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Marine Hydrokinetics Regulatory Processes Literature Review

March 2019

R O'Neil
G Staines
M Freeman

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the U.S. Department of Energy
under Contract DE-AC05-76RL01830

Pacific Northwest National Laboratory
Richland, Washington 99352

Purpose

Under a project with the U.S. Department of Energy's Water Power Technologies Office Marine Hydrokinetic Program (Program), Pacific Northwest National Laboratory is reviewing existing marine renewable energy regulatory material in published, docketed, or circulated forms. This literature review describes existing regulatory conditions, details the regulatory history of seminal marine renewable energy projects, and summarizes recommendations from key reports about marine energy regulation.

There is substantial available literature regarding the environmental effects of marine energy. The authors intentionally avoided reviewing literature regarding direct environmental effects, instead focusing on the literature that provided insight into the regulatory impact of having little knowledge or no established mechanism to address those effects.

This report will be combined with over 30 interviews conducted in 2017 with experienced marine renewable energy regulators, stakeholders, and developers into an analysis of marine energy regulation.

The goal of the greater project is to identify actionable tasks to improve regulatory efficiency for marine renewable energy, to reduce the cost and time of deployment while preserving environmental stewardship and the needs of other ocean users.

Acknowledgments

In addition to the documents cited in footnotes throughout this report, the authors wish to acknowledge those individuals who offered their expertise and experience in marine energy regulatory environment through interviews and exchanges over the last year. The authors are particularly grateful for the sponsorship and guidance of Samantha Eaves and Hoyt Battey of the U.S. Department of Energy Water Power Technologies Office.

Acronyms and Abbreviations

ALP	Alternative Licensing Process
AMP	Adaptive Management Plan
AMT	Adaptive Management Team
BOEM	Bureau of Ocean Energy Management
CBP	U.S. Customs and Border Protection
CWA	Clean Water Act
CWG	Collaborative Working Group
CZMA	Coastal Zone Management Act
DOE	U.S. Department of Energy
DOI	U.S. Department of the Interior
EA	environmental assessment
EIS	environmental impact statement
EMF	electromagnetic field
EPAct	Energy Policy Act of 2005
ESA	Endangered Species Act
FAU	Florida Atlantic University
FAQ	Frequently Asked Questions
FCC	Federal Communications Commission
FERC	Federal Energy Regulatory Commission
FONSI	Finding of No Significant Impact
FPA	Federal Power Act
FWS	U.S. Fish and Wildlife Service
FY	fiscal year
ICPC	International Cable Protection Committee
ILP	Integrated Licensing Process
LIDAR	light detection and ranging
MEC	Marine Energy Council
MHK	Marine hydrokinetics (wave, tidal, ocean and in-river current energy capture technologies)
MMPA	Marine Mammal Protection Act
MOU	Memorandum of Understanding
MSP	Marine Spatial Planning
MTB	mooring and telemetry buoy
MWPMA	Marine Waters Planning and Management Act
NEPA	National Environmental Policy Act of 1969
nm	nautical mile
NMFS	National Marine Fisheries Service

NNMREC	Northwest National Marine Renewable Energy Center
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NOP	National Ocean Policy
NREL	National Renewable Energy Laboratory
NWP	Nationwide Permit
Ocean SAMP	Ocean Special Area Management Plan
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
OPT	Ocean Power Technologies
ORPC	Ocean Renewable Power Company
PAD	preliminary application document
PC Landing	Pacific Landing Corporation (now Pacific Crossing)
PG&E	Pacific Gas and Electric
PMEC-SETS	Pacific Marine Energy Center South Energy Test Site
PP	preliminary permit
PPLP	Pilot Project License Process
PUC	Public Utilities Commission
PUD	Public Utility District
RITE	Roosevelt Island Tidal Energy
SNMREC	Southeast National Marine Renewable Energy Center
Snohomish PUD	Snohomish County Public Utility District
TISEC	Tidal In-Stream Conversion
TLP	Traditional Licensing Process
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
WEC	wave energy converter
WETS	Wave Energy Test Site

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1.0 Overview of Regulatory Authorities

Marine and hydrokinetic energy technologies convert the energy of waves, tides, and river and ocean currents into electricity. The deployment of these technologies is regulated by various federal and state agencies depending on where deployment would occur.

The U.S. Department of Energy (DOE) Water Power Technologies Office Marine Hydrokinetic Program (Program) is focused on advancing MHK technologies that capture energy from the nation's oceans and rivers. The Program's efforts fall under four broad categories: 1) foundational and cross-cutting research and development, 2) technology-specific design and validation, 3) data sharing and analysis, and 4) reducing barriers to testing. Through both data sharing and analysis and reducing barriers to testing categories, the Program works to reduce the time and costs associated with siting MHK projects to 1) better quantify the potential magnitude, costs, and benefits of MHK power generation and 2) identify and address other barriers to MHK deployment.

This document has been prepared to support the Program's MHK market acceleration and deployment activities by describing existing federal and state regulatory conditions, detailing the regulatory history of seminal marine renewable energy projects, and summarizing recommendations from key reports about marine energy regulation.

