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Issues Affecting Tidal, Wave, and In-Stream Generation Projects

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Summary

The development technology that generates electricity from ocean waves, tides, and river currents is still in its infancy. However, Congress has provided some policy guidance on these energy sources through the Energy Policy Act of 2005 (EPACT05; P.L. 109-58). The act addresses this area of energy innovation by clarifying federal jurisdiction over, and encouraging the development of, these alternative energy sources. The act contains provisions for assessment of and reports on renewable energy resources by the Department of Energy; production incentives for renewable energy production; benchmarks for renewable energy purchases by federal facilities; and grants supporting rural electrification with preference given to renewable energy facilities. The act directs the Secretary of Energy to conduct research and development (R&D) programs for ocean energy, including wave energy and kinetic hydro generation projects, and amends the Outer Continental Shelf Lands Act to give authority to the Secretary of the Interior to grant leases on the Outer Continental Shelf (OCS) for the production of energy from sources other than oil and natural gas (while protecting existing authorities of other state or federal agencies).

This report provides an overview of developments and considerations regarding wave, tidal, and in-stream energy generation technology. It summarizes federal involvement in the regulation of this new industry and highlights current issues in the field. Because the development and application of these technologies are in the pre-commercial stage, the regulatory requirements governing their implementation are not always clear. To some, there is uncertainty regarding which federal agency most appropriately has jurisdiction over these projects and the regulatory processes that are necessary to ensure resource protection and adequate oversight while encouraging the development of a new energy source seen to have promise.

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Renewable energy technologies will continue to gain importance in the national energy portfolio as long as the public and Congress remain concerned about the long-term availability of affordable oil, gas, and coal supplies and the potential environmental impacts from power generation through traditional thermal, nuclear, and large hydropower projects.

The renewable energy technologies that produce electricity from waves, tides, and river currents are still in the experimental stage, and utility-scale generation projects are not yet in place. However, the energy generation potential from these sources has been recognized in recent legislation. The Energy Policy Act of 2005 (EPACT05; P.L. 109-58) clarifies federal jurisdiction over, and encourages the development of, these alternative energy sources. Title II of the act contains provisions for assessment of and reports on renewable energy resources by the Department of Energy; production incentives for renewable energy production; benchmarks for renewable energy purchases by federal facilities; and grants supporting rural electrification with preference given to renewable energy facilities. EPACT05 §931 directs the Secretary of Energy to conduct research and development (R&D) programs for ocean energy, including wave energy and kinetic hydro generation projects, and §388 amends §8 of the Outer Continental Shelf Lands Act (43 U.S.C. §1337) to grant authority to the Secretary of the Interior to grant leases on the Outer Continental Shelf (OCS) for the production of energy from sources other than oil and natural gas. Further, under P.L. 110-140, the Congress authorized $50 million annually from FY2008 through FY2012 for the creation of a national ocean energy research center.

Because the development and application of these technologies are in their infancy, the regulatory requirements governing their implementation are not always clear. To some, there is uncertainty regarding which federal agency most appropriately has jurisdiction over these projects and the regulatory processes that are necessary to ensure resource protection and adequate oversight while encouraging the development of a new energy source seen to have promise.[1]

The federal policy issues that may arise for entities interested in developing wave, tidal, or river current generation projects center on agency jurisdiction and authority, regulatory processes (related to agency jurisdiction), and applicable

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[1] In a presentation titled *Overview: EPRI Ocean Energy Program,* the Electric Power Research Institute estimates that the total U.S. wave energy resource is approximately 2,100 tera-watt hours annually (one tera-watt hour is one trillion watts produced over one hour), or roughly 1/6 of the country's annual energy requirement. See [http://www.epri.com/oceanenergy/oceanenergy.html].

legislation.[2] The location of a project — offshore, near-shore, or in an estuary or river — determines which federal agency is responsible for its oversight. The agency with ultimate responsibility will, in turn, determine what type of process applies. Finally, a number of federal statutes may apply to a potential energy installation, depending on its type, location, and the agency with jurisdiction.

Background

Energy Sources and Technologies

For each type of energy resource, a number of specific generator designs have been considered and, as the technology is further developed, new engineering solutions may be devised to generate power with the energy of moving water or waves. Rather than provide great detail on specific mechanical designs, this discussion of technology will focus on the broad categories of renewable ocean and river power generation currently under development.

River Flow. Hydroelectric dams — the most familiar waterpower technology — have been a source of energy for centuries, but they have costs due to the changes they create in river flow patterns.[3] However, kinetic, or free-flow, turbines do not rely on the differential height of water on either side of an impoundment to generate electricity, but instead use the force of moving water to spin turbine blades.[4] River currents may be harnessed as a power source with new turbine technologies similar to those identified below for tidal power generation.

Tidal Flow. Tidal generation uses the energy of moving water to spin a generator and may produce power from water moving in two directions: inward on the flood tide and outward on the ebb tide. Tidal power technology projects fall into two broad categories: barrage projects and in-stream generators. Barrage generation is similar to the construction of a traditional hydropower dam in that an impoundment is built across a river estuary or other area subject to tidal flow and electricity is generated by the difference of water height on either side of the barrier, depending on whether the tide is flowing in or out. In-stream projects do not impound water but instead use the energy of the tidal current to spin a turbine.[5]

Tidal resources are modest overall in the United States, although significant potential exists in some areas, such as New England, northern California, and the

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[2] CRS Report RL32658, *Wind Energy: Offshore Permitting*, by Adam Vann, provides additional detail on regulatory issues related to energy development in the ocean.

[3] See [http://www.idsnet.org/Resources/Dams/Development/impact-enviro.html].

[4] Edison Electric Institute, *Kinetic Energy Turbines.* See [http://www.eei.org/industry_issues/energy_infrastructure/fuel_diversity/hydro/index.htm].

[5] See [http://www.eere.energy.gov/consumer/renewable_energy/ocean/index.cfm/mytopic=50008].

