

# Department of Energy Begins October 1

Despite the demands of an immensely complicated reorganization, the new Department of Energy is planning to begin operations on October 1. 'We've got 100 people in 11 transition teams working on it,' a spokesman said.

Nominees for at least some of the 15 DOE positions that must be filled by Presidential appointment and Senate confirmation will be announced this month, the spokesman said. Secretary of Energy James

R. Schlesinger received Senate confirmation August 4, within hours of his formal nomination. The Senate also confirmed Charles Curtis to head the present Federal Power Commission, which will become the Federal Energy Regulatory Commission under the DOE.

President Carter signed the "Department of Energy Organization Act" into law (PL 95-91) on August 4, noting that it brings "together under one roof about 50

different agencies". Among these, the Energy Research and Development Administration (ERDA) and the Federal Energy Administration (FEA) will make up the vast bulk of the DOE, along with the Federal Power Commission. The DOE will also have a large role in Federal energy resource leasing policy and regulation, especially on the outer continental shelf (OCS).

The organization of the new agency was largely left up to the Secretary of Energy in the DOE Act, which specifies only that it perform at least 11 listed functions, and that responsibility for these be divided among eight assistant secretaries as the Secretary sees fit.

Among the 11 functions mandated for the agency are: "...management of all forms of energy production ...including ...energy-technology programs"; research and development on solar energy resources; "...conducting a comprehensive program of research and development on the environmental effects of energy technologies and programs"; "promotion of competition in the energy industry"; and "responsibilities for conducting a continuing liaison between the Department, .and the public".

(See DEPT. OF ENERGY, Page 5.)

Program. The State of Hawaii, through the NELH, provided funds in the amount of \$75,000 for the construction and installation of the uncontaminated surface seawater supply system. This system is capable of continuously delivering between 1700 and 3500 gallons per minute of seawater to the OTEC heat exchanger. A series of tests under various flow and light conditions, combined with test cleaning techniques, will validate this heat-exchanger design and will provide the needed data for determining net efficiency and heat-exchanger cleaning schedules. This experiment was originally designed to take place over a six-month period. However, based on some current results, we are planning to extend the test series to one year.

The second experiment taking place at the NELH Ke-ahole site is an ERDA-sponsored University of Hawaii/Carnegie-Mellon University warm-water biofouling and corrosion experiment located on a subsurface buoy about 400 yards offshore. The current phase of the project consists of pumping water continuously through 10 one-inch aluminum tubes located on the buoy at a depth of 50 feet below the surface. The underwater electronic package on the buoy measures the decay in heat transfer across the walls of the tubes as an indication of biological growth. These measurements are made upon command from shore with the data signals passing through the armored cable. This experiment, initiated last February, has already yielded valuable information about possible OTEC heat-exchanger biofouling rates.

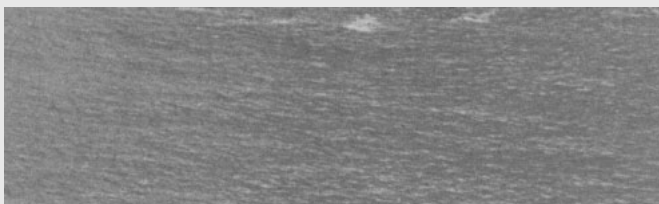


## Hawaii Leads Nation in Alternative Energy

The Natural Energy Laboratory of Hawaii was created by legislative action in 1974. The bill provided for planning funds which were matched on a dollar basis by the County of Hawaii. The Ke-ahole site for the NELH was chosen after a careful review of all the criteria necessary for its successful operation. Some of the most important criteria were nearby availability of cold, deep ocean water; a warm ocean surface layer not subject to strong seasonal cooling; high annual solar radiation; accessibility to logistical support including major airports, harbors, and highways; and an adequate area of undeveloped land. The

Ke-ahole Point site is unique in fulfilling all of these major criteria, and has the added advantage of being owned by the State of Hawaii.

