miami; February 25, a workshop in Atlanta, GA; February 26, a workshop in New York City; March 4-5, a workshop in Washington, D.C.; March 11-12, a workshop in Buffalo, NY; hoping to see you, I'll be in Boston February 27 and 28, and March 1, 6, 7, 8, and 9 to host you, if you show up."

A letter with only two sentences written February 6, 1978, by Shamcher arrived.

Mansur, with your exquisite connections to Energy man James Schlesinger, you may wish to have him personally read enclosed letter and article. [*Waiting for the Ocean Electrician,* The San Francisco Bay Area Guardian, February 2, 1978. This article was written by the "level-headed" person mentioned but unnamed earlier; his name is Neil Douglas Klotz.]

Thank you for all you're doing.

Enclosed was a letter for Secretary of Energy Schlesinger.

Mr. Schlesinger, from the mood in this area, expressed, for example in the enclosed

article, you are seen as the king pin on whom rests the fate of this administration at the next election. So will your guardian angels let you read the enclosed? And may we know whether you do?

In 1963, as head of a United Nations Mission to Tunisia, I favored a nuclear desalting—and power plant. At that time I would have been proud of a position with the AEC (Atomic Energy Commission) of which you were once the chairman.

Since then, we have come to know what is well expressed in Geology-and-Engineering Professor Ernest E. Angino's article in Science, 2 December 1977: We may be able to store nuclear waste, yes, though not in the ocean, not in ice caps, only in "stable" rock formations, which are only available in Asia and Australia.

If we get permission, how do we know that succeeding governments for 1000 years will uphold this permission?

The enclosed article, on which I was not consulted, should have added other energy systems, all ready to go as OTEC is, such as Professor Otto Smith's local and general solar systems, his and other people's wind mills—all of this cost equivalent to current power sources, plus more reliable, plus less likely to show cost overruns than nuclear plants. The Nuclear solution, furthermore, is grossly unfavorable to our job situation and really also to our general technology, while the mentioned alternative sources are most suitable.

You may dispose of some of the persons featured in the article, myself for one, but a vast number of first—rate experts stand ready to oust you, including your departmental advisers, except such as Dr. Abrahim Lavi in the OTEC division, who however is leaving, and his request for a replacement has not been answered. The Administration will fall with you. This will create a disturbance, to say the least.

You can gradually, tactfully, initiate and carry out another scenario: Shift two billion of the 3.4 billion for Nuclear matters to the OTEC and Smith [?] solar systems and give the construction to those companies who have suffered from following previous Government policies and have sunk their funds in useless investments. Reimburse these companies for unacceptable losses, when appropriate. Bear-fighters (see "Waiting..." article) [where this bear story is told] and others may assist you in this task... or…

On March 14, 1978, I reported to Shamcher that his letter to Schlesinger had been sent out to John F. O'Leary, Deputy Secretary of Energy, Frank R. Pagnotta, the Executive Office of the President for Energy Policy and Planning, Pak Yoshiharo, Senator Matsunaga's energy man, Peter Flesher, Congressman Studds' energy man, Jerry Brady, Senator Kennedy's energy man, who said he never heard of OTEC.

Bud Francis of the Applied Physics Laboratory said he had received Shamcher's letter and was willing to give an educational presentation to folks like Brady, who might be instrumental in getting Kennedy to spearhead a priority status bill for OTEC.

I closed my letter of March 14th by promising to see if Dr. Russell Peterson of the Office of Technical Assessment (OTA) had read the letter to Schlesinger on my way through Washington to Puerto Rico for the second time.

But first, there is an OTEC conference in Miami.

CHAPTER 11

OTEC CONFERENCE IN MIAMI

A Jack Anderson story, "Interest Conflict Charged at DOE," in The Washington Post greeted me when I stopped in Washington, D.C., Thursday, February 16, 1978, en route to the OTEC Conference in Miami. The first 6 paragraphs were as follows:

> *President Carter assaulted the oil conglomerates last year with the same results he could have expected if he had pelted the Washington Monument with snowballs. For the President never backed up his words with the action that would demonstrate he meant what he said. Despite his brave rhetoric, he continued to follow the bipartisan tradition of upholding oil privileges.*
>
> *His criticism of the oil industry had scarcely faded from earshot when Robert Strauss appeared quietly at his side, ostensibly as his trade ambassador. But White House sources tell us no one does more whispering in Carter's ear than the suave Strauss. He speaks the oil language, with a soft Texas accent.*
>
> *Then the President selected Lynn Coleman, another amiable Texan, to run the Energy Department's legal staff.*
>
> *The general counsel is in a unique position to influence energy policy. Yet Coleman came out of Houston, a city spawned by oil fortunes. He was a law partner of ex—Treasury Secretary John Connelly, the darling of the oil industry. Coleman refused to give the Senate a list of the firm's clients, but we can report it represents the giants of oildom, including Exxon, Mobil, Shell, Texaco and Union Oil.*
>
> *We can also reveal that his law firm not only litigates but lobbies for its oil and gas clients. Coleman was a registered lobbyist himself. Nor did the firm merely represent oil companies; it got into bed with them...."*

The DOE had approximately 8,000 employees when it was formally constituted October 1, 1977. The OTEC branch had 5 full-time members.

The Fifth Ocean Thermal Energy Conversion Conference was held at the Konover Hotel in Miami Beach, February 20 through the 22nd, Monday through Wednesday. There was a reception held Sunday which I didn't attend, because I had a workshop.

Upon registering, I met Richard Arlen Meyer, the editor of The OTEC Liaison, which had published Shamcher's letter challenging people like Metz and Joplin who were advocating a cautious approach to OTEC development. [see Chapter 10] Shamcher, Richard, Sabira, and I had coffee together, but

Shamcher didn't drink anything but water.

Richard was as gung ho for OTEC as I was. He had been a small businessman, had lived in Japan, and, although he didn't know for sure at the time, he was beginning a new career working to promote OTEC, just as I was, with a difference. Richard had created a product which would allow him to fund his advocacy. He was passing out his January, 1978, volume 1, number 6, issue of The OTEC Liaison to all who attended the conference. He had the audacity to publish a large excerpt of John Judge's article from Government Executive, (December, 1977), *entitled Ocean Power: Is the US Afraid of it?*

This article said everything we had been writing; for example, these quotations,

- *Government programs in Ocean Thermal Energy Conversion are reaching the study for study's sake limit.*
- *A powerful energy alternative is going begging because of fractional management and fear of pilot-plant commitment.*
- *The US, through the newly formed (and not yet fully organized) Department of Energy, seems bent on aborting a potentially staggering economic asset—and all but giving it to Japan.*
- *The asset is Ocean Thermal Energy Conversion (OTEC)-basically an engineering system designed to extract energy from solar-heated ocean water. And it is being researched to death by the Energy Research and Development arm of DOE." [All emphases mine.]*

Never under-estimate the government's ability to spend money. This conference was huge. Hundreds of technical men were in attendance. At least 178 papers were presented. Many had multiple authors or represented the work of a team. Yet frustration was rampant.

Session 2A, what I am calling the first session, was Ocean Systems. In the first session, Mr. T. Berndt from Alfa—Laval, the company Heronemus had hooked up with, complained that heat exchanger and platform design had to be integrated, but they were not. A full sized plant was needed to integrate all elements.

A man from Gibbs and Cox, Robert Scott, in the first session also decried the lack of integration. He said they were given money to research something which was not feasible. That, he said, was the trouble of not integrating ocean systems with power systems.

I assumed that most all the presenters at the conference were being funded by the government. So they were taking the government's money, and the government's process was driving them crazy. It's a wonder some had the balls to speak the truth, because they were biting the hand that fed them.

It was a frustration for me that the other two meetings during the first session, Session 2B, Power Systems and Session 2C, Economics and Commercialization, met simultaneously with the other two. So it was only possible for me to attend a third of the presentations.

Shamcher was staying with Sabira, the secretary of ADEE, at Sabira's daughter's place. We rode to and from the conference together and ate lunch together. At the conference, we went our separate ways.

Shamcher and the University of California were on the program—at the end of the second day. His team was listed last, 4D, along with other groups of presenters on the subject of "Alternative Power Cycles" (meaning the open-cycle).

Competing with him during same time slot were three other meetings: 4A, Environment and Siting (There was a full-time government man concerned with "sites"), 4B, Heat Exchanger Technology, and 4C, Economics and Commercialization, presided over by my friend from Puerto Rico, Robert Cohen. I attended that one.

Cohen posed several interesting questions that he wanted the answers to:

- Who would be the owner-operators of OTEC plants?
- Who will provide the capital to build them?
- Cohen wanted to know how commercial interests can take over the government initiated work?
- He wanted to hear from utilities (at the meeting tomorrow) what financial incentives they would require and what type of plant they might prefer?

I skipped his meeting with utilities, but caught up with him the second half of the third day at his workshop on "Economics, Cost, and Commercialization".

In the Workshop, Mr. Cohen was soliciting scenarios for the commercialization of OTEC. I made a note: Shift 1 billion from the DOE nuclear budget, then remembering Shamcher's letter to Schlesinger, changed it to two billion. My heart grew agitated when I heard Mr. Cohen say they would take suggestions from the floor "like a town meeting". I shivered with agitation, as I fleshed out my proposal, which seemed to fit under the eleventh option he called "Integrated Systems Support". I was so nervous I was trembling.

Using two billion, I wrote with my heart beating wildly, shifted from the nuclear budget, hire
1) Anderson
2) the Applied Physics Laboratory (APL)
3) Alfa—Laval [meaning Heronemus at the University of Massachusetts]

4) Lockheed and
5) a mixed team [like California and the Colorado School or Mines, Golden, Colorado]
to build open and closed cycle plants in
1) Hawaii
2) Puerto Rico
3) in the gulf stream off Florida
4) the Gulf of Mexico and
5) at sites off Brazil [which was mentioned by APL as their favored grazing ground for their OTEC plant ships].

Here was an opportunity to present Shamcher's enlightened view to the conference at large, rather than to just a few bureaucrats! Unbelievable! In my wildest fantasy, I never imagined this scenario. A public vote by those involved. I presented it to the committee. The vote of the committee was four in favor, seven against, with 25 abstentions.

I was devastated, incredulous. I felt really bad after the session that day. It wasn't until I was walking down 136th Street, SW, to Scott's Fried Chicken place that I was able to describe my condition as a heavy heart.

Perhaps I had a heavy heart from all the impressions of the conference in general. Perhaps I had a heavy heart from having lunch with two tall executives from Westinghouse who were so skeptical about OTEC.

The next day we all sat together in the Plenary session. Everyone from the whole conference was assembled in a huge auditorium, and Bob Cohen prepared to read the resolutions of the Economic and Commercialization committee. The reading included my recommendation that we spend 2 billion to simultaneously build plants in Hawaii, Puerto Rico, the Florida current, the Gulf of Mexico and a tropical grazing plant.

My heart was beating furiously in anticipation, just like during the workshop, only it was worse. To try to change my state, I left the room, went to the bathroom, snuffed some water up my nose in the ritual ablution of yogis, and came back.

First, Mr. Cohen noted that my suggestion under the heading "Integrated System Support" was similar to another one. Then it was discovered that this other man was a DOE employee and was ruled ineligible, so he brought me his notes, and I was asked to step to the front to present our position to the Plenary Session.

I did it, but there was no vote by the body; I simply reported what had happened yesterday. It was anticlimactic. All that lingered was the relative lack of enthusiasm I discerned at the conference for

building OTEC plants. One would assume that the OTEC developers would be dying for money to build an OTEC plant. One would expect that the OTEC contractors would want a model, just like a wind program would want to have some model windmills, or the biogas program would feel compelled to have some models of methane converters.

I rehashed the vote. Perhaps the lawyer voted against me, because we didn't have legislation governing OTEC plants yet. He said they were planning on spending between 1978 and the end of the century developing the legal framework to accommodate OTEC. Perhaps Jay Yaffo, one of Heronemus' colleagues, voted against me because he couldn't deliver an integrated system for 2 years.

A man from Westinghouse suggested there was such a thing as smothering something with money. A DOE man mumbled they'd be a laughing stock at the Department if they brought a suggestion like mine.

Shamcher's take on it was, "The more that are against it, the sooner it will come." I said, Yes, as soon as the President says, "We need a functioning OTEC plant in 2 years," everyone will say, Yes, yes, we need a plant right away.

Shamcher's plan, which he first articulated in my presence to Laskar Wechsler of Hydronautics, Inc., a man with a group interested in the open-cycle not favored by the government, and later to others, was to build a plant in Egypt. Not for power but for water, fresh water only. To run it and watch it for six months or so, test the water and see if the resource was there, that is, see if the cold water stayed cold or not. If the measurements showed that the cold water was replenished, then add a generator and make electricity as well, since a water only plant required a smaller temperature difference.

The lack of enthusiasm I discerned at the conference among many, I understood afterward as an expression of their lack of experience. They couldn't be faulted for that.

What I fault then and now is our lack of leadership, our inability to see we can shift to solar and nobody will lose. Do I think that Shamcher could have directed a successful OTEC development program?
Yes.
Did he?
Yes.
Was it going to happen?
No.
All this he knew, I guess. And his well grounded path of progress was to urge others, many others, to

get the experience and get up to speed, so that it could happen.
While Shamcher had been pursuing Egypt before the OTEC conference in Miami, I had been pursuing Iran.

Part of Heronemus' vision that he expressed in his paper *Toward a National Solar Energy Policy* was to trade OTECs for Iranian oil. The temperature differences were excellent off the coast of Iran.
The compelling reason for me to address a friend in Iran was that President Carter had just returned from a visit with the Shah and had agreed to sell him 6-8 nuclear power plants.

On February 5, 1978, I received an answer from Dr. Seyyed Hussain Nasr, the eminent Islamic scholar who was Director of the Imperial Iranian Academy of Philosophy. I had met him in Geneva, Switzerland, at a meeting of the Temple of Understanding which I had attended with Samuel L. Lewis in 1970.

Nasr said:

> *Iran is interested in nuclear energy solely for the purpose of providing enough energy for various types of industrial development in the growth of its cities. But even this of course poses a major problem, so that any alternative source of energy would be of great interest to us.*
>
> *I think what you should do is to present the report which you have sent me to His Excellency Amir Abbas Hoveday, Court Minister, Sacdabad Palace, Tehran, Iran, so that he can present it to His Majesty the Shah and have a total study made of it. I shall try to follow it up at this end.*

The conundrum created, when a non-governmental American like me gives new information to a foreign government with close ties to the United States government, was foremost in my mind when I approached Iran. The problem in Iran, like most anywhere, would be that the Iranians would consult with their American counterparts.

The Miami conference had showed me clearly not only DOE's point of view, but industry's timidity through lack of experience. I took this into consideration when I addressed His Excellency Amir Abbas Hoveday in Tehran, Iran, February 28, 1978, I told him,
I can speak with more authority than the U.S. government, because I have 30 years experience working on OTEC behind me. I am not 81 years old, but Bryn Beorse (mentioned on page 6 of my "OTEC History") is....