Pacific Northwest. Where feasible, tidal generators have the benefit of great predictability, as tides can be calculated years in advance.[6]

Waves. Wave energy technologies generate electricity from the undulating motion of the ocean's waves.[7] The power in the moving wave may drive a turbine or other device directly or it may pressurize air or hydraulic fluid to power a generator. Waves contain more energy than other renewable energy sources like solar radiation. Wave size is predictable many hours or even days in advance. The United States has considerable wave energy potential, and wave energy generators may minimize aesthetic issues by being located far from shore, underwater, or protruding only slightly above the surface of the sea.[8]

Ocean Thermal Energy Conversion (OTEC). OTEC systems rely on technology that uses the ocean's thermal gradient — the difference in temperature of water layers — to drive a generator. These systems require that the temperature between the warm surface water and the cold deep water differs by at least 36°F. Under these circumstances, an OTEC system can produce electric power. The requirement for this temperature differential limits OTEC systems largely to tropical zones. Ocean temperature differentials in the Pacific Northwest, for example, range from 0° to 20° F.[9]

OTEC technology has been demonstrated at the Natural Energy Laboratory of Hawaii (NELHA), at Keahole Point on the Kona coast of the island of Hawaii. It has become the world's foremost OTEC laboratory and test facility. Unlike the other technologies discussed, due in part to the limited number of suitable sites and the expense of the technology, OTEC systems have not been the focus of recent ocean energy proposals in the United States.[10]

Project Activities

Energy projects designed to harness the power of waves, tides, or river currents are being considered in a number of U.S. states. Wave energy is being explored in locations such as California, Oregon,[11] Hawaii, New Jersey,[12] Rhode Island,[13] and

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[6] EPRI, *Overview: EPRI Ocean Energy Program the Possibilities in California* (June 2006). See [http://www.epri.com/oceanenergy/attachments/ocean/briefing/June_22_OceanEnergy.pdf].

[7] See [http://www.eere.energy.gov/consumer/renewable_energy/ocean/index.cfm/mytopic=50009].

[8] EPRI, *Overview: EPRI Ocean Energy Program* (September 2006). See [http://www.epri.com/oceanenergy/oceanenergy.html].

[9] Northwest Power and Conservation Council, *Biennial Assessment of the Fifth Power Plan, Assessment of Other Generating Technologies* (November 2006), p. 6. See [http://www.nwcouncil.org/energy/Biennial/BiennialOther%20gen.pdf].

[10] See [http://www.eere.energy.gov/consumer/renewable_energy/ocean/index.cfm/mytopic=50010].

[11] U.S. Dept. of Energy, Energy Efficiency and Renewable Energy (EERE), *California and*
(continued...)

Washington.[14] Tidal power generation is being considered by California,[15] Maine,[16] and Washington, and a prototype project has been deployed in New York's East River.[17] Finally, in-stream energy projects are being evaluated in the Mississippi River and other locations such as Alaska.[18]

Congressional Action

The 109th Congress considered legislation to authorize funding for guaranteed loans to be used for clean energy generation, including ocean energy sources (H.R. 2828), and to allow revenues from OCS leases to fund ocean energy development (H.R. 4761). Neither of these measures was enacted. As introduced, H.R. 4241 would have, in part, authorized funding for mitigation of environmental impacts from the development of alternative energy sources, including those from the ocean. The bill was enacted (P.L. 109-171) but without this provision in the final version. During the development of EPACT05, an income tax credit for wave, tidal, river current, and OTEC was approved by the Senate but later dropped in conference committee.[19] EPACT05 does address wave, tidal, and in-stream energy directly or indirectly in a number of ways. Title II of the act contains provisions for assessment of and reports on renewable energy resources by the Department of Energy; production incentives for renewable energy production; benchmarks for renewable energy purchases by federal facilities; and grants supporting rural electrification with preference given to renewable energy facilities.

Under the Energy Independence and Security Act of 2007 (P.L. 110-140), the 110th Congress has authorized $50 million annually from FY2008 through FY2012 for the creation of at least one national ocean energy research center. Congress has also approved funding for hydrokinetic energy development in FY2008

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[11] (...continued)
Oregon Pursue Tidal and Wave Energy Projects (October 18, 2006). See [http://www.eere.energy.gov/states/news_detail.cfm/news_id=10339].

[12] EERE, *New Wave Energy Prototypes Deployed in Hawaii and New Jersey* (November 23, 2005). See [http://www.eere.energy.gov/states/state_news_detail.cfm/news_id=9551/state=NJ].

[13] EERE, *Rhode Island Launches Wave Energy Pilot Project* (October 1, 2004). See [http://www.eere.energy.gov/states/news_detail.cfm/news_id=8628].

[14] See [http://finavera.com/wave/makah_bay].

[15] EERE, *California and Oregon Pursue Tidal and Wave Energy Projects* (October 18, 2006). See [http://www.eere.energy.gov/states/news_detail.cfm/news_id=10339].

[16] EERE, *Maine Assesses Tidal Power Potential* (June 2006). See [http://www.eere.energy.gov/state_energy_program/project_brief_detail.cfm/pb_id=1010].

[17] See [http://verdantpower.com/what-initiative].

[18] See [http://www.ferc.gov/industries/hydropower/indus-act/hydrokinetics/permits-issued.asp].

[19] Staff of the Joint Committee on Taxation, Description and Technical Explanation of the Conference Agreement of H.R. 6, Title XIII, the "Energy Incentives Act of 2005." JCX-60-05 (July 2005).

appropriations legislation. Under P.L. 110-161, approximately $10 million is provided for water power R&D, which includes hydrokinetic generation.

Incentives for Wave, Tidal, and In-Stream Projects

Legislation pertaining to several funding and tax incentive programs that would apply to energy projects using waves, tides, or river currents is mentioned above. Additionally, EPACT05 Title II authorizes production incentives for renewable energy production as well as grants supporting rural electrification with preference given to renewable energy facilities.

There are also state efforts to encourage the development of these projects. Florida has a renewable energy production tax credit that covers a number of energy sources including tidal energy, wave energy, and OTEC projects. The credit is $0.01/kilowatt-hour and the program is to continue through June 2010.[20] Similarly, Maine offers matching funds, up to $50,000, for some parties interested in developing renewable energy resources, including tidal power generation. New Jersey also has a program intended to recruit renewable energy industries to the state by competitively offering grants of up to $500,000 to applicants wishing to develop commercial renewable energy systems.[21]

Environmental Issues and Other Considerations

These technologies are appealing to some due to their renewable energy sources and emission-free operation. In contrast to hydroelectric dams, free-flow turbines do not impound water, divert flow, or prevent sediment transport. However, as the technologies develop — especially if their application grows to a commercial scale — there will be environmental issues to consider. These issues likely will include:

- Withdrawal of wave energy: converting some of a wave's power into electricity reduces wave height, which may alter the coastal or marine environment.
- Interactions with marine life: power plants may artificially provide resting space for seals and sea lions and nesting for sea birds, and may create artificial reefs below the surface; and devices with open spinning turbines may pose a hazard to fish or mammals.
- Air or water emissions: devices using hydraulic fluid may leak, releasing pollutants.
- Aesthetic concerns: there may be issues with the visual appearance of some devices, and some designs may produce noise that affects humans or marine life.
- Construction and decommissioning of facilities: habitats, structures on the sea bed, and sediment deposition may be affected by these activities.

