OCEAN ENERGY DEVELOPMENT IN THE 1990s

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Of all known sources of renewable energy, the ocean possesses the greatest power potential. To date this potential remains virtually untapped. This, however, is bound to change over the next decade. Technological progress in the development of ocean energy systems has steadily continued, even in the absence of the government grants and preferential tax treatment accorded to other renewable energy developers. Moreover, new policy directions, such as the removal of barriers to entry to both domestic and international utility markets by the Energy Policy Act of 1992 and the Clinton Administration's evident enthusiasm for renewables, should stimulate private investment in ocean energy projects.

This article surveys the technological, regulatory and financial issues pertaining to ocean energy development and highlights potential development obstacles created by regulatory gaps under current law.

I. THE CURRENT STATE OF OCEAN ENERGY TECHNOLOGY

The term "ocean energy" encompasses a wide range of systems which utilize either the ocean itself, e.g., changes in water temperature, tides and currents, or derivative resources such as wind, marine biomass and salinity gradients to generate electricity. Those systems which make direct use of the ocean, which are the primary focus of this article,[1] may be grouped into four main categories: ocean thermal energy conversion (OTEC), tidal power, surface wave energy and subsurface current.

A. OTEC

OTEC uses the temperature differences between the ocean's warmer surface waters and deep cold water to generate electricity. An OTEC system may be mounted on a platform or on a free floating vessel. A closed OTEC system uses warm surface water to vaporize a working fluid with a low-boiling point, such as ammonia. The resulting vapor drives a turbine and generator which produces electricity. The vapor then flows to a condenser where it is cooled by cold water and recycled to close the system.

An open OTEC system employs the same process, except that sea water acts as the working fluid. Warm sea water enters evaporators which convert water into steam. The evaporation process also removes the salt from the

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1. The technology for generating energy from derivative ocean resources is not well advanced and thus, will not be discussed in this article. For additional information on these technologies, see R.S. SEYMOUR, ed., OCEAN ENERGY RECOVERY: THE STATE OF THE ART, American Society of Civil Engineers, New York (1992) [hereinafter, OCEAN ENERGY RECOVERY].

water. The resultant steam drives the system's turbines and is then condensed by cold water, and returned to the ocean. Alternatively, the recondensed water, which was desalinated during the evaporation process may also be used as freshwater.

OTEC facilities may sustain a number of spin-off industries. Because the evaporation process in the open OTEC system removes salt from the seawater, the system can act as a desalination plant.[2] At the 210 KW open OTEC system at Keahole, Hawaii, the nation's only operating open OTEC system, cold seawater pumped for energy production is also used to air condition buildings at the site and irrigate a vegetable garden. The cold, nutrient-rich water then mixes with warmer water to provide a breeding ground for micro-algae and lobsters.[3]

The environmental impacts of OTEC have not been extensively explored[4]. The large flows of hot and cold water could conceivably affect global weather patterns. In addition, the carbon dioxide contained in ocean water could be released into the atmosphere when it is pumped up and heated in the condenser, although such releases are minor in comparison to oil or coal-fired plants.[5]

Economic and climate concerns pose the greatest obstacle to the increased development of OTEC systems. OTEC plants require a temperature difference of approximately 20° celsius for operation, thus restricting application of the technology to tropical waters.[6] The estimated capital cost of an OTEC facility, based on existing designs is on the order of $10,000 per kilowatt-installed,[7] which is more than five times the cost of other conventional fuel facilities.[8] However, these capital costs could be eventually be balanced by minimal operating expenses. Conceivably, an OTEC plant could be designed for unattended operation[9] with operating costs as low as 8 mills/kilowatt-hour.[10]

B. Tidal Power

A traditional tidal energy system consists of a barrage or dam that is

2. For additional diagrams and details on OTEC system, *see*, THOMAS JOHNSON, ET. AL., RENEWABLE ENERGY: SOURCES FOR FUELS AND ELECTRICITY 543 (1993). (hereinafter RENEWABLE ENERGY)

3. *Ocean Pioneer Mines Clean Energy Source: Deep Cool Water*, N.Y. TIMES, July 13, 1993, at C1.

4. *Id.*

5. *See* JOHNSON, *supra* note 2, at 543-4.

6. *Id.* at 543-4.

7. *Id.*

8. The capital costs per kilowatt-installed for conventional plants which began operation in 1991 are as follows: $937 for a hydroelectric facility; $1700-$2200 for fossil steam plants and $285-$321 for gas turbine electric plants. ELECTRIC PLANT COST AND POWER PRODUCTION EXPENSES 1991, ENERGY INFORMATION ADMINISTRATION (May, 1993) at 10. Since no nuclear facilities came on line in 1991, the average capital costs of such facilities for that year is unavailable. *Id.*

9. *See* RENEWABLE ENERGY at 543.

10. *See* ELECTRIC, *supra* note 8. By comparison, the average annual operating expense for conventional facilities for the period of 1985-1991 is: 3.88 mills/kwh for hydroelectric plants; 2.29 mills/kwh for fossil-fueled steam electric plant; 10.49 mills/kwh for nuclear plants and 9.61 mills/kwh for gas turbine electric plants.

constructed across an estuary and is equipped with a series of gated sluices to permit entry of water to the basin.[11] During high tides, water enters the basin where it is held until the tide recedes sufficiently to create suitable head[12] and then released through turbines. Operational tidal power plants utilizing this technology include a 240 MW plant at La Rance, France which recently celebrated 25 years of operation and an 18 MW plant, completed in 1980, located in Annapolis, Canada.[13] The operating experience of these plants has been positive, with availability in recent years of 97% and modest maintenance requirements.[14]

The development of traditional tidal power projects in the United States has been impeded by high project costs and adverse environmental impacts. The construction of a dam or barrage is a lengthy, expensive process, although the costs of the resultant energy can be reduced if the barrage functions primarily as a bridge, flood control barrier or some other type of civil work project.[15] Moreover, because of tidal system's impacts on wetlands, fish passage and water quality and sedimentation within the estuary, it is questionable whether such projects could survive review under existing environmental regulation.

More recently, scientists have begun to explore hydropneumatic methods for exploiting tidal power.[16] A hydropneumatic system uses a low dam, the upper gates of which open at high tide and allow water to enter and fill a series of air chambers. The water compresses air which drives a turbine. At low tide, the lower gates are opened and the water is released from the chamber, creating a partial vacuum/suction effect which drives the turbines.[17] In theory, the hydropneumatic system produces fewer adverse impacts because the low dams and slowly moving gates allow fish and sediment to pass more freely.

C. *Wave Energy*

Ocean wave energy systems convert the mechanical energy of waves into electricity. Although a variety of devices have been developed to exploit wave energy,[18] the most successful systems have been those where the turbines or other moving parts remain above the water,[19] and are driven by changes in air

11. Description of a tidal power system is taken from RENEWABLE ENERGY, 518-522.

12. Head is the pressure of water as measured with reference to the vertical distance of its release. The pressure that the water exerts when it falls (i.e. its head) increases in relation to the distance of its drop. In a tidal system, the distance that water impounded in the basin will drop and correspondingly, its head, are greatest when the tide outside the basin has fully receded.