After some quotations from Shamcher's letter to Schlesinger [see in Chapter 10], I said,
Beorse, more than anything, wants to build an OTEC plant before he dies. He's got at least 10 more years. He is a voice in the wilderness here, but could be ready at a moment's notice to hop a plane to Tehran, and I would love to come with him sometime, say, in May or June.

Please forgive my boldness, but I felt that His Majesty would be glad to know about OTEC, especially when I heard he was seeking 6 to 8 nuclear plants for Iran....

His Excellency answered me April 10, 1978. When The Boston Globe reported on April 16th,

> *In a recent interview, the shah insisted that Iran would push ahead as scheduled with its most economically questionable projects, massive petrochemical complexes and 23,000 megawatts of nuclear power by 1994*, I wrote again May 10, 1978, to His Excellency Amir Abbas. *You may try to study OTEC by securing US Department of Energy (DOE) reports or Congressional Research Service (CRS) Issue Briefs, which US congressmen use to inform themselves about issues. But CRS issue briefs are not informed of OTEC history even, which I sent to you; namely, that six small plants have been built, three of them by the French . . . and another three by the University of California, after Bryn Beorse had introduced the principle to the University.*

His Excellency had written,

The matter has been transmitted to the related agency of the Government of Iran for study, and they will, if necessary, contact you in due course.

Study OTEC, I told him, *by getting it from the horse's mouth. Bring Mr. Beorse and his promoter to Iran for travel expenses and $300 per day. He is 82 and currently being courted by the Indians and Egyptians for OTEC consultations.*

Having shared all these communications with Shamcher, he wrote His Excellency Amir Abbas Hoveday on May 18, 1978,

> *Your Excellency, what my friend Mansur Johnson has written you is correct except for one point in his May 10 letter: I never charge anything for consultations on OTEC.*
>
> *Being the one familiar with the entire history of OTEC after the death of the French pioneers, my services are priceless and not for sale for any money. What Mansur wishes to charge per day or week is his business. For me: Nothing at all.*
>
> *When in 1959 I talked to India's Prime Minister Nehru and a roomful of Indian scientists, I had even paid my own travel expenses. I would wish to do that when visiting you also. But now, at 82, I unfortunately cannot afford it, so, either my strict travel expenses have to be paid or you could send a person, or a deputation to this university and receive the proper information.*
>
> *The proper information can, however, not be transmitted by letters only, and eventually visit to your possible OTEC sites by informed OTEC workers is essential.*

Enclosed are some papers spotlighting the present situation in the USA. It seems quite possible that the first producing plants will be built outside the US. We have become too rich and lazy to apply new technology as and when required.

By November, 1978, Iran was experiencing riots in the streets and strikes in the oil fields. The New York Times November 12, 1978, said the shah:

..cracked down on his closet allies, including Amir Abbas Hoveida, Prime Minister from 1965 to 1977, and Gen. Nematollah Nassiri, former head of the secret police, Savak. Scores of other officials and prominent businessmen were arrested on charges of corruption and abuse of power.

The Chicago Tribune, November 12, 1978, said,

After 37 years as ruler, the shah remains a masterful political strategist with a proven record of divide—and—conquer tactics. Moreover, he has moved deftly to shift blame for the country's ills away from the throne and onto government officials—a ruthless exercise that has seen two of his most trusted aides clapped in jail last week.

One is Gen. Nematollah Nassiri, 72, the much-hated head of the SAVAK secret police force for more than a decade. In anti-regime circles, Nassiri was perceived as the shah's chosen instrument for imprisonment and torture of political opponents.

Another is Amir Abbas Hoveyda, 58, who was prime minister for 13 years before being elevated a year ago to be the shah's closest personal adviser.

The differences between the two men—the hated Nassiri and the shrewd, respected Hoveyda—are so distinct that many Iranians concluded the shah was scrambling to shift wholesale blame onto the people who were in charge during the oil boom years when corruption was rampant.

Five months later, on April 9, 1979, an AP photo appeared in papers showing a man with out-stretched hands speaking to a tribunal. The photo's headline: "Last Plea."
In the background a bearded man wears a turban. The caption reads, "Hands out spread, Amir Abbas Hoveida makes his final defense before a revolutionary court in Tehran. The Shah's premier for 13 years, he was executed shortly after the hearing."

CHAPTER 12

YOU REMEMBER NIXON, OTEC, INC., BRAZIL, INDIA AND OTEC AS A SUBSTITUTE FOR NUCLEAR POWER?

You remember back in Chapter 2 when I quoted Shamcher, "Governor Brown now seems an only hope. He has the public ear, and is not dumb, like Nixon."?

Nixon had recently been impeached and was in exile at San Clemente, California, just down the coast from Los Angeles, between LA and San Diego.

One of the places I visited immediately following the Canada talk in June, 1977, was California. I conceived a plan, a way for Nixon to redeem himself in the eyes of the US public. It involved OTEC.

In the letter which I hand-delivered to the gate at San Clemente was information about OTEC and the suggestion that he buy national TV time and tell the public about OTEC, urge its adoption, and redeem himself in the eyes of all.

Diane Sawyer (who was working as his secretary at the time), did you allow him to see my proposal?

A little over a month after Shamcher sent me $10 to support my work, I wrote a letter to Richard Meyer, the editor and publisher of The OTEC Liaison on December 28, 1977, whom I hadn't met yet. Citing Dr. Mayer [David Mayer, University of New Orleans mathematics professor who chaired the 1977 OTEC conference], I said,

Mr. Meyer, this person would like to underscore the too small section in Dr. David F. Mayer's fine letter published in the November issue of The OTEC Liaison concerning the French work.

Where things are at today is that the French work has been totally overlooked. Reports of US government research, in your November issue, that the French carried out 20 or more years ago prove this.

The historical steps went something like this: 1) a laboratory demonstration 2) a small plant simulating ocean conditions, and 3) a small ocean test.

By 1929, George Claude had accomplished all three. Energie des Mers took it from there and were ready by 1956 to build a full-scale plant.

The first two steps were duplicated by Bryn Beorse at the University of California. He studied what the French were doing in 1947 and 1948, built and tested 3 plants, and designed a full—sized, open-cycle plant to be constructed at La Jolla, near the Scripps Oceanographic Institution, for the purpose of desalinization rather than the production of power, but using ocean thermal differences—ready to build in the middle 50s.

Today the US government is back at step 2, testing at the Argonne National Laboratory high-performance heat exchangers, being considered for the 1-megawatt ocean test.

This person would like to work to utilize the French design and build a full-scale plant somewhere in the world. Or, he would like to steam directly into the tropical grazing plant business and work in conjunction with the Applied Physics Laboratory at Johns Hopkins University. Or, he would like to help Messrs Anderson get however many millions they need to develop heat exchangers, design turbines; and ultimately, to prove that whatever their plant costs, it is a bargain.

Not to mention Heronemus, Lockheed, and TRW. I'm a sales rep without a company, and funding seems to be the big problem. Therefore, this person would like to pledge $5,000 toward the establishment of a fund to be held at the Shawmut Bank of Boston, under the trusteeship of one of the vice-presidents.

This fund will accumulate until the Board of Directors decides we have enough to build an OTEC plant that will demonstrate economic viability.

Let Heronemus, Dugger and Beorse make up the Board of Directors.

Richard responded graciously January 24, 1978,

> *I, for one, certainly appreciate your offer to pledge money towards the establishment of a fund to further develop OTEC, and am investigating this possibility.*

In November, 1977, I had asked Dr. Gordon Dugger of Johns Hopkins on the telephone if he would be willing to be on the Board of Directors of an organization (ADEE, Alternative Directions in Energy and Economics, Inc.) whose purpose was to disseminate information about OTEC.

He paused thoughtfully, but declined, saying he thought they ought to go on alone, taking what came to them.

I had a man in the trust department at my bank in Boston in mind as trustee and kept an appointment with him at 1:30 on January 4th to discuss the matter. But as things unfolded, nothing more came of it.

You remember in Chapter 11 where I mentioned that Carter's proposed sale of nuclear power plants to the Shah was the motivating factor for me to address Iran? A similar thing happened with Brazil.

The Boston Globe in March, 1978, quoted the Cardinal Archbishop of Sao Paulo, Paulo Everisto Arns, as saying, "No Brazilian will accept restrictions in the nuclear field." I wrote His Excellency the Archbishop March 31, 1978, and told him that while our President might want to restrict Brazil in nuclear matters, others like myself would like to give Brazil all the power she needs with half of the

problems. I enclosed *Waiting for the Ocean Electrician* for him and argued simply:

The day before yesterday, opponents of nuclear power in the U.S. asked the Energy Department to phase out atomic power plants. We have tried nuclear energy and find it lacking.

Primarily the reason is that if some sorcerer's apprentice created a man who excreted feces the likes of nuclear wastes, the concerned citizens with a reverence for the earth, a love of nature, and a consideration for coming generations who would have to look after these deadly stockpiles would, no doubt, look for a more benign way of producing electricity.

He didn't respond.

Not long after The Boston Globe published on May 10, 1978, my letter with the title "No cheap way to store N-wastes". I wrote:
The Globe reported (April 8) that the Supreme Court "gave the whole issue of nuclear waste an honest examination", but we wonder what that means?

Did the court note Prof. Angino's article in Science (December 2, 1977) that, yes, we can store waste, but only in "stable" rock formations located in Asia and Australia?

California prohibits licensing nuclear plants until authorities demonstrate a technology "to permanently dispose" of the wastes.

Boston's kindly but unfortunate inheritor of federal nuclear waste disposal, Dr. John M. Deutch, thinks a timetable putting off for 10 years burying wastes in New Mexico will alleviate "the fears in California that the federal government has no plan". [The Washington Post, March 16, 1978].

But a storage plan is not a technology "to permanently dispose" of nuclear wastes. A multi-billion dollar program to shoot it into the sun, with good odds it won't land in Biscayne Bay, is a better bet.

Please remember this the next time you hear from small thinkers that nuclear energy is not the most expensive. Add to their costs—25 years of government subsidies and a waste disposal mortgage for 10,000 years at some 20-odd nuclear national parks.

I represent a group that wants to expedite the transition to solar energy worldwide. On the large scale, we are advocating a gradual and tactful shift to ocean thermal energy conversion plants (OTECS) and giant wind systems, which are environmentally benign, to involve the industrial giants in the transition from nuclear to solar energy systems.

It is good for people to know that we have these huge, ready-to-go systems like OTEC and wind power, which can take over for nuclear power today.

That was 13 years ago at this writing in 1991. In December, 1978, I put a bill in the hopper of the state legislature to have a moratorium on N-plants in Massachusetts, copied exactly from the California bill.

At that time the Seabrook nuclear power plant with two units in New Hampshire was being built. Activists from my town of Hull, working with 20 other towns in New England, denied Seabrook $375 million in construction funds. This activist action killed the 2nd unit that was planned at Seabrook.

The scam we exposed that allowed us to deny these funds was that the Massachusetts Municipal Wholesale Electric Company (MMWEC) planned to get our communities to buy more power than was needed. MMWEC would then sell the excess power purchased by the towns to New York and Canada.

We couldn't see clearly then that the inability to own the sun was what was preventing the implementation of the various solar energy options.

On May 18, 1974, India exploded an atomic "device" at Pokhran. Canada had been supplying India with uranium fuel rods. After the explosion, Canada suspended all nuclear fuel shipments. The Americans delayed making additional nuclear fuel shipments until 1975, then they resumed shipments.

In the April 2, 1978, edition of the Los Angeles Times, Sharon Rosenhause reported the following,

> *Last Friday President Carter signed a measure requiring India and any other recipient of US nuclear materials to place all nuclear facilities under international inspection and safeguards.*
>
> *If India refuses to comply—and Prime Minister Morarji Desai's government has said it will do so—the fuel shipments would stop after an 18—month grace period unless the President extends them on the basis that a cessation would hurt US nonproliferation objectives or its security posture.*
>
> *Many people here believe that India made a major mistake in going ahead with the May 18, 1974, explosion at a time when its peaceful nuclear program was far from self—sufficient.*
>
> *"They were smart enough to make a bomb, and they were stupid enough to blow it up," one said. "They've had nothing but trouble since then."*
>
> *Dr. Homi N. Sethna, chairman of the Indian Atomic Energy Commission, bristled when asked in an interview at his Bombay office whether India had erred. "I*

wouldn't like to comment," he said.,"What did India gain by nuclear explosion?"

In Chapter 10, I mentioned writing several letters between September and February, 1978, to India. It accelerated. Between February, 1978 and June, 1979, I exchanged 15 letters with India.

As mentioned, I was connected internationally with many spiritual people as a result of the meeting in Geneva I attended with the Sufi Murshid Samuel L. Lewis. Asha Mirchandani lived in Bombay and had attended the conference in Geneva. Bombay is located on the west coast of India, where temperature differences suitable for OTEC are available.

Shamcher wrote to Dr. A. Ramachandran, Government of India, Dept. of Science and Technology, New Dehli, on March 17, 1978:

On the coast around Bombay you have some of the most suitable sites for a land-based open cycle plant, which would produce power and desalted ocean water.

On April 27, 1978, my friend Asha sent me a copy of his letter to the man mentioned in The Los Angeles Times article mentioned above, Dr. H.N. Sethna, Chairman and Secretary to Government, Atomic Energy Commission, Bhabha Atomic Research Centre, Bombay.

Mr. Sethna, I take this opportunity of writing this letter to your kind self as a humble social worker and as a member of the International Committee, The Temple of Understanding.

I have been fortunate to attend three World Conferences at Calcutta, Geneva and New York.

I am happy to inform you that I met one friend Mr. Johnson. He has very kindly forwarded to me the Great Project and desires that I should put him in touch with right people to help him to implement the same.

I thought of your kind self and hence I am forwarding the Project OTEC (Ocean Thermal Energy Conversion). I sincerely hope that the same will be found interesting and something will be done for the benefit of our Country in particular and Humanity in general.

After the Miami Conference, Shamcher had also written on March 17, 1978, to Professor K.T. Merchant in Bombay, India. Some time in April, I received the copy. He said:

Professor Merchant, upon receiving today your delightful letter of March 6 with copies of your own letter to Shri Morarjibhai [Desai, the Prime Minister] and Dr. Ramachandran's reply to you, I wrote the enclosed letter to Dr. Ramachandran, and hope you will look at it and see if it is appropriate, along with the other enclosed

letter copies, and then, if you approve, send on all of it to Dr. Ramachandran.

After this opening, impressive to me because of the high level connection, Shamcher continued,

> *It is so much better to have a trusted friend sending it on instead of just sending it from an unknown stranger like myself. Beside, I will thus have your assistance in judging whether it is proper to send it.*

Unwittingly, I had done the right thing and practiced what Shamcher advised by using Asha to reach the head of the Atomic Energy Commission. That a nuclear man would be interested in solar energy is another matter; I had sought to have Asha pass OTEC information on to a personal friend, as did Shamcher.

Shamcher's letter to Ramachandran began,

> *Professor K.T. Merchant, my dear friend, has sent me a copy of your letter to him of 27 February 1978, and of his own letter to your Prime Minister, Shri Morarjibhai Desai of February 17, 1978.*

Next was Shamcher's description of the Miami OTEC conference which agreed with mine, which was related in the last chapter.