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[20] More information on state incentives is at [http://www.dsireusa.org].

[21] Ibid.

- Project siting: can affect other uses like shipping, boating, and commercial and recreational fishing.[22]

Project Location

Offshore areas are subject to various federal and state authorities. Which federal agency has lead responsibility for regulatory oversight of a specific ocean or in-stream generation project depends on the location of the project. Depending on the specific locale, more than one state or federal agency may exercise jurisdiction. All ocean and inland waterway jurisdictions[23] are defined in reference to the following technical demarcations, illustrated in **Figure 1**.[24]

Baseline. This is the boundary line dividing the land from the ocean, and other waters are defined by their distance from the baseline in nautical miles (NM).[25] The baseline is defined as the mean low water line along the coast as shown on official U.S. nautical charts. It is drawn across the mouths of rivers and the entrances to bays, and along the outer points of complex coastlines. Bodies of water that are inland of the baseline, such as bays, estuaries, and rivers, are considered inland waterways.

State Waters. Generally, offshore state waters cover the area from the baseline out 3 NM, although it is to 9 NM for the offshore Gulf coasts of Texas and Florida, as well as Puerto Rico. This area of state jurisdiction was granted by the Submerged Lands Act of 1953 (43 U.S.C. §1301 et seq.). Although the federal government may regulate commerce, navigation, power generation, national defense, and international affairs within this area, states also have the authority to manage, develop, and lease resources throughout the water column as well as on and under the associated sea bed.[26]

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[22] EPRI, *Offshore Wave Power in the US: Environmental Issues*, E21 Global EPRI-007-US (December 2004). See [http://www.epri.com/oceanenergy/attachments/wave/reports/007_Wave_Envr_Issues_Rpt.pdf]. EPRI, *Overview: EPRI Ocean Energy Program* (September 2006). See [http://www.epri.com/oceanenergy/oceanenergy.html].

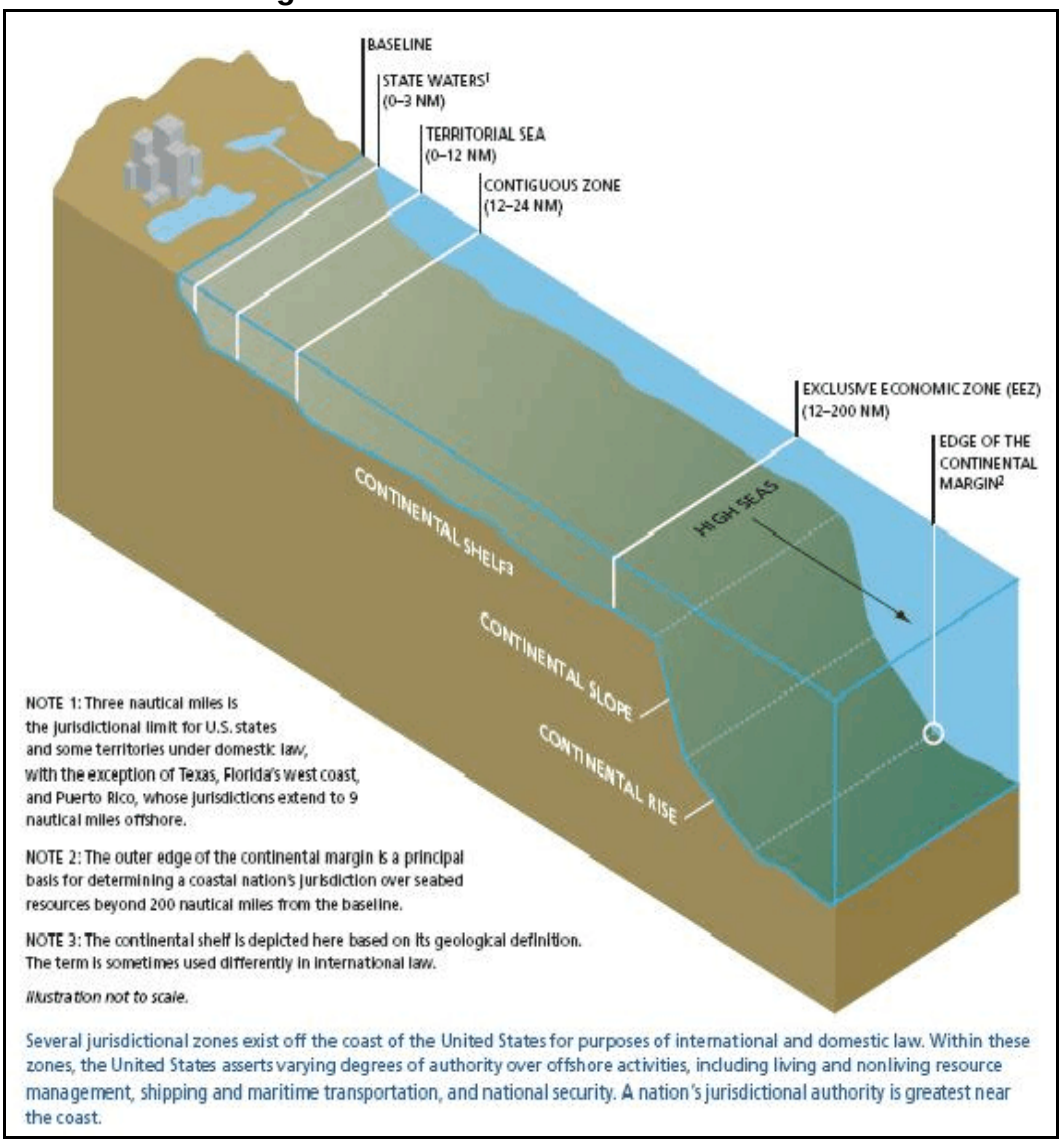
[23] For more detail on maritime boundaries, see CRS Report RL32912, *State-Federal Maritime Boundary Issues*, by Laura K. Welles, Aaron M. Flynn, and Eugene H. Buck.