13. JOHNSON, *supra* note 2, at 522-3.

14. *Id.*

15. *Id.*

16. *See* ALEXANDER GORLOV, *Pneumatic Method for Tidal Energy Exploitation*, MARINE TECHNOLOGY SOCIETY CONFERENCE PROCEEDINGS, September 25-26, 1992 [hereinafter MTS CONFERENCE 1992].

17. *Id.*

18. *See* RENEWABLE ENERGY at 531-33 for additional descriptions of other type of wave systems, including heaving floats, surface followers, surge systems.

19. R. J. SEYMOUR, *Renewable Ocean Energy Resources,* MTS CONFERENCE 1992, September 25-26, 1992, at 56.

pressure. These systems, which employ air driven turbines are known as "pneumatic wave energy systems." A typical pneumatic wave device consists of an oscillating water column (OWC), which is a narrow, open-ended chamber, with a turbine-installed at the top and mounted (with the upper end of the chamber remaining above water) either on the seabed or with other OWCs on a large common frame. As waves enter the lower end of the OWC and splash around inside, the air pressure at the top of the chamber changes and drives the turbine. Frequently, OWCs are equipped with a Wells turbine, which displays the unique characteristic of rotating in the same direction irrespective of the direction of airflow.[20]

OWC devices may be mounted on shore, offshore or on near shore caissons. Most of the successfully operating, grid-connected systems, which together total less than half a megawatt, are land or caisson based. These systems include three small Japanese plants, an OWC device on the Scottish island of Islay and a 350 KW Norwegian plant which has operated continuously since 1986,[21] although a similar prototype system at the same site was destroyed by a storm in 1988.

Because offshore waves are more powerful than at shore, near-shore caisson-based systems located at depths of 10 to 25 meters offer the greatest energy potential.[22] Caissons also afford corresponding environmental benefits in that they act as protection against shoreline erosion and contribute to the development of aquaculture and other marine recreation. By contrast, land-based systems may require shoreline modification and like traditional tidal systems, might not survive review under existing environmental regulation.

Ocean wave energy is a relatively low cost renewable. One recent study concluded that for plants of 30 MW or less, wave power is the cheapest of any ocean energy source and is less expensive than small hydropower or diesel generation.[23]

D. Current Energy

An ocean current energy system utilizes turbines to tap large, relatively swift subsurface ocean currents such as the Gulf Stream. While few details are available regarding these systems, some of the proposed configurations borrow from low head river turbine technology,[24] and employ slower moving turbines designed to operate efficiently in river currents.

The environmental impacts and the costs of ocean wave and current systems are comparable. In addition, ocean current systems, which might be deployed deep below the surface, may be less vulnerable to destruction by storms or vessels than most surface wave energy facilities. Still, ocean current systems have not been extensively studied and continued refinements, particularly improvement of their operational efficiency, may be necessary to further enhance the economic viability of these systems.

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20. JOHNSON, *supra* note 2, at 533-4.
21. SEYMOUR, *Renewable Ocean Energy Resources*, MTS CONFERENCE 1992, 56.
22. *Id.*
23. *Id., citing* HAGERMAN, *Economics of Wave Power*, OCEAN ENERGY RECOVERY, ch. 9.
24. SEYMOUR, *supra* note 19, at 57.

II. APPLICABLE REGULATORY REGIME

The foregoing ocean energy systems are subject to different regulatory procedures. The licensing of OTEC facilities is governed by the Ocean Thermal Energy Conversion Act of 1980 (OTEC Act)[25] and the corresponding regulations promulgated by the National Oceanic Atmospheric Administration (NOAA),[26] which establish a "one-stop" licensing procedure for proposed OTEC facilities. The regulatory scheme governing ocean tidal, wave and current systems is less defined: under existing law,[27] either the Federal Energy Regulatory Commission (FERC) or the Corps of Engineers (Corps) could plausibly assert jurisdiction over tidal, wave and current systems depending upon project location.

A. OTEC Requirements

1. Applicability of Licensing

An OTEC license must be issued by NOAA[28] for the construction and operation of (1) OTEC facilities sited on standing platforms located in whole or in part within territorial seas of the United States or, (2) on vessels documented under the laws of the United States, or (3) any OTEC facility, irrespective of whether sited on a vessel or platform, which is connected by a cable or pipeline to any State.[29] Demonstration OTEC facilities or plantships qualified by the Department of Energy, non-permanent OTEC test-platforms and land-based, OTEC related construction activities are exempt from these requirements by the NOAA regulations.[30]

OTEC facilities located on undocumented vessels within territorial waters do not require NOAA licenses. Nevertheless, these facilities may still be subject to regulation by the United States under principles of international law.[31]

The NOAA licensing process is both extensive and costly. Since 1981, when NOAA first issued its OTEC licensing regulations, four companies have requested a preapplication consultation with NOAA, which is preparatory to

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25. 42 U.S.C.A §§ 9101-9168 (1988 & West Supp. 1993).

26. 15 C.F.R. § 981 (1993).

27. *Id.*

28. *See* 42 U.S.C.A. § 9111(a); 15 C.F.R. § 981.50 (1993).

29. *Id.* The term "state" includes the District of Columbia, Puerto Rico, Guam, American Samoa, the Virgin Islands, the Northern Mariana Islands or any other commonwealth territory over which the United States has jurisdiction. 15 C.F.R. § 981.40 (1993).

30. *See* 15 C.F.R. § 981.50(c) (1993). The OTEC project at Keahole in Hawaii is an example of an operational demonstration OTEC facility within the United States exempt from licensing.

31. The 1982 Convention on Law of the Sea authorized coastal states to establish exclusive economic zones (EEZ), extending up to 200 miles from shore and over which the coastal state could regulate exploitation and development of resources from the seabed, as well as other activities including water power production. Although the United States never ratified the 1982 Convention, President Reagan established an EEZ in 1983. *See* Proclamation No. 5030, 48 Fed. Reg. 10,605 (1983). Thus, if a foreign OTEC vessel is positioned within the United States' EEZ, it could be subject to regulation. *See also* Kent Keith, *Laws Affecting OTEC Development*, 43 U. PITT. L. REV. 1, 14 (1981).

filing an application; however, no completed application has been filed.[32] In a 1983 review of its OTEC application proceedings, NOAA noted that the OTEC industry was in its formative stages, which may have contributed to the low number of participants in the application process.[33]

2. Licensing Procedure

An OTEC application must include specific information regarding the proposed size and site of the project, a description of project operation, design and construction procedures, and an assessment of potential environmental impacts.[34] Applicants can request that certain portions of their application be given confidential treatment.[35] The application fee is $250,000,[36] a cost which could pose a major impediment to small, start-up operations.

