



Wave Power in the US: Permitting and Jurisdictional Issues



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Table of Contents

1. Introduction 3

2. Legal and Policy Framework 4

 2.1 Ocean Jurisdictions 4

 2.2 Federal Agency Jurisdictions 5

 2.3 Federal Regulations..... 8

 2.4 State and Local Jurisdictions..... 10

3. Wave Power Demonstration Projects..... 11

 3.1 Background 11

 3.2 Wave Energy Converter Buoys at the Marine Corps Base Hawaii, Kaneohe Bay 11

 3.3 Makah Bay Pilot Offshore Power Plant ---- AquaEnergy Group 12

 3.4 GreenWave Rhode Island ---- Energetech 15

4. Summary 17

 4.1 Lessons Learned from Offshore Wind Policies 18

 4.2 Strategic Considerations 18

Appendix A: FERC ALP Process 20

Appendix B: Selected Interviews..... 23

Endnotes..... 24

List of Tables and Figures

Figure 1. Ocean Jurisdictions..... 5

Figure 2. PowerBuoy at Marine Corps Base in Hawaii, Island of Oahu. 12

Figure 3. AquaEnergy Wave Power Conversion Device..... 13

Figure 4. Energetech’s Wave Energy System..... 15

Table 1. Selected Federal Regulations 9

1. Introduction

E2I, Electric Research Power Institute (EPRI) and Global Energy Partners LLC (Global) are collaborating with state energy agencies and utilities from Maine, Massachusetts, San Francisco, California, Oregon, Washington and Hawaii, and the Department of Energy's (DOE) National Renewable Energy Laboratory (NREL) to define system designs for wave energy conversion device power plants at one site in each of those states. The overall project objective is to demonstrate the feasibility of wave power to provide efficient, reliable, environmentally friendly and cost-effective electrical energy and to create a push towards the development of a sustainable commercial market for this technology. This report, funded by the NREL,

“investigates the existing regulations for permitting and licenses for coastal/ offshore/ outer continental shelf (OCS) renewable electrical power generation for the three site-device options. Potential national level agencies involved are the National Oceanic and Atmospheric Agency (NOAA), the U.S. Army Corps of Engineers (USACE), and the Federal Energy Regulatory Commission (FERC). In addition, various state and local agencies may be involved¹.”

This report assesses the current regulations applicable to wave energy demonstrations and explains the legal barriers and challenges associated with getting a test project approved. Given that there are not specific statutes or national leadership supporting wave power, the regulatory framework is in flux and each demonstration project will have a different pathway for approval to operate. The research is based upon the experience of NREL staff with offshore wind energy projects in the US and Europe, interviews with legal experts and developers,² and analysis of selected studies from Europe³

Experiences from the offshore wind industry are relevant to future planning and permitting requirements for wave energy, though the jurisdictional issues and the lead agencies may be different. The reason for using information from wind energy is that planning rules for wave energy projects generally have not been prepared or tested yet and offshore wind is farther ahead developmentally. There are two proposed offshore wind projects in the US testing jurisdictional issues, i.e. the Cape Wind project off of Hyannis in Massachusetts and the Long Island Power Authority project off of Jones Beach, Long Island. It is expected that ocean jurisdiction issues and environmental standards and regulations for offshore wind energy may, in many cases, provide some insight to demonstrating wave projects.

Section 2 discusses the policy framework and international ocean jurisdictions briefly, the legal framework for federal agency jurisdictions as well as selected federal and state laws that are applicable to a wave energy project. Section 3 describes current events with wave power demonstration projects, providing a brief overview of the technology and a summary of their regulatory experiences. Section 4 summarizes the lessons learned from the wave power projects as well as what we can learn from the regulatory pathway of installing offshore wind power projects in the US (Section 4.1). The last section (4.2) outlines some strategic considerations to streamline the regulatory requirements and clarify the jurisdictional issues.

2. Legal and Policy Framework

There is not a national program promoting the development of wave energy projects in the US though wave energy is consistent with the National Energy Policy (NEP).⁴ The NEP seeks to promote cost effective, clean, domestic energy resources and strengthen national security and energy independence. At this point, there is very little political awareness of the role of wave power in increasing production of renewable energy except on the state level where demonstration projects are proposed⁵ or where EPRI has conducted research for future pilot programs⁶. Public education and successful demonstrations will raise the awareness of the potential for wave power technology and may build the momentum needed to develop and support pilot programs.

In addition, the US has not signed onto the Kyoto Protocol (1997) which established targets for reducing greenhouse gas emissions and promotes the use of renewable energy, such as wave power. The state legislators' establishing Renewable Portfolio Standards (RPS) are the driving forces behind the momentum for increasing the production of renewable energy sources by setting firm targets and providing subsidies, where necessary. The RPSs appear aimed at biomass, wind and solar energy options without consideration for wave power as yet.

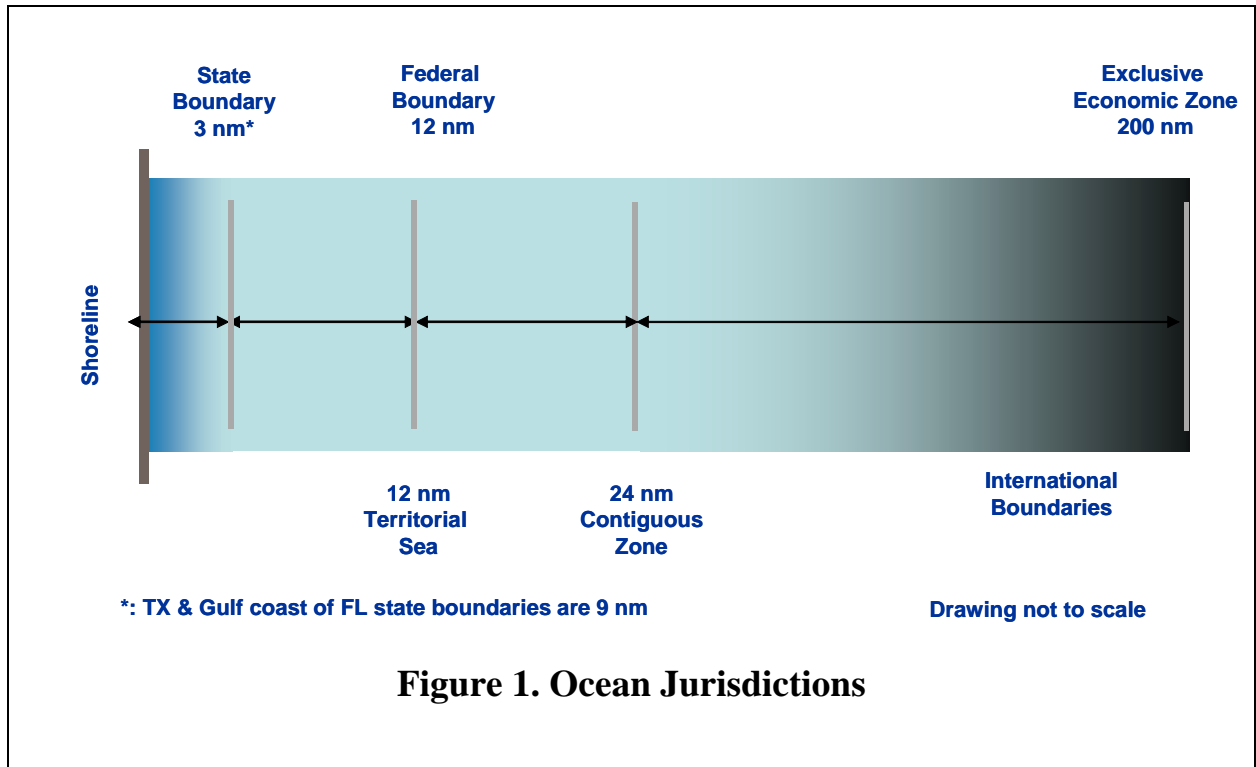
2.1 Ocean Jurisdictions

This section provides an overview of the international law of the sea governing ocean jurisdictions as well the federal statutes and agency authorities affecting the regulatory regime for a wave power project. Lastly a brief mention of the state authority and how this governs the licensing and permitting activities is provided.