[24] U.S. Commission on Ocean Policy, *Primer on Ocean Jurisdictions: Drawing Lines in the Water* (hereafter referred to as *Primer*). On December 19, 2004, the commission expired, as provided under the terms of the Oceans Act of 2000 (P.L. 106-256), as amended. However, the following website is to continue to be available as an archive of the commission's work: [http://www.oceancommission.gov/documents/full_color_rpt/03a_primer.pdf]. For the Minerals Management Service definition of Outer Continental Shelf, see [http://www.mms.gov/aboutmms/ocsdef.htm].

[25] A nautical mile is 1.15 statute miles.

[26] *Primer*, pp. 70-71.

Figure 1. Boundaries of Ocean Jurisdictions



Source: See [http://www.oceancommission.gov/documents/full_color_rpt/03a_primer.pdf].

Territorial Sea. Under international law,[27] every coastal nation has sovereign rights over the air space, water column, sea bed, and anything beneath it, within its territorial sea. In 1988, President Reagan proclaimed that the United States' territorial sea extended 12 nautical miles seaward from the baseline.[28]

Contiguous Zone. International law establishes a contiguous zone adjacent to a nation's territorial sea. The contiguous zone of the United States covers the area between 12 and 24 nautical miles off shore. Within this area a country has more

[27] United Nations Convention on the Law of the Sea (LOS). The United States is not a signatory to the Convention.

[28] Presidential Proclamation 5928 (54 *Fed. Reg.* 777, December 27, 1988).

limited authority that is generally related to customs, immigration, and sanitation laws.[29]

Exclusive Economic Zone. The exclusive economic zone (EEZ) is an area recognized under international law within which a nation has sovereign rights for exploiting, conserving, and managing living and nonliving resources within the water, or on or under the sea bed. In 1983, President Reagan proclaimed that the United States' EEZ extends to 200 nautical miles.[30]

Outer Continental Shelf. The federal government administers the outer continental shelf (OCS), which comprises the submerged lands, subsoil, and sea bed lying between the seaward extent of the states' jurisdiction and the seaward extent of federal jurisdiction. Typically, this is the area between three and 200 nautical miles.

Federal Agencies' Authorities and Federal Legislation

Depending on project type and location, a number of federal agencies may be involved in reviewing or permitting of a wave, tidal, or in-stream generation project. Federal laws may directly or indirectly affect a proposed ocean or in-stream energy project. Laws that protect fish and wildlife or regulate pollution or public safety will have a direct effect. Compliance with such laws will dictate what can or cannot be done, how a project can be operated, or where it may be located. Laws with an indirect effect could include a statute that has a broader influence on the project. For example, §388 of EPACT05 established the Department of the Interior's Minerals Management Service (MMS) as the lead federal agency with oversight for renewable energy project leasing on the OCS — thus changing the applicable regulatory process. EPACT05 §388 also makes clear that MMS authority does not supersede the authorities or responsibilities of other state or federal agencies. Many federal statutes define the oversight authority of specific agencies, although some statutes apply generally to federal actions. The authorities are listed below by agency alphabetically with cross-cutting federal authorities and state authorities at the end.

Corps of Engineers

The U.S. Army Corps of Engineers is responsible for a number of permitting activities in waterways and offshore areas. In this capacity, it may be involved in the development of an ocean or in-stream energy project. Specifically, the Corps regulates and issues permits for structures and work that affect navigable waters under §10 of the River and Harbors Act.[31] The Corps also issues permits for the discharge of dredge and fill material into navigable waters under §404 of the Clean

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[29] In 1999, through Presidential Proclamation 7912, President Clinton extended the outer boundary of the contiguous zone of the United States from 12 to 24 nautical miles (64 *Fed. Reg.* 48701, September 8, 1999).

[30] Presidential Proclamation 5030 (48 *Fed. Reg.* 10601, March 10, 1983).

[31] 33 U.S.C. §403.

Water Act (CWA).[32] Additionally, the Corps may be involved in water quality certification under §401 of the CWA, as described below.[33]

Clean Water Act, 33 U.S.C. §1251, et seq. The primary purpose of the CWA is to protect and restore the quality of the nation's surface water. Sections of this act that may be applicable to wave, tidal, and in-stream energy projects are described below.

§401 Water Quality Certificate. Applicants for a federal license to conduct an activity that might result in any discharge of a pollutant, including water that contains pollutants (a temperature change may be considered a pollutant), must obtain a water quality certificate from the state in which the project will be located, certifying that the project will comply with applicable state water quality standards. Some wave, tidal, or in-stream generation projects may be construed as discharging water, and so must comply with this regulation. Section 401 only applies to locations within three nautical miles of the coast.

§404 Dredge and Fill. This section of the CWA regulates the discharge of dredged or fill material into waters of the United States. The law requires a permit for the discharge of any such material. Permits are issued by the Corps, in consultation with and using environmental guidance issued by the Environmental Protection Agency (EPA). However this permit, too, is only applicable within the three nautical mile limit.

Rivers and Harbors Act, 33 U.S.C. §403. Section 10 of the Rivers and Harbors Act requires a permit issued by the Corps for any obstruction not authorized by Congress that would be built in the navigable waters of the United States. A project being constructed under a FERC license is exempt from this permit.[34] Projects which are exempt from FERC licensing — either through application for a standard exemption, or those experimental projects (such as the Verdant Power tidal energy project) that are granted a limited exemption — may need to apply for a §10 permit from the Corps.

Federal Energy Regulatory Commission (FERC)

FERC is the federal agency responsible for licensing non federal hydroelectric projects. The agency derives its authority to license hydropower projects under 16 U.S.C. §817 (1) of the Federal Power Act (FPA). This section of the act states that for the purpose of generating power, it is illegal to construct, operate, or maintain any dam, reservoir, powerhouse, or other works across, along, or in any of the navigable waters of the United States without a FERC-issued license.

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[32] 33 U.S.C. §1344.

[33] 33 U.S.C. §1341.

[34] Corps regulations state that issuance of a FERC license precludes the need for a §10 permit (33 C.F.R. §221.f.).

Preliminary Permits, Licensing, and Exemptions. FERC has three general administrative categories that may apply to a potential wave, tidal, or in-stream generation project. First, a proposed project may be issued a preliminary permit. This permit is not required prior to license application. A permit is valid for up to three years and gives the holder priority status if the holder chooses to apply for a license. That is, the permit reserves a project location for the applicant while the holder conducts feasibility studies and prepares a license application. It does not allow a demonstration project or any other construction, and the permit holder must file periodic reports on the progress of the feasibility studies.