An applicant for a NOAA license must also comply with applicable state and federal regulations and obtain those federal and state permits and authorizations necessary for construction and operation of the OTEC facility.[37] Compliance with applicable federal and state regulation is a necessary prerequisite to issuance of a NOAA license.[38] An applicant may arrange for a pre-application consultation with NOAA to identify applicable state and federal regulations.[39]

An applicant for an OTEC license has the option of requesting a Consolidated Application Review (CAR). As part of the CAR process, those federal, state and local agencies with jurisdiction over any aspect of the proposed OTEC project may enter into an agreement defining their respective jurisdiction over the project and coordinating the timing for their review of the application.[40] The CAR team would also provide notice and conduct a public meeting to brief interested members of the public on the proposed project.[41]

Participation in the CAR process does not excuse an OTEC applicant from obtaining necessary permits and authorizations from state and federal agencies. However, the CAR process is a useful planning tool through which the timing and processing of these multiple permits can be coordinated.

Once an OTEC project application has been submitted, NOAA will conduct public hearings and prepare an Environmental Impact Statement (EIS) on the proposed facility. To avoid duplication of effort, the NOAA regulations provide that the EIS prepared by NOAA, in cooperation with other fed-

32. WILLIAM FOX, *Ocean Thermal Energy Conversion,* FEDERAL REGULATION OF ENERGY, 827 (Supp. 1991).

33. *Id.*; *See also* 48 Fed. Reg. 21,154 (1983).

34. *See* 15 C.F.R. § 980 (1993) for a detailed description of OTEC application requirements.

35. 15 C.F.R. § 981.100 (1993).

36. 15 C.F.R. § 981.130 (1993).

37. *See* 15 C.F.R. § 981.210 (1993). In addition, these requirements are discussed in greater detail in pt. II.A.3.

38. *See* 15 C.F.R. § 981.470 (1993) which states an "The Administrator may issue a license in accordance with the provisions of this part unless. . . (1) The Administrator determines that the applicant cannot or will not comply with applicable laws, regulations and license terms and conditions."

39. 15 C.F.R. § 981.70 (1993).

40. 15 C.F.R. § 981.390 (1993).

41. 15 C.F.R. § 981.440(c) (1993).

eral agencies, will fulfill the requirements of those federal agencies with permitting responsibilities over the proposed OTEC project.[42]

Finally, upon completion and review of the EIS, NOAA may issue an OTEC license. In so doing, the NOAA Administrator must find that the proposed project (1) will comply fully with all applicable federal and state laws and regulations, (2) does not pose any adverse environmental or public interest impacts, and (3) does not interfere with freedom of navigation or other reasonable uses of the high seas and the Outer Continental Shelf as defined by United States or international law.[43]

3. Potentially Applicable Federal and State Law

As described previously, a proposed OTEC facility must comply with an array of other state and federal statutes and regulations.[44] However, federal agencies with permitting responsibility over an OTEC facility can use the EIS prepared by NOAA[45] to satisfy their obligations under the National Environmental Policy Act.[46] The requirements of the applicable federal and state regulations are briefly summarized below.

a. Discharge Permits and Water Quality Certification

OTEC facilities located on both platforms and vessels[47] are subject to the provisions of the Clean Water Act of 1972 (CWA),[48] which prohibits the discharge of pollutants from point sources into the waters of the United States and the contiguous, twelve-mile zone, without a permit from the state.[49] Under the CWA, the term "pollutants" includes spoil, garbage, biological materials, chemical wastes, rock, sand, and industrial and agricultural waste,[50] but excludes water, irrespective of whether the chemical content or temperature of the water has been altered by a particular process.[51] Given that most open system OTEC facilities discharge only water, which does not constitute a pollutant, a discharge permit would not be necessary for compliance with the CWA.

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42. 15 C.F.R. § 981.310(b) (1993).

43. 15 C.F.R. § 981.470 (1993).

44. 15 C.F.R. § 981.210 (1993).

45. 15 C.F.R. § 981.310(b) (1993).

46. 42 U.S.C. § 4332(2)(C).

47. Technically, the Clean Water Act only requires a permit for the discharge of pollutants from a point source other than a vessel. 33 U.S.C.A. § 1362(6). However, the OTEC Act makes the CWA applicable to all OTEC facilities by providing that "an OTEC facility shall be deemed *not* to be a vessel for the purposes of the CWA." 42 U.S.C.A. § 9117(f) (emphasis added).

48. The Clean Water Act is also referred to as the Federal Water Pollution Control Act, 33 U.S.C. §§ 1251-1387 (1988).

49. The definition of "state" under the CWA includes the District of Columbia, the Virgin Islands, Puerto Rico, Guam, and American Samoa. 33 U.S.C. § 1362(3) (1988).

50. 33 U.S.C. § 1362(6) (1988).

51. Courts have held that discharges of impounded water from hydroelectric projects, which display low levels of dissolved oxygen and colder temperatures than downstream water, do not constitute "pollutants" within the meaning of the Clean Water Act and thus,would not require a discharge permit. *See* National Wildlife Federation v. Gorsuch, 693 F.2d 156 (D.C. Cir. 1982).

By contrast, a closed OTEC facility, which might utilize ammonia or another low-boiling point chemical as a working fluid is more likely to require a discharge permit. Ammonia would fall within the category of "chemical waste" and would therefore constitute a pollutant as defined by the CWA.[52] Since a closed system OTEC facility could release ammonia into the ocean either through a leak in the system's pipes or through an accidental spill, a discharge permit would be required.[53]

In addition, depending upon the prospective project's location, an applicant for an OTEC license may also require water quality certification pursuant to section 401 of the CWA.[54] The CWA provides that any applicant for a federal license to conduct any activity which may result in the discharge of *any* substance (including water) into the "navigable waters of the United States" must obtain certification from the appropriate state agency that the discharge complies with applicable state water quality standards.[55] Because the CWA defines "navigable waters of the United States" as those waters extending up to three miles offshore, the CWA's water quality certification requirement does not apply to OTEC projects which emit discharges beyond the three mile limit.

It is difficult to predict whether OTEC facilities will face problems in achieving the degree of compliance with state water quality standards necessary for certification under section 401 of the CWA. To begin, the impacts on ocean water quality resulting from releases of water which was processed through an OTEC plant have not been fully explored.[56] Finally, recent legislative proposals to amend the CWA to authorize states to develop more stringent water quality standards could make the section 401 certification process more difficult for OTEC projects.[57]

b. Dredge and Fill Permit

To the extent that the proposed OTEC project will include a transmission line or cable to shore or entail some other type of dredge or fill activity, the applicant must also obtain a permit from the Corps of Engineers under section

52. 33 U.S.C. § 1362(6) (1988).