The United Nations Convention on the Law of the Sea (UNCLOS)⁷ sets out the rights of a coastal national over its territorial seas (out to 12 nm) out to 200 nm of the Exclusive Economic Zone (EEZ). The zones establishing national sovereignty over sea, airspace and economic resources is complex, with overlapping legal authorities and agency responsibilities⁸. As shown in the graphic below, the primary ocean jurisdictions for purposes of this report involve the state and federal boundaries that are generally 3 nm⁹ from the "baseline" or the low water line along the coast. Since wave energy devices may be near shore, offshore or far offshore, the geography of the site and the designated federal and/or state jurisdictions establish the first layer of the legal framework.

An interesting aspect of the ocean jurisdictions in regards to wave power is to examine the ownership of the seabed and how the federal and state governments exercise their rights for the benefit of the public, in accordance with the "public trust doctrine." The doctrine established the responsibilities of the states to manage the public trust assets so that the public can fully utilize the lands, water and resources for specified public uses. The Coastal Zone Management Act (CZMA) gives individual states jurisdictional rights out to 3 nm with review authority beyond this zone. Under CZMA, the federal government provides funding to states to develop and administer coastal programs in accordance with the guidelines set forth in the CZMA¹⁰. Under the Submerged Lands Act (SLA), the location of the energy and mineral resources determines whether or not they fall under state control. The SLA granted states title to the natural resources

located within three miles of their coastline (9 nm for Texas and the Gulf coast of Florida). The Outer Continental Shelf Lands Act (OCSLA) reserves the federal right to manage and develop resources in the seabed beyond the three mile limit, including oil, gas, and all other minerals. These laws do not take into account wave power, since this is a non-extractive resource and it is not specifically addressed in the legislation.



In regards to offshore wind, the issues of seabed ownership and lease rights are not resolved. The offshore turbines can be permitted for installation on federal lands, but the wind developer does not have property rights to the seabed because there is not a leasing program. The property rights aspects of ocean resources or non-extractive resources are in flux without any clear legal interpretation to date. Generally, these laws will be clarified as more ocean energy projects are deployed, including wave power demonstrations. This clarification will arrive through legal challenges defining the law and the public trust, as is the case with the first offshore wind project in the northeast,¹¹ and/or new Congressional legislation that will expand agency authorities over renewable resources.

2.2 Federal Agency Jurisdictions¹²

Federal agencies are charged with interpreting the statutes to define their authorities. The legal framework for permitting wave power projects is uncertain because there are no regulations written specifically for siting, installing or operating a wave device. Given that there are only

two proposed demonstration projects in U.S. waters (one is already installed, see Section 3), they will be the guinea pigs pushing an interpretation of legal and jurisdictional issues.

One of the most significant barriers to wave power development is the uncertainty of federal jurisdiction and who assumes lead agency authority for wave power demonstration projects. There are four key agencies that would potentially exercise jurisdiction over wave projects in the marine environment. It is assumed that agencies regulating “activities” and “structures” in the ocean as well as “power sources” from water (i.e., hydroelectric plants) would be applicable. The four federal agencies include FERC, the USACOE, and NOAA and the Minerals Management Service (MMS). Below a brief description of these authorities are discussed and the background to the current regulatory environment is provided in brief.

The NOAA mission, under the US Department of Commerce, focuses on conservation and management of the nation's coastal and marine resources. NOAA is the only agency that has licensing authority and regulations specifically designed for a marine renewable project, the law administering the licensing and regulation of ocean thermal energy conversion (OTEC) projects. To date no plants have ever been licensed and there is little interest in OTEC demonstrations.¹³ At this point in time, NOAA is only involved in a wave project if there are ocean uses associated with their regulatory authority, e.g., a wave project located within a protected area such as a Marine Sanctuary (see the AquaEnergy case study in Section 3).

The MMS under the U.S. Department of the Interior, administers extractive uses of the seabed under the Outer Continental Shelf Lands Act (OCSLA). The OCSLA authorized the Secretary of the DOI to manage exploration and development of the Outer Continental Shelf (OCS). The Secretary subsequently delegated this authority to the MMS which now administers offshore programs such as gas and oil exploration, leasing, and royalty payments.

In June 2002, the Bush Administration proposed legislation to Congress in the Energy Bill (Cubin Bill - HR 793) granting authority to DOI to manage energy development on the OCS, as an amendment to the OCSLA. This legislation would designate the MMS as the lead agency for non-extractive energy projects and new regulations would be promulgated. These new regulations may include provisions for leasing of the seabed and royalty and/or lease payments for wave energy devices as well as offshore wind facilities. Moreover, a uniform permitting process would be coordinated across appropriate federal agencies¹⁴. This new regulatory regime would not supersede any existing regulatory requirements, but it is expected that the MMS would serve as the lead agency and coordinate the process. It is not certain how this new program for ocean energy developments would affect the current legal interpretation and authority for licensing and permitting offshore wind plants.

Currently, the USACOE is the lead agency with jurisdiction for permitting offshore structures, based upon Section 10 of the Rivers and Harbors Act from 1899¹⁵. This permit relates to structures altering or obstructing navigable waters outside of state limits (3nm) and extends activities into the Outer Continental Shelf out to the 200 nm of the EEZ. This statute does not make any specific references to energy-related projects, however, the USACOE has assumed the lead agency responsibilities for permitting offshore wind facilities. The Corps issues Section 10

permits for underwater submarine cables and transmission lines. On the other hand, the permit does not confer any property rights or leases within the OCS.

FERC pursuant to the Federal Powers Act¹⁶, is an independent agency regulating interstate transmission of natural gas, oil, and electricity and hydropower projects. FERC also has regulatory authority over the terms and rates for power supply contracts from a wave power project to a local utility.¹⁷ FERC issues licenses for private hydropower development on navigable waterways, federal lands and commerce clause waterways. Hydropower licensing processes is a time consuming and expensive process, given that it was designed to address complex issues associated with hydropower projects. This process includes consulting with a wide range of stakeholders, identifying environmental issues through a scoping process, and preparing environmental documents such as an environmental assessment (EA) or an environmental impact statement (EIS). Licenses are issued by Commission Order. This traditional licensing process takes several years to complete and the license is issued for 30-50 years. Clearly, the FERC regulations were not designed for temporary test pilot wave power projects.