This section provides an overview of the various federal and state regulatory authorities that are important to MHK project development. Additional information on the practical application of these laws and regulations can be found in other documents.[1] This section is intended to complement other descriptions of regulatory and legal frameworks by providing the evolution and rationale for why the authorities have developed or been applied to MHK development.

1.1 Federal

When marine energy developers first began to seek federal approvals, there was considerable debate about which agency had jurisdiction over various activities. Pacific Gas & Electric Company (PG&E) received two preliminary permits from the Federal Energy Regulatory Commission (FERC) for projects off the coasts of Mendocino and Humboldt counties, California, in March 2008. Several requests for rehearing were filed, including a jurisdictional challenge from the U.S. Department of the Interior (DOI). DOI argued that FERC did not have the authority to issue preliminary permits or licenses for water power development in the Outer Continental Shelf (OCS). The Energy Policy Act of 2005 (EPAct) had expressly authorized DOI to issue leases for energy activities other than oil and gas development.[2] In its responsive October 2008 Order on Rehearing, FERC published an extensive rejection of DOI's position, citing several features of the Federal Power Act (FPA) such as federal lands and Commerce Clause waters that compel FERC to issue water power licenses in the OCS.[3]

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[1] See for example, *Siting Methodologies for Hydrokinetics: Navigating the Regulatory Framework (*Pacific Energy Ventures 2009) https://www.energy.gov/sites/prod/files/2013/12/f5/siting_handbook_2009.pdf and *The Law of Marine and Hydrokinetic Energy* (Stoel Rives 2011) https://www.stoel.com/the-law-of-marine-and-hydrokinetic-energy

[2] 43 U.S.C. 1337 (2008). Section 388 of the Energy Policy Act of 2005.

[3] 125 FERC 61,045. Order on Rehearing, October 16 2008, P-12781 *et al.*

By April 2009, FERC and DOI had signed a Memorandum of Understanding[4] (MOU) that is the basis for marine energy governance authorities today. This combination of authorities is not codified in rule or statute, but it is discussed at length in a joint white paper.[5] It also is relatively untested for MHK, with only one advanced proposal for marine energy development located on the OCS—the Northwest National Marine Renewable Energy Center (NNMREC) Pacific Marine Energy Center South Energy Test Site (PMEC-SETS), which is discussed later in this report.

This decision to combine authorities into a single coherent process has consequences for state and federal regulation. First, the point of departure for MHK energy and environmental regulation is the existing FERC approval process for licensing traditional hydropower facilities. Whereas states generally have central permitting authority for large energy generating projects such as natural gas and wind plants,[6] FERC retains jurisdiction for issuing permits for gas pipelines, liquefied natural gas facilities, and water power projects. This jurisdiction over water power generating resources is rooted in federal authorities for interstate commerce and public waterways.

Many states have developed processes that "fit" underneath FERC hydropower licensing processes, and initially these authorities were exercised for MHK oversight. There are, however, notable differences in applying hydropower regulations to MHK facilities. In at least one instance in Oregon, this included issuing a water right, which is the coordinating foundation for environmental requirements on traditional hydropower projects.[7] Although states do not normally issue water rights in the ocean, theoretically they could do so due to state territorial waters.

Second, these projects are commonly located in marine environments with their own permitting authorities, laws, and practices. Examples include navigation with the U.S. Coast Guard (USCG) and seafloor permits with the Bureau of Ocean Energy Management (BOEM). For marine energy developments, these marine regulatory requirements are additional to—rather than replacements of—the hydropower licensing process administered by FERC.

Today this "stacked" approach to marine energy regulation persists (Figure 1). States and federal agencies have signed MOUs with FERC, which has made investments in staff and communications efforts to focus on MHK development. BOEM has taken a similar approach, establishing state task forces and reorganizing its program to adopt renewable energy planning missions as well as permitting regimes. Processes have been tested in state waters where FERC is the lead regulatory agency. The state of Maine is a successful example where an MOU with FERC, along with state specific legislation, established the state Department of Environmental Protection as the lead in the permitting process. However, the OCS and BOEM's leasing and easement authority are not yet part a regulatory record.

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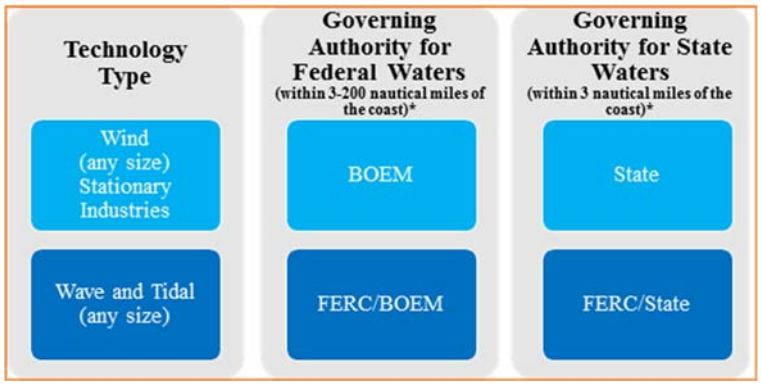
[4] Memorandum of Understanding between the U.S. Department of Interior and the Federal Energy Regulatory Commission. April 2009. https://www.ferc.gov/legal/mou/mou-doi.pdf (last accessed August 23, 2017).