Now, nearly three years later, we are viewing the first ocean experiments designed to provide data on biological fouling for an ocean thermal-energy conversion (OTEC) heat-exchanger configuration identical to that proposed for an OTEC plant operation. This experimental configuration was designed by the Johns Hopkins University/Applied Physics Laboratory. Its construction and placement at the NELH site were funded by the National Sea Grant



An aerial view of the NELH Keahole Point site

Photo credit: NELH

(See UPDATE ON HAWAII, Page 6.)

# The OTEC Liaison

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

VOLUME 1 NUMBER 2  
September 1977

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## Please Subscribe!

As advised in April, the first three monthly issues of *The OTEC Liaison* will be sent at no charge to attendees of the March New Orleans conference. This will include this second issue (September) and the October issue. Financing thereafter will be largely dependent upon subscriptions, and your support is earnestly requested and required. An "early-bird allowance" of \$10 off the regular subscription rates is offered as an extra inducement until November 1, 1977. *The OTEC Liaison* will provide continued liaison [from the French: *an instance or means of communication between bodies, groups, or units*] to the community of ocean thermal-energy conversion, with response to your expressed needs. Your comments and criticisms are welcomed.

### CALENDAR

● **Feb 20-22:** 5th Ocean Thermal Energy Conversion Conference, Miami Beach FL. Info: T. Nejat Veziroglu, Director, Clean Energy Research Institute, Univ. of Miami, PO Box 248294, Coral Gables FL 33124:  
● **Oct 10-12:** OTEC Biofouling and Corrosion Symposium, Seattle WA. Info: Dr. Robert H. Gray, Chairman, Symposium Committee, Battelle Pacific-Northwest Laboratories, PO Box 999, Richland WA 99352; (509) 946-2937.

## QUESTIONNAIRE RESULTS

*The OTEC Liaison* was more than gratified by the enthusiastic response to the questionnaire sent to attendees of the March New Orleans conference. The results are tabulated below:

A total of 194 responses were collected out of 330 mailed for a 59% response.

### AREAS OF INTEREST

Biofouling and Corrosion	17.2%
Total Systems	16.4%
Environmental and Siting	14.7%
Heat Exchangers	13.5%
Ocean Engineering	12.9%
Instrumentation	6.6%
Manufacture of Components	5.9%
Investment	3.4%
News Media	1.5%
Observer	1.0%
All of Above	.5%
Other	6.4%

### FUNDING

Independent	47.2%
Outside	33.3%
Combination	7.5%
Undecided	12.0%

### FREQUENCY


Monthly	81.1%
Bimonthly	13.9%
Weekly	.6%
Undecided	4.4%

### INTERNATIONAL INTEREST

Yes	91.4%
No	8.6%

The role of *The OTEC Liaison* will be largely determined by your needs. Your comments and suggestions toward that end are encouraged. Input is both invited and necessary for a viable communications instrument. If you have information or questions, please do not hesitate to call or write Richard Arlen Meyer, Editor and Publisher, *The OTEC Liaison*, 1910 N. Elston Ave., Chicago 60622, Illinois: (312) 489-5900.

The OTEC Liaison is happy to have received the unsolicited letter reproduced below:



UNITED STATES  
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION  
WASHINGTON, D.C. 20545

**SEP - 9 1977**

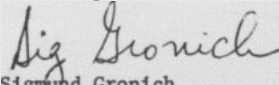
Mr. Richard Arlen Meyer  
Editor and Publisher  
THE OTEC LIAISON  
1910 N. Elston Avenue  
Chicago, Illinois 60622

Dear Mr. Meyer:

It is my privilege to be one of the first to congratulate you on the inaugural issue of THE OTEC LIAISON. Such a publication will undoubtedly be a valuable addition to today's energy-related literature, and we wish it the best of success.

The publication is appearing at a key time in the OTEC story. The coming year may well be characterized as the year OTEC moves from paper concepts to ocean-going hardware.

