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Volume 3, Number 4 (April 1979)

The OTEC Liaison

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AN INTERNATIONAL NEWSLETTER ENGAGED AS LIAISON FOR THE COMMUNITY OF OCEAN THERMAL ENERGY CONVERSION

UTILIZING THE EXPERTISE AND EXPERIENCE OF THE OFFSHORE OIL INDUSTRY FOR OTEC/SOLAR OCEAN ENERGY

As readers found out for themselves if they were able to attend the giant Offshore Technology Conference (OTC) held recently in Houston, the offshore marine industry is technologically advanced—probably further than most realize. For example, Combustion Engineering has an oil and gas production platform already in operation in the North Sea’s Ninian Field that weighs 600,000 metric tons—the largest concrete structure ever floated. While OTEC proponents have consulted extensively with marine firms, the largest (continued on Page 3)

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MINI-OTEC ON SCHEDULE

The latest on Mini-OTEC is that dedication ceremonies will be held in Honolulu, Hawaii on May 29th. Immediately following the ceremony, the barge will be wrapped in a “cocoon” and towed to Keahole Point, on the big island of Hawaii, with expectations for its being on-site and operable between the 4th and 5th of June.

MINI-OTEC: “SPUTNIK OF THE SEA” TO BE DEDICATED MAY 29TH

Mini-OTEC, the world’s first demonstration of the potential of solar power from the ocean, will be dedicated in a ceremony in Honolulu on May 29th. Attending will be Governor Ariyoshi, Senator Matsunaga, and other dignitaries. Immediately thereafter Mini-OTEC will be towed to its site off Keahole Point on The Big Island of Hawaii.

MINI-OTEC CLEARED ENVIRONMENTALLY BY DAMES AND MOORE REPORT

No significant environmental problems are expected for the Mini-OTEC plant to be operated off the coast of Hawaii, according to a recent environmental assessment completed by Dames and Moore of Los Angeles. The experimental OTEC plant is expected to go into operation by May and continue testing for about six months. Sponsored by the State of Hawaii, Lockheed, and Dillingham Corporation, the Mini-OTEC project will demonstrate the technical feasibility of using OTEC to generate electric power as an alternative to fossil fuels. The proposed 50 KW facility will be located on a floating barge moored about one mile offshore from the Natural Energy Laboratory of Hawaii at Keahole Point.
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URGENT!
CALL FOR PAPERS

The Offshore Technology Conference (OTC), held annually in Houston in May of each year, is not only the largest conference of any kind held throughout the world, but also an important meeting for all OTEC proponents. The 1979 meeting had over 85,000 in attendance, as visitors from everywhere came to see and discuss the latest innovations in offshore technology.

Most of the major firms currently involved with OTEC exhibit at this conference, and many others exhibit which are rapidly becoming involved.

The OTC Conference is an ideal forum in which to present papers because it provides fast publication in a high-quality, widely-distributed volume. The huge audience allows the presentation of papers which alone could not draw an international audience of this size and caliber.

Abstracts are required now for the May 1980 meeting. It is requested that abstracts as well as papers contain quantitative results.

Please forward material to Richard A. Meyer, The OTEC Liaison, 1303 South Michigan Avenue, Chicago 60605. If you have any questions call (312) 427-3000.

NEW CONCEPT FOR OTEC: BRINGING CONDENSERS TO COLD WATER

An interesting letter was recently received by TOL from Gerald E. Kron, of the Pinecrest Observatory in Flagstaff, Arizona. It contains several interesting concepts, and is therefore reproduced herein with the permission of the author. Comments are invited from our readers.

Dear Mr. Meyer:

I am writing about your interesting article on ocean thermal energy which appeared recently in the Explorers Journal. Two designs were shown: one by Lockheed and the other by TRW. These designs are similar in that both require the transport of enormous quantities of cold water from a considerable depth up to the condensers. All of this water must be accelerated and raised against an unfavorable density gradient by pumps run from the station's power output, an output that will be quite expensive in view of the large capital investment and the low Carnot efficiency of the station.

Why not bring the condensers to the cold water? The condensers could be designed to be tall, thin things that would cool from convection; a counter-flow principle could be used. They could be floated in neutral equilibrium at a depth that could be chosen for maximum thermal efficiency.

