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The Solar Ocean Energy Liaison

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The OTEC Environmental Effects Assessment Program Plan, 1981-85 (EAP) was released by NOAA's Office of Ocean Minerals and Energy (OME) in June 1982. The document outlines the status of current knowledge about the environmental effects of OTEC commercialization, prioritizes the areas which need further research, and defines NOAA's program plan to approach the remaining questions.

The plan was prepared pursuant to the passage of the OTEC Act of 1980, which directs the administrator of NOAA to initiate a program to assess the environmental effects of OTEC and to prepare a plan to carry out that program.

The primary objective of the EAP is to obtain the environmental information required to allow commercial development of OTEC to the maximum extent compatible with acceptable environmental risk. To meet that objective, the EAP identifies the research required to obtain the necessary information on both individual and multiple OTEC-plant deployment.

The third chapter of the EAP is a summary of the Environmental Research Plan.

CORIOLIS PROGRAM DELAYED

Research into the potential for producing electricity from ocean currents, known as the Coriolis Program, has reached a standstill despite the favorable conclusions of the technical- and economic-evaluation phase of the project. As with many other R&D programs, the Coriolis Program is foundering in the wake of federal budget cuts. However, unlike many other R&D projects, this one was initially funded with private money, and there is hope that such funding can again be raised to continue the development of this solar ocean-energy technology.

During the first years of the Coriolis Program, 1973-78, more than $750,000 was spent by Mr. Walter Hajduk, through a corporation called HydroEnergy Associates, on the design of ocean turbines. In 1978 DOE awarded $230,000 to Aero-Vironment Incorporated, with the (continued on Page 2)
The individual Coriolis turbines consist of a pair of counter-rotating rim-suspended catenary rotors, an augmenter duct of 91.5 meters (300 feet) exit diameter used to increase the energy flux through the rotors, a rim drive with distributed induction generators located in the duct hull, a mooring system, and an electrical transmission line bringing power to shore. The augmenter duct is hydrodynamically designed to more than triple the energy-extraction capability of the rotors.

The rotors, developed by D. F. Thompson, are of special interest because of their catenary construction. There is no central shaft; the blades are attached to the rims which are mounted in the duct hull. The blades have essentially no bending stiffness, so the hydrodynamic loads due to the current are taken in tension by cables installed inside the blades. The blades do, however, have torsional stiffness to maintain proper pitch setting.

The rim drives have gear racks mounted on their side faces, and power is extracted by six equally-spaced power-takeoff gears which input to the low-speed shafts of step-up gearboxes. The gearboxes connect to induction generators with the proper step-up ratio to permit the generators and catenary rotors to operate at constant speed with high efficiency over a range of current speeds. Each unit is rated at 7.4 megawatts and delivers 6.6 megawatts ashore. Power is collected for several units and is taken ashore via an AC transmission line.

The goals of Phase III are to (1) develop adequate hydrodynamic-analysis tools, (2) select and specify a system design with special attention to the rim-drive system, (3) conduct engineering and economic studies to support a life-cycle cost analysis, and (4) study and recommend a test-module size and design as the next program step.

The tasks of Phase III included (1) duct hydrodynamic design, (2) rim-drive definition, and (3) system-engineering and economic studies.

The basic conclusion of Phase III is that an optimal Coriolis unit will be rated at 6.6 megawatts, will have a 91.5-meter (300-foot) exit diameter, will use a duct of moderate augmentation, will have a "rated" plant cost of $2470 per kilowatt and an "operating" plant cost of $2850 per kilowatt, and will have leveled life-cycle costs which appear favorable when compared to levelized revenue calculated for the same system operating lifetime.

This phase of the Coriolis Program has shown that the units can be fabricated and installed for a capital cost within the range of $15.8 to $16.6 million, that "operating" plant costs will range from $2320 to $3200 per kilowatt, that first-year operating and maintenance costs will range from 3% to 9% of capital costs, and that the units will produce enough electricity at a sufficiently high capacity factor to make private investment attractive enough to commercialize the system.

The program plan, outlined at the favorable conclusion of Phase III in late 1981, envisioned federal funding through the small-scale-model demonstration phase, with private funding being attracted for the subsequent prototype-demonstration phase.

However, as noted earlier, those funds were not made available. Researchers at the Pasadena-based AeroVironment are still confident that enough private capital can be raised to continue the Coriolis development program, and are meanwhile concentrating on the river-turbine application of the ocean-current technology.

CALL FOR PAPERS: ENERGY ENGINEERING CONGRESS

The Association of Energy Engineers has issued a call for papers for the Sixth World Energy Engineering Congress, to be held at the Georgia World Congress Center in Atlanta November 29th through December 2nd, 1983. The theme of the Congress is "Advances in Energy Cost Savings for Industry". Sessions will cover a wide range of subjects including Systems Financing, Management, and Alternative Energy Technologies.