As promising as OTEC appears for the long-term future -- it may be the only solar option capable of competing economically for baseload electrical production -- the technology is perhaps the least publicized of all solar concepts. Thus, there is a need for information so that the American public can play an intelligent role in determining our national energy policy.

Sincerely,  
  
Sigmund Gronich  
Chief, Ocean Systems Branch  
Division of Solar Energy

## COMMENTS FROM QUESTIONNAIRE

**SUGGESTIONS REGARDING POSSIBLE FUNCTIONS OF THIS NEWSLETTER, DETAILED BELOW, WERE OFFERED BY SEVERAL CORRESPONDENTS. THE OTEC LIAISON WILL ENDEAVOR TO MEET THESE NEEDS.**

The OTEC Liaison looks like a good idea. It should, of course, deal with open cycle work and progress as well as closed cycle. I would like to see it kept short and meaty.  
— R. E. H., Boulder CO

Weekly issues seem too frequent. Bi-weekly or monthly is better, but monthly can sometimes let things of importance lapse.  
— J. R. J., Washington DC

All of the above [projected features of this newsletter] are useful. I would also recommend including guest editorials or critiques, or letters to the editor as means of keeping the newsletter lively and slightly controversial.  
— K. J. B., Stillwater OK

Our interest is simply in following the developing technology and perhaps in contributing somewhat when possible. OTEC Liaison seems a worthy approach to this end.  
— E. S., Bay St. Louis MS

The only way the public and industry can become knowledgeable is by good distribution of information—factual information, not pie-in-the-ey type. Government can't fund all of OTEC, but industry won't participate without knowing more about it.  
— E. M., Lake Success NY

Thank you for initiating a communication channel for people interested in OTEC. I was made aware of your newsletter by Dr. Robert Reid, whom I work with here at the Aerospace Corporation. I am interested in OTEC for both personal and professional reasons. As such, I would appreciate being put on your mailing list and assisting in the communication process. Thank you for your efforts and the initial letters.  
— S. A. K., Los Angeles CA

It's a great idea—just what is needed.  
— L. G., Houston TX

This new publication should do more than ERDA is trying to do with its weekly news and more about the approach of Inter Solar Energy Society except for OTEC. Good luck!  
— C. W. H., Seattle WA

Brazil, India, Russia are alerted [toward OTEC development]. We may soon be outdistanced, the slow way we work it now. I am grateful for present high caliber work, but worried about slow progress.  
— B. B., Keyport WA

This newsletter is truly needed in "bring us together" with a common news organ.  
— J. D. T., Alexandria VA

I think the more independence you wish to show in this letter (the fewer strings held by ERDA), the sponger the newsletter will be.  
— J. H. A., York PA

A lot of relevant data, especially biological data, exists but is not published. The newsletter could be a forum to discover the main problems and progress of OTEC development. It should include some political discussion, since this will help determine sites.  
— J. A., Corvallis OR

It seems to me that the main benefit would be to advise of impending legislation affecting OTEC, of long-range plan changes made, and most important of forthcoming reports; the ERDA Summaries are too infrequent. I believe there should be no draw bank; in fact I believe it is highly illegal. The intent of the NTIS is to avoid such little costly collections. Rather, your proposed letter might highlight the availability of specific technologies, reports, and developments to improve accessibility to NTIS.  
— E. J. B., Ventura CA

I am interested in the position of EROA regarding OTEC, Direct Solar, Biomass, Wind, Tide, and other methods of energy generation.  
— L. G., Houma LA

We are a potential electric-utility customer for an OTEC system  
— L. A. W., New Orleans LA

We are interested in the social, political, and economic impacts.  
— A. J. M., New Orleans LA