The second category, licensing, refers to the traditional operating license associated with nonfederal hydropower projects. This is the regulatory document referenced in 16 U.S.C. §817 (1). Hydropower licenses typically are issued for up to 50 year periods and may require several years of pre-application analysis and review before submission of an application and issuance of a license.[35]

FERC has introduced two license modifications to hydrokinetic projects that aid project developers. The first is a pilot license process. The goal of the hydrokinetic pilot license is to eliminate barriers to development by reducing processing time to as little as six months, allowing installation of test equipment, and allowing power generation to the grid. The license requires that projects have a size of five megawatts or less, be easily removed or deactivated, and be installed for no longer than a five-year term. There are additional provisions for site decommissioning and project changes or equipment removal if unexpected environmental impacts arise.[36] The second license modification is a conditioned license. Unlike the pilot license program, this is a full project operating license which allows applicants to begin non-construction activities while some permitting processes — such as water quality certification — are still pending.[37] On March 20, 2008, FERC finalized the first license under this program for a wave energy project in Washington.[38]

Finally, for some projects, FERC may issue an exemption to the licensing required under the FPA. An exemption is valid in perpetuity and the process of applying for an exemption may be simpler than applying for a license. However, there are some stipulations and technical specifications for an exemption. To be exempt, a project must be rated at less than 5 megawatts (MW)[39] and use a natural water feature[40] for head (or be built at an existing dam).[41] An exempted project is

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[35] For more information on FERC licensing, see [http://www.ferc.gov/industries/hydropower/gen-info/licensing.asp].

[36] See [http://www.ferc.gov/industries/hydropower/indus-act/hydrokinetics/energy-pilot.asp].

[37] See [http://www.ferc.gov/news/news-releases/2007/2007-4/11-30-07.asp].

[38] 122 FERC ¶61,248.

[39] Projects that are constructed in existing conduits may be up to 40 MW if the developer is a municipality.

[40] To be eligible for this type of exemption, in addition to meeting other requirements, the (continued...)

still subject to mandatory prescriptions set by state and federal fish and wildlife agencies and FERC.[42]

Additionally, in a 2005 declaratory order, FERC ruled that Verdant Power LLC may deploy an in-stream tidal generator in New York's East River without need for a FERC license.[43] This ruling differs from a standard exemption in that it is not granted in perpetuity. The company is developing new generation technology that would employ moving water currents to generate electricity without a dam or conduit. FERC made this ruling with several specifications: (1) the technology must be experimental; (2) the proposed facilities must be used for a short time to gather data in support of a license application; and (3) power generated from the test project will not be transmitted into, or displace power from, the national electric grid thereby affecting interstate commerce.[44]

Federal Power Act, 16 U.S.C. §817 (1). The FPA authorizes FERC to regulate hydroelectric facilities on navigable waters of the United States. FERC maintains that its authority extends to the oceans under the FPA, referencing 16 U.S.C. §796 (8) "... streams or *other bodies of water*...." (emphasis in original) and cites Presidential Proclamation 5928 as having extended the territorial sea, and thus its federal jurisdiction, to 12 nautical miles.[45] FERC contends that wave and tidal energy projects are under its jurisdiction based on FERC's interpretation of the FPA — adding its own emphasis — "... any dam, water conduit, reservoir, power house, *or other works incidental thereto*...."[46]

The agency has asserted that project features such as undersea anchors, or a conduit leading to a station on the shore, would occupy land under federal jurisdiction, so the project would require a FERC license. Additionally, FERC finds that any generator connecting to, or displacing power from, the electric transmission grid affects interstate commerce, thereby triggering a need for a FERC license.

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[40] (...continued)
developer of a wave or tidal energy project in the ocean would need to successfully argue to FERC that the facility would use a "natural water feature," e.g. the ocean.

[41] See [http://www.ferc.gov/industries/hydropower/gen-info/licensing/exemptions.asp].

[42] Ibid.

[43] *Declaratory Order re Verdant Power LLC's Roosevelt Island Tidal Energy Hydropower Project, under P-12178*. 111 FERC ¶61,024 (April 14, 2005).

[44] Verdant Power indicated that, due to the nature of its proposed technology, it must be connected to the grid to generate power. However, it proposed to provide the power generated to the end users at no charge, and to compensate Consolidated Edison of New York, Inc. and New York Power Authority for any power displaced by the test. FERC accepted this proposal. 112 FERC ¶61,143.

[45] 54 *Fed. Reg.* 777, December 27, 1988.

[46] 16 U.S.C. §817(1).

Finally, FERC has stated that it considers wave or tidal energy structures to be powerhouses under the FPA licensing provision,[47] and has indicated that it considers wave and tidal projects that connect to the electric grid to be powerhouses affecting interstate commerce, thus requiring a FERC license.[48]

Fish and Wildlife Service

The Fish and Wildlife Service (FWS) may have jurisdiction under the Endangered Species Act (ESA)[49] and the Marine Mammal Protection Act,[50] depending on the location of a proposed project, and consultation with FWS may be required. If a proposed wave, tidal, or in-stream energy project might interfere with birds identified under the Migratory Bird Treaty Act (MBTA),[51] FWS consultation would be required.

Endangered Species Act, 16 U.S.C. §1531 et seq. The ESA protects plants and animals that have been designated by FWS or the National Marine Fisheries Service (NMFS) as threatened or endangered. Once a species is listed, any action undertaken or funded by a federal agency must be publicly determined by FWS or NMFS not to be jeopardizing the species or adversely affecting its designated critical habitat.[52]

Fish and Wildlife Coordination Act, 16 U.S.C. §661. The Fish and Wildlife Coordination Act provides the authority for FWS and NMFS involvement in evaluating fish and wildlife impacts from proposed water resource development projects. The act requires that fish and wildlife resources be given equal consideration to other aspects of a proposed project, and it mandates that federal agencies that construct, permit, or license water resource projects must consult with the relevant federal and state fish and wildlife agencies regarding possible effects and necessary mitigation to the resources under their authority.

Marine Mammal Protection Act, 16 U.S.C. §1361-§1407. The act prohibits harassment, hunting, or capture of any marine mammal. It may apply if a proposed project is deemed by a regulatory agency to harass marine mammals. This decision may be based on project location or some aspect of its construction or performance.

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[47] 16 U.S.C. §817 (1).