In 2003, FERC determined through a first-time legal interpretation that the AquaEnergy Group demonstration project in the state of Washington falls under the jurisdiction of the Federal Powers Act.¹⁸ FERC has determined that a wave energy buoy is a hydro project with a “power house” that uses water to generate electric power. If the electric power will be sold onto the grid, this is another jurisdictional area for FERC. While FERC would clearly have jurisdiction over wave technologies used in riverine environments, there is a legal question as to whether their definition of “navigable waterways” extends to coastal waters up to 12 nm from shore (the Territorial Sea). The legal interpretation of their jurisdiction out to 12 nm is not consistent with the SLA and OCSLA. As a result of this murky but landmark decision, it is likely that any ocean technology project (tidal, current, oscillating water column) could be determined to be a hydro project by FERC. This interpretation of the FPA places FERC in the lead for any approvals of wave power projects in the US (a brief overview of this licensing process is provided below with more details in Appendix A).

A FERC license can be applied for using an alternative licensing process (ALP) that permits scoping of environmental issues to occur prior to the application being filed with the Commission. This is an attempt to streamline the process of applicants pre-filing and then following the FERC licensing application process. The applicant files a preliminary draft environmental review document along with the application for license¹⁹. The ALP is more flexible overall, but more cumbersome at the beginning, as it attempts to combine four processes into one collaborative process:²⁰

- Pre-filing consultation process with a variety of interested parties involves three steps: holding a public hearing to solicit comments; distributing the preliminary application and comments to the involved agencies, and developing a scoping document
- Evaluation of project impacts, pursuant to the National Environmental Policy Act (NEPA).²¹ The applicant drafts the document in collaboration with FERC and the other cooperating agencies. The agencies, under FERC leadership, identify which issues need to be addresses, what type of field research is needed and what other regulations might be applicable.

- Preparing other Federal and state regulatory reviews materials, such as the Section 7 of the Endangered Species Act (ESA) or the Marine Sanctuaries Act.²²
- Implementing a negotiation process (if appropriate).

It would appear that a FERC license, designed for long term hydropower projects, are quite extensive for the temporary installation of one or two buoys in the ocean. Also, according to FERC regulations, a Section 10 permit from the USACOE is not required when a FERC license is issued²³. Plus FERC and the USACOE have a Memorandum of Understanding that provides a mechanism to conduct joint environmental reviews. In addition, without clear jurisdictional authority, due diligence procedures, or property rights, FERC may have potential conflicts with offshore wind permits or other ocean technology projects, if they are proposed to be sited in or around the same area.

2.3 Federal Regulations

Understanding the issues of federal agency jurisdiction must go hand-in-hand with an understanding of the federal regulations addressing potential environmental impacts at the project site. There is a plethora of statutes and regulations relevant to oceans, coasts and the management of marine resources. There are over 40 principle statutes on the federal level,²⁴ but only a handful is directly relevant to wave power jurisdictions.²⁵ A selected list of applicable federal regulations is presented in Table 1 below. The primary federal regulations applicable to a specific wave power project will be slightly different depending on the project size and location, competing use of the ocean space, and state shoreline issues. Due to the lack of clear authorities and that agency interpretation of the regulations are evolving, this list will certainly change in the near future.

Table 1. Selected Federal Regulations

| Legislative Authority | Major Program/Permit | Lead Agency |
|--|--|---|
| Federal Power Act | Issues license for any type of electric power generation within/on navigable waters; interconnection is parallel process | FERC |
| Rivers and Harbors Act - Section 10 | Regulates all structures and work in navigable water of the U.S. Extended out to 200 nm under the OCSLA for fixed structures/artificial islands | U.S. Army Corps of Engineers (District Office) |
| National Environmental Policy Act (NEPA) | Requires submission of an environmental review for all major federal actions that may significantly affect the quality of the human environment | U.S. Army Corps of Engineers (District) Council on Environmental Quality |
| Coastal Zone Management Act | Jurisdictional rights to states to review activities for that may affect the state’s coastal resources | State Coastal Zone Management Agencies |
| Navigation and Navigable Waters | Navigation aid permit (markings and lighting) | U.S. Coast Guard |
| Clean Water Act | Regulates discharges of pollutants into the waters of the United States | U.S. Environmental Protection Agency |
| Migratory Bird Treaty Act | No “taking” or harming of birds determination | Fish and Wildlife Service Migratory Bird Conservation Commission |
| National Historic Preservation Act | Consultation on the protection of historic resources — places, properties, shipwrecks | Department of the Interior State Historic Preservation Offices |
| Magnuson-Stevens Fishery Conservation & Management Act | Conserves & manages fish stocks to a 200-mile fishery conservation zone & designates essential fish habitat | National Marine Fisheries Service Department of Commerce |
| National Marine Sanctuary Act (Title III) | Designates marine protected areas | National Ocean Service (within NOAA) |
| Endangered Species Act | Consultation on action that may jeopardize threatened & endangered (listed) species or adversely modify critical habitat. May require the preparation of a Biological Assessment | Fish & Wildlife Service (Interior) National Marine Fisheries Service |
| Marine Mammal Protection Act | Prohibits or strictly limits the direct or indirect taking or harassment (Permits may be sought for “incidental take”) | Fish & Wildlife National Marine Fisheries Service |
| Submerged Lands Act | Granting states a title for public lands/natural resources held in trust by the government | Minerals Management Service |
| Outer Continental Shelf Lands Act | Manages the OCS with leasing rights for minerals production. Also covers artificial islands, installations, and other devices located on the seabed | Minerals Management Service |
| Estuary Protection Act | Conserves estuarine areas | Fish and Wildlife Service |

2.4 State and Local Jurisdictions

Under most federal licensing/permitting regimes (e.g., FERC hydropower licensing, Section 404 permits), federal agencies must consult with the affected states and comply with their laws and regulations. For the foreseeable future, each permitting process will differ slightly depending on the role of the state agencies that will have either parallel review authority, additional requirements relating to the CZMA, and a range of state environmental statutes protecting public resources. The general approvals on the state level include the following:

- Environmental Quality Review Boards
- Clean Water Act Certifications
- Coastal Zone Management Programs
- Siting Boards for Energy Facilities and Transmission Lines
- State Parks, Forests, and Cultural & Historic Resources
- Tidal Wetlands and Coastal Erosion Hazard

Local government agencies will most likely get involved with the cable landfall connection. The local land use groups include Town Planning and Zoning Boards that regulate by-laws (e.g., setbacks) and construction on local tracts of land.

Some states will have a more cooperative attitude than others depending on the experience and willingness of the state to promote wave power. In some cases, a state may take a very conservative approach to regulatory compliance for a demonstration project by requesting extensive field surveys and/or separate state approval processes.²⁶ This, in effect, will discourage other developers from proposing demonstrations because the cost and schedules are not tenable for a pilot project.