[5] BOEM/FERC Guidelines on Regulation of Marine and Hydrokinetic Energy Projects on the OCS," Version 2, July 2012. https://www.ferc.gov/industries/hydropower/gen-info/licensing/hydrokinetics/pdf/mms080309.pdf

[6] State energy facility siting councils and county governments typically issue permits for energy projects outside of FERC jurisdiction. Scope and scale vary. For example, in Oregon, wind facilities with a generating capacity of 105 MW or greater fall under state jurisdiction. For wind facilities with capacities below 105 MW, the county government would issue a conditional use permit to authorize construction and operation. https://www.oregon.gov/energy/facilities-safety/facilities/Pages/Council-Jurisdiction.aspx last visited March 1, 2019.

[7] Oregon's hydroelectric water right is the state's established venue for applying state environmental protection authorities; therefore, the state asserted the requirement for a water right for MHK development in order to preserve standing authorities.



* The coastal zones of Texas, western Florida, Louisiana, and Puerto Rico extend 9 nautical miles (nm) offshore.

Figure 1. Jurisdiction by Technology and Location

In contrast, and as noted above, offshore wind development does not fall under FERC jurisdiction. Offshore wind developers must meet the marine obligations established under a BOEM lease and applicable federal, state, and local authorities, but are not required to follow FERC licensing procedures.

1.1.1 Federal Energy Regulatory Commission

FERC is an independent federal agency led by a Commission of up to five partisan commissioners confirmed by Congress. FERC has many responsibilities, including oversight of bulk power system reliability, electric power markets, operation and access to transmission systems, and natural gas. FERC also issues authorizations for natural gas pipelines and water power projects.

1.1.1.1 Jurisdiction

The authority to issue water power licenses originates with the FPA. The current jurisdictional tests are as follows:

- Located on navigable waters of the United States
- Occupy U.S. lands
- Utilize surplus water or water power from a U.S. government dam; or
- Located on a stream over which Congress has Commerce Clause jurisdiction, where project construction or expansion occurred on or after August 26, 1935, and the project affects the interests of interstate or foreign commerce.[8]

All marine energy projects, regardless of location in riverine or marine environments, fall under Part 1 of the FPA unless expressly relieved of jurisdiction. A FERC Declaratory Order, known as the "Verdant Exception" (discussed in Section 2.0), describes the conditions under which a marine energy project is not required to receive FERC authorization for operation. Briefly, the three conditions are that the deployment be experimental in design, deployed for a short term, and have no effect on interstate commerce.

[8] "Section 2.1. When is a License Needed?" Handbook for Hydroelectric Project Licensing, Federal Energy Regulatory Commission, April 2004. https://www.ferc.gov/industries/hydropower/gen-info/handbooks/licensing_handbook.pdf last visited June 29 2017.

1.1.1.2 Hydropower Licensing

For hydropower, FERC has established three licensing processes by rule: the Traditional, Alternative, and Integrated Licensing Processes.[9] The Traditional Licensing Process (TLP) offers license seekers substantial control over all activities before an application is filed with FERC. This was the only licensing process until a large class of hydroelectric projects sought renewed licenses in the early 1990s under the Electricity Consumers Protection Act of 1986, which set new balances between public and private uses of waterways for hydroelectric power. In 1997, FERC created a new, Alternative Licensing Process (ALP) that creates a broad structure over "pre-filing" activities to foster flexible timelines, stakeholder collaboration, applicant-prepared environmental assessments (EA), and, historically, settlements. The Integrated Licensing Process (ILP), which FERC added in 2003, creates a tight structure and timelines in the pre-filing period. Goals of the ILP are to involve FERC licensing staff at the onset of the process, address study requests and record disputes early in the process, and bring timeline rigor.

To date, MHK projects seeking a FERC license have selected various pathways (Table 1).

Table 1. Marine Energy Licensing Process by Year and Project

Project	Proponent	Project No.	Process Selected	Application Filed / Approved	Status
Reedsport	Ocean Power Technologies (OPT)	12713	TLP	6/1/2010/ 8/13/2012	Surrendered
Cobscook Bay	Ocean Renewable Power Company (ORPC)	12711	Pilot Project License Process (PPLP)	9/1/2011/ 2/27/2012/ Extended 12/16/2015	
Roosevelt Island (RITE)	Verdant Power (Verdant)	12178 / 12611	TLP/PPLP	4/6/2007/ Exempted 4/14/2005	Active
PacWave (formerly PMEC-SETS)	State of Oregon	14616	ALP	Draft application filed 4/20/2018	Active
Wave Connect	PG&E	12779	PPLP	Not filed	Withdrawn
Admiralty Inlet	Snohomish County Public Utility District	12690	PPLP	4/23/2012	Surrendered
Makah Bay	Finavera Renewables	12751	ALP	11/21/2006 / 12/21/2007	Surrendered