53. Courts have affirmed that a discharge permit is required by the CWA even when the discharge is unintentional and results from, e.g., a fissure in a collection system or the overflow of fluids contained by a wall. *See* Fishel v. Westinghouse Elec. Corp., 640 F. Supp. 442, 446 (M.D. Pa. 1986) (citing United States v. Earth Sciences Inc., 599 F.2d 368, 374 (10th Cir. 1979)).

54. 33 U.S.C. § 1341(a) (1988).

55. *Id.* (emphasis added).

56. *See* JOHNSON, *supra* note 2, at 543-4.

57. The Senate Environment and Public Works Committee introduced legislation (S. 1081) as part of the upcoming reauthorization of the CWA which authorize states, in the context of their section 401 permitting programs, to evaluate not only whether a proposed activity would comply with state water quality standards but also whether it will allow for the protection, achievement and maintenance of certain designated uses, including the protection of fisheries and recreation. *See* GEORGE O'CONNOR, *Revival of FERC's Hydropower Program*, 14 ENERGY L.J. 127, 150 (1993).

404 of the CWA.[58] As with water quality certification, the section 404 "dredge and fill" permit requirement only applies to those portions of the OTEC project located within the navigable waters of the United States, i.e. within three miles of shore.[59]

c. Corps of Engineers Structure Permits

(i) Rivers and Harbors Act

Section 10 of the Rivers and Harbors Act (RHA) authorizes the Corps of Engineers (Corps) to issue a permit for the installation of any structure in navigable waters of the United States which may potentially interfere with navigation.[60] Under the Corps' regulations, those structures requiring a permit by definition include "without limitation, any pier, boat dock, boat ramp, wharf, weir, boom, breakwater, artificial island, power transmission line, permanently moored floating vessel . . . or any other obstruction to navigation."[61] Because platform-based and permanently moored vessel-based OTEC plants and associated transmission cables fall within this definition of "structure," a Corps permit would be required under the RHA to construct and maintain those facilities located up to three miles offshore.

(ii) Outer Continental Shelf Lands Act

Are OTEC facilities located beyond the three mile limit subject to the Corps' structure permit requirement? This article maintains that such permits would indeed be required, although, admittedly, the scope of the Corps' authority to issue a permit for facilities dedicated to ocean energy production located beyond the three mile limit remains unresolved.

Section 4(d) of the Outer Continental Shelf Lands Act (OCSLA) extends the Corps' regulatory authority to prevent obstruction to navigation under the RHA to structures attached to the outer continental shelf (OCS), i.e., the submerged lands lying outside the three mile limit of shore and extending outward approximately 200 miles, "for the development and production of resources."[62] Arguably, a strict reading of section 4(d) of the OCSLA would suggest that the Corps lacks authority to issue permits for OTEC projects located on the OCS, because such projects are dedicated to water power production and do not develop or produce resources of the OCS.[63] The OCSLA does not clarify the meaning of the term "resource"; however, a companion statute, the Submerged Lands Act (SLA)[64] defines "natural resources" as

58. 33 U.S.C. § 1341(c) (1988); 33 C.F.R. § 323 (1992).

59. *Id.*

60. Rivers and Harbors Act, 33 U.S.C. § 403 (1988).

61. *Id.*

62. *See* Outer Continental Shelf Land Act, 43 U.S.C.A. §§ 1331-56 (1991).

63. For a broader development of this argument, *see* Kent M. Keith, *Laws Affecting the Development of Ocean Thermal Energy Conversion in the United States*, 43 U. PITT. L. REV. 1, 26-28 (1981).

64. 43 U.S.C. § 1301(e).

"includ[ing] without limiting the generality thereof, oil, gas, and all other minerals and fish, . . . and other marine animal and plant life, but does not include water power or the use of water for the production of power."[65]

Notwithstanding these provisions, the Corps has traditionally exercised broad authority under section 4(d) of the OCSLA, requiring permits for activities such as the construction of a reef-based community development, complete with a palace and post office,[66] which technically, would not "develop or produce" the resources of the OCS. In light of this precedent, coupled with the fact that the NOAA regulations themselves identify the Corps' permitting requirements under the OCSLA as having potential applicability to OTEC facilities,[67] a developer would need to obtain a Corps permit prior to installing an OTEC facility on the OCS.

Finally, it should also be noted that these questions regarding the Corps' authority to permit OTEC facilities on the OCS do not arise where the proposed OTEC facility would sustain spin-off industries such as mariculture or fisheries industries. In such cases, the OTEC project would quite clearly develop OCS resources, thereby triggering the permit requirements of section 4(d) of the OCSLA.

d. Coast Guard Marking System

OTEC facilities must comply with the Coast Guard's regulations governing the marking, documentation and safety of OTEC facilities.[68] The Coast Guard promulgated these regulations pursuant to provisions of the OTEC Act.[69]

e. Other Applicable Federal Environmental Laws

The licensing of an OTEC facility is a federal activity and thus triggers the consultation requirements of the Endangered Species Act (ESA).[70] Section 7 of the ESA requires federal agencies undertaking an action to consult with the Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS) to insure that the proposed action would not jeopardize the continued existence of endangered species or result in destruction of critical

65. Those courts which have addressed the issue disagree as to whether definitions in the SLA are relevant in interpreting the OCSLA. *See* State of Alaska v. Bundrant, 546 P.2d 530, 546 (Alaska 1976) (provisions of the SLA do not apply to OCSLA); United States v. Ray, 423 F.2d 16, 22 (5th Cir. 1970) (Court uses definition of resource in SLA to shed light on the meaning of "natural resource" in OCSLA).

66. *See* United States v. Ray, 423 U.S. 16 (5th Cir. 1970). In this case, the Corps enjoined a developer who sought to construct "the Atlantis Isle of Gold," a sovereign nation complete with a congress, post office and government palace from proceeding without first obtaining the required permit under section 4(d) of the OCSLA.

67. 15 C.F.R. § 981.220(h) (1993).

68. *See* 46 C.F.R. § 106 (1992).

69. 42 U.S.C.A. § 9119(c).

70. 16 U.S.C.A. §§ 1531-43.

habitat.[71] The NOAA regulations implement these provisions of the ESA and direct OTEC applicants to provide sufficient information to enable NOAA and the consulting agencies to determine whether the proposed OTEC project will jeopardize endangered species or destroy critical habitat.[72]

The Marine Mammals Protection Act (MMPA)[73] prohibits any activity, whether public or private, which results in the taking, i.e. harassment,[74] hunting or capture of depleted endangered marine mammals. The MMPA applies to activities in ocean waters extending up to 200 miles offshore. In some limited cases the MMPA authorizes takings by permit.[75] As a practical matter, the potential effect of the MMPA on OTEC facilities is minimal since it is unlikely that the OTEC projects will result in the taking of endangered marine mammals.

f. Coastal Zone Management Act

The NOAA regulations for OTEC licenses implement the Coastal Zone Management Act (CZMA),[76] under which coastal states[77] with approved CZM plans must concur that the issuance of a federal license for an activity which is either located within or affects the state's coastal zone is consistent with the state's CZM plan.[78] The CZMA authorizes the Secretary of Commerce to reconsider and, ultimately, overrule a state's finding that proposed activity is inconsistent with the state's CZM plan.[79] Both the OTEC Act and the NOAA regulations omit this override provision and instead, give states effective veto power over OTEC projects under the CZMA by flatly prohibiting the NOAA administrator from issuing an OTEC license absent the express concurrence of the state.[80]

g. State Laws

In addition to the CZMA, coastal states may regulate OTEC projects more directly by laws enacted through their authority under the SLA, which vests states with control and title to all lands and natural resources beneath ocean waters up to three miles seaward of the state's coast.[81] Although the SLA reserves to the federal government the regulation of water power produc-

71. 16 U.S.C.A. § 1537.

