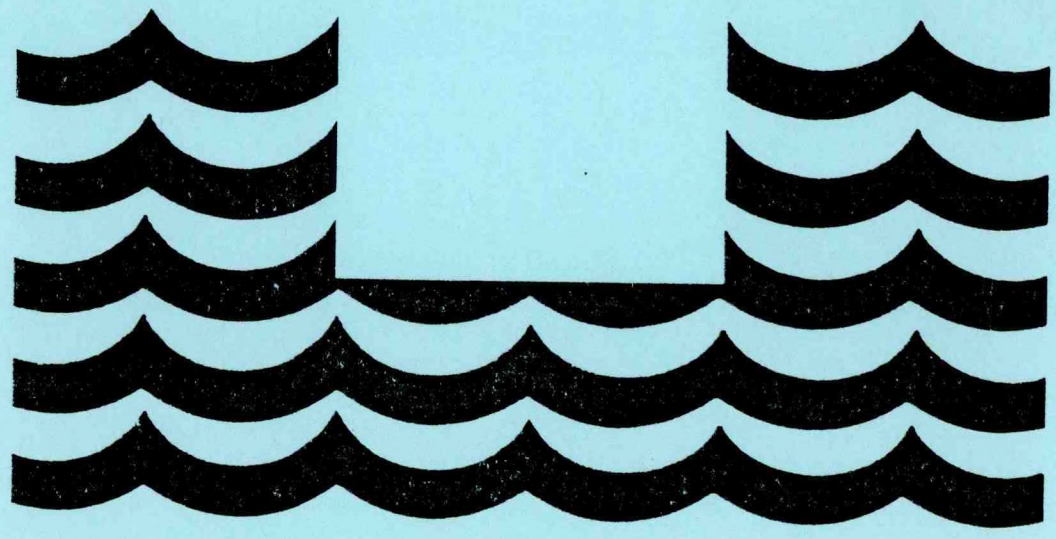


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Ocean Thermal Energy Conversion

Report To Congress: Fiscal Year 1985



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration

March 1986



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Washington, D.C. 20230

THE ADMINISTRATOR

APR 23 1986

Honorable George Bush
President of the Senate
Washington, D. C. 20510

Dear Mr. President:

I am pleased to submit to Congress the Ocean Thermal Energy Conversion Report of the National Oceanic and Atmospheric Administration for Fiscal Year 1985 pursuant to Section 405 of the Ocean Thermal Energy Conversion Act of 1980 (Pub. L. No. 96-320, as amended by Pub. L. No. 98-623, 42 U.S.C. Sections 9101-9168).

Sincerely,


Anthony J. Calio





UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Washington, D.C. 20230

THE ADMINISTRATOR

APR 23 1986

Honorable Thomas P. O'Neill, Jr.
Speaker of the House of Representatives
Washington, D. C. 20515

Dear Mr. Speaker:

I am pleased to submit to Congress the Ocean Thermal Energy Conversion Report of the National Oceanic and Atmospheric Administration for Fiscal Year 1985 pursuant to Section 405 of the Ocean Thermal Energy Conversion Act of 1980 (Pub. L. No. 96-320, as amended by Pub. L. No. 98-623, 42 U.S.C. Sections 9101-9168).

Sincerely,


Anthony J. Gallo



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Ocean Thermal Energy Conversion

Report To Congress: Fiscal Year 1985

Prepared by:

National Oceanic and Atmospheric Administration
National Ocean Service
Office of Ocean and Coastal Resource Management
Ocean Minerals and Energy Division
Washington, D.C. 20235

March 1986



U.S. DEPARTMENT OF COMMERCE

Malcolm Balridge, Secretary

National Oceanic and Atmospheric Administration

Anthony J. Calio, Administrator

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EXECUTIVE SUMMARY

Ocean thermal energy conversion (OTEC) activities conducted by the National Oceanic and Atmospheric Administration (NOAA) during FY 85 are described in this report to the Congress. The agency focus during FY 85 has been on preapplication consultation with potential applicants, revision of regulations for OTEC licensing, completion of an export study required by the 1984 amendments to the OTEC Act of 1980, and analysis of the environmental impacts associated with an OTEC facility.