[9] These processes are discussed in great detail in the Handbook, *ibid.*

1.1.1.3 Preliminary Permits and Memorandums of Understanding

To offer security to prospective license applicants, FERC issues a "preliminary permit" under Section 4(f) of the FPA.[10] While not a prerequisite for a license, the preliminary permit assures an entity that if it is studying a site, it will have first rights to filing a license application.[10] In the 2000s, the preliminary permit model was challenging to implement. In traditional hydropower, single entities sought vast numbers of preliminary permits, which led to concerns about increased workload and the viability of pursuing the full permit slate at one time. There also were concerns about "site banking," as preliminary permits are issued for 3-year periods and can be renewed. FERC intentionally limits the scope of preliminary permits to an administrative action, with no substantive requirements of the permit holder other than to cooperate with affected property owners and consider applicable comprehensive plans. The preliminary permit does not authorize construction or operation. To maintain a permit, the holder must submit status reports every 6 months showing significant progress.[11]

Marine energy developers began to apply for preliminary permits as early as 2002, but permit applications increased dramatically in 2006 and 2007 (Figure 2 and Figure 3). See Appendix A for a comprehensive list of FERC applicants.

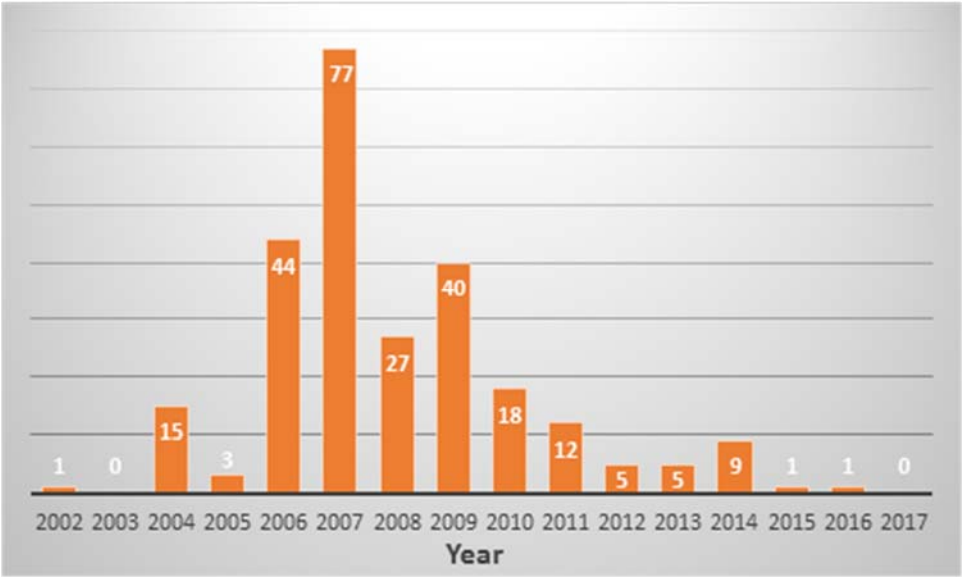


Figure 2. FERC Preliminary Permit Dockets by Initiation Year

Two challenges quickly emerged. First, affected communities were unfamiliar with FERC and the nature of preliminary permits as opposed to licenses for project construction and operations. What familiarity existed was related to federal authorization of liquefied natural gas facilities. Second, permit seekers were not constrained by the usual geographic features of a river-based site, and requested vast areas for resource characterization review. FERC was unsure how to constrain permits spatially in the ocean.

[10] 16 U.S.C. § 797(f) / 18 CFR ∬ 4.80 (2008). The purpose of a preliminary permit is "to secure priority of application for a license for a water power project under Part I of the FPA while the permittee obtains the data and performs the acts required to determine the feasibility of the project and to support an application for a license.
[11] *Reedsport OPT Wave Park, LLC*, 118 FERC ¶ 61,118 (2007), *order issuing preliminary permit*. Available at https://www.ferc.gov/whats-new/comm-meet/2007/021507/H-1.pdf