An Indian scientist did attend the Miami OTEC conference. Shamcher said he was sorry he didn't meet him.

> *Such conferences are apt to be confusing, featuring popular and not necessarily the most efficient types of equipment and running several programs simultaneously, so that even the most conscientious attendant cannot take in the whole program and may miss essentials.*

Shamcher went on to describe his work, OTEC history and his prior association with Nehru,

> *I talked about this system to a room full of eminent Indian scientists in 1959. Prime Minister Jahawarlal Nehru was in the audience.*

Shamcher noted that the Miami conference was devoted primarily to the closed-cycle. He said,

> *The open cycle seems the starting point.*

Shamcher had realized and was expressing to many, including Schlesinger, around this time that he once favored a nuclear power and desalting plant in Tunisia. His line to Dr. Russell W. Peterson, Director of the Office of Technological Assessment (OTA), was*, I was embarrassed and shy about my almost unique knowledge,* meaning knowledge about OTEC in the early days.

These days it was different. To Dr. James M. Hester, Rector of the United Nations University [UNU] in Tokyo, he wrote April 10, 1978:

> *After the death of the French pioneers, I am the most experienced in this particular OTEC field, and would like to recommend to you who among the OTEC crowd are worthy of active UNU work in this field, in the various categories, such as open cycle, closed cycle, tube and shell heat exchangers or plate-fin heat exchangers or other types, and how the work could or should proceed.*
>
> *Since I will be 82 in April and may not have much longer to act, please contact me without delay. I require no fee or salary for this service, which is my duty to UNU and the world it represents.*

What Shamcher got from the Miami conference, he expressed in the same letter*:*

> *No national government has—or seems likely to—jump from 'research' (now degenerated into a repetitious game) to implementation.*

CHAPTER 13

BUILDING AN OTEC PLANT IN PUERTO RICO

The Players:

Antonio Barcelo, the Governor's nephew

Carlos Romero Barcelo, Governor of Puerto Rico

Bryn Beorse aka Shamcher, Research Associate, University of California

Alberto Bruno, Director of Planning, Puerto Rico Water Resource Authority

Jimmy Carter, President of the United States

Frank Castellon, Director of Puerto Rico's Energy Office

Howard S. Coleman, Acting Director, Division of Central Solar Technology

Frank R Pagnotta, Energy Secretary Schlesinger's Chief of Staff

Donald S. Sasscer, Acting Associate Director, Center for Energy and Environment Research, the University of Puerto Rico

James Schlesinger, Secretary of Energy

R.T. Thorne, Assistant Secretary of Energy Technology

The Play:

To manifest an OTEC plant in Puerto Rico

Background:

Time magazine, February 20, 1978, at the time of the Miami OTEC Conference was predicting death for the bill which Schlesinger and a dozen staffers had cooked up "in semi-secret fashion and presented it to Carter, who in turn pressed it on the nation.

With its emphasis on conservation, the bill fails to give sufficient incentive to business to increase production of oil and gas.

It gives little attention to nuclear power and practically none at all to the energy available from unconventional sources such as shale, oil, underground steam and the sun.

TIME has learned that whether such measures are adopted or not, a Son of Energy Bill is already in the works. Reports Correspondent Don Sider: *Around Schlesinger's shop they're calling it National Energy Plan 2, and Schlesinger wants it ready as quickly as possible.*

It will be a catalogue of alternative energy approaches and will provide federal aid for developing and bringing to market solar power, wind and water power, coal gasification,

the extraction of oil from shale and the generating of electricity by burning garbage and municipal wastes.

When members of ADEE (Alternative Directions in Energy and Economics) in San Francisco made contact with Antonio Barcelo, the governor's nephew, the problem of access seemed to be solved.

Antonio was sympathetic to the work of ADEE and was willing to help.

On March 7, 1978, he sent me a letter:

> *Mansur Johnson*, he wrote, *I have been told of your interest in going to Puerto Rico to talk to the Governor about OTEC. I was told in a rush and for that reason it has been impossible to arrange a definite date at which you can visit the Governor. Nevertheless, I have written to my uncle and let him know that a member of ADEE will be visiting him very soon.*

How do you make something happen? Obviously, you go to the man in charge, like the Governor, and ask him to do it. Next, you anticipate potential problems and address them in advance.

In Washington March 2-6, I spoke on the telephone with Schlesinger's Chief of Staff, Frank Pagnotta. Mr. Pagnotta wanted to refer me to an Assistant Secretary for International Affairs, but when asked if Mr. Schlesinger wanted data before making a commitment to alternative energies, he said yes, and that was my hook. Shamcher was my data. I made sure he knew about Shamcher's work.

Additionally, there was a Public Law (93-577) included under the Federal Non-Nuclear Energy Research and Development Act of 1974. It had a provision, S 5906, which provided an elaborate framework for Federal, public and private collaboration in energy research, which had never been used. I let the Governor of Puerto Rico know about that.

As well, there was the 90 million dollars worth of useless (to Puerto Rico) already purchased nuclear equipment which Puerto Rico could use as a credit toward an OTEC pilot plant.

In a letter to the Governor on March 14, 1978, the writer urged the Governor to pursue a meeting with Schlesinger. "My purpose in making this contact," I told him, "is to provide you with data and to encourage you to ask Schlesinger to begin construction of an OTEC pilot plant."

As a follow up, a 6 page report submitted to the Governor's energy man, Frank Castellon, detailed the facts, the politics, and a recommendation on how to proceed.
Among other things, I told him,

There is still time for the fiscal year (FY) 1979 budget to contain direct help for Puerto Rico, just as the FY 1978 budget, with its additional 10 million dollars for the Johns Hopkins University, Applied Physics Laboratory (JHU/APL) tropical grazing OTEC plant ship, really got that program off the ground. So much so that Dr. Wm. H. Avery, OTEC supervisor and APL Assistant Director for Exploratory Development, told me at the OTEC

Conference in Miami February 20-22, "In a year the JHU/APL tropical grazing plant <u>will be</u> the government program."

I arrived in Puerto Rico Friday, March 17, 1978, to make an appointment to see the Governor. I hoped to see him on Monday, following the weekend Sufi workshop I had scheduled to pay my expenses. Frank Castellon, Governor Barcelo's Energy Secretary, was who the Governor's secretary referred me to when I called to make an appointment with the Governor.

The Governor's secretary told me Friday, when I called, to call back Saturday between 9 and 11 for a Monday appointment with Mr. Castellon.

"Who are you staying with?" she asked.
"Antonio, the Governor's nephew, has already written to the Governor about me," I answered.
"Are you from Washington?" she asked.
"No, Boston," I said.
"Who are you staying with?" she persisted.
"Carlos," I said, and she let it go at that. I didn't realize at the time my "Carlos" (Varona, a college professor) was different than her Carlos (Barcelo, the Governor). Nor did I pursue the possibility that she had a place for me to stay.

When I met with Frank Castellon at 10 am Monday he told me that the Governor's words to him about my letter were, "Either this man has been to the Energy Department to find out what we are going to do and comes back to tell us, or he is a great mind thinking along the same lines as other great minds."

First, I was flattered, "a great mind"!

My second take on it was: Coming all the way to Puerto Rico to tell them what they are already doing! What's the point? The implications of this were too staggering to assimilate at the moment. The story continued.

When I asked Frank Castellon about Schlesinger, he said Schlesinger was busy with the energy bill mentioned above. Castellon said the last time he saw the Energy Secretary, Schlesinger asked, "What's OTEC again?"

Frank asked for and agreed to circulate a letter from me about my interest in helping Puerto Rico to Don Sasscer's CEER (Center for Energy and Environment Research), Alberto Bruno's WRA (Water Resources Authority), Puerto Rico's electric company, and the Office of Energy.

The letter requested by Mr. Castellon dated March 21, 1978, told all concerned that for almost a year the writer was dedicated to and working full-time on OTEC and alternative energy solutions to

the energy problem. He would consider it an opportunity to work in concert with the enthusiastic forces at both the CEER and WRA, or in some capacity in the Energy office. This kind of job was just what he was looking for; and he would be willing to come on board for $36,000 a year. Frank Castellon told me on the telephone April 16, 1978, that my salary requirement was high. He said an Under-Secretary of Commerce in Puerto Rico made only $18,000; Cabinet members in Puerto Rico were paid $27,000, and the Governor himself only pulled down $30,000, plus a house and car.

The full significance of a dream I had in Washington immediately before coming to Puerto Rico escaped me until this moment. The dream was me getting an office in the White House. It was the same office held by a student of mine who had a mental problem. At the time I was flattered to have the office. It never occurred to me my actions were borderline crazy.

When Shamcher noted the approach I took with the Governor, he advised me to "take him by both hands and lead him to Washington to see President Carter."

Now I had to alter my original advice to Governor Barcelo that he talk to Schlesinger. Where did I go wrong? Why did I misdirect the Governor?

For one thing, I overlooked that Schlesinger was a nuclear advocate. This was highlighted in a column titled "Some Jerry Brown Moves" by Mary McGrory on March 14, 1978. McGrory wrote:

> *Department of Energy Secretary James R. Schlesinger told the delegates to the first National Solar Energy Conference that he wished them well.*
>
> *They were glad to hear it, but not entirely sure he meant it. Something about the flat, dead tone in which he spoke belied his words. There was none of the warmth and enthusiasm which suffuses his frequent public utterances about the virtues of nuclear energy. To solarites, Schlesinger is a black hat, and his appearance was regarded as an exercise in fence-mending rather than a demonstration of commitment.*
>
> *Solar is the orphan in the Carter energy budget, nuclear the fair-haired child. The only political figure on the national landscape offering opposition to the nuclear future envisioned by Schlesinger is Gov. Edmund G. (Jerry) Brown of California, who, alone among the governors recently gathered here, stressed "alternative sources of energy"....*

My letter to the Governor, with copy to Frank Castellon, a copy of Mary's column, and a copy of my report to Frank, back—tracked from my original advice for him to speak to Schlesinger.

Responding to Shamcher's advice, I told him,

It may not have been the highest wisdom to urge you to see Secretary Schlesinger. I thought he could

influence President Carter to gradually and tactfully shift the national focus from nuclear to solar energy, and deliver OTECs and other alternative energies to Puerto Rico if he wanted.

It may be that he does not want to. Even though Robert Thorne got Marvin to stop sinking the OTEC program I now feel the seriousness of the need in Puerto Rico warrants seeking an audience with the President.

No doubt he will refer the matter to Schlesinger—that is his executive prerogative with energy matters, but what is really at stake is a shift of national priorities in the direction of renewable energy options.

You can remind President Carter that his political survival perhaps depends on his ability to answer the strong challenge of Governor Brown.

On May 8th, 1978, Governor Brown visited Shamcher. I received notice of it when Shamcher sent me a copy of his letter to Dr. Colonel Russell L. Schweickart (the astronaut), who worked for Brown, with "This must be kept strictly to yourself for the time being, I think," written at the top. What happened was not your ordinary meeting.

Read on:

> *Dr. Schweickart, your expeditious response to my request to see the Governor—two days after our meeting, Saturday the 6th, on Monday evening May 8th—was much appreciated and superbly satisfactory.*
>
> *I did not talk to him, not necessary, not ever. He talked to me and showed that he had a perfect concept of what is happening, what must be done; that he has a valid strategy, to show first in California, then take over the nation.*
>
> *He also showed that the Buddhas and Jesuses in other worlds and this world are in close contact with him, and, in fact, that he is one of them.*
>
> *As you know, our concept of the on-earth-living Buddhas has always been unreal and idealized according to our warped concept of "perfection", while our concept of the Buddhas and others who passed over to the other world has been much too flimsy.*
>
> *They are as active in our affairs as when they visited and, in fact, similar and as "great" beings are living now.*
>
> *The written traditions are awfully oblique. Four great books on the Buddha were in fact irretrievably lost.*
>
> *It won't disturb, but will enhance, Governor Brown's career or trail if I run Buckminster Fuller awhile.*

Telling candidate Brown, he's going to run Fuller? Isn't this a strange thing to write to a Presidential candidate who had just visited you? Bear with me while I finish Shamcher's letter to Governor Brown's man Col. Schweickart. Then I will present his letter to Buckminster Fuller.
Shamcher went on:

> *Governor Brown should watch his voice. He used it too much without paying enough attention to its preservation. He can project its clarity and strength from appropriate inner-to—outer thrust or "meditation" which he knows so well.*
>
> *You promised I would see the Governor in about 180 days. You did it in 2. I appreciate the improvement.*
>
> *I would be eternally indebted to you if you would kindly convey the above to the Governor, just so he sees that I know. The delays in sending back the irreplaceable material I had sent him, I now know, is not his fault, nor is anything his fault. Or anyone's fault for that matter. Our state and nation have just grown beyond easy management.*

There was a part of Shamcher that gave up on reaching the current administration. I knew this when he revealed his efforts to persuade various individuals to run for president. On May 8, 1978, Shamcher wrote R. Buckminster Fuller in Philadelphia,

> *Mr. Buckminster Fuller, on May 6th at Davis, California, you asked me to write you on my proposal that you, or your designate, run for President of the USA, in order to get home to more people what you have so long fought for through books, lectures etc.*
>
> *If you designate a man other than yourself, he should be sufficiently well-known to command the attention of newsmen to keep him in the news until election time. Of newsmen whom I have approached on this matter: Norman Cousins, SATURDAY REVIEW plus columns plus many commissions etc. He says: Good idea, but might I not become another Harold Stassen? (Harold at least became well-known through his repeated efforts. But he did not have the program.)*
>
> *The candidate's program would be yours: For one thing, that within ten years we can establish energy systems without any recourse to oil, coal or nuclear (I brought the Ocean Thermal system to this country in 1948. It can in five years begin to supply the grids on competitive costs. Many other systems are ready).*
>
> *Ecology can be solved by harvesting pollutants for useful chemicals. We have so much to do that every willing hand can be employed as soon as we think.*

A tentative cabinet would show what we want: I would say without rigidity: Dr. John H.G. Pierson, retired Science & Economics advisor to the United Nations (wrote and often gave the speeches of 3 General Secretaries), for Secretary of State.

His friend Prof. Emile Benoit of Columbia University as Secretary of Treasury. Both have worked on the matter of full employment for 40 years and have what I consider a simple, effective human approach.

Professor—former Navy Captain in charge of shipbuilding—William Heronemus of the U. of Massachusetts: Energy Czar (Has now allied himself with Alfa-Laval, Swedish firm, for OTEC building).

Herbert York, Secretary of Defense. He was advisor to four presidents, now favors a greatly reduced, but more effective and less saber-rattling defense.

The candidate should either have no party affiliation or just a tentative one, and take in no money or, for example, just one dollar per person or less. He should "run" as much or little as he wants, with no regard to such customs as the primary or TV time (except what is given, free or very reasonable). He just needs to sit and admit that he is "running".

The people of the US will have someone to vote for—even the 46% that <u>did not vote</u> in the last Presidential election.

Your program will be known, will jump from some hundred thousands to hundreds of millions. (Other newsmen to whom I wrote but had no direct response: Jack Anderson, Tom Braden).

I have been saving the first thing Frank Castellon said to me for last. He said, "We know the technology is ready to go. There is a meeting scheduled April 10 with Bob Thorne."