72. 15 C.F.R. § 981.210 (1993).

73. 16 U.S.C.A. §§ 1361-1407.

74. The FWS regulations define "harass" as "an intentional or negligent act or omission . . . annoying wildlife to such an extent as to significantly disrupt normal behavior patterns." 50 C.F.R. § 17.3.

75. 16 U.S.C.A. § 1374.

76. 15 C.F.R. § 981.330 (1993).

77. Under the CZMA, coastal states include Puerto Rico, the Virgin Islands, Guam, the Commonwealth of the Northern Mariana Islands and the Trust Territories of the Pacific Islands and American Samoa. 43 U.S.C.A. § 1452(3).

78. 43 U.S.C.A. § 1456.

79. 43 U.S.C.A. § 1456(c)(3)(a).

80. *See* 42 U.S.C.A. § 9111(c)(10); 15 C.F.R. § 981.330 d (4) (1993).

81. 43 U.S.C.A. § 1301(a)(2).

tion and navigation within the state's three mile zone,[82] nevertheless, states are still authorized to issue siting permits and property leases for portions of the OTEC cables and transmission lines resting on submerged lands within the state's boundaries. Further, states may have other permit requirements or prohibitions on construction, in wetlands, beaches or shoreline recreational areas. These requirements, which vary from state to state, will most likely apply when the OTEC facilities are interconnected to an onshore grid.[83]

B. Regulation of Ocean Tidal, Wave and Current Systems

The OTEC Act authorizes NOAA to regulate the licensing of plantships or standing systems designed to use temperature differences in ocean water to produce electricity, but does not extend NOAA's regulatory power to ocean tidal, wave or current systems.[84]

1. Relationship Between Corps and FERC Jurisdiction Over Ocean Tidal, Wave and Current Systems

As previously discussed, the Corps' jurisdiction over tidal, wave and current systems derives from its authority to prevent obstructions to navigation within the three mile limit under section 10 of the RHA and on the OCS under section 4(d) of the OCSLA.[85] However, the FERC's assertion of licensing jurisdiction over a project would preempt the Corps' authority to issue a structure permit under section 10 of the RHA.[86]

2. FERC's Authority

The FERC's jurisdiction over ocean energy systems would arise out of the Federal Power Act (FPA) which authorizes the FERC to issue licenses for privately developed hydroelectric projects.[87] Both tidal and current systems, which are driven directly by water, and pneumatic tidal and OWC wave energy systems, which are driven by changes in air pressure, would likely be considered hydroelectric projects by the FERC because they ultimately convert the mechanical power of water into electricity.[88] However, a FERC

82. 43 U.S.C.A. § 1311.

83. It is unclear whether the provisions of the SLA would empower a federal agency developing a water power project in a state's three mile zone to preempt the state's environmental regulation or condemn its land for a project. As will be discussed in pt. II.B.2., the FERC has preemptory and condemnation authority; however, this authority derives from the provisions of the FERC's enabling statute, the Federal Power Act and not the SLA. Because no federal agency has ever attempted to develop water power projects within a state's three mile coastal zone under the SLA, questions regarding preemption and condemnation have never been addressed by the courts.

84. 43 U.S.C.A. § 9102(11)-(12).

85. *See*, pt. II. C.A.3.C. The analysis for why the Corps would have jurisdiction to permit an OTEC project on the OCS applies similarly to any type of ocean energy project.

86. Federal Power Act § 4(e), 16 U.S.C. § 797(e). Even though the Corps could not issue a permit, it could still propose conditions to prevent obstructions to navigation for inclusion in the FERC license.

87. Federal Power Act, 16 U.S.C. § 797(e) (1988).

88. Although the FERC has never determined that a hydropneumatic system, which indirectly employs water power, constitutes a hydroelectric project that must be licensed under the FPA, such a conclusion is implicit in those orders where the FERC identified projects which did not require licenses

license is only required for those hydroelectric projects (1) located in navigable waters of the United States; (2) located on streams that Congress has the authority to regulate (i.e. commerce clause waters) and affects the interests of interstate commerce [through connection to an interstate grid]; or (3) located on public lands owned by the United States.[89]

a. Licensing Authority on Navigable Waters Within the Three Mile Limit

Arguably, the ocean could be considered a "navigable water of the United States," thereby triggering FERC jurisdiction over ocean-based hydroelectric systems. Although Congress's primary focus in enacting the FPA was to regulate the development of hydroelectric projects on streams and rivers, the FPA's definition of "navigable waters," also includes "other bodies of water," which arguably, could encompass the ocean.[90] This may have been the jurisdictional basis for two FERC orders issuing preliminary permits to study the potential development of two tidal power projects to be located in Maine.[91] However, because these orders do not set forth any explicit basis for jurisdiction and have not been subject to judicial review, they cannot be regarded as a definitive pronouncement of the FERC's authority over ocean energy projects located in ocean waters up to three miles offshore.

Moreover, that the FERC may have authority to license ocean energy projects within navigable waters does not mean that the FERC could extend its jurisdiction to projects located on the OCS beyond the three mile limit. Although the FPA does not define the scope of "navigable waters of the United States," the term, as used in other statutes, typically refers to waters within three miles of shore.[92]

b. Licensing Authority Outside the Three Mile Limit

It is unlikely that the FERC could require licenses for ocean projects located outside the three mile limit under its jurisdiction over commerce clause waters or public lands owned by the United States. The phrase "commerce clause waters," as used in the FPA refers explicitly to streams[93] and

because they did not generate hydroelectricity. In these orders, the FERC explained that when water power is used to produce a nonelectrical product, such as heat or compressed air, such projects are not hydroelectric. *See Tufflite Plastics, Inc.*, 13 F.E.R.C. ¶ 61,016 (1980); *Building 69, Inc.*, 63 F.E.R.C. ¶ 61,066 (1993).