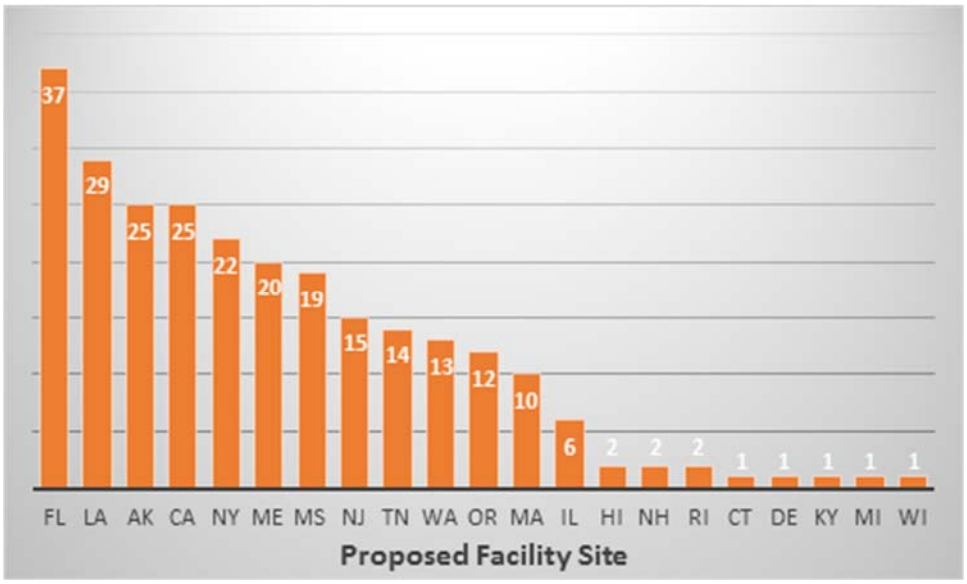


Figure 3. FERC Preliminary Permit Dockets by State

FERC states that it is executing an "… ongoing effort to support the advancement and orderly development of innovative hydrokinetic technologies."[12] The agency maintains a website expressly for MHK development, with Frequently Asked Questions (FAQs) and historical documentation.[13] In initial stages of project proposals, FERC proactively scheduled outreach meetings in affected communities.[14] In the Developmental Analysis section of FERC National Environmental Policy Act of 1969 (NEPA) documents, where the need for power and economic value of a project is assessed, FERC staff typically state that initially uneconomic projects are a stepping stone to commercial viability of the technology.

FERC has signed MOUs with state and federal agencies to ensure coordination and communication during the permitting and license process (Table 2). For states, these MOUs typically describe the roles and authorities that FERC and the state hold in the process. Then the reason for the MOU is stated, and in the context of MHK typically includes the coordination of procedures and schedules for efficient and timely process as well as the protection of natural resources and economic and cultural concerns. The MOUs between agencies are more specific regarding authority and jurisdiction. In fact, the MOU between FERC and DOI is the current jurisdictional description used for MHK installations on the OCS.

[12] BOEM / FERC Guidelines on Regulation of Marine and Hydrokinetic Energy Projects on the OCS," Version 2, July 2012. https://www.ferc.gov/industries/hydropower/gen-info/licensing/hydrokinetics/pdf/mms080309.pdf
[13] https://www.ferc.gov/industries/hydropower/gen-info/licensing/hydrokinetics.asp
[14] See, e.g., "Notice of Licensing Outreach Meeting: Understanding the FERC Licensing Process," issued December 2008 for a meeting held February 24, 2009 in Ocean Shores, Washington. P-13058.

Table 2. FERC Memorandums of Understanding

Co-Signing Entity	Year	Topics Addressed
State of Oregon	2008	FERC agreed not to issue preliminary permits until the state Territorial Sea Plan was amended to reflect marine energy sites. Agreed to treat the plan as a comprehensive plan under the FPA 10(a). Specific to wave energy projects.
State of Washington	2009	Washington will assist project applicants through the Governor's Office of Regulatory Assistance. The state may opt for site planning and would ask FERC to consider this plan when issuing permits and licenses. Documents prepared for FERC applied to state permitting requirements to facilitate the process.
State of Maine	2009	Created mechanism for the state Department of Environmental Protection to lead the process. Documents prepared for FERC applied to state permitting requirements to facilitate the process.
DOI	2009	FERC will issue licenses or exemptions for MHK projects only after BOEM has issued lease, easement, or right-of-way. FERC agreed not to issue preliminary permits in the OCS. The entities will coordinate processes and will jointly develop practices for hydrokinetic approvals. Both retain discretion to issue approvals or determine whether to coordinate on NEPA as well as for project inspections.
State of California	2010	The state and FERC agreed to participate fully and maintain communication to make the regulatory process efficient and timely. Specifically, agreed to coordinate their efforts to the extent possible for both NEPA and California Environmental Quality Act requirements. Further, no license can be issued that will affect land, water, or natural resources without concurrence from the California Coastal Commission or the San Francisco Bay Conservation and Development Commission.
USCG	2013	FERC agreed to require applicants to also include the USCG in preliminary permit applications and to include them in all other processes like NEPA scoping allowing them to comment. Though, by participating, USCG agrees not to become a party to the licensing.

1.1.1.4 Conditioned Licenses

In November 2007, FERC issued a policy statement that described its intent to issue conditioned licenses for hydrokinetic projects.[15] The stated premise was to "… shorten the regulatory process and speed the development of meritorious hydrokinetic projects." Conditioned licenses allow the developer to complete the FERC licensing process but do not authorize the developer to conduct onsite construction or installation activities until all other legal requirements have been met.

Conditioned licenses were not a new concept. Under the Natural Gas Act, FERC had taken a similar approach of conditioning authorizations for natural gas pipelines. For hydroelectric projects, FERC indicated that state permits and federal laws such as the Clean Water Act (CWA), Coastal Zone Management Act (CZMA), and Endangered Species Act (ESA) were the principal reasons for extended licensing timelines. In its view, to support innovation and the development of hydrokinetic demonstration projects, the conditioned license approach was warranted and would strengthen a developer's ability to secure funding by having their license in hand, decreasing uncertainty for future prospects. Additionally, the conditioned licenses did not change the project's ultimate environmental obligations or limit other authorities.

[15] 121 FERC ¶ 61,221; Docket No. PL08-1. *Policy Statement on Conditioned Licenses for Hydrokinetic Projects* (2007).