[48] 102 FERC ¶61,242.

[49] P.L. 93-205; 16 U.S.C. §1531 et seq.

[50] 16 U.S.C. §1361-§1407.

[51] 50 C.F.R. §10.13.

[52] For background on the ESA see CRS Report RL31654, *The Endangered Species Act: A Primer*, by M. Lynne Corn, Eugene H. Buck, and Kristina Alexander.

Migratory Bird Treaty Act, 50 C.F.R. §10.13. The MBTA prohibits the harming of more than 800 species of migratory birds.[53] If an energy project might harm any of the species, consultation, and possibly permitting, would be required through FWS.

Minerals Management Service (MMS)

MMS in the Department of the Interior, manages the nation's OCS oil, natural gas, and other mineral resources. The agency collects, accounts for, and disburses more than $8 billion annually in revenues from offshore federal mineral leases and from onshore mineral leases on federal and Indian lands. With the passage of EPACT05, MMS has additional authority to act as the lead federal agency for leasing OCS lands to be used for renewable energy projects.

Under the program described as Alternate Energy-Related Use (AERU), MMS has some jurisdiction over energy projects on the OCS including, but not limited to: offshore wind energy, wave energy, ocean current energy, offshore solar energy, and offshore hydrogen generation. MMS will also have jurisdiction over other projects that make alternate use[54] of existing oil and natural gas platforms in federal waters of the OCS.[55] MMS will grant easements, leases, and rights-of-way for renewable energy uses of the federal OCS, and is to issue regulations related to the implementation of its additional authority. EPACT05 stipulates that the agency must also establish a formula for revenue-sharing with coastal states that are within 15 miles of a renewable energy project.

EPACT05, §388, stipulates that MMS authority does not supercede the existing authority of any other agency for renewable energy project permitting. Thus, a wave or tidal energy project on the OCS may still require a FERC license to operate although leasing and environmental review would be fulfilled by MMS.[56] The act did not authorize any additional activities related to oil or natural gas reserves, and MMS was not granted jurisdiction over areas within the boundaries of the National Park System, national wildlife refuges, national monuments, or the National Marine Sanctuary System.[57]

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[53] See [http://www.fws.gov/permits/mbpermits/ActSummaries.html].

[54] MMS indicates that alternate uses of existing oil and gas platforms may include nonenergy activities such as offshore aquaculture, research, telecommunications, and recreation. MMS is not seeking authority over those activities, but rather would grant permission for a platform's use, with ultimate authority over the specific activity being the purview of the appropriate federal agency. See [http://ocsenergy.anl.gov/guide/platform/index.cfm].

[55] See [http://ocsenergy.anl.gov/].

[56] Personal communication with Ms. Julie Fleming, Legislative Specialist, Minerals Management Service, Washington, DC, January 22, 2007.

[57] Finavera's Makah Bay Project is located within the Olympic Coastal National Marine Sanctuary, thus MMS authority does not apply to that project.

The National Environmental Policy Act of 1969 (NEPA, 42 U.S.C. §4332(c)) stipulates that federal agencies must prepare an environmental impact statement (EIS) on major federal actions with potential for significant changes to the quality of the human environment. MMS has determined that establishing the AERU program and rulemaking constitute a major federal action and has completed a programmatic environmental impact statement (PEIS) on its proposed AERU program.[58] The PEIS analysis is focused on the environmental, cultural, and socioeconomic effects associated with different approaches to implementing the AERU program and its related rulemaking. Specifically, the programmatic PEIS process is intended to:[59]

- Provide for public input concerning the scope of national issues associated with offshore alternate energy-related use activities;
- Identify, define, and assess generic environmental, socio-cultural, and economic impacts associated with offshore alternate energy-related use activities;
- Evaluate and establish effective mitigation measures and best management practices to avoid, minimize, or compensate for potential impacts; and
- Facilitate future preparation of site-specific NEPA documents. Subsequent NEPA documents prepared for site-specific AERU projects will be based on the Programmatic EIS and MMS' final Record of Decision.

With the issuance of a final PEIS analyzing the environmental impact of a program to develop wave, tidal, and current energy projects on the OCS, MMS now anticipates the completion of a final rule on the process of lease application and energy project development in the fall of 2008.[60] MMS will not issue decisions on hydrokinetic energy projects until a final rule is established, but in advance of a final rule it has established an interim process that includes limited-term leases to allow data collection and technology testing.[61] This specifically excludes commercial-scale project development.[62] Additionally, MMS has released its proposed rules for alternative energy projects on the OCS with a 60-day comment period.[63] The proposed rules indicate that two types of leases may be available for project sponsors: commercial and limited. Commercial leases would have a term up to 25 years and allow full commercial energy production. Limited leases would have a shorter five-year term and are intended for site assessment, technology testing, and other pre-

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[58] See [http://ocsenergy.anl.gov/eis/why/index.cfm].

[59] See [http://ocsenergy.anl.gov/faq/index.cfm#ScopeAnalysis].

[60] See [http://www.mms.gov/offshore/CIAP/PDFs/Visio-3timelines040207A.pdf].

[61] See [http://www.mms.gov/offshore/RenewableEnergy/OCSPolicyCmteMtg022107.pdf].

[62] 72 *Fed. Reg.* 214, November 6, 2007.

[63] 73 72 *Fed. Reg.* 132, July 9, 2008.

commercial activities.[64] MMS indicates that it intends to finalize its rulemaking process by December 2008.[65]

Energy Policy Act of 2005, P.L. 109-58. EPACT05 clarifies federal jurisdiction over, and encourages the development of, alternative energy sources. Section 388 amends §8 of the Outer Continental Shelf Lands Act (43 U.S.C. §1337) to grant authority to the Secretary of the Interior — through MMS — to grant leases on the OCS for producing energy from sources other than oil and gas.

MMS views its primary authorities under §388 to be (1) granting leases, easements, and rights-of ways for renewable energy-related uses on federal OCS lands; (2) acting as the lead agency for coordinating of the permitting process with other federal agencies; and, (3) monitoring and regulating facilities used for renewable energy production and energy support services.[66]

Outer Continental Shelf Lands Act, 43 U.S.C. §1331-§1337. This law stipulates that energy developers operating on the OCS are required to have a federal lease for the project. Originally limited to oil and gas resources, §8 of the Outer Continental Shelf Lands Act was amended by EPACT05 to include energy from sources other than oil and gas, naming MMS the lead agency. Wave and tidal energy developers on the OCS will require a lease even if a FERC license is required for the project.