During FY 85, NOAA prepared draft regulations to incorporate the 1984 amendments to the OTEC Act. Proposed regulations were published in the Federal Register on November 21, 1985. NOAA also began in FY 85 a study of the export potential of technologies related to OTEC development. The report will be submitted in May 1986.

The OTEC Act of 1980 also calls for the initiation of a program to assess the effects on the environment of OTEC facilities and plantships. In support of this program, during FY 85, NOAA continued research activities emphasizing information needs related to the licensing of an OTEC operation. Activities included further research on the regional influence of an OTEC operation, defining the area within which the thermal plume of one OTEC operation might be expected to impinge so as to degrade the thermal gradient used by another OTEC operation, and research related to the potential effect of OTEC operations on fisheries.

Chapter I

INTRODUCTION

General

The Ocean Thermal Energy Conversion Act of 1980, as amended, (Pub. L. No. 96-320, as amended by Pub. L. No. 98-623, 42 U.S.C. §§9101-9168) (the OTEC Act), established a licensing and permitting system for the development of ocean thermal energy conversion (OTEC) as a commercial energy technology. The Act applies to facilities located in U.S. territorial waters or connected to the United States by pipeline or cable. The law also applies to all OTEC plantships owned or operated by U.S. citizens and all OTEC facilities or plantships documented under U.S. law. The Act requires that a person obtain a license from the National Oceanic and Atmospheric Administration (NOAA) in order to own, construct, or operate such a facility or plantship. The OTEC Act and the implementing regulations provided the framework for the development of a commercial OTEC industry. With a decline in oil prices and increased energy conservation, no application for an OTEC project has been received yet by NOAA. However, several projects are in various stages of preliminary engineering and design.

Purpose and Organization of Report

This report was prepared in response to Section 405 of the OTEC Act. It provides a description of the OTEC related activities conducted by NOAA during FY 85. Chapter II of this report

provides background information on the provisions of the OTEC Act of 1980. Chapter III describes the regulatory and licensing activities for OTEC facilities. The supporting NOAA environmental investigations are described in Chapter IV.

Chapter II

OTEC STATUS

OTEC Background

The principle behind OTEC, that a heat engine can be powered by the temperature difference between cold water of the deep sea and relatively warm water near the sea-surface, has been described in previous annual reports. The first attempt to apply the principle dates to 1929 when a French engineer, Georges Claude, constructed a land-based OTEC facility on the coast of Matanzas Bay, Cuba. Although the plant itself was a commercial failure, it did validate the concept. The concept has been further validated in recent years through experimental projects by the United States and by Japan. However, many design and economic uncertainties remain with regard to a commercial scale plant. Added to this uncertainty has been the downward trend in the price of crude oil and the loss of the energy tax credits, both of which have detracted from the cost effectiveness for a commercial scale OTEC plant.

Industry Status

Certain companies are still pursuing the significant potential which has been identified for development of commercial OTEC facilities and for the export of OTEC technology. During FY 85, NOAA has been working with two potential applicants for U.S. OTEC licenses. The Ocean Thermal Corporation (OTC), a division of Basix Company, has been revising preliminary

plans for a 50-Mwe OTEC plant off Hawaii. At the time of this report, OTC is developing a joint venture to build and finance construction of an OTEC facility. OTC has indicated they plan to submit in late 1986 an application for a license to construct an OTEC facility for a site on Oahu, Hawaii. Another company, Sea Solar Power Inc., contacted NOAA in FY 85 requesting information on the OTEC license process. Sea Solar Power has indicated they plan to construct a floating OTEC facility somewhere in the Caribbean. No date for this application has been announced.

Other countries are also assessing the commercial viability of OTEC. Most notable are the Japanese and French efforts. The Japanese built a 100-kWe (gross) plant on the island of Nauru several years ago, and successfully operated it for a short period before the seawater pipes were destroyed by a typhoon. This plant is now being upgraded to 500-kWe with plans to eventually achieve 3-MWe. The Japanese have also reported on a 25-kWe (net) plant, which has been operated since September 1982, located in the Kagashima Prefecture in Kyushu, Japan. According to one report, conceptual designs for two additional demonstration plants have been completed: a 1-MWe floating plant for Agunishima, and a shelf-mounted plant for Kumeshima, both off the coast of Okinawa.