In the development of this policy statement, FERC held an October 2007 technical workshop at which FERC staff presented pilot licenses as another solution. By spring 2008, the staff proposal for pilot licenses effectively became the primary focus point for regulatory support of hydrokinetic projects. In April 2008, the staff launched a new pilot project licensing process and issued a FAQ on Conditioned Licenses that described differences between the two approaches.[16]

1.1.1.5 Pilot Licenses

Recognizing the gap between a 30- to 50-year commercial license and a short-term test under the Verdant Exception, FERC staff created an expedited process for marine hydrokinetics to receive a pilot license (Figure 4). These procedures are rooted in the authority of the Director of the Office of Energy Projects to waive or modify portions of licensing requirements "for good cause."[17] No new rules were created.

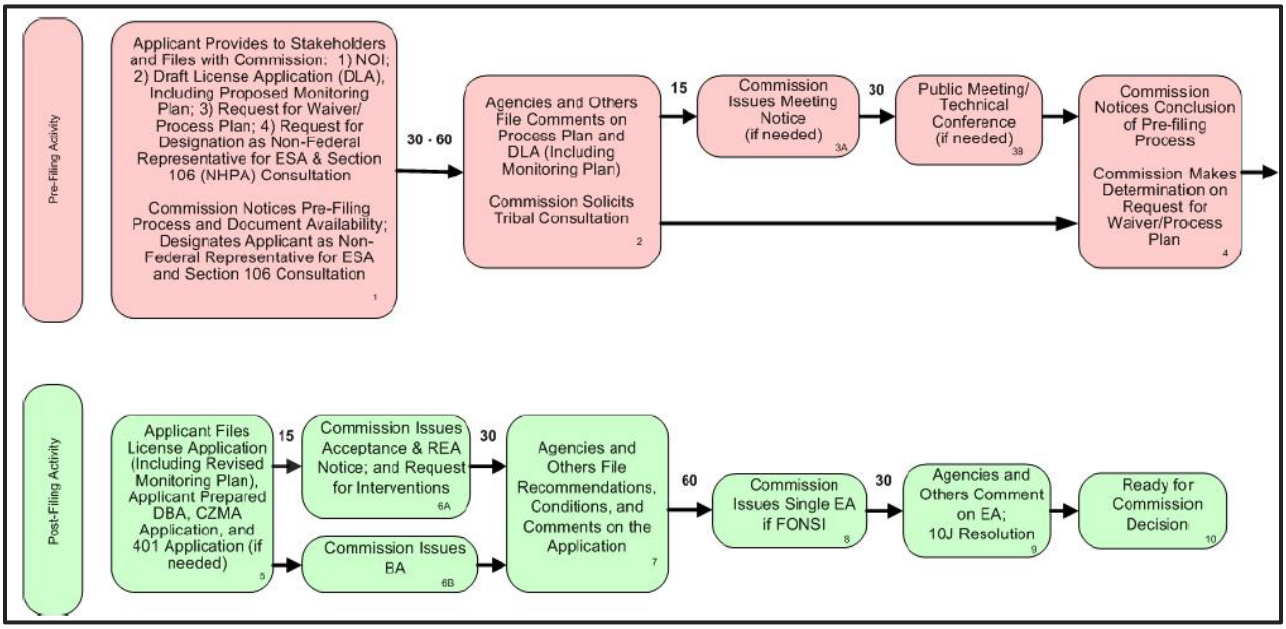


Figure 4. Diagram of Hydrokinetic Pilot Project Licensing Procedures[18]

The hydrokinetic PPLP is described in a guidance document issued in April 2008.[19] To qualify, projects must be "small," which is considered to be both small in electric capacity (less than 5 MW) and in physical footprint; seeking a short-term license (anticipated 5 year term); avoid siting in sensitive locations; and agree to be curtailed, shut down and even removed if unacceptable risks arose. The project must also consent to full removal and site restoration after the conclusion of authorization, and submit a draft application that is suitable to conduct environmental analysis.

In the guidance document, the stated goal is to condense the timeframe from filing an application to making a licensing decision to 6 months. In no instance was this goal met. Four projects received pilot licenses. The duration between draft license submittal and license issuance from FERC varied from approximately 2 to 4 years among projects (Table 3).

[16] Staff FAQs on Conditioned Licenses, filed April 14, 2008 in PL08-1. Accession No. 20080414-4003.
[17] 18 CFR § 5.29(f)(2)
[18] From the FERC Guidance Document, *Licensing Hydrokinetic Pilot Projects*, p. 14
[19] "Licensing Hydrokinetic Pilot Projects," April 2008. https://www.ferc.gov/industries/hydropower/gen-info/licensing/hydrokinetics/pdf/white_paper.pdf

Table 3. Four Pilot Project Licenses Issued by FERC for MHK Projects

FERC Pilot Project	FERC Docket Number	Draft Pilot License Application Submission Date	Pilot License Issuance Date	Duration from License Application to License Decision
Admiralty Inlet, WA	P-12690	December 2009	March 2014	4 yr 3 mo
Cobscook Bay, ME	P-12711	July 2009	February 2012	2 yr 7 mo
Roosevelt Island, NY	P-12611	November 2008	January 2012	3 yr 2 mo
Tanana River, AK	P-13305	January 2011	October 2012	1 yr 9 mo

1.1.2 Bureau of Ocean Energy Management

The following text about BOEM comes from *Siting Methodologies for Hydrokinetics: Navigating the Regulatory Framework (*Pacific Energy Ventures 2009).[20]