In summary, the extensive level of coordination and possible field studies required for the approval process are barriers to demonstrating wave power in a timely and cost effective way. The private developer is responsible for funding the preparation of the NEPA document that may take several years to prepare. Complying with this licensing process, cooperating with dozens of federal and state regulators, and executing field surveys and monitoring studies will add significantly to the developer's pre- and post-construction costs as well as scheduling issues. Significant interagency coordination is required between the federal and state agencies where the wave power project will be sited. Parallel review and approval processes will occur at the state level and each state may have its own approach to regulatory compliance as well as its own permits. Early public and agency involvement is critical to identify the interested groups and agencies involved in the approval process.

Developers are driving interpretations of the permitting process, since the federal planning agencies do not have a specific legal framework for wave power. As discussed in the case studies below, current demonstration projects are experiencing delays and having trouble with financing because of the uncertainties with regulatory jurisdictions on the state and federal levels. It is expected that the interpretation of laws and regulations applied to offshore wind projects may in some cases apply to wave energy projects and/or will influence the path forward. Given the uncertainty of marine impacts and the lack of field data, each project will be approved on a

separate track with a different set of agency concerns. For all ocean energy projects, it is a case where demonstrations and projects are preceding policy and legal frameworks!

3. Wave Power Demonstration Projects

3.1 Background

The US Department of Energy does not have an ocean energy program. Developers and state organizations are filling this federal void and taking a lead role in demonstrating the potential of marine renewable technologies to diversify our national energy portfolio. The experiences of obtaining permission to deploy these devices through federal and state agencies will be instructive for future projects.

There are three demonstration projects highlighted in this section that provide a brief overview of the technologies and the regulatory pathways in Hawaii, Washington State and Rhode Island. Some details on the technologies are provided only to the extent that it helps explain the potential effects on the marine environment that may trigger regulatory compliance issues. The size and working components of the demonstrations provide a window into the perception of how the regulators view this technology in the ocean. Unlike wind turbines, there are many different technology concepts for wave power that are undergoing proof of concept demonstrations. The understanding of the regulations and how the developers are complying with the law was gathered primarily through interviews with the developers and the federal and state regulators²⁷. The summary of the technologies are gleaned from the E2I /EPRI/Global series of Wave Power reports²⁸ as well as literature from the developers²⁹.

Section 4.1 highlights the lessons learned from the nascent offshore wind power industry in the US. As another ocean technology in the early stages of development in the US, government agencies and developers are learning how to navigate these new permit requirements under the jurisdiction of the USACOE. The final section summarizes the findings of the regulatory analysis and provides several recommendations about overcoming the barriers to permitting and licensing wave power projects in the US in a more efficient manner.

3.2 Wave Energy Converter Buoys at the Marine Corps Base Hawaii, Kaneohe Bay³⁰

“The Office of Naval Research (ONR) is currently funding the phased installation and operational testing of six Wave Energy Conversion (WEC) buoys off North Beach, Marine Corps Base Hawaii, Kaneohe Bay developed by Ocean Power Technologies (OPT). Department of Defense (DOD) installations are vulnerable during times of national conflict due to their reliance on conventional fuels for electrical power generation. Coastal DOD sites with suitable wave energy potential could obtain supplemental power using wave energy if it can be demonstrated to be efficient, reliable, and cost-effective.

The WEC system components include the buoy, anchor base, hydraulic lines, equipment canister, undersea cable, land cable, utility vault to house the connection of the undersea and land cables, and equipment shelter. In addition to the WEC system, the demonstration will include the installation of four mooring clumps within the buoy field for anchoring workboats. Installation and operational testing would occur over a two- to five-year time period.

OPT's PowerBuoy wave generation system, similar to the AquaBUoy, captures and converts wave energy into a controlled mechanical force which drives an electrical generator. OPT developed and refined their wave power conversion technology under the Small Business Innovation Research program sponsored by ONR. A single first-generation WEC buoy deployed off Tuckerton, New Jersey, produced an average of 250 watts (W) of power. Further refinements to the technology resulted in a design for more efficient extraction of the energy from a wider range of wave conditions. The demonstration of the buoys in Hawaii is the first deployment of a fully instrumented, full-scale buoy designed for large power output.

The project was supported by a \$12 million Congressional earmark. ONR coordinated the permitting process with the USACOE. FERC was not involved in this process and there were no state approvals. Given the location of the project on military lands, the permitting process was expedited and there were no public hearings held.

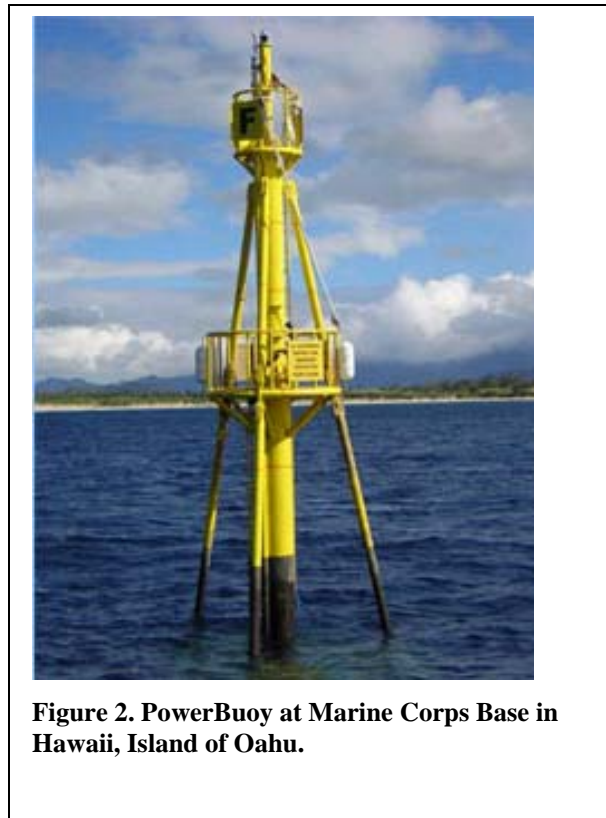


Figure 2. PowerBuoy at Marine Corps Base in Hawaii, Island of Oahu.

The application for a section 10 permit included the Navy prepared 300 pages environmental assessment. The “letter of permission” from the USACOE covered the buoys and the cable. The early special conditions were to prepare an endangered species plan before construction and a biological monitoring plan for fish and benthic organisms was required as part of the NEPA analysis, particularly the scope of environmental regulations evaluated and the cooperation with state and federal agencies. The Navy is expected to develop this plan under their best management practices in the future. The environmental assessment provides an overview of the potential environmental effects from the demonstration. This analysis will be useful for future NEPA analysis. However, the military base location makes this a unique site with a streamlined approach to permitting and very positive state cooperation.

3.3 Makah Bay Pilot Offshore Power Plant ---- AquaEnergy Group

The AquaEnergy Group from Mercer Island, WA developed the AquaBUoy technology from two former Swedish models: the Inter-Project Services (IPS) tail-tube point absorber and the hose-pump. The wave energy technology has a diameter of six meters. It generates electricity by converting wave energy into high pressure water flow to run a turbine. The technology is a closed loop hydraulic system. Each buoy has an individual capacity ranging from 80 to 250 kW.