89. Federal Power Act, 16 U.S.C. § 817 (1988).

90. Federal Power Act, 16 U.S.C. § 796(8) (1988).

91. The orders issuing the permits do not provide an explanation of the FERC's jurisdiction over the projects. *See Passamaquoddy Tribal Council*, 11 F.E.R.C. ¶ 62,236 (1980) (proposed dam would impound Half-moon Cove and electricity as Half-Moon Cove empties into Cobscook Bay after high tide); *First Fiduciary*, 31 F.E.R.C. ¶ 62,241 (1985). Neither of these projects ever reached the licensing stage.

92. *See* Clean Water Act § 404, 33 C.F.R. § 328.4(a) (1992). (defining "waters of the United States"); River and Harbor Act § 10, 33 C.F.R. § 329.12 (1992) (defining "navigable waters of the United States").

93. *See* Federal Power Act, § 23(b), 16 U.S.C. § 817 (1988) (referring to commerce clause waters as "streams, other than those defined as navigable waterways.")

was intended by Congress to encompass smaller bodies of water than "navigable waters."[94] Thus, the ocean beyond the three mile limit of shore is not a commerce clause water over which the FERC has licensing jurisdiction. Nor is the OCS a jurisdictional "public land owned by the United States." While the United States has rights to exploit OCS resources, it does not hold a proprietary interest in the land itself.[95]

Finally, it should be noted that while section 4(d) of the OCSLA explicitly extended the Corps' authority under the RHA to issue structure permits to the OCS, the OCSLA does not similarly extend the FERC's licensing powers. Without such an express extension of power, the FERC should lack the authority to issue licenses beyond the three mile limit.

3. Conclusions on FERC and Corps Jurisdiction

Although the FERC arguably has a plausible legal basis for asserting jurisdiction over ocean energy projects within the waters of the United States, policy considerations would favor Corps' jurisdiction over all ocean energy projects. The Corps, which has permitted piers, wharfs, underwater transmission and submarine cables and other ocean structures has more expertise than the FERC in dealing with regulation of the ocean. In addition, the Corps' permitting process may prove less burdensome for small, start-up projects than that of the FERC.[96]

Developers may wish to seek additional guidance from the Corps and FERC regarding these jurisdictional questions prior to proceeding with a project. However, to the extent that uncertainties cannot be resolved through agency cooperation, Congress may eventually need to take action to implement a simple and inexpensive regulatory regime to foster development of ocean energy projects.

4. Applicable Federal and State Laws

The FERC licensing and the Corps' permitting processes are fairly extensive.[97] While both agencies' processes have common features, including the submission of information by the applicant describing project configuration anticipated environmental impacts, and the preparation of an environmental assessment by the agency, the FERC's process requires a greater degree of participation from federal and state resource agencies and the general public and affords significant deference to comments and proposals submitted by fish

94. Federal Power Comm'n. v. Union Elec. Co., 381 U.S. 90, 105 nn. 20-21 (1965) (citing legislative history of section 23(b) of the FPA and Congress' intent to regulate development of hydropower on streams which were too small to be navigable).

95. 43 U.S.C. § 1333(a) (1986); *See also* United States v. Ray, 423 F.2d at 22 (holding that unauthorized construction on OCS does not give rise to a claim of trespass because the United States' interest is "something less than fee simple.")

96. *See, e.g.*, George C. O'Connor, *Will the Commission's Hydropower Program Revive in the '90's?* 14 ENERGY L.J. 127, 128 n.8 (1993) (discusses problems for small hydroposed by the high costs of environmental compliance).

97. *See* 18 C.F.R. § 4 (1993) (FERC hydroelectric licensing regulations) and 33 C.F.R. Part 320-322 (1992) (Corps' permit regulations).

and wildlife agencies.[98]

Both the Corp's and the FERC's processes incorporate the same federal laws which apply to OTEC facilities, including the water quality certification and dredge and fill permit requirements of the Clean Water Act, the Coastal Zone Management Act, the Endangered Species Act, and the Marine Mammal Protection Act.[99] Developers would also need to consult with the Coast Guard to determine the need for marking any underwater structures which are part of the proposed ocean energy project.[100]

Within three miles from shore, state laws pertaining to matters such as the leasing of submerged lands or required permits for construction on wetlands or beaches apply with full force in the Corps' permitting proceedings. While these state laws would also govern projects regulated by the FERC, they may be preempted to the extent that they conflict with competing provisions of the FPA.[101] In addition, FERC licensees have rights of eminent domain and thus, could potentially condemn state lands necessary for project operation instead of leasing necessary lands from the state.[102]

III. Financial Benefits and Incentives for Ocean Energy Developers

For the most part, ocean energy developers can take advantage of the measures implemented by the Public Utilities Regulatory Policies Act of 1978 (PURPA) and the Energy Policy Act of 1992 designed to reduce barriers to entry to the electric utility market and stimulate development of renewable resources.[103] Ocean energy developers may also benefit from the FERC's growing willingness to approve market-based rates for arms length, purchase power contracts between utilities and independent power producers (IPPs). However, a number of the financial benefits available to other renewable developers, such as grants and incentive programs, do not extend to most ocean energy projects, particularly those utilizing tidal wave and current technology.

A. Benefits Under PURPA and the Energy Policy Act

1. Qualifying Facility Status

"Qualifying Facility" (QF) status under PURPA generally entitles eligible cogeneration and small renewable projects to guaranteed power purchase

98. *See* 18 C.F.R. § 4.38 (1993) (describing three stage agency consultation and public hearing requirements); 18 C.F.R. § 4.34(e) (1992) (implementing Federal Power Act § 10, 16 U.S.C. § 803L(j) (1988), which requires heightened consideration of terms and conditions proposed by fish and wildlife agencies).

99. *See* discussion, *infra*, pt. II.A.3.

100. 33 C.F.R. §§ 64-67 (1992). The more extensive Coast Guard regulations promulgated pursuant to the OTEC Act would not apply to tidal, wave and current systems.

101. California v. FERC, 495 U.S. 490 (1990) (The FERC's recommended minimum flows control over conflicting flow regime proposed by the State).

102. 16 U.S.C. § 814 (1988).

103. *See Small Power Production and Cogeneration Facilities*, 10 F.E.R.C. ¶ 61,314 (1980).

contracts with utilities at avoided cost based rates[104] and exemption from corporate regulation under the Public Utilities Holding Company Act (PUHCA) and state laws and rate regulation under the FPA. In creating a category of QFs, Congress intended to encourage competition in the energy industry and stimulate use of renewables.

As small projects using renewable energy, ocean energy projects fall within the contemplated purpose of QFs. Nevertheless, certain technicalities in PURPA may bar many ocean energy projects from obtaining QF status.

To begin, under PURPA, only facilities located within the 50 states of the United States, the District of Columbia or Puerto Rico are eligible for QF certification.[105] The FERC has interpreted this provision strictly, maintaining that PURPA does not authorize a grant of QF status for entities located in the Virgin Islands or other United States territories.[106] The FERC's decision could exclude from QF status many OTEC facilities, which are likely to be sited in the tropical waters of United States territorial islands.