- Certain hydrokinetic projects, such as ocean wave or current energy conversion facilities, may be sited on the OCS, which includes all submerged lands between the seaward extent of state waters (typically 3 nm from shore) and the seaward extent of U.S. jurisdiction (approximately 200 nm from shore). Hydrokinetic projects located partially or wholly on the OCS require authorization for use of the submerged lands on which project activities occur. Use of submerged lands on the OCS for renewable energy activities is managed by BOEM, a bureau in DOI that manages the nation's natural gas, oil, and other mineral resources on the OCS. The EPAct gave BOEM authority for OCS renewable energy development by amending the Outer Continental Shelf Lands Act (OCSLA) of 1953. Under authority delegated to it by the Secretary of the Interior, BOEM is the lead agency for hydrokinetic leases on the OCS; within BOEM, Office of Renewable Energy Programs manages renewable energy activities, including hydrokinetic leases.
- In addition to a lease from BOEM, construction and operation of hydrokinetic projects on the OCS also require a license from FERC.21 Unlike projects in state waters, FERC will not issue preliminary permits for projects on the OCS, as the hydrokinetic lease will provide site priority.

It is important to note that FERC will not issue a license until BOEM has issued a lease for the project; likewise, construction and operation of a hydrokinetic project on the OCS cannot commence without a FERC license, even if a lease has been issued.[22] However, certain cases may allow hydrokinetic developers to conduct some technology testing under a commercial lease prior to receiving a FERC license.[23]

BOEM procedures for authorizing renewable energy activities on the OCS provide for three types of leases: commercial leases, limited leases, and research leases. A *Limited Lease*, typically issued for a 5-year term, authorizes activities such as site assessment and technology testing. A limited lease does not authorize long-term or large-scale operations, and it cannot be converted into a commercial lease. In

[20] https://www.energy.gov/sites/prod/files/2013/12/f5/siting_handbook_2009.pdf
[21] BOEM is the lead agency for hydrokinetic leases; FERC is the lead agency for hydrokinetic licenses.
[22] Memorandum of Understanding between the U.S. Department of Interior and the Federal Energy Regulatory Commission, April 9, 2009 *available at* http://www.mms.gov/offshore/RenewableEnergy/PDFs/DOI_FERC_MOU.pdf
[23] See Verdant Power, 111 FERC ¶ 61,024, clarified at, 112 FERC ¶ 61,143 (2005).

addition, if a FERC license would be required at any point in the project life, BOEM will not issue a limited lease for the project; as such, it is expected that most hydrokinetic developers will pursue commercial leases.

A *Commercial Lease* conveys access and operational rights to produce, sell, and deliver renewable energy, as well as the right to one or more project easements for the purpose of installing transmission cables and other needed facilities. Generally issued for a 30-year term, a commercial lease includes an initial 5-year, site-assessment term and a 25-year construction and operations term.[24]

A *Research Lease* is available only to federal agencies, state agencies, or universities that have legal standing as a state agency. Research leases authorize technology testing and research, and have been issued with a 30-year term for wind projects. BOEM will not issue Research Leases in areas where doing so could interfere with potential commercial renewable energy activities.

BOEM has created several State Task Forces as part of its program for offshore wind leasing. These task forces can be seen as early stakeholder engagement that is so often cited as key to gaining consent and license (or lease, in the case of BOEM), and could be key in future MHK development. Fourteen task forces have been created so far for California, Delaware, Florida, Hawaii, Maine, Maryland, Massachusetts, New Jersey, New York, North Carolina, Oregon, Rhode Island, South Carolina, and Virginia. Intergovernmental Task Force Engagement is part of the entire process: Planning and Analysis, Leasing, Site Assessment, and Construction and Operations.

State task forces established by BOEM are listed in Table 4.

1.1.3 Other Federal Authorities

This section discusses federal authorities that have been specifically modified to apply to MHK permitting and siting or otherwise have a novel jurisdictional question in its application. It is not an exhaustive description of federal authorities that apply to MHK.

1.1.3.1 Federal Environmental Protection Authorities

As noted above, the FERC licensing process applies to MHK siting and development. Federal environmental authorities with a nexus to project footprints and operations therefore apply as well.[25] Appendix B of this report provides a list of applicable federal authorities, while Appendices A and B of the FERC licensing handbook provide short descriptions of critical federal authorities including the FPA.[26]

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[24] Longer lease terms may be negotiated to correspond with the operations term in a FERC license or to accommodate pilot-project relicensing.

[25] The Hydropower Reform Coalition, a coalition of environmental and river recreation organizations, published a compendium handbook that describes the legal boundaries of environmental authorities in detail. This handbook is available online and is organized by administering agency rather than authority. *Citizen Toolkit for Effective Participation in Hydropower Licensing: Hydropower Licensing Guide.* See especially Section 2, Overview of Hydropower Regulation. (Hydropower Reform Coalition, Washington DC, Original publication 2005). https://www.hydroreform.org/hydroguide/hydropower-licensing/citizen-toolkit-for-effective-participation. (last visited May 29, 2018).

[26] Handbook for Hydroelectric Project Licensing, Federal Energy Regulatory Commission, April 2004. https://www.ferc.gov/industries/hydropower/gen-info/handbooks/licensing_handbook.pdf last visited May 29, 2018.