The deadline for submission of abstracts is November 1st, 1983. For further information write to the Sixth World Energy Engineering Congress, 4025 Pleasantdale Road, Suite 340, Atlanta, Georgia 30340.
(continued from Page 1)

which was formulated on the basis of the 
research needs identified in the preceding 
chapter, and an assessment of the studies 
completed or nearly completed by DOE. 
NOAA has decided that there are two gen-
eral areas of research critical to its responsi-
bilities in the early commercial stages of 
OTEC which will be addressed with the 
available funding: effects on fisheries, and 
direct licensing requirements.

Provisions for periodic review and evalua-
tion and possible changes in the direc-
tion of the plan based on shifts in OTEC 
development are also included in the final 
chapter. These future tacks will be taken 
on the basis of input from public-interest 
groups and industry involved in OTEC de-
velopment and commercialization.

The OTEC Environmental Effects Pro-
gram Plan, 1981-85 is available from the 
Office of Ocean Minerals and Energy, Na-
tional Oceanic and Atmospheric Admini-
stration, 2001 Wisconsin Avenue Northwest, 
Washington DC 20235.

INTERNATIONAL CALENDAR

Listed below are conferences and sym-
posiums pertinent to solar ocean energy, 
gleaned from various solar, energy, and 
oceanographic publications. Major meet-
ings recently completed are still listed for 
the benefit of readers who may wish to 
contact conference organizers for reports of 
proceedings.

Oct 27-29: Fifth Annual Conference on 
Environmental Licensing and Regulatory 
Requirements Affecting the Electric Utility 
Industry, L’Enfant Plaza Hotel, Washing-
ton DC. Topics will include status of fed-
eral environmental regulations, pollution-
control financing, and Congressional action 
on the Clean Water Act and Resource Con-
servation and Recovery Act. Info: Stuart 
Patterson, Envirosphere Company, Two 
World Trade Center, New York, New York 
10048, (212) 839-1071.

Oct 29: National Conference on Service 
Priorities of Ocean Users, National Aqua-
rium, Baltimore, Maryland. Sponsored by 
the National Oceanic and Atmospheric 
Administration. Info: Joyce Wood, NOAA 
Office of Policy and Planning, (202) 377-
5181.

Nov 7-12: First US-China Conference on 
Energy, Resources, and Environment, 
Beijing, People's Republic of China, spon-
sored by the Society of Engineering Science 
and the China Society for Energy Research. 
Info: Professor S.W. Yuan, School of En-
gineering and Applied Science, George 
Washington University, Washington DC 
20052.

Nov 18: Third Annual Minuteman Cor-
rosion Symposium, Newton, Massachusetts. 
The symposium will concentrate on metals 
commonly used in marine applications. 
Info: William J. Curran, The Foxboro 
Company, Neponset Avenue, Foxboro, 
Massachusetts 02035, (617) 543-8750.

Dec 13-15: Fifth Miami International 
Conference on Alternative Energy Sources, 
Miami Beach, Florida. Presented by the 
Clean Energy Research Institute of the 
University of Miami in co-operation with 
the International Association for Hydrogen 
Energy. Info: Pat Kelley, Miami Interna-
tional Energy Exposition, 204 West Lin-
wood, Kansas City, Missouri 64111, (816) 
561-1069.

Feb 7-9: International Diving Symposi-
um '83, Hyatt Regency Hotel, New Or-
leans, Louisiana. Info: Association of Div-
ing Contractors, 1799 Stumpf Boulevard, 
Suite 4, Gretna, Louisiana 70053, (504) 
362-0074.

Mar 17-19: Coastal Zone Resources and 
Law of the Sea Expo '83, World Trade 
Center, Singapore. Info: Cahners Exposi-
tion Group, Cahners Plaza, 1350 East 
Touhy Avenue, PO Box 5060, Des Plaines, 
Illinois 60018, (312) 299-3311.

Apr 4-5: Wind/Solar Energy Technol-
ogy Conference, University of Missouri, 
Columbia. Co-sponsors include UMC, the 
American Society of Civil Engineers, the 
American Wind Energy Association, the 
Department of Agriculture, and others. 
Info: C. H. Stickney, College of Engi-
neering, University of Missouri, Columbia, 
Missouri 65211.

May 2-5: 1983 Offshore Technology 
Conference, Houston, Texas. Info: Pro-
gram Manager, OTC, 6200 North Central 
Expressway, Drawer 84706, Dallas, Texas 
75206.

Jun 1-4: Coastal Zone '83, San Diego, 
California. Co-sponsors include the Ameri-
can Society of Civil Engineers, Federal 
Office of Coastal Zone Management, Cali-
ifornia Coastal Commission, Coastal States 
Organization, and US Naval Facilities En-
gineering Command. Info: Coastal Zone 
'83, PO Box 26062, San Francisco, Cali-
ifornia 94122.

Aug 29-Sep 1: Oceans '83, San Fran-
cisco, California. Sponsored by the Marine 
Technology Society and Institute of Elec-
trical and Electronic Engineers' Council on 
Oceanic Engineering. Info: Oceans '83, 
Tech Program Chairman, PO Box 71030, 
Sunnyvale, California 94086.