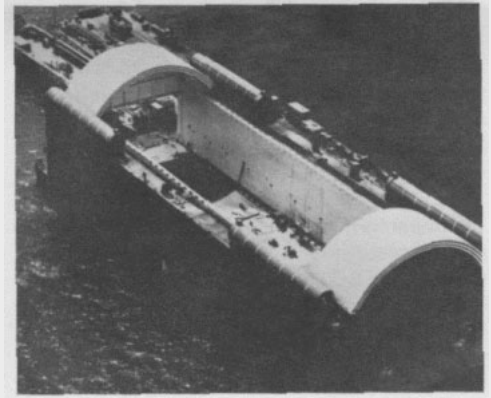
Identification of major workers in various fields to promote free exchange of information.  
— WCLS, El Segundo CA

Contracts pending (RFPM and the like), Briefly summarized, contracts let (with key contacts), schedules, progress, data sources/types available, editorial section (opinions confined to this section only), assistance offers and needs, miscellany.  
— K. H. E., Honolulu HI

EROA and Commerce Daily now appear to be covering ERDA-sponsored activities more promptly. Contractors Report distribution is still slow with processing through NTIS. Foreign coverage would be a useful product. There are a number of energy newsletters on the market now—which I have found to be less than useful. ERDA's periodic workshops have also helped to disseminate information. In summary, I'm not sure you are going to perform a useful function, but would consider a short trial subscription to give you an opportunity to demonstrate what you have in mind.  
— L. W., Laurel MD

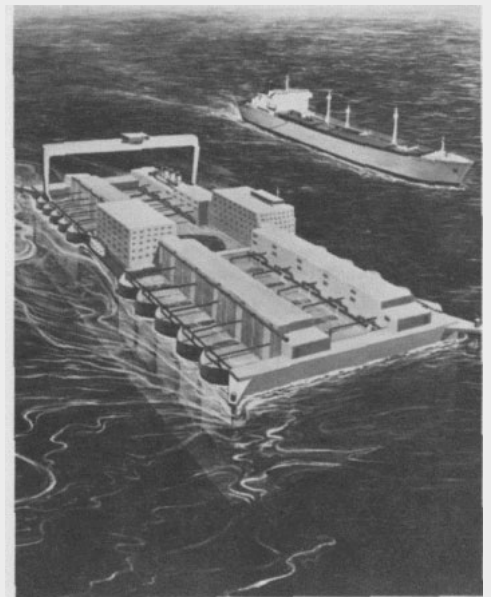
Please pass on that there were too many papers per session [at the March conference] and we were always late. Weed out, cut back, and save our time.  
— J. M. Z., Gloucester Point VA

Great idea. The Hawaii biofouling team will supply newsworthy items to the extent we are permitted by ERDA/Battelle. We look forward to a range of current news items.  
— F. C. M., Honolulu HI



OTEC-1, which will be used to test 1MW heat exchangers: (above) as the "Hughes Mining Barge" that carried secret grappling equipment for recovery of a sunken Soviet submarine; and (below) as an ERDA artist visualized it in its new role as a floating test facility. An RFP for the conversion to OTEC-1 is now slowly moving through the agency's internal approval processes and should be out sometime this fall, according to Sigmund Gronich, chief of the Ocean Systems Branch.

Photo credit: ERDA



## Proceedings of March Conference

The latest word (as of September 19) on the mailing of the proceedings of the March New Orleans Conference from George E. Loup of UNO is that a final version will be sent to Abe Lavi for approval and they are expected to be in the mail during the week of September 25. Printing and binding delays together with late receipt of material from contributors caused the tardiness. [Editor's note: Six months seems far too long for the dissemination of this important information. A letter to the director of the 5th OTEC Conference in February (see Calendar) urging hastening of the next Proceedings mailing is suggested.]

The OTEC Liaison Chicago 60622 September 1977

# APL's Ocean Grazing Plant Concept Gets Congressional Support

The first OTEC pilot/demonstration plant to hit the water could be one based on the "tropic oceangrazing plant" concept developed at the Applied Physics Laboratory (APL) of Johns Hopkins University.

Congressional enthusiasm for the Project (a departure from the Energy Research and Development Administration's main thrust: OTEC-electric plants) has apparently increased considerably over the Past few months. "I welcome this support for this project because I believe that this particular approach to the ocean thermal-gradient technology is the most viable approach for early application," Rep. Mike McCormack (D-WA) told his colleagues on the House floor July 13.