I had decided it must have been Thorne who pressured Marvin to answer carefully my congressman Gerry Studds when Castellon said, "Marvin, he's not much interested in OTEC, but Thorne is."

When I reported this to Shamcher, he addressed Thorne on July 10, 1978.

On July 25, Howard S. Coleman, Acting Director, Division of Central Solar Technology, a lesser light than Thorne, answered Shamcher, as follows:

Dr. Beorse, your letter dated July 10, 1978, and addressed to Mr. Robert D. Thorne was referred to me for response.

In reviewing your letter and the referenced correspondence, there appears to be no major difference between your and the Department of Energy's objectives.

The OTEC program has made tremendous advances over the past two years...We agree with your observation that the actual cost cannot be predicted with any degree of precision before an actual system is built and operated...However, cost and institutional constraints are such that a crash solar program to develop all proposed concepts at full scale and simultaneously is precluded.

Shamcher responded July 28, 1978:

Dr. Coleman, your letter of July 25 was a fine example of communication between Government and citizen and gave me deep satisfaction. Also I fully realize that as an Energy Department executive you had to say what you said about "cost and institutional constraints".

Luckily, however, not merely the Energy Department but the entire administration is constantly changing; views, aims and goals are changing, just as my own views have been changing from fingering laboratory OTEC plants in the fifties to the present—may I call it an EMERGENCY?

Correspondence with Energy-Treasury-Defense Departments, with Chase Manhattan Bank, with the Chamber of Commerce has often resulted in agonizing responses from men who feel we have drifted along a road of economic dreaming (along with other nations)—dreaming without vision, and that we must now decide on a radical change which at first would involve substantial financing—far beyond what any present Budget Director would officially find possible, and which might cause substantially higher inflation rates for a while.

Though such inflation may be drastically reduced by new financing systems—not new to history but to present practices. [Refers to Giro-credits, I doubt Coleman had a clue.]

There are many valid energy systems besides OTEC, which may not even be necessary, but since OTEC happens to have been better researched than many other alternatives, we may both agree to include it in the package.

The reason the various types should rather be built and tested simultaneously is that, for example, the open cycle versus the closed cycle, and land-based plants versus floating plants are so entirely different systems that testing one of them says nothing about the others.

Only one with many years experience in OTEC systems can know that.

Also, a type carefully planned and nurtured through years or decades by one firm or university is necessarily much better than a mixture of many types, cooked together by Government and private firms and university people as a "compromise". To "save" a few billion dollars by proceeding slower, and with only one plant at a time, may well turn out to be: Not a saving but suicide.

I am enclosing a condensation of the Benoit-Mayer program as a further explanation of these matters (perhaps I should apologize for the slant inevitably introduced in my condensation).

If you, dear reader, expect more from the exchange above between the Energy Department and Shamcher, I am sorry to say there is no more. Again, it is perhaps the reason Shamcher began searching for presidential candidates. He realized the futility of dealing with this administration.

PUERTO RICAN RETROSPECTIVE

The premise that you go to the man ostensibly in charge (Puerto Rico's Governor Carlos Romero Barcelo) and ask him to do something (build OTEC plants) was asking too much of a client state. The vassal doesn't tell the master what to do. The Puerto Rican government was in an unequal partnership with the United States government. Puerto Rico couldn't act independently.

In 1978 the tripartite issue of statehood versus commonwealth status versus independence divided Puerto Ricans.

Puerto Rico had commonwealth status and was governed by a pro-statehood Governor.

On April 12, 1978, The Boston Globe reported on Governor Barcelo's visit to Boston in an article titled, "Puerto Rico governor seeks island investors in Boston." Writing for the Globe, Anne Kirchheimer said,

Since the 194Os, Puerto Rico has been a tax paradise for business, with its 100 percent tax exemption for periods up to 30 years and its large supply of cheap labor.

Although the island had the highest standard of living in the Caribbean and Latin America, the average per capita income was half that of Mississippi, the poorest state in the U.S.

"Faced with an eroding tax base," she wrote quoting the governor, [last year 52 percent of the island's tax base was exempt, compared with 24 percent in 1973 and a projected 75 percent by 1980] "a 20 percent official unemployment rate, a cost of living

15 percent higher than any city on the US mainland...Puerto Rico can no longer afford to give investors a free ride," the governor said.

"The most important incentive for investing in Puerto Rico is security of investment," Romero Barcelo said.

"Our administration is committed to strengthening and closing ties with the rest of the US mainland. Our party, the New Progressive Party, advocates statehood as a final solution."

In other words, the present administration in Puerto Rico was interested in working hand in glove with Washington; Frank Castellon, Puerto Rico's Energy man, with the Department of Energy (DOE), and so on down the line.

A Sufi lady named Teresa urged me to write her friend Jorge Gaskins, President of the Union de Pequenos Agricultores (Union of Small Farmers) because he was interested in energy matters and well-informed about goings-on in Puerto Rico.

"Castellon," he wrote me June 19, 1978, *"is our own pipe-smoking version of Schlesinger. For the moment his niche is secure as resident expert. He seems to be exploring OTEC. I understand that a small OTEC is destined for Vieques, no matter the opposition from local groups. Later Punta-Tuna in Maunabo will be the site for the gigantic OTEC that you seem to imply that you would like to see in Puerto Rico. Proposals have been made. CEER has consultant contracts out as does Castellon's Energy Office."*

Gaskins said,

We are pretty well informed on energy policy in Puerto Rico. Energy like everything else is controlled by the United States' interests. Puerto Rican public policy has long been bought by the bond holders. Two thirds of the Puerto Rican government's budget is Federal (US) funds.

The crucial significance of the close ties between Puerto Rico and Washington had escaped me when formulating a strategy for manifesting OTEC there back in March.

CHAPTER 14

OTEC FOR WATER ONLY IN THE VIRGIN ISLANDS

Around May 3, 1978, it was revealed to me by Frank Castellon that Puerto Rico sold water to the Virgin Islands.

To Shamcher I said, *The next time I call Mr. Castellon, it will be to ask details concerning the Virgin Islands' fresh water situation which they import from Puerto Rico; for example,*

A. Who in Puerto Rico sells the water?

B. How much is it?

C. How many gallons per day do the Virgin Islands purchase?

D. Who buys it in the Virgin Islands?

It just so happened that two months before on March 9, 1978, Shamcher had completed an update of his 1954 OTEC desalting plant. The document with the title "A Desalting Process Using the Thermal Difference in the Ocean" was in my hands. The whole thing was eight pages long.

The cover page stated,

> *In 1954, the Sea Water Conversion Laboratory of the University of California tentatively designed a desalting plant for the Los Angeles-San Diego area where thermal difference between surface water and at 500 meter depth was sufficient for desalting but not for power production. The design was based on three small plants built and tested. Bids on components were obtained from component manufacturers: Westinghouse, Braun condenser manufacturers, Baldwin locomotive and pipe manufacturers, etc.*

On May 10, 1978, after a telephone conversation with Mr. James Moorehead at the Virgin Islands Public Works Department, I reported to Shamcher,

Here's the data from the Virgin Islands. They pay 38 cents per 1000 gallons for the fresh water and an additional $8 per 1000 gallons for the water to be delivered. That's $5,028 per day, figuring they buy at least 600,000 gallons per day.

Mr. Moorehead said they get between 600,000 and 800,000 gallons per day, but they could use 3½ million gallons per day based on per capita usage.

I don't know how to translate these figures into your figures, which speak in terms of acre feet prices of OTEC desalted water. What do I do with your $85 per acre foot price of OTEC water?

Shamcher wrote May 16, 1978, telling me that one acre foot of water (that's an acre of water one foot deep) was equivalent to 326,700 gallons. So when I made the calculations, including updating (multiplying by 4) the 1954 price to 1978 dollars, OTEC produced water cost $340 dollars an acre foot and Virgin Islands (Puerto Rico imported) water cost $2,732 per acre foot!

Mansur, he wrote, *I understand they pay about $8.38 per 1000 gallons desalted. High.*

My letter to Governor Juan Luis, St. Thomas, Virgin Islands, on May 18, 1978, began,
Governor Luis, based on information given to me by Mr. James Moorehead, Public Works Department, an OTEC desalting system can provide the Virgin Islands with fresh water 9 times cheaper than you are presently paying....

I submitted the letter to Shamcher for review. When his suggestions were incorporated, my letter began,
Governor Luis, based on information given to me by Mr. James Moorehead, Public Works Department, the Virgin Islands could obtain fresh water for a fraction of the price you are presently paying, through an OTEC plant, of which Frank Castellon of the Puerto Rico Energy Office spoke to you about.

You pay $8.38 per 1000 gallons, that's $2,732 per acre foot. The University of California got water for $85 per acre foot in 1954, but their plant cost estimate has been updated by a factor of 4 to 30 million dollars. Their water cost today depends on local conditions; namely, the temperatures at the site....

Like the main character in the movie *Powwow Highway*, I was always alert to signs that caught my eye. All the quotations from magazines or newspapers in this book are not a result of library research. When I traveled, I read, always alert to a change in the political wind, a statement from a politician or bureaucrat that might give me a talking point; or, as in the San Juan Star when I was in Puerto Rico March 20, 1978, a source of funds.

The article, "U.S. execs, Arabs form investment banking firm" begins,

A group of businessman from the ruling families in Saudi Arabia and the United Arab Emirates have joined with American executives to form an investment banking

venture in the United States to recycle petrodollars into investments here (New York) and abroad.

The new venture, the Petra Capital Corp. will open its New York offices next month, according to Petra's chairman, Peter J. Tanous, a former first vice-president of Smith, Barney, Harris Upham, the New York investment firm.

I told Shamcher I had that company's New York telephone number. The article concluded with the cryptic remark,

He (Mr. Tanous) declined to discuss the sources or quantity of funds that Petra would have at its disposal.

While waiting for more than a month to pass, so that Mr. Tanous would be situated in his new office, there was another interesting article in The Boston Globe March 27, 1978, "Saudi Arabia to get water from Canada."

"It's so simple," drawled 50 year old Tom Reynolds, "that nobody ever thought of it before. Yes sir, the water tankers are coming."

The former Canadian Navy helicopter pilot is busy setting up a deal to ship billions of gallons of sparkling fresh water—now gushing unused into the sea off the coast of British Columbia—to the parched sands of Saudi Arabia.

To do it, he says his company has obtained exclusive rights to export fresh water from Canada and worked out a deal to charter one of the brand new Japanese supertankers that has been lying idle.

With the relish of a prospector tucking into his first big strike, Reynolds describes how the idea hit home with him and his associates when he found out last year that the Saudis were seriously considering towing icebergs to their desert kingdom.

Checking a little further, Reynolds said he and his associates were astounded to find that the men from Riyadh had budgeted no less than $12 billion to help alleviate their water supply problems. This included extensive geological surveys and massive investment in desalination plants...."

Mr. Reynolds had a contract for a billion gallons. He planned to sell the water for 16 cents a gallon and store it in 100,000 gallon neoprene bladder tanks they used in the Canadian

arctic. He expected to deliver 10 million gallons every 60 days. His 1 billion gallon contract would require 100 tanker trips from Canada to Saudi Arabia.

He said it cost Saudi Arabia $1.19 per gallon to desalt water, so his 16 cent per gallon price was cheap. Shamcher's $340 per 326,700 gallons works out to something like 1/1000 of a cent per gallon! I didn't know how to pursue those Saudis who were negotiating with Mr. Reynolds, so I waited until July 5, 1978, to address Mr. Peter J. Tanous of the Petra Capital Corp.

After relating how Petra came to my attention I said,
Please tell me if the 'investment banking venture' mentioned in the San Juan Star article includes venture capital projects in the 25—30 million dollar range (Shamcher's 5 million gallon per day plant was estimated at 30 million*), because if it does, I would like to talk to you.*

On July 24, 1978, Mr. Tanous wrote to me and said, *Mr. Johnson, unfortunately, we have little interest in venture capital projects in the 25—30 million dollar range. Thank you for your interest.*

I noted in my May 23, 1978, letter to Shamcher that Frank Castellon told me he sometimes felt "discouraged" about the future of OTEC in Puerto Rico. He had been to Washington, and the high cost of OTEC was getting him down. I told Frank that the cost-effectiveness of the water-only plant that I was contemplating for the Virgin Islands would certainly attract investment money. I told him Shamcher's plant could supply water 9 times cheaper than current costs. He urged me to write Governor Luis, which I did 4 days later May 27th.

By June 12th I was puzzled:
But Shamcher, if I am not off the wall, why isn't anyone picking up your plum? The Virgin Islands looks so attractive, because they are a desert island. Why not place a pilot plant somewhere not only to show OTEC works, but where they need the water, not to mention the power?
Remembering the importance J. Hubert Anderson placed on a "letter of intent", (an intention to purchase power if it were provided) I requested such a letter from Frank Castellon of the Puerto Rico Energy office.

He said in his letter of June 27, 1978, exactly what I asked him to say:

> *I must say that we are very interested in the development of an OTEC system, and that we have several ideal sites available complying with the 3 miles off-shore distance and*

a 20 degree difference in temperature required.

This above information has been compiled working with the Federal Government, but we are very much interested in welcoming private capital into the development of such a system. The local electrical public utility, Puerto Rico Water Resources Authority (PRWRA) under Pedro Vazquez will be involved in the technical and operational aspects.

A copy of his letter, and a copy of my letter to Virgin Island's Governor Luis went to Shaikh Zaki Yamani, the Saudi oil minister, who had gone to school at Harvard:
Sheikh Yamani, As-salaam Aleikhum! As you can see from the enclosed letter to Mr. Rockefeller, I am looking to be connected with Saudi investors for the purpose of building an OTEC plant to provide fresh water and power and, most importantly, to demonstrate a new technology, so hundreds and thousands more can follow, and we can restore a balance to our lives.
The copy of the letter from Mr. Frank Castellon shows Puerto Rican interest in OTEC.
The copy of the letter to Governor Luis shows how attractive an OTEC plant could be to a desert island.
From your high position I know you could help me make OTEC a reality.

Shaikh Yamani never answered me.

I spoke with the leader of the Sufis, Pir Vilayat Khan at his headquarters near New Lebanon, New York, and he suggested contacting Professor Sa'id, an Iraqi professor at American University, about an introduction to the Saudi royal family.

My reasoning for pursuing the Saudis, again, was that Arab oil would only get more valuable the longer it stayed in the ground. Development of OTEC could allow the Saudis to conserve their finite resource and get much needed water. Therefore, my reasoning went, the Saudis might be persuaded to finance the development of OTEC.

Professor Abdul Aziz Sa'id, Professor of International Relations at The American University in Washington, D.C., graciously provided me with an introduction to Mr. Jack Bridges, who directed the Faysal Foundation for the Saudi royal family.
Professor Sa'id's letter began,

Mr. Bridges, good greetings. Mansour [spelling Mansur in the Arabic manner rather than the Persian] Johnson has submitted to you a request for transmission to the Faysal Foundation. The project he has outlined in his proposal is feasible and important. The

integrity of Mansour Johnson is above reproach. His sincerity of purpose and commitment to the project and training qualify him for serious consideration. You are welcome to inquire from me further about this matter.