With this design, only the ammonia working fluid would have to be transmitted, and this could be accomplished with flexible hoses—large for the gaseous state, smaller for the liquid state. There would be more condensers than needed, so that one or two would be available for cleaning. This could be done by blowing the flotation tanks to bring the condensers up during good weather for servicing and cleaning.

Sincerely yours,

Gerald E. Kron

NATIONAL OCEANS WEEK MAY 19TH THROUGH 26TH

Dr. Jacques-Yves Cousteau has been named Honorary Chairman of National Oceans Week—May 19th through 26th—during which various activities are planned in the Alexandria, Virginia and Washington DC area.

Joining Captain Cousteau on the Sponsoring Committee for National Oceans Week is Congressman John B. Breaux; Frank N. Braynard, who planned the 1976 tall-ships event; John N. Dalton, Governor of Virginia; Richard A. Frank; Melville B. Grosvenor; Admiral John B. Hayes; Senator Ernest F. Hollings; Juanita M. Kreps, Secretary of Commerce; Senator Warren G. Magnuson; Congressman John M. Murphy; Ambassador Elliot L. Richardson; and S. Dillon Ripley, Director of the Smithsonian Institution.

The following article, reproduced in its entirety, appeared in the April 9th issue of The Wall Street Journal. Reprinted with permission of The Wall Street Journal, Copyright 1979, Dow Jones and Company, Incorporated. All rights reserved.

CRITICAL STUDY LEADS TO TUNE-UP OF POSTS AT ENERGY AGENCY

Schlesinger Clarifies Roles Of Two Top Aides Following Coopers & Lybrand Report

by a Wall Street Journal Staff Reporter

Washington: A critical study by a private consulting and accounting firm has prompted management changes at the Energy Department.

The $34,000 study, by Coopers & Lybrand, was commissioned by the agency to pinpoint areas where management might be improved. Almost since the Department was formed in 1977, it has drawn criticism for mismanagement.

In response to the study, Energy Secretary James Schlesinger ordered a restructuring of the roles of his two top deputies, an area that never has been precisely clarified. Deputy Secretary John O’Leary will serve as the principal internal manager of the agency, allowing Mr. Schlesinger more time to testify in Congress and attend to outside chores. Under Secretary Dale Myers will report to Mr. O’Leary.

The study said that some of the Department’s management difficulties result because it has spent most of its existence fighting for legislative initiatives, often at the expense of good management.

The study criticized the computer models the Department uses to make energy forecasts, essentially saying that some are too unwieldy to be quickly useful. It also questioned the adequacy of communications among the agency’s divisions and with outsiders on many occasions.

A top Department official said that the agency has “made substantial progress already” in responding to these criticisms.

NEW ENERGY R&D BOOK PUBLISHED

A new book just published may be of special interest to TOL readers: Energy Research and Development Program in Western Europe, by Charles Simeons, published by Elsevier, Box 211, 1000 AE, Amsterdam, The Netherlands.

Pfizer and Heat Exchangers

The Composite Metals Division of Pfizer is investigating cladding copper to aluminum and/or titanium for possible use in OTEC heat exchangers. This division of Pfizer is a dominant factor in the metal-cladding of housewares, and is seeking diversification in the application of that technology.

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of these companies have only recently begun to see the potential for their technology in ocean energy other than the extraction of oil.

A recent development, then, taken from offshore oil technology has been proposed by J. Ray McDermott and Company of New Orleans that may have a profound effect on OTEC implementation.

One of the largest such firms, J. Ray McDermott suggests that the principle of the guyed tower might all but eliminate concerns regarding the effects of ocean forces on both the cold-water pipe and submarine cables of proposed OTEC plants in that such a platform would be basically stationary.

Readers may have seen the extensive advertising campaign this winter by Exxon (see reproduction of ad in this issue) illustrating the principles of the guyed-tower platform.

The adaptation of this technology to OTEC was initiated by W. L. (Larry) Green of McDermott, who prompted that firm's top management, at their own expense, to perform a static non-linear structural analysis of an OTEC guyed-tower configuration. That study has been completed, the concept has been reviewed with the Department of Energy's Bill Sherwood, and a paper amplifying the study will be given at the Sixth Annual OTEC Conference in Washington in June.