McCormack was referring to the inclusion of \$2.4 million for OTEC in both House and Senate versions of the Fiscal 1978 authorization for the Commerce Department's Maritime Administration (Mar. Ad). The generous authorization came too late, however, to influence the MarAd appropriation bill, signed into law (PL 95-86)

on August 2. That bill included no funds for OTEC work, but MarAd officials received permission from the House Appropriations Committee to re-program \$200,000 for FY '78 to keep work on hull designs and related matters going. The authorization bills are still in Senate-House conference to resolve differences between the two versions.

So far, Congress has provided \$10.1 million in the FY '78 (ERDA) appropriation bill, which was signed into law (PL 95-96) by the President on August 7. Of that amount, \$8 million is to go directly into detailed system design and engineering at APL, and \$2.1 million into acceleration of basic studies and preliminary design of specific items such as pumps and turbines to fit the needs and conditions of the pilot plant.

At this writing, however, ERDA can't spend the money it has for "new initiatives" such as the APL work, because the FY '78 authorization bill, which normally is passed before the appropriation, has yet

to be voted on by the House. It was scheduled to come up on the House floor September 12, but may face lengthy debate over such non-OTEC provisions as money for the Clinch River fast-breeder nuclear reactor.

The final cost of the initial version of the APL plant would be around \$50 million, according to William H. Avery, director of the OTEC project at APL and an assistant director of the laboratory. That includes about \$45 million to build the massive concrete hull and install the OTEC components, and \$5 million for testing and the first year's operation, he said.

"If we get the funding for a demonstration plant, it could be in operation by calendar year 1980," Avery said. "A commercial plant could be in operation two and a half years later—by 1983-1984." The engineering design that will begin soon under ERDA funding should result by the end of 1978 in specifications to go into requests for bids on construction of the plant.

APL's initial plant would include a full-scale hull (470 feet by 196 feet, with a 60-foot draft), a cold-water pipe (60 feet in diameter and 3,000 feet long), and a gantry crane (200-ton capacity), but only one five-megawatt (5 MW) electrical power module. There would be no ammonia plant initially, but an electrolysis unit for Production of hydrogen would be included.

Conversion of the pilot plant to a 100 MW full-scale demonstration plant will be a matter of adding more 5 MW power modules, Avery said. A full-scale hull and cold-water pipe are necessary in the pilot plant, he insisted, because their characteristics change with size. For example, he noted, a 15-foot pipe and a 60-foot pipe differ in stiffness by a factor of about 25.

APL's plans now include a test of a new heat-exchanger cleaning system about September 20, and a test of a full-scale 5 MW heat-exchanger element in January 1978 at ERDA's test facility at Argonne National Laboratory. Proposals to use a water-jet cleaning system have been abandoned, Avery said, as a result of tests that showed it "much less effective" than wiping the surface with a cloth. The new system does just that, swiftly enough that inner surfaces of the APL heat exchangers could be wiped once a week if necessary. APL plans to try it out soon in the ocean off Hawaii.

Congressional support of the APL concept means that ERDA now will develop ocean thermal energy along two parallel tracks: as a source of onshore electricity generated offshore and cabled to users, and as a means of producing energy-intensive products without using fossil or nuclear fuels. The agency has emphasized the OTEC-electric concept in the past, stressing the step-by-step development of plant components.

APL's experience in defense work has convinced its staff that "the stepwise ap- (See OCEAN GRAZING, Page 6.)

Outlined below are the key personnel of the Energy Research and Development Administration and their current responsibilities, along with contact locations and associated contractors. The above information, requested by several readers of The OTEC Liaison, was supplied in a mid-September conversation with ERDAs Bob Cohen.