The project will be an array of four buoys that will be moored to concrete anchors. The buoys will occupy an array that is 625 feet long and 450 feet wide. They require water depth greater than 250 feet to generate electricity. The AquaBUoy closest to the shore will be used as a central point for collection of the electricity generated. The project will be located approximately 3.2 nautical miles west from Hobuck Beach in Makah Bay, Clallam County, Washington. A 15' by 15' interconnection station located near a 12 kV distribution line of the Clallam County Public Utility District will be used to distribute the power. The Clallam County Public Utility district and the Northwest Energy Innovation center are supporting the demonstration of AquaEnergy's technology off the coast of Washington state for a combined capacity of 1 MW³¹.



Figure 3. AquaEnergy Wave Power Conversion Device

Between April and August, 2002, AquaEnergy submitted preliminary state applications to the US Coast Guard and Army Corps of Engineers, NOAA and the Olympic Coast National Marine Sanctuary to conduct marine research in Makah Bay from September 2002 to March 2003. The temporary permits were issued. As part of their process to involve the public, AquaEnergy sent letters out to affected groups to invite their participation. This solicitation process led to a FERC determination that they had jurisdiction over the project because it is a “water-powered project”, inclusive of their definition of “power house” under the Federal Powers Act, and their jurisdiction would include navigable waters out to 12 nm (territorial seas). In addition, since cable landfall goes through the Makah Indian Nation, FERC indicated that this would be considered federal lands³².

This decision changed the game for wave power demonstration projects. AquaEnergy filed a request for a re-hearing and challenged the Director’s and full Commission decisions. AquaEnergy was denied a re-hearing for this decision in February 2003 and subsequently they filed a request to use the ALP in July 2003. Their request was approved expeditiously in September 2003. The ALP enables the developer to prepare scoping and the NEPA document (in this case an EA) at the same time thereby keeping the process collaborative. As part of the

requirements for a FERC license, a Communications Protocol was prepared that outlines how the developer will communicate with interested parties during the process.

An Interagency Scoping document was drafted and circulated to regulatory agencies on the state and federal level and other interested parties in August 2003³³. The agencies outlined their concerns and comments on the approach the developer will use to assess the potential environmental impacts of their demonstration. A revised Scoping Document #2 was issued in February 2004, following three public hearings in August 2003, and more than seven comment letters from interested parties. During this process, there have been a few problems with staff turnover creating some inconsistency in how the studies and concerns will be addressed. These problems are common with federal agency approvals and create additional delays because of evolving opinions from a single agency or delays in reviewing materials promptly.

This project also presents some special circumstances because of the location of the project in a Marine Sanctuary. This brings in NOAA jurisdiction to issue a Permit for operating within the Olympic Coast National Marine Sanctuary from the regional office in Port Angeles, Washington. Given the strict regulations of a marine sanctuary, the developer is required to conduct various surveys to assess the potential impacts, including:

- Seafloor and vegetation mapping, including bathymetric and side-scan sonar surveys
- Field work on marine mammal migration
- Assessment of the cable installation and routing
- Study of sedimentation environmental and transport rates

The company completed its ocean floor survey and is beginning its marine research, cable routing analysis and a geo-physical survey. The Washington State Department of Ecology and Washington Department of Fish and Wildlife may require a Biological Assessment for fish species and the scope of this study has not been decided yet.

After 2 ½ years, the developer still has some major milestones to get licensing approval from FERC and state approvals including:

- Completing environmental field studies
- Continuing agency and other interested parties coordination process
- Preparing the Applicant-prepared EA and submitting a complete FERC application
- Coordinating with FERC for a Final EA, including issuing a Staff-EA and providing for 30-45 day comment periods for review
- Obtaining the Commission Order for a license, and
- Obtaining FERC approval for a power supply contract under FPA Part II

According to FERC, once the Applicant EA is submitted, the process may still take 12-18 months because of the iterative review process with other government and non-governmental agencies. AquaEnergy is still expecting to be operational by 2006.

3.4 GreenWave Rhode Island ---- Energetech

Energetech America, the Connecticut based affiliate of Energetech in Australia, developed its wave energy system in the early nineties. The system is a shoreline device requiring water depths of up to 50 meters to concentrate ocean waves’ energy on its parabolic walls. The waves in constant motion rush air into an oscillating water column (OWC) that includes a narrowing chamber that increases the pressure of the air delivered to a turbine. The turbine powers a generator placed above water level that produces electricity distributed through cables under the seabed. The structure is made of steel. It weighs 450 tons and is approximately 40 feet high, 100 feet long and 120 feet wide. It rests on pads on the ocean and is moored by cables to pilings in the seabed.

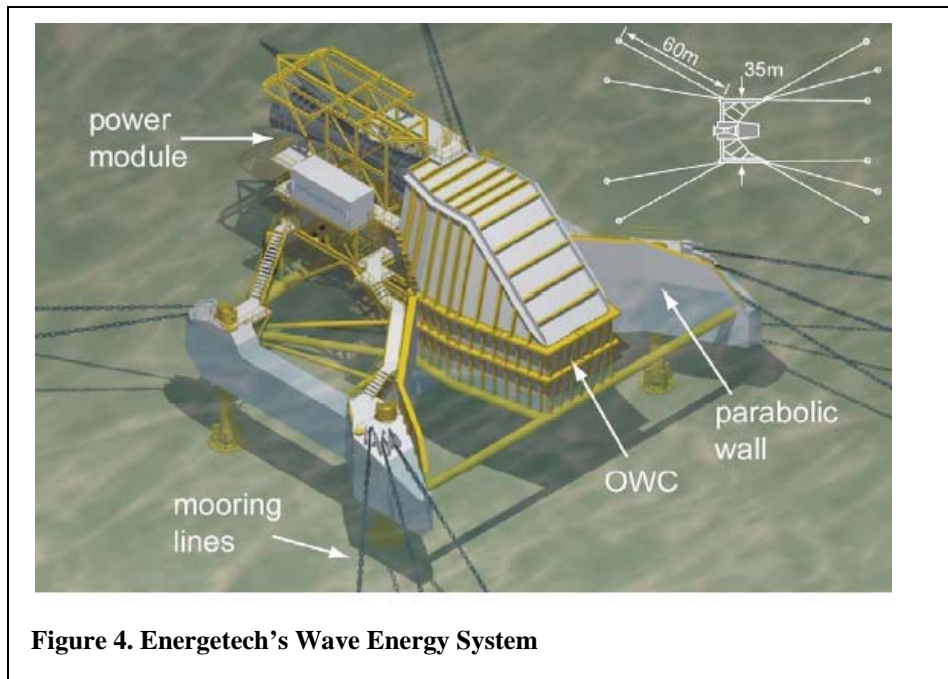


Figure 4. Energetech’s Wave Energy System

“The current guyed tower design, for Energetech’s forthcoming Port Kembla wave energy plant, utilizes an asymmetric mooring arrangement with 6 forward mooring legs and 4 rear mooring legs in approximately 10m mean water depth. The structure is supported vertically on 4 mooring legs that are pinned to the structure and the seabed. This guyed mooring arrangement is expected to be economic for water depths from 5m to 50m. Variations within this concept may include the number and make-up of the mooring legs (e.g., use of wire or fiber moorings), the use of alternative anchor points (e.g., driven piles, suction anchors, drag anchors, gravity blocks etc) and the number & location of vertical supports. Alternative fully moored concepts also being developed and these will be suitable for water depths from 20m upwards. Unlike freely floating devices, this device is dependent on local site conditions such as ocean floor properties and water depth and we expect that each site will require customization of the mooring.³⁴”

The wave energy system can be built as part of a coastal structure and results in low maintenance costs due to its accessibility. The project is expected to produce 500 kW of electricity.