Below is the abstract of that paper:

A FEASIBILITY STUDY OF AN OTEC GUYED-TOWER CONFIGURATION

A static non-linear structural analysis of an OTEC guyed-tower configuration has been performed. The purpose of the study was to examine an alternative to floating OTEC power plants used in nearland applications—for example to supply electric power through underwater cables to island or mainland grids. This approach is attractive in that it seems to eliminate the as yet unresolved dynamic problems with the cold-water pipe and the electric power-transmission cables associated with the floating OTEC concepts. This study used payload information from previous efforts (350 MW size) to allow some comparison of results with prior studies, but cost-optimization studies have not been performed for the OTEC guyed-tower combination.

This study applies the experience of one of the world's largest offshore marine contractors to the near-land OTEC problem. This experience includes designing, fabricating, and installing thousands of structures in oceans all over the world, including the present deep-water record holder, which is designed to withstand hurricane loading in over a thousand feet of water. The study uses the pragmatic approach of examining the structural adequacy, life, and station-keeping ability of a structure sized from preliminary consideration of fabrication and installation stresses.

Results of the study indicate that an OTEC guyed-tower power plant can be built and installed, and would necessarily have superior life and station-keeping ability by comparison with a floating OTEC power plant. The optimum generating capacity has yet to be determined, but is probably in excess of 1000 megawatts.

(Editor's note: All study of the application of guyed-tower technology toward OTEC implementation to date has been done by J. Ray McDermott. However, twelve companies have participated with the Exxon Production Research Company in the offshore test of the guyed tower. They are: Broken Hill Proprietary, Ltd., Brown and Root, Inc., Chicago Bridge and Iron, Gulf Research and Development, J. Ray McDermott, Marathon Oil Company, Mitsubishi Heavy Industries, Ltd., Mobil Oil Research and Development Corporation, Nippon Kokan, K.K., Penzoil Company, Placid Oil Company, and Technomare, SPA: truly an international effort.

Further information on guyed towers may be obtained from an article entitled "Tests Recognize Guyed Tower Potential", Pages 218 to 229 of the May 1978 issue of Offshore magazine.

Comments, pro or con, on the use of this concept for OTEC implementation are invited by and will be published in TOL.)
The "Guyed Tower"—a new way to get oil from deeper waters.

Exxon has found a new way to get oil from waters too deep for conventional drilling and production platforms. It's called the "guyed tower" and it may be used to recover the oil from Exxon's recent significant discovery in the Gulf of Mexico—an oil field lying under 1,200 feet of water which may hold more than 50 million barrels of petroleum.

The slim steel tower is held in place by guy lines which are weighted and anchored to the ocean floor. It is topped by a conventional platform deck.

Water depth, tower size, and weather conditions dictate the number and size of the guy lines. A typical Exxon guyed tower would have 16 to 24 guy lines.

Huge weights lift off the ocean floor when storm waves are very large. This Exxon-designed feature protects the guy lines from severe strain during storms.

The tower base is forced into the sea floor and acts as a pivot to allow the tower to move with wind and wave action.

Energy for a strong America.

A typical ad run by Exxon as a part of their advertising campaign exhibiting advanced offshore technology. This illustration of the guyed-tower concept was published in the Wall Street Journal.

• A live radio transmission, powered by Mini-OTEC, is expected to be received during the 6th Annual OTEC Conference in Washington June 18th through 22nd.
• Bryn Beorse, of the University of California Sea Water Conversion Laboratory, will appear on a New York City talk show in July to discuss OTEC.
• An article on OTEC will appear in the June issue of The Humanist.

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Sunnyvale, California: Lockheed has received a $233,450 contract from the National Oceanic and Atmospheric Administration (NOAA) to study mooring systems for a floating power plant that could supply enough electricity for a city of 200,000 persons. Such a plant could be in commercial operation before the end of this century.

Under the mooring contract, engineers at Lockheed Missiles and Space Company, Sunnyvale, California, will develop preliminary designs for two experimental platforms that might be placed at a Puerto Rico site. At the same time, the engineers will look into the feasibility of using similar designs for possible commercial power plants of up to 400-megawatt capacity, according to Dr. Roger Potash, naval architect and Lockheed project leader.