TYPE OF ACTIVITY	EROA PERSONNEL	SUPPORT ORGANIZATION	KEY PERSONNEL
ocean Systems	Sigmund Gronich	Gilbert Associates Inc. Frederick Harris Inc. (subcontractor)	John Van Summern
Resources and Environment	Lloyd Lewis	Argonne National Laboratory	Jack Dittmars
Definiton Planning	Bob Cohen		
Power Plant	Abe Lavi	Argonne National Laboratory	Norm Sather
		Oak Ridge Laboratory	John Michel
Ocean Engineering	To Be Hired	NAVFAC	H. Ottesen
	W. Sherwood	NOAA	Joe Vadus
Biofouling and Corrosion	Gene Kinelski	Battelle Pacific Northwest Laboratories	Lyle Perrigo
Electric Cable	Bill Smith		
		Gilbert Associates Inc. 1828 L Street NW, Suite 1201 Washington DC 20036 (202) 331-0252	
		Oak Ridge National Laboratory (ORNL) Post Office Box Y Oak Ridge, Tennessee 37830 (615) 483-8611. Extension 35000	
		Battelle Pacific Northwest Laboratories (PNL) Battelle Boulevard, PO Box 999 Richland, Washington 99352 (509) 946-2112	
		Argonne National Laboratories 9700 South Cass Avenue Argonne, Illinois 60439 (312) 739-7711	
		US Naval Facilities Engineering Command (NAVFAC) 200 Stovall street Alexandria, Virginia 22332 (202) 325-0505	
		Energy Research and Development Administration Division of Solar Energy Washington DC 20545 (202) 353-3000	

# St. Croix Biofouling and Corrosion Tests

Biofouling and corrosion tests began off Christiansted, St. Croix in the Virgin Islands on July 19, under the supervision of the University of Miami's Rosenstiel School of Marine and Atmospheric Sciences. The field experiments are riding piggyback on a Navy research barge moored in more than 12,000 feet of water seven miles north of the city. An official of the Energy Research and Development Administration explained to *The OTEC Liaison*.

Warm surface seawater is pumped from a depth of 60 feet, with the flow divided on deck between the biofouling experiment and a bank of aluminum tubes used in the corrosion study. Flow rates in the tubes are set at six feet per second (fps), the planned velocity in early OTEC heat exchangers, and three fps.

Biofouling—really the change in resistance to heat transfer through the walls of an aluminum tube—is being measured with a device developed at Carnegie-Mellon University, the EROA official said. The device consists of a copper block tightly surrounding the tube. The block is heated to an equilibrium temperature, then the heat is turned off and the rate at which the residual heat is carried away (by water pumped through the tube at six fps) is recorded.

Computer analysis of the resulting data yields figures for the resistance to heat transfer ( $R_f$ ) in  $^{\circ}\text{F}/\text{btu}/\text{ft}^2\text{-hr}$ . "The maximum we can tolerate to make an OTEC heat exchanger work" properly is an  $R_f$  of 0.0005, noted the official, "Our aim in life," he added, "is to get (down) to 0.0001". but ERDA considers a level of 0.0003 acceptable.

ERDA plans to continue the series of biofouling and corrosion tests with tubes of titanium, 90-10 copper-nickel alloy, and stainless steel, as well as the aluminum used in current tests. An experiment to go on a 40-foot discus buoy in the Gulf of Mexico is being designed now. It will likely have two Carnegie-Mellon devices on deck, and another, sealed inside an eight-inch PVC pipe, attached far down the mooring line in deep cold water. The official said similar submerged units have been used in studies in Hawaii.

The barge on which the St. Croix experiments are mounted is operated for the US Navy by Tracor Marine, Inc. Its deep-water moor is said to be a world record. Tracor also is operating the OTEC field experiment, sending data and tubes for analysis back to the Rosenstiel School near Miami.