Rhode Island's Energy funds contributed \$100,000 for the University of Rhode Island to participate in the research and development of the project. The university is currently conducting detailed wave analysis and underwater surveying studies through its graduate school of oceanography and department of ocean engineering. The renewable energy funds of Massachusetts (\$650K) and Connecticut (\$250K equity investment) provided funding to support this demonstration. Though the developer targeted significant resources from state clean energy funds, they still have major challenges ahead with the state and federal government permit process. Clearly without the expectation of an approval, the company will not be able to secure funding for the next steps.

In 2003, the developer submitted a "preliminary determination application" to the RI Coastal Resource Management Council (CRMC). The developer originally proposed the demonstration on a breakwater, but the state was opposed to this site. Thereafter the developer moved the proposed location a couple of hundred meters within the same Point Judith, RI area. This was also the year the FERC determined they had jurisdiction over wave power projects with the AquaBuoy demonstration discussed above.

At this point, it is not clear which permits/licenses will be required. The state agencies such as the RI CRMC and the RI Department of Environmental Management (DEM), the USACOE New England District and FERC are the primary government players. Based upon preliminary interviews, it is not clear how these agencies will collaborate and lead the process. The state's CRMC has a proven interagency process in place to coordinate with multiple agencies. Energetech has also begun the stakeholder process by sending out 120 letters to interested parties and meeting with them. The developer has hired a law firm to navigate them through this process and they are expecting to file for a FERC Alternative Licensing Procedure (ALP). The next steps involve:

- Convening stakeholder meetings
- Developing a Communications Protocol
- Determining interagency roles - CRMC, DEM, USACOE
- Filing relevant documents with FERC

The CRMC responsibilities involve a Coastal Zone Management consistency review determination and a separate Assent. There are two pathways for this Assent --- One (A) Assent involves an Environmental Permit with only an Administrative review whereas the other (B) Assent occurs because the project triggers the approval of the Council and a public hearing. This Council meets 2 times per month to review these cases. It is not clear which Assent will be applied to the Energetech demonstration.

The RI DEM may also get involved in the approval of this demonstration project by issuing a Water Quality Certificate under the Clean Water Act (Section 401) because of potential eel grass impacts from installation. There are not expected to be any dredging issues with this demonstration, but the state agency is questioning the definition of fill material because of the large size of the parabolic walls. The state Division of Marine Fisheries will also review the project application for potential impact to fisheries.

The state agency officials involved with this demonstration are not familiar with this technology. They may be wary of the size of the parabolic walls and the potential impact from the mooring lines. The footprint may trigger additional state reviews because there is not enough current information about potential marine impacts. Uncertainty with the state or federal agencies may lead to unforeseen delays and additional survey work for the developer to determine the scope of the potential effects on the marine environment.

The company projected that “permits” would be issued by fall 2005, project manufacturing would begin in late 2005 and they would operate for three years starting in 2006. This appears very optimistic in light of the fact that a FERC application has not been filed, the scoping document not drafted, and it is the first pilot project in Rhode Island.

4. Summary

Each of the three demonstration projects has a unique story and special circumstances. The OPT demonstration in Hawaii is the best example of how a developer could expedite a demonstration, but it may not be replicable. ONR streamlined the permitting process, provided financial assistance, through Congressional Appropriations, a private consulting company conducted a thorough NEPA analysis with federal funds, the power is not hooked up to a public grid, and the Navy supported the project in order to bolster national energy security of the military base with this independent domestic resource. Also the EA may provide useful environmental data and analysis for other NEPA documents.

The AquaEnergy experience has clearly forced the hand of FERC in “claiming” jurisdiction over wave energy projects in the ocean out to 12nm. This 30-50 year license, designed for complex hydroelectric projects, appears unsuitable for the temporary operating permits needed for a demonstration site. How the developers reconcile these convoluted regulatory requirements with the pressures of testing and lining up investors is unknown. The developers have had very positive and early involvement of stakeholders with considerable community support. Additional marine studies and permits are needed, however, because of their location in a Marine Sanctuary and on Tribal Lands. Clearly, the FERC licensing process is a significant barrier to demonstrating wave power in the US. The AquaEnergy Group demonstration in Washington is the guinea pig of wave power on the west coast as they are pioneers in seeking a FERC license under the ALP.

The regulatory pathway for the Energetech demonstration is behind the others and it is still not clear how the experience with AquaEnergy will affect their regulatory strategy on the east coast. There is hope that the experience on the West coast will assist the legal team in navigating their way through the regulatory maze. Clearly, they know that FERC is the lead agency and they will be filing to use the ALP. It is not clear whether this New England state will streamline the permitting process for wave power because of ocean use conflicts with various stakeholders, limited sites, and the perceived impacts on the marine environment. Clearly, Energetech will be a pioneer in permitting wave projects in New England. In addition, there may be political sensitivities from the Cape Wind offshore wind project located in Nantucket Sound, in their neighboring state of Massachusetts. This project has a very vocal opposition, raised questions

relating to a private use of a public resource as well as the adequacy of the regulatory regime to manage ocean energy projects.

4.1 Lessons Learned from Offshore Wind Policies

As mentioned in the introduction to this report, experiences from the offshore wind industry are relevant to future planning and permitting requirements for wave energy, though the jurisdictional issues and the lead agencies may be different. It is expected that ocean jurisdiction issues and environmental standards and regulations for offshore wind energy may, in many cases, provide some insight to demonstrating wave projects.

- Everyone is a pioneer --- the first two projects are setting the regulatory pathway for the next
- The market is significantly influenced by government policy, but a private developer and a municipal utility are attempting to deploy technologies before national policies are in place. The production tax credit is the only national policy influencing these developments.
- Jurisdictional issues are unresolved, but projects are proceeding
- Permitting and NEPA compliance are costly and time consuming, but it allows for public involvement.
- In the case of the Cape Wind project, 17 public agencies are involved in the scoping and review of the 3800 page NEPA document and two lawsuits from project opponents have been unsuccessful.
- Environmental risks are unknown to regulators and they err on the side of needing more and more information, even though there is a significant body of work accomplished in Europe
- Appropriate and practical alternative sites need to be considered early on, with the support of state politicians, to avoid sensitive habitats and communities
- Cable installation and landfall raises state and local jurisdictional issues
- Future developments will be clustered and this raises cumulative impact issues which are unknown at this time
- Current permitting and jurisdictional issues present a formidable barrier to the deployment of small, short-duration demonstrations of offshore wind turbines

4.2 Strategic Considerations

The emerging wave power industry is a nascent ocean energy industry that is challenging the extent of our legal and jurisdictional interpretation of ocean energy projects. Since there is not a national energy policy that specifically includes the development and demonstration of wave power technologies in the US, the current developers will be subjected to an uncertain regulatory regime for the foreseeable future. The paucity of data on environmental risks presents another barrier to development. Uncertain marine science information typically leads regulators to request more extensive field information. At this point, no serious marine effects have been associated with this new technology, but the developers will have a long road proving this without any methodical governmental research program. This has been the same experience in the offshore wind industry in the US. Below some strategic considerations are outlined that highlight some suggested steps to streamline and better define the regulatory pathway for future wave power demonstration projects.