The OTEC power plants could displace more than 300,000 metric tons and would borrow construction techniques used in offshore oil drilling.

Potash said three basic mooring systems, three anchor concepts, and four candidate materials will be investigated in the design study. Power-transmission-systems integration also will be part of the study.

Mooring systems under study are single-anchor leg, multiple-anchor leg, and tension-anchor leg. The tension-anchor leg might use a half-mile-long cold-water pipe as the cable between anchor and plant.

Anchor systems are gravity or clump-pile (driven into the seafloor), and conventional embedment. Materials to be studied include steel, concrete, synthetics (nylon and polyethylene), and Kevlar.

Principal subcontractors working with Lockheed on the one-year mooring study are IMODCO of Los Angeles and Simplex Wire and Cable Company of Portsmouth, New Hampshire. IMODCO is a pioneer developer of offshore single-point-moor terminals for large petroleum tankers. Its most recent project is near Santa Barbara, California in 500 feet (155 meters) of water.

Lockheed and other companies have been engaged in OTEC studies for the US Department of Energy and other governmental agencies since mid-1974. Lockheed has concentrated on the engineering and economic aspects of OTEC and has evaluated six different OTEC platform designs to determine the most likely candidate to be in commercial operation in the 1985–2000 interval.

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April 1979

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COURTESY PREDICTS WIDE USAGE OF OCEAN ENERGY

In the March 1979 issue of the Calypso Log, published by the Cousteau Society, there is a major article by Dr. Jacques-Yves Cousteau entitled View from the Bridge: Saving the Ocean's Resources.

Under the heading Energy from the Sea, Dr. Cousteau writes: "Energy from the sea will satisfy most of our needs in 30 years through ocean thermal-energy conversion (OTEC), winds, currents, waves, salinity gradients, and bioconversion. Moreover, oceans will supply the fuel for nuclear fusion."

SIMPLEX RECEIVES CABLE CONTRACT FOR $4.8 MILLION

The US Department of Energy has awarded a contract for the development of underwater power-transmission cables for Ocean Thermal Energy Conversion plants. The $4.8 million four-year contract was awarded to Simplex Wire and Cable Company, Portsmouth, New Hampshire, to develop high-voltage power cables that will be operating at depths of 4,000 to 6,000 feet. According to Simplex, the cables will be suspended from the OTEC plants down to the ocean floor and, because of the long vertical distance that must be bridged, will be subjected to severe mechanical stress. Some of the conditions that will be encountered, Simples said, are the constant flexure caused by deep ocean currents and cycle bending, and twisting induced by plant motion and wave action.

DOE TO NEGOTIATE OTEC CONTRACT WITH WESTINGHOUSE

The Westinghouse Electric Corporation's Steam Turbine Division at Lester, Pennsylvania has been selected by DOE for negotiation of an Ocean Thermal Energy Conversion follow-on contract to provide for the detail design and construction of heat exchangers for testing on board DOE's OTEC-1 ocean test platform.

The contract, valued at approximately $2.3 million, calls for the heat exchangers to employ advanced heat-transfer surfaces in a shell-and-tube design. The units, rated at .13 megawatts, will provide data for much larger scale designs which could be utilized in future OTEC plants which will generate electricity.

The OTEC-1 test platform will be stationed off Hawaii to test power-system components and subsystems beginning in the spring of 1980.

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Apr 10: Linked-Spar Motion—Compensating Ocean Lift System Design: Contractor to design a linked-spar motion-compensating ocean lift system from overall concept and general size and configuration specified by the Government. It is a new class of passive motion-compensation system utilizing a stable spar buoy to support the suspended load and its lift line through the buoy and back to the surface support ship. Necessary analyses, engineering calculations, weight estimates, and assumptions made in the design will be documented in a report. Estimated level of effort 560 hours. Selection evaluation criteria consist of: (1) experience in the design of metal structures; (2) experience in the field of ocean load handling; (3) experience in generating, analyzing, and evaluating concepts and developing them into practical systems; and (4) professional qualifications and capabilities of staff to be assigned for duration of the contract. Firms which meet the requirements described are invited to submit completed Standard Forms 254 (unless already on file) and 255 (US Government Architect-Engineer Qualifications). Firms having a current SF 254 on file with this office and those responding by 25 Apr 79 will be considered. See Note 62. This is not a request for proposal. No other general notification will be made. Direct all inquiries to Opal Forde, (805) 982-5506. Reference 79-0028. Civil Engineering Laboratory, Attn: Code L23, Naval Construction Battalon Center, Port Hueneme CA 93043.