Present French efforts are in the R&D phase. A 5-MWe land-based, pilot plant is being considered for Tahiti. A feasibility study was completed in 1980 with detailed site and environmental

investigation completed in 1984. The technical design phase of the project was completed in 1985. Although the plan calls for construction between 1986 and 1988, the needed capital has not been totally raised yet.

Study on Export Potential

NOAA undertook a review of the mechanisms available to promote the export of U.S. technologies related to ocean thermal energy conversion in response to the November 8, 1984 amendment to the OTEC Act of 1980 (Pub. L. No. 98-623). NOAA consulted with appropriate other agencies, organizations, and industry to develop a report to Congress detailing the steps the U.S. Government is taking and plans to take to promote and enhance the export potential of OTEC components, facilities and plantships manufactured by U.S. industry. The report, which will be submitted in May 1986, will review the current status of OTEC-related industries and exports, and discuss recommendations for measures to enhance their exports.

Chapter III

OTEC LICENSING RELATED ACTIVITIES

The OTEC Act established federal jurisdiction over ocean thermal energy conversion facilities located in U.S. territorial waters, or connected by pipeline or cable to U.S. territory, or plantships owned or operated by U.S. citizens. The OTEC Act calls for a unified licensing process among all federal agencies (except Coast Guard inspections and approvals) involved in licensing a facility or plantship. The system is administered by NOAA.

Review of OTEC Licensing Regulations

NOAA published final regulations implementing the OTEC Act in the Federal Register on July 31, 1981 (46 FR 39388-38420). In 1984, Congress passed amendments to the OTEC Act. During 1985, NOAA conducted a review of the existing OTEC regulations and prepared draft regulations to incorporate the 1984 amendments.

On November 21, 1985, NOAA published a proposed rule (50 F.R. 48097-48099) incorporating the 1984 amendments to the OTEC Act. Final rules are scheduled to be published in the Federal Register in May 1986.

Preapplication Consultation and Federal/State Coordination

Preapplication consultations are intended to facilitate overall OTEC development by identifying potential problems for particular OTEC projects, thus enabling managers to plan

and adjust design features if necessary during early development stages. Preapplication consultation therefore fosters early dialogue between NOAA and potential OTEC license applicants. A preapplication conference is an important step in enabling NOAA subsequently to meet the 356 day statutory review process outlined in the Act. During FY 85, preapplication meetings have been held with the Ocean Thermal Corporation (OTC).

OTC began intermittent preapplication consultations with NOAA in July 1982 on a proposed 40-MWe OTEC pilot plant intended eventually for commercial operation. OTC was one of two corporations that originally received cost-sharing contracts in 1980 from the Department of Energy (DOE) for the conceptual design of a 40-MWe OTEC pilot plant. OTC decided to proceed with a commercial venture when DOE ended its participation in the demonstration project. In October 1984, OTC submitted a letter of intent to file a formal license application with NOAA.

OTC plans to construct a 50-MWe ocean thermal energy facility near shore in shallow water at Kahe Point, Oahu, Hawaii. The warm water intake for the OTEC plant will be connected to the thermal discharge of the Hawaiian Electric 600-MWe fossil-fuel plant, thereby boosting the thermal resources above that available from the ocean alone. NOAA has held two preapplication consultations during FY 85 with OTC:

In February 1985, NOAA met with OTC and Skadden, Arps, Slate, and Florn to review the OTEC license process.

On May 17, 1985, NOAA met with OTC to review its proposed revision of its development plan for the Hawaii OTEC project.

Hawaii OTEC Permit Guide

NOAA published in 1985 a 110 page Guide to Permits and Regulations Applicable to Ocean Thermal Energy Conversion Projects--Hawaii Edition. The permit guide has been prepared in order to provide OTEC project sponsors with an overview of potential licenses, permits and authorizations required by state, federal and local agencies. It is also intended as a reference guide for state, local and federal agencies processing OTEC permit applications. The report outlines the preapplication process, the formal application review process (including a detailed timeline), an overview of all federal permits and licenses potentially required for an OTEC project and an overview of all state and local licenses required for a project built in Hawaii.

