OCEAN ENERGY

A Prospectus
by
John Piña Craven

Most of the usable energy of the earth derives from a gigantic unshielded fusion reactor that we call the sun. Like a giant rotisserie the rotating earth exposes the surface of the tropical ocean to the heat of the sun. This creates a layer of hot but chaotic fluid energy . The rotation of the earth creates tropical currents which intersecting with the continents drives the hot chaos to the North and South polar regions. Here the heat radiates out into space creating ice and near freezing water that nonetheless contains chaotic energy. By virtue of its density the water sinks to the bottom and eventually returns to the equatorial region. Thus there is a layer of hot or warm chaos overlying a gigantic reservoir of cold throughout the world ocean. When and if this hot water mixes with the cold water 'coherent energy' called thermodynamic energy can be obtained in the form of the wind, waves, rain and other climatic manifestations. The amount of hot chaotic energy that can be converted to coherent and potentially useful energy is proportional to the difference in temperature between the hot and the cold masses of the ocean. But in the absence of a cooling medium like the deep ocean water, masses of hot matter, no matter how hot, cannot generated coherent useful forms of energy. Thus the ocean with its warm surface and deep ocean coldwater is the major reservoir for renewable thermodynamic energy derived from the sun..

The sun also generates vast quantities of radiation energy. This energy is stored in plants through the process of photosynthesis. The pigments in chlorophyll or beta carotene are stored in a miniature energy factory in the plant called a chloroplast. The pigments extract energy from the suns photons which is transmitted to a little energy battery called adenosine triphosphate which cuts the CO_2 molecule into carbon and oxygen. The oxygen is released to the atmosphere and the carbon is employed with the hydrogen to create green plants. Thus the radiant energy of the sun is stored, in the short term, in living plants, in the long term in wood, in the longer term in coal and in the longest term of all, as oil.

From the beginning of civilization the energy of the world that produced food clothing and shelter was produced by the burning of wood, a product of the radiant energy of the sun. Its transportation was propelled by wind in the sails of ships and wind machines whose energy was derived from the thermodynamic energy of the ocean.

From the dawn of civilization until 1850, wood and wind were the energy resources of the world. With the advent of steam, coal replaced wind as the fuel which empowered the industrial revolution and coal was king until the end of

WWI when oil was introduced as a more practical alternative for motorized vehicles and aircraft. It did not displace coal until after World War II when the exploitation of Middle East oil began. Today the nation and world dependency on oil is nearly absolute. Tomorrow the national and world demands from energy will not be less. They will be greater. Continuing dependency on oil in the twenty first century is possible but not certain. The challenge to the oil industry does not yet relate to the volume of oil left in the worlds reservoirs but the industrial inability to maintain, modernize and make more efficient the existing industry - much less to expand the capability to meet growing national and world demand. A decision to revert to coal or displace oil with an alternative in our life time is thus moot. There are no alternate energy resources on the horizon that can be developed in a timely manner .

In the face of this technological imperative can we conceive of an alternate development strategy which, maintaining our dependency on oil will satisfy the total needs of the nation and the world. Perhaps we can . We must first adopt a concept of complementary and supplementary energy resources and we must recognize that the greatest untapped pool of complementary energy is the cold chaos of deep ocean water.

At present we meet the air conditioning and industrial cooling needs of oil powered machinery by utilizing the atmosphere (as we do for road mobile vehicles) or by refrigeration plants for air conditioning or by cooling towers or by water from rivers and lakes for power plants of every description (conventional or nuclear). Every refrigeration plant generates more heat than it does cool. and every cooling medium that is hotter than the average atmospheric temperature contributes to global warming.

For the past two decades at the Natural Energy Laboratory of Hawaii we have met air conditioning and industrial cooling needs by direct heat exchange with cold deep ocean water. In every instance the energy consumption has been reduced by an incredible 90%. In this process there is no production of Carbon Dioxide or other atmospheric pollutants and the net effect on the atmosphere is one of global cooling. Studies have indicated that cities and facilities within five miles of the Western Coast of the United States or on the shores of the Great Lakes could similarly benefit from the substitution of cold water cooling for our current energy intensive cooling systems. The capital development cost for such a development would be enormous but more than cost effective. At NELH the amortized cost of 1000 gallons of deep ocean water having a temperature of 5degrees Celsius is only ten cents. At the Common Heritage Corporation the energy cost for cooling a standard industrial container modified as a chill house is less than eight cents per day.
This complementary resource of deep ocean water is in fact our largest energy resource and is renewed by nature every day as long as the sun shines and the earth rotates and heat radiates into space at the poles.

There is other good news. There is a supplementary energy resource that has already been developed and deployed for almost fifty years. It is the pressurized water nuclear reactor as employed and deployed in American military submarines. These reactors are fail safe. Unlike many land based versions of nuclear power they will not go critical if they lose their water or if they are destroyed by accident or act of terrorism. Thirteen feet of water is as effective a shield as one foot of lead. If by war or accident or terrorist sabotage they are crushed in ocean depths their tomb is shielded from the atmosphere in a way that no land based or space based reactor can match. Despite this fifty year experience with hundreds of nuclear submarines deployed continuously at sea, the public is still fearful and unaware of this remarkable record of safety. The public may have also forgotten the incredible industrial pace with which the nuclear submarine Navy was built. The first Polaris Fleet Ballistic missile submarine was authorized in the autumn of 1955. The first four submarines were deployed in 1959. Production was accelerated until “the boat of the month club” deployed eighteen of these submarines in eighteen months bringing the total to 41 in only 15 years. A nation that could accomplish that feat could certainly produce 100 offshore pressurized water reactors in submerged facilities located in the benign storm free environment of the ocean at a depth of 300 feet or more in the same time frame. Each could feed 1000 megawatts of power into the grid at appropriate points on the shore, serving more than fifty American cities and metropolitan regions.

Is this complementary supplementary energy approach an appropriate strategy? Wiser heads than ours may envision other ocean systems. If so it is time for them to speak. Nay it is time for them act. To the extent that the control of oil is at the root of our present day war on terrorism procrastination will only exacerbate the conflict. Indeed we need at least two springboards of complementary and supplementary hydrocarbon free energy resources to give the world the breathing room and the breath to prepare for an alternative to oil in the year 2101.