This recommendation along with my 3 page letter went to Mr. Jack Bridges. Under headings: Who am I? What is OTEC? What design do you have for the plant? What is the plant cost? What sites are ideal? Why build this OTEC plant privately? I forcefully made my arguments, concluding:

World demand for oil will, no doubt, remain high. To conserve oil, it would seem to be in Saudi interest to demonstrate alternative energy sources.

Saudis also need water, and OTEC-produced water could provide Saudis with independence from water entrepreneurs, who would contract to ship tankers full of water from Vancouver, Canada.

Finally, there is in America a strange imbalance. Americans, for example, speak about $500 million in 1979 [The Washington Post, July 17, 1978, page 3] for thermonuclear fusion-produced electricity that might be viable in 2005, when Bryn Beorse could, no doubt, show in 3 years, with an OTEC demonstration plant, how we could produce all the electricity the U.S. needs. $500 million for fusion would be all right, if we had our priorities right and OTEC was getting 2 billion, but we don't, and OTEC may receive 36 million.

Saudi development of OTEC would be an insurance policy against the occurrence of the scenario which has the U.S. muddling along, promising to decrease oil imports with no realistic way to do it, and the resulting depression and war with Russia over Mid East oil fields.

I am writing this proposal without Mr. Beorse's permission. He is 82 years old. He doesn't make plans, and he is unpredictable. I would urge you to act fast. His experience is priceless, his good will boundless....

On July 21, 1978, Mr. Bridges answered graciously.

Mr. Johnson, thank you for your letter of July 18, 1978, and the attached material. I am not a representative of the King Faisal Foundation, nor am I any longer active as an officer of the al Dir'iyyah Institute. However I do go to Saudi Arabia quite frequently and do visit with various officials of the Faisal Foundation. Unless you notify me of any objection within the next few days, I will carry your material with me on my next trip and submit it to the Faisal Foundation for their consideration.

Like most engineers interested in energy, I have been following OTEC myself for many years, and have also concluded that the best approach would be a privately funded demonstration project. However, I find that private sources are getting more and more reluctant to move into projects of this size, and that most of them consider that a successful demonstration would only accelerate government efforts in that area and would not necessarily leave the private investors in a sound financial position.

So we have come the full circle. Private investment "would only accelerate government efforts in that area and would not necessarily leave the private investors in a sound financial position."

The government not doing it, therefore, stops it both publicly and privately.

I tried to make an end run around the government by getting private money, and the privates won't invest because of the government. There is no choice, I decided; we have to go after the government, again, harder. Skip immediately to Chapter 15 to follow where that resolve took us.

However, for the reader who wonders what happened to Mr. Bridges' promise that he would carry my "material with me" on his next trip and submit it to the Faisal Foundation, read on.

My letter of July 27, 1978, opened by thanking Mr. Bridges for offering to deliver my material to the Faisal Foundation. It concluded by asking him, *When are you going next to Saudi Arabia and how long should one expect to wait before hearing from the officials of the Faisal Foundation?*

Having heard nothing by November 17, 1978, my letter to Mr. Bridges was one sentence long: *Mr. Bridges, was my letter of July 27th so thick you couldn't read through to the end where I asked, 'When are you going next to Saudi Arabia?'*

My patience really tested by March 9, 1979, I called Mr. Bridges and learned from Ms. Forbes that Mr. Bridges was ill and only attending to the most urgent business. She gave me the name of Mr. Lawrence Erwin at the Al—Dir'iyyah Institute in Arlington, Virginia.

My letter of March 9, 1979, to Mr. Erwin began,

Mr. Erwin, could you direct me to the proper channel? The enclosed copy of letter was sent to Mr. Jack Bridges in July, 1978, and even though he said in reply, "I will carry your material with me on my next trip (to Saudi Arabia) and submit it to the Faisal Foundation for their consideration," I have heard nothing, until I learned from a telephone call this morning that Mr. Bridges is ill and only attending to the most urgent business....

On March 13, 1979, Mr. Erwin wrote and said,

> *Mr. Johnson, I have read your letter and background information regarding Bryn Beorse and his OTEC desalting and electrical power plant system.*
>
> *I too feel that OTEC has a positive future in desalination as well as an alternative energy system, and sometimes question the speed with which the United States and the Japanese pursue the further development of this technology.*
>
> *As to the possibilities of the Al-Dir'iyyah Institute providing funding for your project, the answer, regrettably, is that we are unable to do so as our focus is basically on small-scale technologies and their application in the rural and agricultural sectors and not on large scale systems such as the one that you propose.*
>
> *Moreover, our grant funds are used to research projects of economic, sociological, institutional and technological aspects of the transfer and application of small-scale technology in less developed countries. Our funds are not used to support persons or organizations in their endeavors to arrange financial assistance for their projects.*

Now I became really annoying and didn't let a dead horse lie. In my March 20, 1979, response, I called his attention to the first sentence in my March 9 letter, which said, *Could you direct me to the proper channel?*

I went on, *It appears that you are sympathetic to my mission, which is to speed the development of renewable energy systems, so I would ask if you could provide me from your, no doubt, wide range of Saudi contacts an 'in'.... Perhaps you could give me an introduction to Shaikh Zaki Yamani. In my capacity as a traveling teacher in the Sufi Order, I too am a Shaikh.*

Bless his heart, he answered me, March 23, 1979:

> *Shaikh Johnson, with respect to your request for directions to 'the proper channel', 'Saudi contacts', or an introduction to Shaikh Zaki Yamani, you will have to accept my apology again, as I can not provide you with any directions or an 'in'*

as I have none; nor can I provide you with an introduction to Shaikh Zaki Yamani as we are not even acquaintances. Other than suggesting that you address your proposal to the U.S. Department of Energy or someone in Saudi Arabia that you have arranged to meet, I can be no further service to you.

CHAPTER 15

OTA (OFFICE OF TECHNOLOGICAL ASSESSMENT)

There was trouble brewing for OTEC. There were signs that came to me through copies of Shamcher's letters to Dr. Russell W. Peterson, Director of the Office of Technological Assessment, dated March 7 and March 21, 1978, although his reason for writing Dr. Peterson escaped me at the time.

Additionally in the letter copy I saw from Dr. T. Nejat Veziroglu dated March 23, 1978, and the Coleman letter quoted in Chapter 13 from July 25, 1978, there were clues. These were strong clues, as Coleman unequivocally said "no" to an accelerated OTEC program, but revealed no substantive information.

Veziroglu was Director of the Clean Energy Research Institute at the University of Miami in Coral Gables. He was interested in hydrogen, which could be produced from OTEC or any of the other renewable energy sources being considered as a fossil or nuclear fuel substitute.

When asked by Shamcher for his comments about DOE policy, Neziroglu opined, "They do not have a comprehensive energy policy." In the same letter, he added, "I also have high respect for the Johns Hopkins' work on OTEC."

(The APL [the Applied Physics Lab at Johns Hopkins University] OTEC plants would produce ammonia at sea. Ammonia, which is less volatile than hydrogen, would then be transformed back to hydrogen on land. APL was keen on using the ammonia to produce fertilizer; I liked ammonia as a source of hydrogen, which is what interested Neziroglu for the coming hydrogen economy.)

"Today I was talking to Dr. Francis of APL," Neziroglu continued, "and asked him about the OTA report. His reply was that the OTA report was based on old data and that they have already sent a rebuttal."

OTA worked for Congress. Its purpose was to make technical assessments on matters Congress dealt with. The input of OTA could be significant. A thumbs-down meant no money.

The Coleman letter of July 25, 1978, stated immediately following the portion quoted in Chapter 13,

> *Within the budgetary constraints we have to work [with], we have been advancing on many fronts in the energy field. However, recent assessments of OTEC by groups outside DOE make it very unlikely that a faster development phase will be mandated by Congress.*

The phrase "assessments of OTEC by groups outside DOE" is the key phrase here. OTA was the group.

Shamcher's talking point to OTA head Dr. Peterson on March 7, 1978, was that his so-called energy experts could not properly assess OTEC.

> *There are no experts except those who have worked for 5 years or more on a certain limited gadget. They become experts in that limited gadget, no more....*
>
> *Now today at least 700 top technical people know about OTEC, as much or more than I know; and you may know too—if you stop listening to PhDs and Nobel laureates who know nothing about either OTECS or solar mirror farms. . .*
>
> *So, if you are to obtain energy experts in your office, contrary to what they have now in DOE [Department of Energy]--Yes, they have one—one OTEC expert in the entire department, who has become so annoyed, being at the bottom of the heap, he is going to quit. His name: Abrahim Lavi. With your gracious permission, I would like to give names from various universities and companies—names of real "energy experts" . . . who have worked sufficiently long with these matters, and showed sufficient independence to be worthy advisors. Thus, pronto, OTA will be miles ahead of our sleepy energy department.*

Shamcher's invitation to Peterson to use real OTEC experts was not accepted. The list Peterson did not request was the same as the one included in the copy of Shamcher's November 14, 1977, letter to Prof. Selim Estafan, National Research Center, Dokki, Cairo, Egypt, which he sent to me with the Peterson letter.

It included "among engineers who have built or designed or worked with land-based open cycle plants" himself, Everett Howe, Alan K. Laird, and Bud Tleimat of the University of California; Dr. Frank Mathews, and A.D. Watt of Colorado School of Mines, Golden

Colorado; Dr. Clinton Brown and Dr. Laskar Wechsler of Hydronautics, Inc. of Laurel Maryland; Dr. Richard Leyendecker, Turbine Division, Westinghouse Corp. in Philadelphia.

Always balanced, Shamcher supplied closed cycle engineers who had worked on closed cycle OTEC systems, including the Andersons, Heronemus, Prof. Clarence Zener and his team at the Carnegie-Mellon University in Pittsburg; Dr. W.H. Avery, Dr. Gordon Dugger and the rest of the APL, Johns Hopkins team; Mr. Lloyd Trimble, Chief Engineer, Bernie Messinger, consultant, and their team at Lockheed; and Robert Douglass and his TRW team, just to mention names and not include the explanations contained in the Egyptian letter.

Shamcher followed this March 7th letter to Mr. Peterson, OTA Director, with another March 21, 1978.

A little before this, a member of the Energy Department, who had seen Shamcher's letter to Schlesinger, had addressed Shamcher seeking more information and "asked to be kept incognito". Shamcher was ecstatic, writing him March 8, 1978, and sending me a copy with the man's name blocked out,

> *Mr. (blank), can you imagine how it feels for one who spent 15 of his 62 working years in Civil Service to find one alive <u>person</u> in our largest Government Department? (or next-largest).*

To Peterson on March 21st, Shamcher alluded to this unnamed person:

> *A flamingly alive and well-placed person in our Energy Department has shown me I was wrong in my remarks about that department in my letter to you 7 March. He wanted my comments and also wanted his anonymity secured. So I enclose copy of some of my comments to him.*

Shamcher's comments were as follows:

> *Thank you also for your enclosure. I knew about these contracts and while they are most encouraging compared to the dead silence in the fifties when we at the University of California worked on these matters, the most desirable in view of our present energy situation would be if 4-5 plants of different types (open-cycle, closed-cycle, foam and mist cycles, Anderson plate—fin heat exchanger, Lockheed or Westinghouse tube and shell heat exchangers) were built now, as fast as our technology could—and that would be much faster than present department plans call for.*

One drawback in all present technology: We believe in "experts". The only experts are those who have worked for at least 5 years on one particular system. PhDs, Nobel laureates who have not worked thus on a system not only know nothing about and cannot evaluate it, but, unfortunately, think they can, or think they ought to pretend that they can.

Similarly, in the Energy Department civil servants are chosen to "manage" projects they barely know the name of. And they are "changed" from time to time, just when they begin to know a certain system.

Actually, a manager of OTEC, for example, should have at least 6 years experience in this one line. All his experience in nuclear, fossil, or what not, is a hindrance rather than a help for his efficiency.

In all the Energy Department there is only one man thus qualified: Dr. Abrahim Lavi, at the bottom of the heap. Over him is Sigmund Gronich, a nice fellow who might work himself up under Lavi, and who "replaced" Robert Cohen, when the latter had finally become an effective OTEC manager.

Equally important and equally cheap, equally ready to be built now are Dr. Otto Smith's solar and wind systems—he claims at one—tenth of the cost of present solar and wind systems operated by the Energy Department.

I think he is approximately right. Ocean waves, tide, methane, waste utilization, algae are other ready and efficient energy sources. Coal is not. Coal mine owners and coal unions will of course insist that coal is king, but why should they dominate us? We destroy more precious soil by coal mining than what we gain, and the miners would benefit from being shifted to less harmful work.

It is ridiculous to "predict" what part each energy system should play in the future. OTEC alone could take care of all, but that will never happen. It is not for us to make predictions but to push all benign systems and let other people and the benevolent future make choices rather than the pompous we.

The matter of money is another point. Only a few of our economists know what money is and how it is "made". One of these, Dr. John H.G. Pierson, former Science and Economics Advisor to the United Nations, just walked in the door. For 40 years he has explained how guaranteed (insured) full employment is the key to our present debacle: Inflation and unemployment simultaneously. There is no real difficulty in creating two billion dollars to build the first actual OTEC and solar and similar plants. It would prevent inflation, not this year but very soon.

But these fine people just coming in want me to go with them to a radio station. Please come again and tell me on which points I should comment. Blumenthal, the Sec of Treasury, knows how to do or create money if Schlesinger and Carter will let him. Miller (Fed) too.

Please come again.

Shamcher concluded his letter to Peterson, which included a copy of the one above with names of his recommended experts,

I feel tempted to give you some names of economists who could provide you with funds to build a proper variety of OTEC plants and other new energy devices before it is too late, but I better wait until you feel a need, and ask.

OTA REPORT MADE PUBLIC

The OTA report hit the pages of the New York Times, June 9, 1978, in a piece titled "Report on Ocean Thermal Energy Calls Early Exploitation Unlikely."

Thermal energy in the Florida current as it flows past Miami is said to be more than enough to provide all the electric power needed by the United States, but Congress's Office of Technology Assessment has concluded that harnessing such energy is a long way off.

Despite enthusiasm in some quarters for what is known as Ocean Thermal Energy Conversion (OTEC), the assessment does not recommend a large increase to the current effort to exploit such energy.

Through the 1977 fiscal year the Federal Government spent about $27 million on OTEC research and development. The 1978 energy budget includes $35 million for that purpose. An all—out effort, including construction of a full-scale plant, would run into billions of dollars, according to the assessment.

Skipping a paragraph, the headline for the next section is: Technology "Not Proven".

The study has found that the technology is not yet proven and probably could not become a viable part of the U.S. energy supply system in this century.

The article concludes,

The study offers Congress the choice of cutting off funds for a separate OTEC program or continuing the current modest effort. Rushing into a full-scale plant, it says, would be a "high risk" approach, committing the program to a system that could soon

become obsolete.

In making its choice, the report adds, Congress must weigh funding of OTEC against investment in other lines of energy research and development.

The OTA report was issued in April, 1978; the New York Times article came out in June, 1978. The University of California responded to the OTA report on August 17, 1978.