## OTEC-1 SHELL READIED

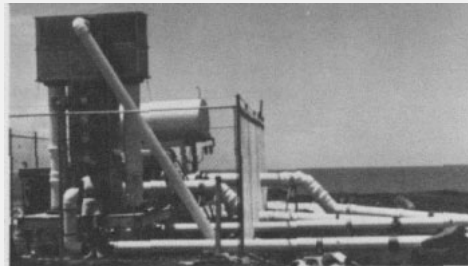
OTEC-1, the converted Hughes mining barge (*The Glomar Explorer*), has now been stripped of earlier equipment and relocated to the Hunter's Point Naval Shipyard (AAA Shipyard) in San Francisco awaiting heat-exchanger tests by 1979.

## DEPARTMENT OF ENERGY (continued from Page 1)

Major divisions of the DOE will include the Federal Energy Regulatory Commission, Energy Information Administration (now a function of FEA), Economic Regulatory Commission, Inspector General, and Office of Energy Research (whose functions, apart from advising the Secretary, are left to his discretion).

The ACT also calls for preparation of "a proposed National Energy Policy Plan" to "consider and establish energy production, utilization, and conservation objectives for periods of five and ten years... (and)... identify the strategies that should be followed... to achieve such objectives." Along with the proposed plan, the Act requires the President to submit to Congress a comprehensive report on energy activities and problems. The first plan/report is due April 1, 1979. In addition, by January 15, 1982 the President must submit a comprehensive review "of each program of the Department".

In writing the DOE Organization Act, Congress included among its stated purposes: "...to assure, to the maximum extent practicable, that the productive capacity of private enterprise shall be utilized in the development and achievement of the policies and purposes of this Act".



Various views of the installation at Keahole, Hawaii



# First Pilot-Scale Designs Underway

Design of the first pilot-scale complete OTEC systems under the Energy Research and Development Administration's program is expected to begin this month. ERDA recently announced that it would negotiate contracts for "conceptual and preliminary" designs with three major industrial firms.

The contracts with Lockheed Missiles and Space Co. of Sunnyvale CA, TRW Inc. of Redondo Beach CA, and Westinghouse Electric Corp. Power Systems Co. of Philadelphia PA should be signed shortly, an ERDA spokesman told *The OTEC Liaison*. The three firms, each of which heads an industrial team, were selected from six that submitted proposals in response to an ERDA request in March.

Following successful submission of the conceptual designs in December, and acceptance of the preliminary designs in September 1978, ERDA will select "one or more" for fabrication of the first five-megawatt (5 MW) OTEC plant(s). Such a pilot plant would be the next step in the program following component testing in OTEC-1, the floating test platform ERDA plans to make out of the "Hughes Mining Barge" originally constructed as part of the *Glomar Explorer* system.

In addition to designs for the 5 MW systems, each contractor will prepare designs for a 25 MW system, as well as for a 1 MW heat exchanger. The heat exchangers are to be used in tests to verify the feasibility of each system design before construction of the 5 MW Pilot plant.

The Lockheed program, managed by Roger D. Fuller, includes as major sub-contractors the Bechtel Corp. of San Francisco and Foster Wheeler Energy Corp. of Livingston NJ. Other team members are Lockheed Electronics Co. of Plainfield NJ and Lockheed Shipbuilding and Construction Co. of Seattle WA.

Members of the TRW team were not immediately known, but the project presumably would be managed under the firm's Ocean and Energy Systems Department, directed by Robert H. Douglass. TRW is currently constructing heat exchangers for delivery to ERDA in late 1978.

Project manager and technical director for Westinghouse will be Eugene Barsness of the Steam Turbine Division in Lester PA. Major participants will include Carnegie-Mellon University, Union Carbide Corporation's Linde Division, Middle South Services (a utility), and the architect/engineering firm Gibbs and Hill. Westinghouse divisions involved will include Sunnyvale CA (the marine division), Oceanic Division, Power Generation Service Division, Large Rotating Apparatus Division, Switchgear Division, Transformer Division, and the Westinghouse Research and Development Laboratories.

Lockheed and TRW submitted feasibility studies to ERDA in May 1975 that outlined the technical and economic problems and possibilities of ocean thermal-energy systems.