Chapter IV

ENVIRONMENTAL ASPECTS

During FY 85, OTEC environmental research continued along the same direction it has taken in preceding years, with one addition. This direction has been a focus on the regional influence of OTEC operations and on the potential effects on fisheries, including an investigation of the biological effects of OTEC-generated sound. The one addition was obtaining expert assistance on the topics of fishery effects and socioeconomic effects related to the preparation of an environmental impact statement (EIS) for an OTEC plant planned for Kahe Point, Oahu, Hawaii.

Regional Influence

The regional influence of an OTEC operation refers to the physical disturbance to the surrounding waters that will be caused by single or multiple OTEC operations in a certain region. The pumping of large volumes of warm, surface and cold, deep waters into and through an OTEC plant and their subsequent discharge at a different location in the water column has the potential for affecting or "influencing" a certain region. This physical influence will also define the influence that will be effected in a chemical and biological manner.

The development of a model to predict the regional influence of an OTEC operation was initiated with Argonne National Laboratory and the final report was published and distributed

in FY 85. Also, as reported in the 1984 Report to Congress, the application of the model to a specific site--Kahe Point on the western shore of Oahu, Hawaii--was initiated. This application was completed in FY 85.

Fishery Effects

As originally reported in the Environmental Effects Assessment Program Plan 1981-1985, which was prepared by NOAA in 1981, the "Achilles heel", if any, on OTEC siting and operation could be the effect on fisheries or other biologically important resources such as corals. Since then, a good part of NOAA's OTEC resources has been devoted to providing further clarification of the fisheries issue. In this regard, during FY 85 further work continued on defining the vertical distribution of fish eggs and larvae in tropical waters near potential OTEC sites. A study in waters offshore of St. Croix and Puerto Rico, initiated in FY 84 through the National Marine Fisheries Service (NMFS), was provided some additional support to complete the work-up and reporting of the data. A final report on that study is due soon. A similar study was initiated with NMFS in FY 85 in waters offshore of Kahe Point. It is the hope of NMFS to continue the latter study at their expense in subsequent years to provide information on changes over time of the fish larvae and eggs. A report of the FY 85 work will be completed in FY 86. The results of these studies will aid the assessment of the effects of OTEC plant entrainment on fisheries and provide a basis for defining mitigation strategies, if needed.

Biological Impact of OTEC Generated Sound

A study of the characteristics and biological consequences of underwater sound generated by OTC's OTEC plant at Kahe Point was initiated in FY 84 and was continued in FY 85. This study was needed to assess the plant's potential impact on marine biota and on the U.S. Navy Fleet Operational Readiness Accuracy Check Site (FORACS) range which is located nearby. Initial results of this study indicate that underwater noise from the plant, primarily generated by seawater pumps and passed down underwater pipes, would have no impact on the Navy's FORACS range. The auditory impacts on fishes and marine mammals typical of Oahu's leeward coast are presently being examined. It is expected that the results of this research project will be available by September 1986.

Environmental Impact Statement

Because of OTC's stated intent to file an application for a commercial OTEC license, and the tight schedule required to process such an application, NOAA began to prepare for such a possibility in FY 85. In addition to providing guidance to OTC on the overall regulatory process, NOAA initiated certain activities related to the eventual preparation of an environmental impact statement (EIS). This move related to the lead time needed to gather certain information and the speed with which a draft EIS must be prepared once an application is received--approximately six months. In this regard, in FY 85 NOAA's licensing office obtained expert assistance on two

environmental aspects of building and operating a commercial OTEC plant at Kahe Point: fishery effects and socioeconomic effects.

The fisheries assistance was obtained from NMFS and is near completion. The socioeconomic question is being addressed by Argonne National Laboratory with consultant help from experts in Hawaii. This study has been slowed somewhat so as to reflect design changes which are presently under consideration by OTC.