Looking back, Shamcher described what happened in a letter dated April 23, 1979,

About the OTA story: University elders, including Bryn, first thought it too wild to even answer, but a newcomer at the U., Cal Herrmann (Doctor of Electro-Chemistry, Sorbonne), pointed out all the adverse comments in the NY TIMES and other large papers, and wrote a first draft of a reply, answering the OTA views point by point, and specifically, that the 'uncertainties' were, many of them, clarified by government funding, and were not reasons for non-funding. Besides, the OTA 'uncertainties' were, many of them, clarified years ago."

In May two weeks after the OTA report was issued, a 113 page book called Renewable Ocean Energy Sources, Part 1, Working Papers -OTEC, appeared from OTA. On page 1, it stated, "The technical feasibility of OTEC has been demonstrated on a limited scale." Compare this with The New York Times impression, "The technology is not yet proven."

Peterson answered Shamcher and the rest of the University of California team October 3, 1978. Included was a Staff Memo to Peterson, the Director of OTA, from two of his men, Robert Niblock and Bennett Silverstein. It was a point by point rebuttal of Shamcher's August 17, 1978, letter—the one initiated by Cal Herrmann, mentioned above.

Without getting into the points, let me present the conclusion of Shamcher's response to Peterson dated November 1, 1978.

Two years ago I tried to contact Robert Niblock when I was in Washington, D.C. I did not succeed. On March 7 and again March 21 this year I wrote you, Mr. Peterson, and at the Fourth OTEC Workshop in New Orleans in 1977, Mr. Bennett Silverstein and I discussed OTEC at length. From all this, I had the impression that OTA's initial report was not so much a technical evaluation as an effort to safeguard large investments in non-renewable energy sources by causing a slowdown in OTEC development.

This view is, of course, as intrinsically valid as ours, and is supported by many. The excellent OTEC report of May, 1978, from OTA shows that you are aware of OTEC

Technology beyond the level of your OTA initial report, and supports the rumor that your own report was intended to be "political" rather than technical.

Before presenting Shamcher's final paragraph to Peterson, let me say Shamcher wrote the same day, November 1, 1978, to Senator Edward M. Kennedy, who was Chairman of the OTA Congressional Board. He summarized developments and concluded,

The issue at stake is not the technical competence of the OTA staff but which instructions, direct or underhandedly, have been given this staff. This matter is discussed in my enclosed letter to Mr. Russell W. Peterson.

As a Senator intimately connected with OTA and its aims, you may want to look into this matter.

Finishing with Peterson, Shamcher wrote,

The issue then is the scenario of the coming depression (if no renewable energy systems are instigated fast). A Presidential commission recently presented the same view of a coming depression. While we do not know that such a depression will happen, if it seems likely, it would seem mandatory to act decisively now. There are many renewable energy systems known to us. OTEC seems to be one of the most favorable, most technologically advanced, and known by more firms and universities than any other system, thus the most ready.

Niblock and Silverstein's Staff Memo, which purported to answer Shamcher's August 17, 1978, letter stated in paragraph 2:

In summary, Mr. Beorse's critiques do not contribute any new information on OTEC to us. Rather, his view of OTEC's future is more positive, more optimistic than may be interpreted from the OTA report. He sees the engineering problems as readily solvable; the OTA report says the problems have not yet been solved, the problems are difficult, and solutions, if achieved, will take considerable time and money. Mr. Beorse seems to fear that the OTA statement that OTEC 'probably could not become a viable part of the U.S. energy supply system in this century' could be a self-fulfilling prophecy, if Congress does not provide the needed funds.

Shamcher responded to the Staff Memo in another part of his November 1, 1978 letter to Peterson featured above:

Our 17 August letter <u>does</u> contribute "New Information" to your OTA report, in detailing how it underevaluates the effects of Federal funding on the uncertainties

identified, and what would be the potential effects of foreign OTEC development on the American economy.

Your report, on the other hand, warns against federal funding because of the technical uncertainties. No optimism or pessimism is involved here, only clarity about cause and effect.

A further point, more implied than directly stated, is that new technologies, particularly in the area of thermodynamics, cannot be reliably evaluated by engineers without years of experience in the specific project in question, particularly when these engineers have numerous other tasks.

The authors of the OTA reports cannot be blamed here. They, and their employers, are victims of a superstition so widespread that my first reaction to your initial report was: Glad it wasn't worse. No comment useful. Younger U.C. scientists thought differently. I joined, signed, and here follows response to the various points in your staff memo.

There is no need to go over the points here. All involved in the OTEC community knew then what was happening, and the reader as well can perhaps see power politics at work.
Shamcher's recognition that OTEC opponent's views were as "intrinsically" valid was generous.

From the viewpoint of the 1990s, Robert Bly's view about the loss of the warrior ideal from *Iron John* (page 165) comes to mind:

It's odd how few strong swords the taxpayers bring forward against these outrages (i.e. chief executives who "vote themselves bonuses just before bankruptcy, sell out the retirement fund, and so on.") or against the savings and loan greediness, or against the presidential campaigners' refusal to debate the issues.

Dave Foreman's experience working in the 7Os (*Confessions of an Eco-Warrior*, p. 16) is also interesting to me. *What had backfired?* [Foreman asked himself]

I thought again about the different approaches to RARE II (Roadless Area Review and Evaluation): the moderate, subdued one advanced by the major conservation groups; the howling, impassioned, extreme stand set forth by off—road— vehicle zealots, many ranchers, local boosters, loggers, and miners. They looked like fools. We looked like statesmen. They won.

Since the people want solar energy, clean air and water, and wilderness, the question for me is: What do you do in a democracy when democracy is thwarted?

Further, Foreman's conclusion (page 145) about the state is chilling:

> *The state, and all of its constituent elements, exists primarily to defend, with the use of lethal force if necessary, the power and status of the economic and philosophical establishment.*

What do you do in a democracy when democracy is thwarted?

Ho Hum

In the late 7Os, we weren't looking at things from the same perspective as the 9Os. When confronted by the OTA information, both Shamcher and myself continued doing what we were doing even harder. Our activities after the OTA report could be characterized by three distinct tracks:
1) educational efforts to rally the people
2) attempts to bring the banks on board
3) to run somebody for president with a program that included solar energy.

We had in the 7Os the perception, widely held, that "if the people only knew" eventually you could affect change. We hoped our educational efforts could affect change. The idea was that if enough people shook their representatives in Congress, we could produce the effects we wanted to produce.

So I went again to Puerto Rico.

CHAPTER 16

PUERTO RICO FOR THE THIRD TIME

A grant from the National Endowment for the Humanities paid my expenses for a trip to Puerto Rico in December, 1978. A lecture on Sufism was arranged at the University of Puerto Rico. And while I engaged in a full round of talks with many people, nothing of substance was recorded in my notes. The most noteworthy was the article generated as a result of an interview with Harold J. Lidin of The San Juan Star.

The article, "Ocean-energy Development Seen Lacking," appeared December 31, 1978. It says it all in a nutshell.

> *Those who believe that OTEC is Puerto Rico's best answer to OPEC are unhappy with alleged timidity at the Water Resources Authority in the development of Ocean Thermal Energy Conversion.*
>
> *Moreover, the engineering approach to OTEC chosen by the local utility is mistaken, according to thermal energy enthusiasts Edgar Morales and Mansur Johnson. The two, spokesmen for a Boston-based organization called Alternative Directions in Energy and Economics, Inc., lately have been badgering Commonwealth officials to put the institutional energy they put into finding a feasible answer to the oil-price squeeze.*
>
> *OTEC, in their mind, can whip the Organization of Petroleum Exporting Countries. The victory can come much sooner, they believe, than the (WRA) planners foresee.*
>
> *The timing of the OTEC breakthrough, Johnson and Morales believe, hinges on whether the United States is willing to redirect its energy initiatives away from nuclear power and the hunt for diminishing oil reserves, and focus on the development of a clean, non-exhaustible power source like OTEC.*
>
> *For Puerto Rico, Johnson believes, thermal energy is the obvious and available alternative to crude oil as the major energy source. For the United States, with its coal, natural gas and uranium, the alternative of thermal energy does not loom so big, so immediate.*
>
> *Thermal energy depends on the power potential created by the contrast of warm surface water with cold waters moving upwards from the ocean depths. At Point Tuna, on Puerto Rico's southeast corner, a peculiar marine configuration offers the combination of warm and cold water very close to shore.*

Two different systems exist for converting this potential into electricity.

One, the method recommended by Johnson and Morales, is the "open—cycle" system. In this technique, warm sea water is exposed to a vacuum and brought to a boil. Steam from the water drives the turbine, which in turn generates electricity. The used steam is fed into pipes, cooled and expelled as pure condensed water, the pure water, a by-product of the energy-making process, supposedly could be piped into Puerto Rico's water-gulping petrochemical plants or shipped to the always dry Virgin Islands.

The second method, the system favored to date by the Water Resources Authority, is the "closed-cycle" process. In this system, sun warmed surface water heats a low-boiling substance like ammonia. The vapor from the low-boiling ammonia is driven into a turbine, which creates electricity as it spins. The steam from the ammonia is then piped through the cold water brought up from the depths, condensing the ammonia and recycling it.

The second method is rather like the conventional oil-fed generating plants that now produce almost all of Puerto Rico's power, with the oil substituting for the ammonia. The oil comes from Venezuela, Algeria and other members of the OPEC cartel, and its price is now more than five times what oil cost when the plants were built.

But, to a degree, oil—price increases are predictable. Moreover, utilities around the United States and other oil-consuming nations are caught in the same oil-price squeeze. There is, for the WRA planners, the comfort of being caught in the same dilemma as their peers on the mainland.

The hazards entailed in going ahead with the ocean thermal energy, by contrast, scare the WRA planners. Orlando Anglero, one of the WRA executives closest to the OTEC project, speaks fearfully of the "monstrosity" of a turbine that must be built under the open-cycle plan.

Rather than tackle thermal energy directly, the WRA approach is to prod the mainland utilities into taking an interest in OTEC research. If the mainland utilities pressure the U.S. Department of Energy, Anglero hopes, the Energy Department will divert significant monies now earmarked for nuclear energy into ocean-thermal energy.

Meanwhile, the WRA also directly seeks Energy Department assistance for a proposed experimental plant at Point Tuna, near Maunabo on Puerto Rico's southeastern corner. The project, as tentatively blue—printed, includes a platform two to three miles offshore and four power-producing generators.

Each module could produce 10,000 kilowatts of power; the total output of 40,000 kilowatts is one—half of one percent of Puerto Rico's power production that comes from the island's hydro—electric demands.

The other 99 percent of the 4 million kilowatts now produced in Puerto Rico comes from oil-fueled plants.

Efforts to extract cost estimates for the Point Tuna project produce only the most tentative of ballpark figures. The platform and the first 10,000 kilowatt module could cost from $100 million to $150 million, Anglero estimated.

One reason the WRA is so vague about the costs is the uncertainty over the size of the hollow tube that must be placed in the sea to conduct the cold water upwards to the surface. Anglero spoke of a tube as large as 100 feet in diameter; Johnson contends a 30-foot wide tube is sufficient.

Shamcher commented on this cold water pipe measurement in a letter dated January 23, 1979. We were speaking in the article in terms of feet. We all meant meters. Shamcher corrected:

You being in Massachusetts, it is fair to quote Heronemus (et company)'s cold water pipeline estimate: 24.5 meters wide (80 feet) or very close to your estimate: 30 meters. This for a 400 megawatt plant. 100 meters, as this other fellow from Puerto Rico said [no doubt quoting Fred Naef's estimate from the conference in Puerto Rico mentioned in Chapter 8] *is so nonsensical that I suspect him of trying to destroy OTEC.*

Continuing on with the article,

The efficiency of the ocean-thermal plants, at this stage, is another guessing game. Anglero suggests the thermal plant will lose 50 percent of the produced energy to the "axillaries"—the turbines and other energy equipment required to make electricity. This compares grossly with the 5 percent loss registered at an oil—fueled plant. Johnson retorts the high energy—loss does not really matter, because your "fuel"—sea water—comes in inexhaustible supply.

For Anglero, ocean-thermal energy is something to promote earnestly but not anything upon which the authority can count in planning its upcoming $1 billion expansion program, at least not in its first stages.

"A utility can use only fuels which are commercially available," in planning an expansion, he remarked flatly.

The fuels available to Puerto Rico in commercial quantity are only three—oil, atomic and coal. Two of these, oil and uranium, may prove elusive. The U.S. government,

already pushing to substitute coal for oil, may bar all new oil-based plants. Worse yet, from WRA's viewpoint, Washington may require the conversion of existing oil—fueled plants here to coal.

The authority had plans for a major atomic power plant at Aguirre on the south coast. The project was abandoned, after contracting $90 million in equipment, when the U.S. Atomic Energy Commission ruled the Aguirre site earthquake-prone.

Another site, near Arecibo, has been designated for an atomic plant. Strong opposition from area residents is a major factor in stalling that project.

Pedro Vazquez, WRA executive director, described the nuclear power project as "filed away in a drawer". Not forgotten, but not active.

Coal, too, offers its own package of objectionable features for Puerto Rico. The use of coal, Anglero admitted, will require construction of an expensive infra-structure. Facilities for unloading, storing and handling the coal, non—existent facilities in Puerto Rico, must be built.

The use of coal will require a new technology for the oil-trained authority engineers.

Mr. Lidin's interview with me which produced the article cited above was noticed in Washington.

Mr. David I. Shapiro of Tracor, Inc. called me January 4, 1979. He had tried to find me through the NE Solar Energy Institute, since the article said I was from Boston. They didn't know me. DOE (the Department of Energy) did.

Orlando Anglero, referred to in Mr. Lidin's article as "one of the WRA executives closest to the OTEC project," was Mr. Shapiro's "Program Manager".

The article, Mr. Shapiro told me, had "hurt morale in Puerto Rico."

My eight pages of notes on the telephone call indicate he flattered me by talking to me a long time. Much of the time was taken up with him reading the article back to me. He was reading the article to me, because I wasn't familiar with it, as it had only been published 4 days before, when I was out of Puerto Rico. I wasn't sure why Shapiro, who identified himself as a former Apollo space program manager, called, until he revealed I had hurt morale.

When he said Anglero was his manager, I knew I had penetrated deeply into the bureaucracy. This American talking to me was pulling the strings in Puerto Rico. I didn't care if he was with the CIA (Central Intelligence Agency); I was willing to work with him. I could even imagine that the CIA was capable of using its clandestine apparatus to build an OTEC. They financed an oil refinery for Syria, according to Wilbur Crane Eveland, [*see Ropes of Sand*]. Their objective analysis might corroborate

ours—that U.S. energy policy was not sustainable—and secretly work to change America's direction for the benefit of the American people, just as they benefited the Syrian people. Who knows? Was I sleeping with the enemy? It didn't matter.

I wrote Shapiro January 6, 1979,
Mr. Shapiro, your phone call was much appreciated. As the manager of Fuentes Fluviales' push for OTEC, you may have considerable influence, so I not only appreciate your call, but I feel honored to make your acquaintance.

When I was in Puerto Rico I got an impression, which you may want to correct. I learned that the best estimates received so far for OTEC were 140 million for 10—40 megawatts. Running the numbers out, it would not be profitable for Fuentes Fluviales to invest. But I was further led to believe that, if the government would pay the difference between the cost of a conventional power plant and an OTEC first plant development cost, OTEC <u>would</u> figure in Fuentes Fluviales' development plans.