Apr 13: Technical Studies Related to the Development of a System for Global Ocean-Climate Monitoring: The RFP is planned for release in late April 1979. The program is being initiated by the National Oceanic and Atmospheric Administration (NOAA) for the purpose of providing technical planning and systems evaluation leading to the development of a global ocean-monitoring system by climate studies. The long-term goal of the development effort is to be an operational observing system implemented on a co-operative international basis to monitor the structure and dynamic behavior of the ocean for the purpose of detecting and evaluating fluctuations that signal the onset of climatic changes. As presently conceived the observing system will evolve from existing and projected observational capabilities including satellites, buoys, shops of opportunity, and island stations into a systematic means of monitoring climatically significant ocean variables. Measured parameters are to include surface temperature, upper ocean heat transport, sea ice extent, sea-level topography, and deep-ocean circulation. In the first phase of the contract, the contractor will be required to: (1) Set out a development strategy for an ocean-climate monitoring system that reflects presently-documented climate program objectives. (2) Analyze performance requirements of systems conceptualized by the contractor to meet these objectives. (3) Assess timely availability of candidate components for application in an evolving observing system. (4) Develop a preliminary plan for implementing the monitoring system, indicating required development effort and expertise to bear on the problem, and that can be matched to needs for information. As presently conceived the observing system will be an operational observing system repecting presently-documented climate program goals. The contractor to conduct systems-engineering studies to determine the most effective system configuration and to perform detailed planning of system-development efforts. A potential contractor must bring a combined scientific and engineering expertise to bear on the problem, and must ensure familiarity with a wide range of climate-related matters. The total duration of the contract, including the follow-up phase, may range from 18 months to two years. The RFP will be released by the US Department of Commerce on or about 27 Apr 79, and proposals will be due two months after release. Interested firms with the requisite capabilities for performing this work should provide a written expression of interest to NOAA outlining pertinent experience and capabilities no later than 20 days from the date of publication of this synopsis. Proposer must be financially sound, have an acceptable accounting system, and possess an ability to comply with Government regulations, including equal-opportunity and small and minority business subcontracting requirements. Multiple contracts may be awarded at the discretion of the Government. No product of these studies will be treated as proprietary by the Government. Technical inquiries will not be honored. This is not a request for proposals. Only those sources deemed qualified by the information submitted will be considered when requests for proposals are solicited. (101) NOAA Data Buoy Office, NSTL Station, MS 39529, Attn: A. J. Oberkirch.


Apr 24: Renewable Energy Policy Analysis: Innovative planning, research, and analysis for the development of renewable energy resources at the local, state, and national level. Renewable systems that are efficiently matched to local needs in scale and thermo-dynamic quality, and that can be locally developed and controlled, are of primary interest. Capabilities to perform planning, research, and analysis are sought for a broad range of factors—economic, environmental, administrative, technical, and others—that affect the use of renewable energy resources. Such analyses would account for local variations in resource availability, climate, economic activity, and end-use demands. Analyses would emphasize inexpensive systems that might be locally implemented in the near term, and frequently would require involvement of state and local governments and public participation. Organizations are invited to send a brief (not more than about five pages) description of their interest, capabilities, and experience in this area. Statements should describe specific areas of interest in local renewable energy systems development, background and experience in state, local and national resources and capabilities. Statements should be sent by 30 May 79, or within 30 days of the publication date of this notice, whichever comes later. This notice invites expressions of interest and capability. Responses will be used to assess program feasibility and to aid design of future programs. DOE will not award contracts or grants on the basis of this notice, or otherwise pay for information solicited. A summary of the responses to this notice will be available to the public upon request. (110) US Department of Energy, Division of Advanced Energy Systems, Policy Room 6E-068 A, Forrestal Building, Washington DC 20585.

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