CALL FOR PAPERS: OCEANS '83

The Marine Technology Society (MTS) 
and the Institute of Electrical and Elec-
tronic Engineers (IEEE) have issued a call 
for papers for the Oceans '83 Conference 
to be held at the San Francisco Hilton 
Hotel August 29th through September 1st, 
1983. The Conference theme is "Effective 
Use of the Sea—An Update". Details on 
the Conference and submission of abstracts 
can be obtained by writing to the Oceans 
'83 Technical Program Chairman, PO Box 
71030, Sunnyvale, California 94086. The 
deadline for the submission of abstracts is 
February 11th, 1983.

US GOVERNMENT 
PROCUREMENT INVITATIONS 
AND CONTRACT AWARDS

Listed below are procurement invita-
tions and contract awards related to OTEC 
in particular and ocean resources in general 
culled from the Commerce Business Daily. 
This is not to be construed, however, as a 
complete list.

Jul 6: South Atlantic OCS Circulation 
Model Application Phase III: Negotiations 
for RFP AA851-RP2-22 are now being 
conducted with Dynalysis of Princeton, 
20 Nassau Street, Princeton, New Jersey 
08540. US Department of the Interior, 
Bureau of Land Management, Branch of 
Contract Operations, Code 851, 18th and 
C Streets Northwest, Room 2447, Wash-
ington DC 20240.

Jul 6: Generation and Review of the 
Oceanographic Systems Program Technical 
Documentation: RFP N62269-82-R-0139, 
closing date on or about July 28th, 1982, 
(215) 441-2683. Naval Air Development 
Center (Code 84563), Warminster, Penn-
sylvania 18974.

Jul 9: Research and Development of a 
Design Concept for a Closed-Cycle Energy 
Source (AWW NCSC Statement of Work: RFP 
N61331-82-R-0034, Attention Code 6410, 
AI Simmons, (904) 234-4422. Naval Coastal 
Systems Center, Panama City, Florida 
32407.

Jul 9: Literature Search to Identify the 
Effect of Test Variables (e.g. 3.5% NACL 
or natural seawater) on High-Strength 
Steel Corrosion Cracking: RFP N00167-
82-R-0019 will be issued approximately 
July 15th, 1982, David Taylor Naval Ship 
Research and Development Center, Be-
thesday, Maryland 20084, Attention Paul 

Jul 13: Oceanographic Research Sup-
port: One lot. Negotiations are expected 
to be conducted with Sachs/Freeman As-
sociates, Bowie, Maryland 20715. Con-
tracting Officer, Naval Research Labora-
tory, 4555 Overlook Avenue Southwest, 
Washington DC 20375.

Jul 13: Participation in International 
Energy Technology Economics Program: 
Negotiations for Contract DE-AC-01-82-
PE-70393 are now being conducted with 
SRI International, Menlo Park, California 
94025. US Department of Energy, Office 
of Procurement Operations, Washington 
DC 20585.

Jul 15: Professional Services Contracts 
for Energy-Related Studies, Including 
Engineering and Economic Analysis: Apprrox-
imately 20 will be awarded during 1982 
and 1983. Contracts will be for no more 
than $15,000 including travel expenses and 
approved rates. Study areas will include, 
but are not limited to, energy-efficient 
land-use planning; energy codes and ordi-
nances; community energy planning; ener-
gy-conserving technologies; solar design; 
electrical generation from small and micro-
hydro, wind, and geothermal resource de-
velopment; direct-use geothermal; cogen-

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eration; biomass; and district heating. Resource assessment will not be included in these contracts, but studies may require evaluation and incorporation of existing resource information. Interested consultants and contractors should submit letters of interest to include: information concerning field(s) of expertise, information concerning relative experience and capabilities of applicant, and identification of key personnel to be assigned to the project(s) including resumes of their experience. After review of submitted statements and capabilities, project bids will be solicited from qualifying firms upon requests from local governments for assistance. Preference will be given to Washington-based firms. Letters and statements of capabilities should be submitted prior to August 13th, 1982. R. Gordon Bloomquist, (206) 754-0774, WSEO Subcontracts, Washington State Energy Office, 400 East Union, Olympia, Washington 98504.


Jul 30: Technical and Cost Analysis of Manganese Nodule Processing to Be Used to Help Implement Responsibilities Created by the Deep Seabed Hard-Mineral Resources Act (PL 96-283) by the National Oceanic and Atmospheric Administration: There are three major aspects of the required analysis: (1) evaluating, expanding, and refining processing sections of the 1977 report entitled "A Description of Manganese Nodule Processing Activities for Environmental Studies"; (2) assessing the technology for producing a manganese product (such as ferromanganese or electrolytic manganese) from processing techniques originally designed to produce copper, nickel, and cobalt as primary products; and (3) estimating capital requirements and operating costs for processing plants based on the processing routes considered "most likely" for early commercial use. US Department of Commerce, Office of Procurement Services Contract Placement Division, Branch A, Room 6416, 14th Street and Constitution Avenue Northwest, Washington DC 20230, Attention Janet Kasmer.