So impressed was I that I passed this information along to my very receptive Congressman Gerry Studds (D—MA) and submitted an article to THE BOSTON GLOBE. As I recall from your reading over the phone of the article, OTEC has no part in Fuentes Fluviales' 1 billion dollar expansion plan.

Looking forward to hearing your response to this and receiving, if you would be so kind, a copy of your Hawaiian testimony.

Notice I said "your Hawaiian testimony". It didn't come home to me this man's reach, until I received his testimony along with a copy of the article about me in The San Juan Star. Mr. Shapiro never wrote me a letter; there were only 2 calls and an envelope which contained the enclosures.

At the top of the 17 page transcript, it said, "Testimony for Mr. Pedro Vazquez, executive Director, Puerto Rico Water Resources Committee/Subcommittee, Research and Development hearings, Honolulu, Hawaii, November 28, 29, 30, 1978." The testimony was delivered by Mr. Julio Fragoso.

Mr. Shapiro told me in our January 4, 1979, telephone conversation that Pedro Vazquez had resigned as head of WRA and was now Secretary of State of Puerto Rico.

CHAPTER 17

FAILING TO GET A GRANT AND SEEKING PRIVATE FINANCING FROM BANKS

When Mr. Shapiro called, I was busy gathering data to put together a grant proposal to demonstrate in Boston the production of electricity using OTEC ammonia from an APL floating plant ship. This was to answer the question: how could an OTEC plant ship generating electricity off the coast of Brazil benefit Boston?

Anticipating the existence of the APL (Applied Physics Laboratory) OTEC plant ships off the coast of Brazil, I had already earmarked the General Dynamics shipyard in Quincy, Massachusetts, as a site to build the ships. Later this year I would facilitate a meeting between the Johns Hopkins team and the Massachusetts Lieutenant Governor's office.

In short, the OTEC plant ships would use the electricity generated to make ammonia. Ammonia has four hydrogens and one nitrogen. Tankers would carry the ammonia to shore (because ammonia is less volatile than hydrogen) and on site the utilities would use the hydrogen in the ammonia to produce electricity from fuel cells.

An article in Scientific American (December, 1978) by EPRI's (Electric Power Research Institute) Arnie Fickett said fuel cells were ready for use by utilities. Hydrogen was the fuel that the fuel cells used to produce electricity. Bud Francis of APL turned me on to Teledyne, and Teledyne told me about Drever Co. who made an ammonia dissociator, i.e. a device which produces hydrogen from ammonia. Drever was located in Woburn, Massachusetts. I visited them.

Shamcher approved, writing January 12, 1979,

> *Your ammonia-hydrogen idea sounds very good basically. Men to ask about this are either John Bockris, professor at Texas University or Veziroglu of the University of Miami or Dugger, Francis and company. Not Bryn at all. Your Puerto Rico project also looks very good now. It cannot be combined with the ammonia-hydrogen project—or can it? The latter, though, requires a great deal of specialized knowledge. You could be one of a team, even the boss if you play your cards cleverly. But don't think you can technically run such a complex thing by just asking a question here and there. Before you even talk about it to any one you must have staff in mind, either already hired, or planned.*

All my time and energy for awhile was spent working on the grant proposal. It was not funded.

Meanwhile, what Shamcher had been stirring up with banks started to make sense to me. He had mentioned feedback received from top people not only in various government departments but also from the Chase Bank in the Coleman letter in July, 1978 [Chapter 13].

Shamcher didn't share any of this bank correspondence until January, 1979. Then he blitzed me with it. First, I received a copy of his November 20, 1978, letter to Chase Manhattan Bank Vice-President George C. White, Jr., which began,

> *You convinced me, on October 18, that when government becomes too big and unable to handle things, banks step in and help. This was my excuse for approaching Vice-President James P. Wallace, whose name and address you gave me. Another of my reasons for approaching him was that another Chase Manhattan Vice—President, Mr. J. Emerson, had told oil companies that a 900 billion advance for searching for more oil during the next ten years was 'not unfinancable'.*

My first response upon reading this was, How did you find out J. Emerson told the oil companies that?

Shamcher answered me January 23, 1979, that Industry Weekly had the story about the 900 billion and added, *John Emerson of Chase wrote me a nice letter not protesting what I had quoted.*

Continuing Shamcher's argument in his November 20th letter, he said to Mr. White,

> *Before Chase Manhattan undertakes such an arrangement* [900 billion for oil exploration] *it would be healthy for you to know what can be expected in the way of renewable energy sources during those ten years. The profitability of new oil sources would depend on this. It would be even more healthful for the Chase Manhattan to manage the financing of such new energy sources also. Then you would have a grandstand view of the entire energy picture.*

In the same packet of letter copies, there was one dated January 16, 1979, to Massachusetts Institute of Technology President Jerome B. Wiesner. Wiesner had recently delivered a widely publicized address to the Federation of American Scientists called "Decline in Budget undermines Scientific Creativity" in newspaper headlines.

Shamcher told Wiesner,

> *Copies of your address were sent to the three concerned Vice-Presidents of the Chase Manhattan Bank in addition to selected federal officials, and thank you very much. Maybe we can work together in instituting an entirely new kind of research*

funding, through banks, with the banks benefiting economically from the results of research along economic channels....

What Shamcher specifically had in mind was communicated thusly:

Dr. Wiesner, how can you stand it? The avalanche of letters, from friends, foes and complete unknowns? And what do I want?

I want you to phone either Vice-President James P. Wallace or Vice-President George C. White Jr. at the Chase Manhattan Bank and say that, yes, such a meeting on energy for the next fifteen years would be essential, may even mean our survival as a nation in a survived globe....

The meeting mentioned had first been proposed to Mr. Wallace by Shamcher in a December 27, 1978, letter. Following up to Wallace in his letter of January 10, 1979, Shamcher noted wide industrial interest in OTEC and highlighted clearly and incisively in each paragraph the government's position, alluding to—this time—DOE's latest negative OTEC assessment, calling it "in—house evaluation".

Here's what Shamcher said to Mr. Wallace:

Mr. Wallace, Lockheed, Westinghouse, the Johns Hopkins University, Boeing, and Centre National pour L'Exploitation des Oceans (in Paris) have recently been pushing—some directly, others indirectly—for the meeting proposed in my letter of 27 December, in which a sound US Energy future would be discussed.

The US Government or its Energy Department, while welcome, cannot effectively run such a meeting, with the overwhelming recruitment from nuclear systems in the upper echelons of the Energy Department, and its lack of experienced personnel. The Energy Department, however, has shown increasing interest in "Commercialization"—which your bank comprehensively represents.

Boeing may present its space station system, which offers cheap total power, but has several technical uncertainties yet and will take longer to complete than OTEC and is more vulnerable to hostile attack. It should be built, though not exclusively.

Lockheed is attracting other industries, in order to have a better deal to present.

Westinghouse's Eugene Barsness is "very enthusiastic" about an OTEC <u>open</u> cycle turbine developed by Richard Leyendecker, mentioned in my December 27 letter, and feels the open cycle eliminates many of the problems of the closed cycle.

The Government, along with some industries, wants to build and test a closed cycle plant only, and consider its performance as indicative of OTEC systems in general.

The same controversy applies to land-based or floating plants.

Simultaneous plants of all types, sufficiently large to show the economy, must be built and tested.

The above-named French institution is also stressing the need for building simultaneously land—based and floating open and closed cycle plants. Where fresh water is needed beside power, open cycle is a must.

Dr. E.J. (Bud) Francis, who worked for many years on a special type OTEC GRAZING SHIP as a member of a team of scientists at the Applied Physics Laboratory of the Johns Hopkins University has expressed repeatedly a wish to get in touch as soon as convenient with you.

This "grazing" ship can seek and move to seasonably advantageous areas to always enjoy a maximum thermal efficiency. It can produce ammonia-hydrogen and other products to be shipped to users. This efficient and economical project has been attacked and bandied about by Government agencies and Congress pretending to understand, culminating in a flat rejection in a recent "in-house evaluation".

Dr. Francis sent me his 6 page reply to the Energy Department, plus tables, and 4-page comment to The OTEC Liaison, an inter-OTEC publication. The letters are rather technical, but if you like, I'll send you copies.

Francis' comment to The OTEC Liaison mentioned at the end of Shamcher's letter concludes:

In summary, it is our opinion that the economic viability and potential benefits of OTEC are sufficiently promising to justify a much more aggressive development of the <u>several</u> attractive OTEC options than has been possible with OTEC funding to date....

BACK AND FORTH WITH THE CHASE BANK

On January 16, 1979, John Emerson of the Chase Bank acknowledged Shamcher's letters addressed both to himself and Mr. Wallace and thanked him. He said he was encouraged to learn "that people like yourself are actively investigating the problems associated with the development of renewable energy resources". Emerson said his reading of the literature showed him "capital costs per unit of output are one of the main stumbling blocks at the moment".

Shamcher answered Emerson's concern about cost on January 24, 1979,

The OTEC capital cost per unit of output has been estimated by capable and responsible builders from half the cost of average nuclear plants and up, and half the building time, with the further advantage that smaller plants are more economically

feasible than corresponding nuclear plants, and the OTEC fuel is free: The oceans.

Most OTEC "literature" is distorted, partly from ignorance, partly by authors who favor other solutions.

He goes on to recommend the author of an article from Ocean Industry (November, 1978) -I don't know who—and William Richards, head of DOE's Ocean Systems branch as excellent consultants who

I assure you are extremely difficult to find. But you need daily consultations with such people if you are to pull the country and the world out of the present and coming crisis—and who is closer to this task than Chase?

The companies (and your customers) referred to in my letter are still hoping for US Government action (while damning the government under their breath) and have as yet realized neither the full impact of Government incapacity, nor the urgency of the present situation. Bankers, especially Chase, have their ears to the rumbles of the world and know or at least feel what must be done, including pressure on a confused Government, which <u>listens</u> to bankers.

After expressing the Chase Bank's willingness to consider their customer's requests to finance OTEC plants, Mr. Emerson suggested on the 16th that given Shamcher's location on the west coast, he "would probably find it more convenient to explore the banking industry's position in financing new energy technology with some of the larger west coast banks."

In answering Emerson January 24, 1979, about location, Shamcher also revealed his relation to the Kennedy White House that I'd never heard before.

Regarding West Coast banks and my momentary "location" I must bore you with a bit of history: In 1938 I landed in New York, headed straight for Chase Manhattan Bank to talk about Giro-credit, a banking system used on-and-off since the time of Babylon, 4000 years ago.

A sample had been operating in Norway with me as general manager. I was not concerned with "helping" the Norwegian venture as much as hoping to add this system to world banking for better utilization of our man power, including inventive genius.

Your managers assured me the US would definitely get into this, though not for another 25 years.

In 1961 [23 years later] Arthur Schlesinger of the White House took me under his wing and in 1963 told me, "We are ready to go, Bryn, as soon as the President returns from this silly trip to Texas...."

Before this, I had close contact with a manager of the Los Angeles branch of a bank calling itself "the biggest in the world". He talked to then President Giannini and came back embarrassed—"I was promoted, Bryn, though apparently on the condition I would never see you again."

In 1977, I was in touch with another California bank, whose President and Vice—President tried heroically to grasp Giro-credit, and finally referred me to Mr. George C. White Jr. of Chase Manhattan Bank.

Letters with enclosures from this gentleman evidenced complete mastery of new and complex banking procedures and during a talk with him on 18 October 1978, I learned more about Giro-credit, its advantages as well as pitfalls, than I had learned during my term of office, until the Nazis stopped our venture (which would have revealed their shady dealings).

Mr. White Jr. gave me the name of Vice-President James P. Wallace for my OTEC venture. Your name came to me via Industry Weekly... So I was back to Chase, my first love.

That was the end of Shamcher's letter to Mr. Emerson on January 24th.

To me, Shamcher wrote January 25, 1979,

The letter from John D. Emerson shows that Chase is ready to finance OTEC and I am thinking of your Puerto Rico project particularly. The letter also shows that he is pushing me down a bit for coming to talk to him instead of his "customers", so don't you approach him and make the same mistake but show suitable portions of the letter to Governors and/or construction firms that would build OTEC. . . .

I took what Shamcher said into consideration when I answered David Shapiro, who I was still hoping would spearhead a Puerto Rican effort for OTEC development, even if it meant making an end run around the Energy Department.

After thanking Mr. Shapiro for his testimony [see Chapter 16] and copy of the article that my interview had generated, I wrote Mr. Shapiro on January 30, 1979,

You may be interested to know that the fear expressed by Orlando Angiero in that article (that the U.S. would 'bar all new oil plants") has occurred here in Massachusetts to a 340 megawatt plant planned for Ludlow, Massachusetts.

In view of that, and knowing what you know about OTEC'S rightness for Puerto Rico,—(his testimony stated, "We have preselected OTEC because we know it is the most favorable relatively near-term alternative energy option at this time that offers us base load capability.")—the Chase Bank's willingness to listen to proposals regarding OTEC financing at this stage may interest you.

Without swerving from the dance you are doing with DOE, you could select the contractor you admire most and go together with the Governor to the Chase Bank—even better if PRWRA is already a Chase customer, because Mr. John Emerson, vice-President, has written, "Several of the companies you refer to in your letters are customers of the Chase Bank, and should they approach us with requests to finance OTEC plants, we would certainly give such requests a close examination."

Lockheed and Westinghouse were two companies mentioned in Beorse's previous letter. I know several at Westinghouse, Hydronautics, and the Colorado School of Mines who could power your drive for an open-cycle OTEC with the Chase, while you continue dancing for a closed-cycle OTEC-10 with DOE.

Emerson's letter is enclosed. If this is a distraction from your other efforts, pardon me, but kindly suggest those who could do something with what seems to be the bank's willingness to prod a vacillating government.

Two days later, Shamcher wrote Emerson again. He had shared the contents of his first letter with a colleague. He had also written separate letters to Westinghouse, Hydronautics, and the Colorado School of Mines, where the Frank Mathews team was based. He shared with them the Chase's willingness to finance plants; he suggested to the latter two,

> *If you are interested in the Puerto Rico venture, ("You probably know about the Puerto Rico pressure to build an OTEC plant and their heated discussion whether open or closed cycle, land—based or floating.") you could contact either the Governor's office or my friend Mansur Johnson, (Boston address given), who is deeply into this project, seems to spend as much time in Puerto Rico as at home. He and I would prefer an open cycle plant, partly because Puerto Rico also needs desalting. But people being prejudiced in so many directions, we'd rather have a closed cycle plant than no plant. But able engineers may still convince them what may be best for Puerto Rico.*

I received no inquiries.

To Richard Leyendecker of Westinghouse, Manager of Steam Turbine Engineering, Shamcher suggested that Westinghouse was so large and its functions so compartmentalized, that maybe he could function as a liaison between the technical man, Leyendecker, and the marketing branch:

It may be difficult for you, a technological genius, to approach the financial wizards in your company, in which case I would be happy to take your advice on whom I should approach.