PURPA's location requirement may also preclude ocean energy projects located in waters beyond three miles from shore from eligibility for QF status. A coastal state's outer boundary runs three miles from shore[107] and thus, a project beyond those limits technically would not lie "within a state" as required for QF status by PURPA. Nevertheless, even though an ocean energy project may be located outside of a state's ocean boundary, a nexus still remains between the project and the coastal state. The project would be subject to the state's regulation under the CZMA and would likely sell power to a utility located within the coastal state. Because of this nexus, an ocean energy project which is sited in the ocean beyond state boundaries should be deemed to be located within the coastal state for purposes of eligibility for QF status under PURPA.

Ocean energy facilities of up to 80 MW, located within a state and meeting the appropriate ownership requirements[108] can certify as QFs and take advantage of the PURPA provisions requiring utilities to purchase QF power at avoided costs rates.[109] The regulations governing the exemption of QFs from corporate regulation under PUHCA and state law and rate regulation under the FPA are more complicated. Under the FERC's regulations, both cogeneration QFs of any size and QFs which are smaller than 30 MW are eligible for these exemptions.[110] However, if a QF is between 30-80 MW and

104. Avoided cost is defined as the incremental costs to a utility of electric energy or capacity or both which, but for the purchase from the QF the utility would generate itself or purchase from another source. 18 C.F.R. § 292.101(6).

105. 16 U.S.C. § 791(a)(15) (1988).

106. *Martin Marietta Aluminum Properties, Inc.*, 37 F.E.R.C. ¶ 61,155 (1986).

107. *See* Submerged Lands Act, 42 U.S.C.A. § 1301 (1993).

108. Not more than a 50 percent interest in a QF may be owned by an electric utility. 18 C.F.R. § 292.206 (1993). A facility however, can be owned in part or whole by an Exempt Wholesale Generator and remain eligible for QF status. *See Richmond Power Enterprise, L.P.*, 62 F.E.R.C. ¶ 61,157 (1993); *infra*, part III.A.2.

109. *See* 16 U.S.C. § 791a; 18 C.F.R. § 292.303-4 (1993) (describes conditions and rates under which utilities are obliged to purchase QF power).

110. *See* 18 C.F.R. § 292.601-602 (1993).

is not a cogeneration plant, it will only be eligible for exemption from PUHCA and FPA regulation if it uses solar, wind, waste or geothermal steam as a primary source of energy.[111] Thus, an ocean energy facility with QF status will only be eligible for exemption from the provisions of PUHCA and the FPA if it is smaller than 30 MW.

2. Exempt Wholesale Generator

The Energy Policy Act eliminates one barrier to entry to the utility market by creating a new class of entities called "exempt wholesale generators" which are exempt from the onerous provisions of PUHCA,[112] but receive none of the other benefits of QF status.[113] The availability of EWG status for ocean energy projects is most significant for those ocean energy projects which the FERC determines fail to meet the location requirements for QF status under PURPA or which may need rates that are higher than avoided costs.

Any person engaged exclusively in the business of owning and/or operating all or part of one or more "eligible facilities" and selling power at wholesale is eligible for EWG status upon application to the FERC.[114] An eligible facility is defined as one which is either used exclusively for the generation of electric energy at wholesale (although it may also sell by-products of energy production)[115] or used for generation of electric energy and leased in its entirety to a public utility company.[116] An EWG can be located either inside or outside the United States.

Ocean energy facilities dedicated exclusively to producing power at wholesale would qualify as EWGs. An OTEC project which produces power for wholesale sales and sustains spin-off industries could also qualify as an EWG, since the spin-off industries would constitute a permissible by-product of electric generation. The availability of EWG status should facilitate joint ventures between OTEC developers and established utilities and remove regulatory barriers to the development of ocean energy projects abroad by domestic utilities.

3. Market-Based Rates

In recent years, the FERC has departed from its traditional cost of service ratemaking practices and has approved market-based rates for utility or

111. 16 U.S.C.A. § 791(17)(E) as amended by the Solar, Wind, Waste, and Geothermal Production Act of 1990.

112. *See* PUHCA, 15 U.S.C.A. § 79z-5a (as amended by Section 711, National Energy Policy Act of 1992).

113. Most experts conclude that QF status is preferable to EWG because of the added benefits of exemption from rate provisions of the FPA and state law and guaranteed avoided cost rates. *See, e.g., QFs Keep Advantages Over EWGs, Despite PUHCA*, ELECTRIC UTIL. WK., (December 7, 1992); R. Fees, *The Case for QF's*, INDEPENDENT ENERGY (July/August 1993).

114. *See* 18 C.F.R. Pt. 365 (1993) for filing requirements for EWG applications. The application fee is $1000. 18 C.F.R. § 381.801 (1993).

115. *Richmond Power Enterprise, L.P.*, 62 F.E.R.C. ¶ 61,157 (1993) (person otherwise meeting EWG requirement may engage in sale of by-products of electric generation such as steam and fly-ash).

116. 18 C.F.R. § 365.3(a)(1),(2)(ii) (1993).

IPP transactions.[117] In so doing, the FERC has expressed its belief that market-based rates could be used to promote competition amongst suppliers and encourage purchasers to seek out those resources which are cost effective.[118] Thus, if ocean energy can be cheaply produced, the availability of market-based rates will make power supply transactions between ocean energy developers and utilities mutually beneficial.

The FERC will approve market-based rates for utility or IPP transactions upon finding that the seller lacked, or had adequately mitigated, market power.[119] A seller can demonstrate that it lacks market power if it can show that neither it nor any of its affiliates:

(1) is a dominant firm in the sale of generation in the relevant market;
(2) owns or controls transmission facilities through which the buyer could reach alternative sellers (or, if the seller or any of its affiliates does own such facilities, they have adequately mitigated their ability to block the buyer from reaching other sellers);
(3) can erect or control any other barrier to market entry; and
(4) has not engaged in any affiliate abuse or reciprocal dealing.[120]

The FERC also views a competitive solicitation process for a power supply contract as evidence of the seller's lack of market power.[121] Once the FERC has determined that the seller lacks market power, the proposed rates are deemed to fall within the legally mandated "zone of reasonableness" required by the FPA.[122]

4. Wheeling

Ocean energy developers can access an expanded market for their power as a result of the Energy Policy Act's expansion of the FERC's authority to order wheeling.[123] The Act's provisions enable wholesale generators of electric energy, after first making a good faith request for transmission services directly to the transmitting utility,[124] to apply to the FERC for a wheeling order. Subsequently, the FERC may issue an order requiring the utility to provide transmission service to the applicant upon finding, among other things, that the rates for transmission service would permit the utility to recover all costs incurred in providing such service and that the requested transmission service is in the public interest.[125]

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117. *See, Commonwealth Atlantic Limited Partnership*, 51 F.E.R.C. ¶ 61,368 (1990).

118. *Commonwealth Atlantic Limited*, 51 F.E.R.C. ¶ 61,368, at 62,248.