- Clarify federal jurisdictions and develop creative solutions for streamlining federal legislation, particularly for small short-term feasibility demonstration projects:
 - Understand the extent of the Memorandum of Understanding between FERC and the USACOE to jointly approve a demonstration. FERC may entertain a proposal from developers to file a petition with FERC for a “Declaratory Order”³⁵ under their regulations and request an exemption from a FERC license for a period of time that would cover the demonstration. FERC would then transfer jurisdiction to another agency, such as USACOE for the test period. This may save time and money, but it has not been tested to date. Perhaps an informal workshop between the developers, FERC and selected legal counsel would assess the feasibility of this option.
- Educate federal and state regulators
 - Disseminate existing information from European studies and the OPT demonstration in Hawaii to provide regulators with a better foundation for interpreting potential environmental impacts from wave power demonstrations and a sliding scale of marine studies necessary to meet state and federal standards. Perhaps a technical tutorial for regulators would transfer this knowledge and thereby influence the extent of future requirements.
- A national policy is needed to integrate our legal approach to wave power and offshore wind projects. The following issues would be central to developing this policy:
 - Identifying “zones” of development that exclude sensitive marine habitats and mitigate potential conflicts of use
 - Address the public trust issues of seabed ownership, ensuring the public receives a fair return from the use of the ocean
 - Ensure that development rights are allocated through a transparent process that takes into account state, local and stakeholder concerns.
 - Identify an ocean test site, possible on federal property, which would assist developers in demonstrating their technologies without a long lead time for approvals.

Appendix A: FERC ALP Process³⁶

1. Send letter to all potential affected entities (governmental and non-governmental entities) inviting participation in the ALP. FERC will give public notice in the Federal Register of the filing by an applicant to use the ALP.
2. Form group based upon affirmative responses to letter (response to letter requested within fourteen days).
3. Develop consensus among stakeholders to use ALP and convene a “Collaborative Group” that will establish a Communications Protocol. The applicant submits a Communications Protocol supported by interested parties, governing the type and frequency of communication, and indicating where public documents will be located.
4. Parallel track pre-application meetings with relevant state agencies and other federal agencies to parallel track permitting with FERC and to obtain regulatory approval of joint application process and commitment of interagency cooperation in application reviews under NEPA and agency-specific guidelines.
5. Simultaneously file with FERC the Notice of Intent, Pre-Application Document (PAD), Communications Protocol, Request for Approval to use ALP. Also file with relevant state and federal agencies plus any additional information and documentation requested by these agencies for pre-application/application review.
 - Request to Use ALP – Drafted by Applicant. Sets out reasons why ALP is warranted and that the stakeholders support using ALP.
 - Communications Protocol – Drafted by the developer. Sets out how the developer will communicate with interested parties during the permitting process.
 - Notice of Intent – Drafted by the developer. Notice to be published by FERC in the Federal Register inviting comment on the request to use ALP.
 - PAD – Drafted by the developer. This document is the preliminary joint application and is developed from existing information, such as project design and location, preliminary list of environmental issues and the potential impacts of the project proposal. It must include (but not limited to) the following:
 - (I) Process plan and schedule for all pre-application activities. This should include the time frames for pre-filing consultation, information gathering, and conducting studies. The plan should also include the proposal location, and date of the scoping meeting and site visit.

- (ii) Project location, facilities and operations (including names, business address, and phone numbers for each person authorized to act as an agent); detailed maps of all relevant lands and waters.
 - (iii) Detailed description of all existing and proposed project facilities and components.
 - (iv) Description of existing environment and impacts with respect to geology and soils resources; water resources; fish and aquatic resources; wildlife and botanical resources; wetlands, riparian and littoral habitat; rare, threatened and endangered species; recreation and land use; aesthetic resources; cultural resources; socioeconomic resources; tribal resources; and a river basin description.
 - (v) Preliminary issues and studies list.
 - (vi) Summary of contacts.
 - (vii) Any other information and documentation requested by FERC, USACOE or state agencies. This process will identify all other federal governmental agencies that wish to comment upon the project (e.g., NOAA).
6. Perform scoping of environmental issues under NEPA and individual agency guidelines. This process includes solicitation of comments from the stakeholders with written comments and a public notice for an informational NEPA scoping meeting with all interested parties.
7. Based upon feedback from scoping, a draft Environmental Assessment (EA) is prepared and filed by the developer with FERC and other state and federal agencies for possible parallel reviews. A revised Application is submitted to FERC and other respective agencies, based upon the findings of the draft EA. This developer-prepared document is the formal “FERC Application.” The complete Application is reviewed for adequacy by FERC. The “FERC Application” must contain:
- (i) Minimum content requirements under 18 CFR 4.38; 18 CFR 4.41, 4.51, or 4.61 and 16.10.
 - (ii) Complete protection, mitigation and enhancement proposals.
 - (iii) Evidence of completion of pre-filing consultation.
 - (iv) A demonstration of compliance and request for a Permit, if appropriate, under the regulatory programs for the Clean Water Act, as well as section 401 certification requirements.
 - (vi) The Draft EA.

8. The FERC Application is accepted via formal letter of acceptance by FERC. If it is rejected, the applicant may be given 90 days to cure the deficiencies. State agencies will review in parallel.
9. If accepted, FERC provides public notice, inviting protests or interventions. Protests or interventions must be done within 60 days.
10. Assuming agreement between FERC and all other interested parties and agencies having regulatory jurisdiction over the project, FERC prepares its environmental and engineering analysis of the proposal and any alternatives to the proposal with input from these agencies.
11. FERC issues a Final Environmental Assessment. If the Commission finds that the wave project will not have a significant effect on the human environment, then a “Finding of No Significant Impact” is issued and no further NEPA documentation (i.e., EIS) is required.
12. Assuming the Final Environmental Assessment is issued, FERC issues a licensing order. Other state agencies requirements may be a condition for this license and they get incorporated into the document as licensing conditions and/or mitigations. FERC cannot dispute these conditions unless it is in the public interest and has the option of denying the license.



Appendix B: Selected Interviews

Federal and State Agency Contacts

Tom Dean, FERC, Headquarters

Nick Jayjack , fisheries biologist, FERC Headquarters

Carol Bernthal, Superintendent, Olympic Coast National Marine Sanctuary, NOAA

John Moskal, Environmental Protection Agency, New England Region

Ron Gagnon , Rhode Island Department of Environmental Management

Project Contacts:

Alla Weinstein, AquaEnergy Group

Mary Jane Parker, AquaEnergy Group

Carolyn Elefant, Law Offices of Carolyn Elefant

Cynthia Rudge, Project Manager, Energetech

Craig Eaton, Attorney, Adler, Pollack and Sheehan P.C.