My feeling is that the Government has become too complex and indeterminate and that we may need support of bankers and other commercial interests to achieve adequate demonstration and then financing, and if Westinghouse has similar views it may be time to approach Chase Manhattan for preliminary talks. I have been in touch with Chase since 1938 on other matters.

It may be that Westinghouse prefers to delay OTEC action until your nuclear interests may have paid off more. I think I understand this feeling well. Also, I see considerable danger in this stand. Nuclear may have to be written off—and to be FIRST with OTEC would mean a great economic advantage in that line. Westinghouse has a record for being FIRST in a number of fields.

To Emerson on January 26, 1979, Shamcher wrote,

Extracts from your letter of 16 January have been forwarded to the referred companies as advised by my colleagues here, with firm requests not to publicize them further. My closest OTEC colleague Dr. Cal Herrman feels you don't need "daily consultations", only occasional ones. He also feels "most" OTEC literature being distorted should be changed to "some". I must stand by "most", not merely for OTEC but for all literature, particularly scientific. It is this "literature" which has brought us to the brink of disaster—a disaster seen more clearly by banks than engineers or governments, and which banks are more able to initiate action on than any other institution...

You may hear very soon from the builder chosen by the Puerto Rican Governor for building the first fully functioning OTEC plant in Puerto Rico, an ideal location....

That's where I came in, only I had heard nothing from Mr. Shapiro.

I waited, and wrote him again February 22, 1979, *David, this is a follow up to my letter of January 30th, in which I proposed that you select a contractor and go with Governor Barcelo to the Chase for the purpose of financing a Puerto Rican OTEC. Enclosed is my resume. May I help you initiate my proposal?*

What more could I say? I said more, but it was not helpful.

Mr. Shapiro had called me the second and last time on January 11. The above February 22, 1979, letter of mine was my second unanswered communication to him.

Shamcher did better than I, he had lunch with his correspondents, Mr. White Jr., Mr. Emerson and others of the Chase Bank, and on July 26, 1979, I received a handwritten card from him thanking me for "valuable publicity".

Shamcher went on,

> *A.J. Meyer II, Chase Vice-President brought up the OTEC Council.*[The first meeting was held in August, 1979.] *I asked him if he wanted to be a member. He said yes. Patrick Joseph Kenan, also a Chase Vice—President, eagerly supported Meyer. This over lunch in Chase's 54th floor restaurant. I phoned Richard Meyer and E.J. Francis* [from The OTEC Liaison and Johns Hopkins, respectively] *and told them. I hope all members of the OTEC Council agree to have him. The talk was my best ever, ask anybody.*

CHAPTER 18

ALMOST HAPPINESS

There was an OTEC conference in Washington in June, 1979, which I attended. The years spent courting my Congressman Gerry Studds paid off handsomely for OTEC. In mid 1979, Congressman Studds, fully informed by this time, was appointed head of the House's Oceanography Subcommittee. He was beautifully positioned to do something significant for OTEC, and he did.

Congressman Studds held hearings on OTEC and Shamcher gave testimony. Included in Shamcher's testimony delivered June 21, 1979, was the following:

> *The speed at which this emergency (crash) program ought to be undertaken is to build sufficient new energy systems to be able to stop all import of oil in 15 years from the start of the program. This is considered feasible and economically sound. Anyone who has seriously studied our national economy knows its resilience, and that a beginning 5 billion a year increasing to 100 billion a year is easily absorbed by sensible cuts in other areas without increasing the total budget. But, of course, a serious resolve must precede such action.*
>
> *Seeing the increasing concern and resolve in our Energy Department and other Government agencies, it seems such a course may become politically possible before it is too late. I refer, for example, to the speech of the Governor of Puerto Rico at the OTEC conference yesterday. Crash programs are in the very nature of the American nation. We do them better than any other undertaking. They are cheaper, because they save the expense of delays and dallying.*

In the bio Shamcher submitted to the Solar Energy Research Institute (SERI), he wrote,

> *According to Congressman Gerry Studds, testimonies before DOE and the House Subcommittee on Oceanography contributed to the House bill on OTEC.*

Yes, we had helped produce a bill in the Congress. Read on.

That OTEC conference did not produce anything noteworthy as I look over my notes, except for several things: I noted that Shamcher said he sat up the night before testifying from 2 to 4 am, and some Tibetan masters came and gave him strength.
Another note was Shamcher's comment to me, "Mansur, you look so critical. I'm sorry."

Then, there was lunch at The Brookings Institution dining room, which we stumbled upon, just walking around. It was only for dignitaries and workers at The Brookings. A sign at the beginning of

the lunch line clearly announced that. I started to leave. Shamcher's rascal nature manifested, and to my embarrassment, he made us stay in line and play dumb about the formalities we were trampling upon.

There was a successful demonstration in Hawaii on August 3, 1979, of the so-called Mini—OTEC. The government had nothing to do with it. It was a joint project of the State of Hawaii, Lockheed, Dillingham, Alfa-Laval (Heronemus), and others. The floating barge OTEC plant generated 50 kilowatts. It put the lie to OTA. It no doubt prompted Hawaii's Senator Matsunaga to introduce the bill which was in hearing October 15, 1979 (and first mentioned here in Chapter 15).

The Department of Energy's Bennett Miller, Program Director of Solar, Geothermal, Electric, and Storage Systems testified before Senator Matsunaga's Subcommittee on Energy Research and Development,

> *DOE believes that the bill is not needed at this time because the bill's provisions basically duplicate our present program plans, with some minor revisions. The principal difference between the bill and our plans is that the bill provides for parallel development, while our plans call for several developments in which the results of each experiment are used in planning the next. While this process generally takes longer to reach a given stage of development than the parallel approach, it does minimize the cost and risk.*

Senator Matsunaga jumped in,

> *Mr. Miller, on page 7 of your testimony, you state that DOE believes that the bill is not needed at this time, because the bill's provisions basically duplicate your present program plans with minor revisions.*
>
> *It seems to me that inasmuch as we have had a breakthrough with Mini-OTEC, and as you say, without the use of federal funds even, and we know that areas such as Puerto Rico, Hawaii, and the Bay Area provide the environment which could be used to accelerate this program, I would think that DOE would be flexible enough, and I have to note that in your statement you say that you would prefer to maintain flexibility over the next year or so.*
>
> *I would strongly urge that the bill's program of parallel programs be carried out. Here is something that can be developed. As you know, the President has committed the Administration to solar energy, and this is up to 20% of energy production, particularly in the area of electricity.*

My question to you is: Is the Department at this time reporting on a policy decision to restrict the next increment to one demonstration plant?

Mr. Miller answered,

Mr. Chairman, it is our feeling that we have to assess, after the results of OTEC—1 (a government test of heat exchangers on a modified ship), what direction we should take. .

Senator Matsunaga:

Well, I have to learn of your flexibility in this regard ... I think we ought to go full-speed ahead. We went to the Moon, and we should be able to have OTEC plants on Earth before 1985 - in the next 5 years.

There was Senator Matsunaga of Hawaii and Senator Tsongas of Massachusetts grilling DOE's Bennett Miller, October 15, 1979.

Under the headline "Who Tells DOE What to Say?" Richard Meyer wrote in The OTEC Liaison, which was renamed the Solar Ocean Energy Liaison,

Since the editor of this newsletter became involved in OTEC, over three years ago, rumors have often been heard as to the reasons behind the turtle-like movements of the OTEC program. Most frequently, it was the mysterious "powers that be" that were purposely hamstringing the rapid development and implementation of solar ocean energy as a partial but substantial alternative to conventional sources of energy such as nuclear, oil, and coal. Other solar technologies have had similar experience. The cartoon reproduced on this page, in fact, is used regularly in the literature of the Solar Lobby.

The cartoon has a character looking like a judge sitting behind a sign that says "'Big Oil". The 8 captions over his head say successively:

You want coal?

We own the mines.

You want oil and gas?

We own the wells.

You want nuclear energy?

We own the uranium.

You want solar power?

We own the er. . .ah. . .

Solar power isn't feasible.

Richard continued:

> *Jacques Cousteau, in a letter to President Carter, expresses surprise that solar ocean energy is "systematically omitted from federal or presidential plans". His comment echoes the rumors we have heard for years. But an apparent confirmation of those views was expressed in the testimony of Dr. Bennett Miller. . .*

and Richard finished by detailing more of Miller's answers to the senators.

The Senators Matsunaga and Tsongas were saying in hearings what we had been saying all along, and more. Not only did they say, we see the Department of Energy dragging its feet, they said: We are going to make you do it. This was Congress talking to the Administration.

When Congress took action, it was opposed by the Department of Energy. When the bills passed and President Carter signed the bills, believe it or not, it didn't matter. The hoped for action, a crash program to build new energy systems, still didn't happen.

What do you do in a democracy when democracy is thwarted?

When President Carter signed Senator Matsunaga's bill July 17, 1980, he said,

> *Senator Matsunaga and representative Fuqua (D-Florida) are to be commended for recognizing the potential contribution that renewable energy resources can make in meeting our nation's long term energy needs. The bill establishes a long-term national goal of 10,000 megawatts of electrical capacity, or energy products equivalent, from OTEC systems by the year 1999.*

It became known as Public Law number 96—310, the Ocean Thermal Energy Conversion Research, Development, and Demonstration Act.

On August 4, 1980, President Carter signed PL 96—320, the Ocean Thermal Energy Conversion Act of 1980, a form of the bill originally introduced by my Congressman Gerry Studds (D-MA). The purpose of this bill in the words of President Carter:

> *This new bill establishes a licensing and permitting program within the National Oceanic and Atmospheric Administration (NOAA) for the OTEC industry, and authorizes use of the Maritime Administration's loan-guarantee authority for the construction of ocean-energy facilities once this technology has been successfully demonstrated.*

Little more than 6 months later, Richard Arlen Meyer wrote in the Solar Ocean Energy Liaison,

> *Shock was felt throughout the OTEC field when, on March 10th, [1981] DOE*

reduced the budget for Ocean Energy Systems to zero ... While no hard information has been forthcoming, the general consensus is that it was DOE and not OMB (Office of Management and Budget) that specifically reduced the FY (fiscal year) 1982 OTEC budget request to zero. It has long been known that DOE has been pro-nuclear and has fought increased funding for other solar technologies and for the Ocean Systems in particular.

Jay Yaffo, the man who had opposed my $2 billion proposal at the 5th OTEC conference, was found defending my two billion dollar figure to the Plenary Session of the 8th OTEC Conference. I read in The OTEC Liaison that Mr. Yaffo said,

The OTEC development fund is under attack. Upon the recommendations of various reports that have been submitted, it is clear that the fund is likely to be reduced from two billion to 500 million dollars. We believe that the industry as a whole—and we as a group—should go on record as trying to prevent the reduction of that fund.

This fund was a facet of Senator Matsunaga's bill that President Carter signed in 1980. It would provide Title XI mortgage guarantees to aid in financing OTEC plants. Mr. Yaffo was responding to the Reagan-backed zero funding for OTEC in 1982.

Not only the nuclear interests, but Vice-President George H. W. Bush under Reagan, we knew, was an oil man. Big oil was threatened by OTEC as well as nuclear. As much as the lower level policy makers who ran the oil-fired electrical generators in Puerto Rico and New England wanted to relieve rate—payers of the burden of the increased cost of oil, those who owned the oil, which included shareholders in EXXON and other oil companies, naturally, wished to maximize their profits.

On December 24, 1979, Shamcher took on EXXON. The one letter copy in my possession is to Mr. C.C. Garvin, Jr., Chairman of the Board, of the EXXON Corporation, dated January 20, 1980. Shamcher indicated in his December 24, 1979, letter his intention of buying some EXXON stock and going to their annual meeting and causing an uproar. His letter of the 20th begins,

Mr. Garvin, in response to my letter of December 24, 1979, we had the great pleasure of an inspiring visit to our laboratory by your Mr. Robert Shaw. Obviously, in a short time your company acquired, through Mr. Shaw's efforts, remarkable understanding of the OTEC concept, though chiefly the one part called the closed system which has been touted by our Energy Department.

The French considered another version, the open cycle, the only viable system, and the Westinghouse company, Hydronautics, and Steam and Rogers (through their OTEC consultant Dr. Frank Mathews) now also lean to the open cycle....

3½ paragraphs of Shamcher's discussion continue until he concludes,

As soon as we are assured that EXXON's excellent work on OTEC will continue without delay, it will be a pleasure to withdraw my letter of 24 December, 1979.

University people are sometimes thought of as a breed who doesn't understand industry. Shamcher wrote in one of his letters that in the 5Os he was "embarrassed and ashamed of his almost unique knowledge of OTEC." At the time he was doing what scientists did: They researched and offered society the results. They left it to others to use or not what they offered. The bear which roared at him in the cave in India, a story told in Neil Douglas Klotz's article, *Waiting for the Ocean Electrician*, where he went to meditate for the rest of his life, changed him. Shamcher continued to EXXON's Mr. Garvin, Jr.,

My own 60 working years consist of 30 years in private industry, 15 in government, 10 at universities, 5 in war. Twenty of my working years were in weaponry in the U.S. and abroad. My laboratory colleagues have similar records. Your Mr. Shaw appreciated this.

There has been frequent reference to EXXON's duty to its shareholders. Every EXXON shareholder I have talked to thought you would secure your own survival, as well as the Nation's, by using your skill and financial power to build ready-to-go, renewable energy systems, particularly since our government now mumbles about securing the flow of foreign oil by suicidal war. Such a war would stop the flow, not secure it.

Richard Arlen Meyer's memoriam to Shamcher in his September, 1980, edition of SOLAR OCEAN ENERGY LIAISON puts a period to this story.
Richard wrote,

Just a month - [March] - *before his death* - [April 29, 198O] - *Bryn canceled the 'Exxon Caper', a plan in which by buying minimal stock, he could have a voice at Exxon's annual stockholders' meeting enabling him to 'persuade' Exxon to back OTEC development.*

His letters brought two Exxon vice-presidents to visit, resulting in the promise of more OTEC R & D by that company. Bryn had accomplished his purpose. He saw Exxon 'in an excellent position to lead this nation to affluence and international helpfulness—and make huge profits in the bargain.'

The Department of Energy (DOE) fiscal year spending for OTEC peaked in 1980 at 43 million dollars. (The FY80 budget, for example, is voted on in 1979.) The three fiscal years that this book is concerned with: FY78, FY79, and FY80 saw the DOE budget for OTEC go from 14.5 million in FY77 to 31.2 million in FY78, to 41.1 million in FY79, to 43.0 million in FY80.

FY1981 DOE funding for OTEC was 34.6 million, FY82, 20.8 million, FY83, 10.5 million, FY84, 5.7 million, FY85, 4.0 million, FY86, 4.9 million, FY87, 4.4 million, FY88, 3.3 million, FY89, 4.1 million, FY90, 4.1 million, FY91, 2.7 million.

Fiscal year 1991 spending of 2.7 million, 17 years after the inception of the OTEC program in 1974, was less spending than fiscal year 1975, the second year of the OTEC program, when 2.8 million was spent.

Did I mention that President Ronald Reagan, who replaced President Jimmy Carter in 1981, removed the solar panels from the White House roof as soon as he moved in?