National Oceanographic and Atmospheric Administration

Pursuant to the OTEC Act,[67] the National Oceanographic and Atmospheric Administration (NOAA) is to be the lead agency for licensing any proposed OTEC project. NOAA retains jurisdiction of OTEC projects on the OCS with passage of EPACT05 §388. However, as noted above, OTEC projects are of limited commercial appeal in most U.S. waters, because OTEC requires site conditions found only in tropical waters. Thus it is primarily of interest in Hawaii, Puerto Rico, and some U.S. territories.

NOAA's National Marine Fisheries Service (NMFS) may also be involved in Endangered Species Act[68] consultations triggered by wave, tidal, and in-stream energy projects, as well as those related to marine mammals under the Marine Mammal Protection Act.[69] NMFS would also be the lead agency ensuring that a proposed energy project did not conflict with fishery management under the

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[64] Ibid.

[65] See [http://www.mms.gov/ooc/press/2008/press0708.htm].

[66] See [http://www.mms.gov/offshore/RenewableEnergy/RenewableEnergyAndAlternateUses.pdf].

[67] 42 U.S.C. §9111.

[68] ESA; P.L. 93-205; 16 U.S.C. §1531 et seq.

[69] 16 U.S.C. §1361-§1407.

Magnuson-Stevens Fishery Conservation and Management Act.[70] NOAA's National Ocean Service (NOS) has authority over national marine sanctuaries and any federal action that may affect these areas would require consultation with NOS.[71]

NOAA has other legal authorities and responsibilities that may affect wave, tidal, and in-stream energy projects. In particular, NMFS (also known as NOAA Fisheries) shares jurisdiction under ESA, MMPA, and the Fish and Wildlife Coordination Act with FWS; these provisions are addressed above. In addition, NMFS and FWS may also prescribe fishways as part of a FERC hydropower license under the Federal Power Act.[72]

Coastal Zone Management Act, 16 U.S.C. §1451-§1464. The Coastal Zone Management Act (CZMA) is the primary federal statute for protecting of America's coastal areas from development, including pollution associated with residential, recreational, commercial, and industrial uses. The CZMA assists states in the development of Coastal Zone Management Programs aimed at balancing the competing uses of coastal resources. The programs define permissible land and water uses within state coastal areas. Federal actions must be consistent with established state programs.

The CZMA requires federal consistency; that is, federal activities that affect the coastal zone must be consistent to the maximum extent practicable with the enforceable policies of a coastal state's federally approved coastal management program. (Federal agency activities are activities and development projects performed by a federal agency, or a contractor for the benefit of a federal agency.) NOAA interprets the CZMA, oversees the application of federal consistency, and mediates CZMA-related disputes.[73] Thus, wave, tide, and in-stream energy projects must be consistent with state coastal zone plans as well as with NOAA implementation of CZMA.

Magnuson-Stevens Act, 16 U.S.C. §1801 et seq. The Magnuson-Stevens Fishery Conservation and Management Act governs the conservation and management of ocean fishing and established the United States' exclusive management authority over all fishing within the EEZ, all anadromous fish throughout their migratory range, except when in another nation's waters, and all fish in the waters of the OCS.[74] The act also established eight Regional Fishery Management Councils that are responsible for preparing fishery management plans designed to provide for the optimum yield from the fisheries in their regions. A wave or tidal energy project must not be constructed in conflict with these management plans.

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[70] 16 U.S.C. §1801 et seq.

[71] 16 U.S.C. §1434(d).

[72] 16 U.S.C. § 811.

[73] See [http://coastalmanagement.noaa.gov/consistency/welcome.html].

[74] Anadromous fish are those that are born in fresh water, mature in the ocean, and return to fresh water to breed.

National Marine Sanctuaries Act, 16 U.S.C. §1431 et seq. The NMSA authorizes the Secretary of Commerce to designate and manage areas of the marine environment that have special significance as national marine sanctuaries. The management of national marine sanctuaries is conducted by the National Marine Sanctuary Program (NMSP). Through the NMSP, the Secretary of Commerce may issue regulations that specify the types of activities that can and cannot occur within the sanctuaries. Permits may be issued for activities which are normally prohibited by the regulations. Any federal actions that may affect a sanctuary require consultation with NMSP.

Ocean Thermal Energy Conversion Act, 42 U.S.C.§ 9101 et seq. The OTEC Act applies to parties interested in applying for a permit for an OTEC project. NOAA, the agency with primary authority over OTEC projects, established regulations for license applicants[75] but withdrew them in 1996 because no applications had been received since the OTEC Act was passed in 1980.[76] However, the OTEC Act is still in force.

U.S. Coast Guard

The Coast Guard regulates waterborne navigation and safety. An energy project requiring the addition of any aids to navigation in U.S. waters must meet Coast Guard approval and conform to established standards.

Hazards to Navigation, 33 C.F.R. §62, §64, §66. Coast Guard regulations establish conventions for marking marine hazards and placing aids to navigation. A proposed project must not be a hazard to navigation and must be marked in compliance with the regulations.

U.S. Environmental Protection Agency

The U.S. EPA may be involved in a tidal, wave, or in-stream generation project if it determines that the project may be considered a "point source discharger." The Clean Water Act authorizes EPA to regulate discharge of waterborne pollutants through a program of National Pollutant Discharge Elimination System (NPDES) permits. The NPDES permit program regulates point sources that discharge pollutants into waterways of the United States.[77]

Discharge Permit, CWA §1251-§1387. The CWA regulates the discharge of pollutants, including sand, rocks, and chemical waste — but not unpolluted water. EPA may issue technology-based effluent limitations for different categories of point source discharge. These are nationally applicable rules that would be incorporated into the CWA discharge permits issued to individual sources under the NPDES program. In the absence of national rules for a particular category of discharger (wave generation projects for example), the permit writer (EPA or state water quality

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[75] 15 C.F.R. §981.

[76] 61 *Fed. Reg.* 2969, January 30, 1996.

[77] 40 C.F.R. §122.

regulators) would develop discharge limits for a specific source using best professional judgement. In many cases, EPA delegates responsibility for the NPDES permit program to qualified states.[78]

Other Federal Legislation

Some federal statutes apply broadly to federal activities and require some action on the part of the lead agency in a process, or from the agency that is intending to conduct an activity such as licensing or permitting.