119. *Commonwealth Atlantic Limited Partnership*, 51 F.E.R.C. ¶ 61,368 (1990); *Enron Power Enterprise Corp.*, 52 F.E.R.C. ¶ 61,193 (1990); *United Illuminating Company*, 60 F.E.R.C. ¶ 61,214 (1992).

120. *United Illuminating*, 60 F.E.R.C. ¶ 61,214, at 61,734, (citing *Enron*, 52 F.E.R.C. ¶ 61,193 and *Commonwealth*, 51 F.E.R.C. ¶ 61,368).

121. *See, e.g., United Illuminating*, 60 F.E.R.C. ¶ 61,214; *Commonwealth*, 51 F.E.R.C. ¶ 61,368.

122. 51 F.E.R.C. ¶ 61,368.

123. Section 721B(5), Energy Policy Act of 1992, amending section 211 of the FPA, 16 U.S.C. § 824.

124. 16 U.S.C. § 824(a) and "FERC Policy Statement Regarding Good Faith Requests for Transmission Services and Responses by Transmitting Utilities under the FPA, as amended by the Energy Policy Act of 1992," 58 Fed. Reg. 38,964 (July 14, 1993).

125. The FERC has issued a Notice of Proposed Rulemaking soliciting comments on appropriate methodologies for the pricing of transmission services. 58 Fed. Reg. 36,400 (July 7, 1993).

B. Financial Benefits and Grants for Development of Ocean Energy Projects

1. Energy Policy Act

The Energy Policy Act of 1992 adopted moderate measures to stimulate private development of renewables. Many of these incentives, however, do not benefit ocean energy developers.

The Energy Act's amendments to the Renewable Energy and Efficiency Technology Competitiveness Act of 1989 (Renewable Act)[126] authorize the Secretary of the Department of Energy (DOE Secretary) to promote the commercialization of renewable energy technologies by soliciting proposals for demonstration and commercial application renewable energy projects. Selected projects would then be eligible for federal financial assistance, including cost-sharing[127] or federal repayment of interest.[128] Although a vast array of renewables, including biomass, solar thermal, wind, geothermal, and ethanol processes qualify for this program, curiously, ocean energy does not.[129]

The Energy Policy Act also directs the Secretary to make "Renewable Energy Advancement Awards," which could include a cash prize, to recognize developments that advance the practical application of various renewables to consumer, utility and industrial uses.[130] OTEC is among the renewables qualified for these awards; however, tidal, wave and current systems are ineligible.

Ocean energy is not totally excluded from all provisions pertaining to renewables in the Energy Policy Act. For example, the Act directs the Secretary of DOE and state commissions to undertake a yearlong study to determine if conventional taxation and ratemaking procedures result in economic barriers for renewable energy plants compared to conventional power plants and submit the results to Congress.[131] In the event that Congress decides to implement additional policies to encourage renewable development, ocean energy developers will have another chance to lobby for their inclusion in such a program.

2. OTEC

Ocean thermal demonstration facilities qualify for certain financial benefits not available to other types of ocean energy projects. The OTEC Research Development and Demonstration Act authorized the DOE to initiate a program to design, construct and operate pilot OTEC plants.[132] Under this program, DOE may also provide direct financial assistance to the demonstration programs for design activities and plant and capital equipment. However, reportedly, as of 1992, DOE ceased funding the OTEC program, citing its cost

126. 42 U.S.C.A. § 12005, as amended by Section 1202 of the Energy Policy Act of 1992, Pub. L. No. 102-486.

127. 42 U.S.C.A. § 13542(b)(c).

128. *See* 42 U.S.C.A. § 12005 (b)(2).

129. 42 U.S.C. § 12005 (c)(2).

130. Energy Policy Act of 1992, § 1204 Pub. L. No. 102-486.

131. *Id.* § 1205.

132. 42 U.S.C. § 9004.

and potential benefit compared to other renewable energy initiatives.[133]

OTEC projects also qualify for obligation guarantees under the Merchant Marine Act of 1936, which was amended by OTEC Act to include a special subfund for ocean thermal demonstration projects.[134] The subfund provides for guarantees of obligations for up to 87.5% of the construction cost of commercial demonstration OTEC facilities and plantships,[135] but no more than five pilot facilities with a total capacity of 400 megawatts may be subsidized in this way.[136] The application process for the guarantee program, which requires a $1000 filing fee, are set forth in the Department of Transportation's Maritime Administration regulations.[137]

It should be noted that virtually no funds have been disbursed under this program since its inception in 1980. In a 1982 report, DOE revised its position regarding government funded research and development, stating that such costs were more appropriately borne by the private sector.[138]

IV. CONCLUSION

The ocean's enormous promise as a source of clean, reliable renewable energy will begin to transform into reality within the coming decades. Even without the federal grants and financial incentives accorded other renewables, eased regulation of the utility industry can assist in attracting the involvement of investor owned utilities in ocean energy projects. The Energy Policy Act's creation of EWGs removes barriers to joint ventures between utilities and ocean energy developers, both within this country and abroad. In addition, while some uncertainty clouds the issue, most ocean energy projects meeting the appropriate ownership requirements would qualify for QF status, which affords, among other things, the benefit of power supply contracts with utilities at avoided cost rates. The FERC's increased willingness to approve market-based rates for IPP transactions will also provide mutual benefits for utilities and ocean energy developers involved in power supply arrangements.

An adequate regulatory process currently exists for permitting ocean energy projects, although admittedly, major issues, such as the Corps' jurisdiction over ocean tidal, wave and current energy development, have not been definitively settled. Resolution of the question of regulatory jurisdiction over ocean tidal, wave and current projects as well as the implementation of eased regulatory procedures, at least for pilot or demonstration wave and current systems which have minimal environmental impacts, would facilitate development of private ocean energy projects. The OTEC Act already exempts pilot and demonstration OTEC facilities from the cumbersome NOAA licensing

133. *International Solar Energy Intelligence Report* (February 7, 1992). Up through that date, DOE's primary involvement in OTEC development consisted of its participation in and funding of the OTEC facility at Keahole, Hawaii. *Id.*

134. 46 U.S.C. § 1271(c), *amended* by the OTEC Act, Pub. L. No. 96-320 (a) (1980).

135. 46 U.S.C.A. § 1279c(a)(3).

136. 46 U.S.C.A. § 1279c(a)(4).

137. 46 C.F.R. § 298.3 (1992).

138. FOX, FEDERAL REGULATION OF ENERGY at 828, *citing* DOE, Sunset Report: Program by Program Analysis 162-65 (February 1982).

requirements, although without a full funding commitment from DOE, this program has also had little success.

The ocean's energy potential remains too large to be overlooked; sooner or later, it will be exploited. Indeed, with continued technological advancements in ocean energy development, changes in the utility industry and the Clinton Administration's positive attitude towards renewables, successful ocean energy development may occur sooner than we expect.