Suzanne Baba, Office of Naval Research

Leslie Matsumoto, Belt Collins, EA preparer, OPT, Hawaii

Endnotes

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- ¹ Offshore Wave Feasibility Demonstration Project, Statement of Work, Schedule and Budget, Phase IA – Concept Level Project/System Definition, December 19, 2003, Prepared by Roger Bedard
- ² See Appendix B for a list of people interviewed.
- ³ Highly recommend the European Thematic Network On Wave Energy, Section E, Social Planning and Environmental Impact, and the Wave Dragon article by Soerenson, et. al, December 2000, See: <http://www.wave-energy.net>
- ⁴ National Energy Policy, White House, May 2001.
- ⁵ The Clean Energy Funds in Rhode Island, Massachusetts and Connecticut are supporting wave power.
- ⁶ EPRI's project has included feasibility studies in selected states, including Oregon, Maine, California, Hawaii, Massachusetts, and Washington.
- ⁷ UNCLOS contains a legal framework covering navigation, maritime boundaries, fisheries, the marine environmental, etc. Since 1994, 138 nations have joined this Convention.
- ⁸ See http://www.oceancommission.gov/documents/prepub_report/primer.pdf
- ⁹ A nautical mile is approximately 6076 feet.
- ¹⁰ [Ocean Thermal Energy Conversion Act](#) (42 U.S.C. sec. 9101); [Coastal Zone Management Act \(CZMA\)](#) (16 U.S.C. sec. 1451); [Outer Continental Shelf Lands Act \(OCSLA\)](#) (43 U.S.C. sec. 1337-1356); [Submerged Lands Act \(SLA\)](#) (43 U.S.C. sec. 1331-1334); [Rivers and Harbor Act, Section 10](#) (33 U.S.C. sec. 401); [Section 404 Dredge and Fill Permit](#) (33 U.S.C. sec. 1344); [Federal Power Act](#) (16 U.S.C. sec. 796 et. seq.), and National Environmental Policy Act <http://ceq.eh.doe.gov/nepa/regs/nepa/nepaeqia.htm>
- ¹¹ See Cape Wind legal cases <http://www.his.com/~israel/loce/corp819.pdf> <http://www.his.com/~israel/loce/corp918.pdf>
- ¹² Much of the legal information in this section is courtesy of the documentation and analysis from the landmark Ocean Energy Resources website from the Law Offices of Carolyn Elefant. See <http://www.his.com/~israel/loce/ocean.html>
- ¹³ See <http://www.csc.noaa.gov/opis/html/summary/otec.htm> for a summary of OTEC (42 U.S.C. Section 9111). NOAA withdrew their regulations governing OTEC licenses due to lack of interest in 1996. Interestingly, the OTEC regulations allowed for demonstration projects and non-permanent test platforms. The application fee was \$250,000!
- ¹⁴ Recently, this proposal was documented in the US Ocean Action Plan, December 17, 2004, page 24. This document was a White House response to the US Ocean Commission Report released earlier this year.
- ¹⁵ See 43 U.S.C. section 403: "It shall not be lawful to build or commence the building of any wharf, pier...or other infrastructure in any port, roadstead...or other water of the US except on plans recommended by the Chief of Engineers and authorization by the Secretary of the Army."
- ¹⁶ "...it shall be unlawful for any person...for the purpose of developing electric power, to construct, operate or maintain any dam...reservoir, power house or other works...across navigable e waters of the US or upon any part of public lands or reservations of the US...except in accordance with a license...[issued by FERC].
- ¹⁷ In most cases, small developers obtain certification as a "qualifying facility" (QF) or "exempt wholesale generator" (EWG) to avoid regulation as a utility or in some cases, obtain more favorable rate treatment. FERC also has jurisdiction over sales by a developer to a utility which are known as "wholesale sales." In most cases, wholesale rates established in a contract between the supplier and purchaser and are then submitted for review to FERC to ensure that rates are "just and reasonable." Retail sales, i.e., sales directly to the end user are regulated by the state utility commissions. Interconnection with the utility means that the demo project has to get in the queue with all other new users of the lines. (Reference: Law Office of Carolyn Elefant).
- ¹⁸ See <http://www.ferc.gov/legal/court-cases/pend-case.asp> and scroll down to the AquaEnergy Group.
- ¹⁹ For a general flow diagram, see www.ferc.gov/help/processes/flow/hydro-4.asp
- ²⁰ Interagency Task Force on Improving Hydroelectric Licensing Processes, "Guidelines to Consider for Participating in the Alternative Licensing Process," December 8, 2000.
- ²¹ 42 U.S.C. 4321 *et seq.*
- ²² <http://www.sanctuaries.noaa.gov/natprogram/nplegislation/NMSA.pdf>
- ²³ See section (f) (1), license applications http://a257.g.akamaitech.net/7/257/2422/12feb20041500/edocket.access.gpo.gov/cfr_2004/julqtr/pdf/33cfr221.1.pdf
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- ²⁴ For a brief summary of specific laws see: <http://www.csc.noaa.gov/opis/html/legal.htm#BNDs>
- ²⁵ [Ocean Thermal Energy Conversion Act](#) (42 U.S.C. sec. 9101); [Coastal Zone Management Act \(CZMA\)](#) (16 U.S.C. sec. 1451); [Outer Continental Shelf Lands Act \(OCSLA\)](#) (43 U.S.C. sec. 1337-1356); [Submerged Lands Act \(SLA\)](#) (43 U.S.C. sec. 1331-1334); [Rivers and Harbor Act, Section 10](#) (33 U.S.C. sec. 401); [Section 404 Dredge and Fill Permit](#) (33 U.S.C. sec. 1344); [Federal Power Act](#) (16 U.S.C. sec. 796 et. seq.), and National Environmental Policy Act <http://ceq.eh.doe.gov/nepa/regs/nepa/nepaeqia.htm>
- ²⁶ Mead, Jane, "Permitting Wave Energy Projects in the Massachusetts Coastal Zone, MA Office of Coastal Zone Management (no date).
- ²⁷ See Appendix B
- ²⁸ The series can be obtained from <http://www.e2i.org/e2i/wavepower/wavepower.html>
- ²⁹ <http://www.oceanpowertechnologies.com/technology> ; <http://www.aquaenergygroup.com/home.htm>; <http://www.energetech.com.au>
- ³⁰ Some of the technical material is from the NEPA document for this project: Department of the Navy, Environmental Assessment for the Proposed Wave Energy Technology Project, Marine Corps Base, Hawaii, Kaneohe Bay, HI, January 2003.
- ³¹ Makah Bay Offshore Wave Energy Pilot Power Plant Project Description, AquaEnergy Group, Revision A, October 5 2002.
- ³² Indian Lands are actually sovereign territory and not federal lands.
- ³³ The Official record can be viewed at <http://www.ferc.gov/docs-filing/elibrary.asp>
- ³⁴ Offshore Wave Energy Conversion Devices, E2I EPRI Assessment, June 16 2004.
- ³⁵ FERC Regulations on a Declaration of Intent - 18 CFR 24.1. See http://a257.g.akamaitech.net/7/257/2422/12feb20041500/edocket.access.gpo.gov/cfr_2004/aprqr/pdf/18cfr24.1.pdf
- ³⁶ The explanation of these steps are adapted from an original document from Craig L. Eaton, Attorney with Adler, Pollack & Sheehan PC working with Energetech