National Environmental Policy Act, 42 U.S.C. §4332(c). NEPA requires the preparation of an EIS for federal actions that may significantly affect the quality of the human environment. Thus, any federal permitting or other action related to a proposed energy project would require first an environmental assessment (EA) to determine if an environmental impact statement is required. The EA and EIS must consider alternatives such as alternate locations, a "no action" option, and socio-economic, environmental, and cultural impacts.

National Historic Preservation Act, 16 U.S.C. §470. The act protects historic, archeological, and cultural resources. Compliance involves consultation with state historic preservation officers (SHPO), Tribes, and other interested parties to determine the effect of a proposed activity on historic properties, and, if necessary, the development of plans to avoid or mitigate damage to important sites.

State Agencies and Statutes

States may have restrictions or impose their own conditions on the use of cultural, fish and wildlife, and water resources and may have laws more stringent than federal law. In some cases, federal law defers to state regulatory agencies for implementing programs related to resource management. There are also likely to be relevant state energy agencies involved in the approval process for a wave, tidal, or in-stream energy project proposal.

Pending Issues

Some aspects of the regulatory procedures applicable to wave, tidal, and in-stream generation projects are yet to be decided. Multiple federal agencies are involved in establishing these projects and the lead agency depends in part on a project's location. Some project developers have contended that there is no consistent template for state or federal oversight of wave, tidal, and in-stream energy project development. They feel that a clearly defined, formal process specific to this type of resource development would be an important step in the growth of this technology.[79] Other parties may have concerns about environmental or other conflicts

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[78] See [http://cfpub.epa.gov/npdes/statestats.cfm].

[79] Personal communication with Mr. Craig Collar, Senior Manager, Energy Resource (continued...)

that may arise from the development of wave, tidal, and in-stream generation projects. They may feel that greater federal involvement and regulatory oversight from several agencies will ensure that these energy resources are developed more slowly, which may provide more opportunities to address conflicts that develop.

MMS Protest of FERC Jurisdiction

Wave, tidal, and in-stream kinetic energy generation technologies are just starting to emerge. The fact that their regulatory status is still evolving is shown by amendments to the law aimed at clarifying the federal role in ocean wave and renewable energy.[80] At least two federal agencies currently have what appears to be a lead role in offshore renewable energy projects.[81] MMS indicates that its authority as the lead agency for projects proposed on the OCS is made clear by EPACT05 §388, and it is not accepting applications for these projects until its rulemaking process is complete in late 2008.[82] EPACT05 §388 includes a clause stating that §388 does not modify or supersede the authority of any other federal or state agency, and FERC is proceeding with permitting actions for projects on the OCS in advance of MMS final rulemaking. Because MMS jurisdiction does not commence until beyond 3 NM, FERC is the primary federal regulatory agency in rivers and ocean waters up to this boundary.

In response to FERC's acceptance of an application[83] for a preliminary permit for a wave energy project that was at least partially located on the OCS off the coast of Oregon, MMS filed a protest of FERC's authority under the FPA to issue permits or licenses for projects on the OCS.[84] MMS cites three points of protest:

- FERC's FPA jurisdiction does not extend beyond 3 NM into the ocean. MMS specifically refutes a FERC claim that Presidential Proclamation 5928 extending the territorial sea to 12 NM also extends FERC authority. MMS cites the Proclamation language indicating that its intent is not to extend or alter existing federal law or jurisdiction.

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[79] (...continued)
Development, Snohomish Public Utility District, Everett, WA. On January 26, 2007. Snohomish PUD is investigating the development of several tidal current energy sites in Washington's Puget Sound.

[80] EPACT05, §388.

[81] For more information on questions regarding FERC and MMS jurisdiction over offshore renewable energy projects, see CRS Report RS22721, *Wave, Tidal, and In-Stream Energy Projects: Which Federal Agency Has the Lead?* by Nic Lane.

[82] See [http://www.mms.gov/offshore/RenewableEnergy/OCSPolicyCmteMtg022107.pdf].

[83] FERC, *Notice of Application Accepted for Filing and Soliciting Motions to Intervene, Protest, and Comments RE AquaEnergy Group Ltd's Coos County Offshore Wave Energy Project Under P-12752* (December 1, 2006).

[84] MMS, *Protest of the United States Minerals Management Service*, FERC Docket P-12752-000. (January 30, 2007).

- MMS cites §388 of EPACT05 granting authority for renewable energy projects on the OCS to MMS.
- MMS asserts that FERC's existing hydropower licensing process is inappropriate for wave energy projects on the OCS for a number of reasons, such as: preliminary permits tie up large areas of potential development based on the first applicant rather than the best applicant; and a 30-50 year FERC license is too long for prototype projects.

Citing the reasons above, MMS requested that FERC reject the preliminary permit application, and also that it stop processing all permit applications for energy projects on the OCS. Although CRS found no public FERC response to the MMS protests, it appears that for a period following the protests no preliminary permits were issued for projects that reach onto the OCS. However, in March 2008, FERC issued preliminary permits for projects that include portions of the OCS off of California. The Department of the Interior has filed a request for rehearing of the FERC order issuing those permits.[85]

FERC has posted a Notice of Inquiry outlining its interim policy regarding its preliminary permitting procedure. Pending final resolution, FERC will continue to issue preliminary permits for wave, tidal, and in-stream generation projects; however, it will administer these permits under a "stricter scrutiny" policy.[86] FERC states that preliminary permits will be issued with more limited project boundaries to prevent site-banking and promote competition, and the required project progress reports will be given closer review to ensure active exploration of the energy resource.[87]

There is a concern among ocean energy proponents that having different agencies with regulatory authority on either side of a 3 NM line may lead to hardship for project developers. Some projects may be sited outside of the limit specifically to avoid FERC licensing, while others that choose to use similar technology inside the 3 NM limit would require a FERC license.[88]

There are some who may oppose wave or tidal power development or have concerns about project impacts. This may especially be true among groups such as fishing organizations, other recreational users, and some environmental interests. These stakeholders may prefer to see a slower-paced licensing process, which they may feel ensures more extensive public involvement and regulatory review.

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[85] FERC, *Request for Rehearing of U.S. Department of the Interior under P-12779-000 and P-12781*.Docket Numbers P-12779-000 and P-12781-000 (April 14, 2008).

[86] FERC, *Notice of Inquiry*, Docket Number RM07-08-000 (February 15, 2007).

[87] Ibid.

[88] *Request for Rehearing*, p 22.