Table 4. State Task Forces Established by BOEM[27]

State Task Force	Wind	Current	Wave	Last Meeting Held	Year Established
Florida		Y		2014	2014
Oregon	Y		Y	2014	2011
California	Y			2017	2016
Maine	Y			2012	2010
Massachusetts	Y			2018	2009
Rhode Island	Y			2018	2009
Hawaii	Y			2016	2012
New York	Y			2018	2010
Delaware	Y			2011	2009
Maryland	Y			2013	2010
North Carolina	Y			2017	2011
South Carolina	Y			2016	2012
New Jersey	Y			2016	2009
Virginia	Y			2017	2009

The most significant environmental protection authorities for MHK development are listed below. It is apparent that after the FPA and FERC, the National Oceanic and Atmospheric Administration (NOAA) is involved in some of the most significant regulations. The authorities listed below include some of the most established and significant environmental authorities governing MHK developments.

- ESA. Under Section 7 of the ESA, FERC must consult with the responsible agency regarding the potential to harm species officially listed as endangered or threatened. In the marine environment, the agency typically responsible for managing the at-risk species is NOAA, although the U.S. Fish and Wildlife Service (FWS) within DOI may be consulted for avian species or for effects associated with land-based project features.
- NEPA. NEPA requires federal agencies issuing a decision that may affect the environment to publish an analysis of the environmental impacts of that decision, including reasonable alternatives. For MHK developments to date, FERC has exclusively issued an EA, which is a lower analytical threshold than an environmental impact statement (EIS) on the basis of fewer anticipated impacts and reduced complexity and risk.
- CZMA. Federal actions affecting any use or resource of a state's coastal zone, including projects authorized by specified federal licenses or permits, must be consistent with the enforceable policies of a state's federally approved coastal management program. Under the CZMA, the state must certify that an MHK development and proposed actions under a license are consistent with its CZMA Program. State jurisdiction to certify consistency with the CZMA Program is not limited by distance, only by substantive nexus.[28]

[27] https://www.boem.gov/Renewable-Energy-State-Activities/

[28] For example, NOAA approved the state of Oregon to establish a Geographic Location Description seaward to the 500 fathom depth for marine energy, meaning that any marine energy activity seeking federal approval within that boundary is automatically referred to the state for consistency with the state coastal management program under the CZMA. See https://www.oregon.gov/LCD/OCMP/docs/GLD_final.pdf.

- Fish and Wildlife Coordination Act. This act requires FERC to consider the recommendations of federal fisheries agencies regarding protection and enhancement of fish and wildlife,
- Magnuson-Stevens Fishery Conservation and Management Act. As the primary law governing marine fisheries management in U.S. waters, this act requires FERC to consult with NOAA on any licensing action that may adversely affect essential fish habitat for diadromous fish.
- Marine Mammal Protection Act (MMPA). The MMPA prohibits harm (i.e., "take") to marine mammals, with limited exceptions for certain activities and for incidental, insignificant levels of harm. Both NOAA and FWS have jurisdiction to implement the MMPA.[29]
- CWA. Under CWA Section 401, a state, with delegated authority from the federal government, must certify or otherwise waive the authority to certify that a discharge into state waters complies with established water quality standards associated with affected water bodies. State agencies have not established water quality requirements offshore in the same fashion as stream reaches, though within state territorial waters, they may use Section 401 to manage the discharge of pollutants, such as hydraulic fluids or lubricants.
- FPA. Under FPA Section 4(e), FERC must give "equal consideration" to environmental and public values of the resources and energy values. In traditional hydroelectric licensing processes, Section 4(e) is an important authority related to federal land management, but this portion of the section is not relevant for marine energy development. Under FPA Section 10(a), FERC must ensure that a project "… be best adapted to a *comprehensive plan* for improving or developing a waterway or waterways for the use or benefit of interstate or foreign commerce, for the improvement and utilization of water-power development, for the adequate protection, mitigation, and enhancement of fish and wildlife (including related spawning grounds and habitat), and for other beneficial public uses, including irrigation, flood control, water supply, and recreational and other purposes." Under FPA Section 10j, FERC must "… protect, mitigate damages to, and enhance fish and wildlife (including related spawning grounds and habitat) affected by the development, operation, and management of the project." Under Section 10(j) the federal and state fish and wildlife agencies recommend license conditions to protect, mitigate damages to, and enhance fish and wildlife.

1.1.3.2 U.S. Army Corps of Engineers Nationwide Permit 52 – Water-Based Renewable Energy Generation Pilot Projects

The addition of Nationwide Permit (NWP) 52 in 2012 and creates a U.S. Army Corps of Engineers (USACE) mechanism for a nationwide permit for pilot projects only. This is defined as an experimental project in which devices will be monitored to collect information on performance and environmental effects. The discharge of the project must cause less than 0.5 acre loss to waters of the United States. This permit allows up to 10 devices with no mention of actual electrical output limitations. Application for NWPs is region specific; in some locations they are not used at all; for example, the New England states where only regional general permits are allowed.

The NWP process generally begins with the prospective permittee submitting a pre-construction notification to the USACE, where it is entered into a database, evaluated for completeness, and a determination is made if it qualifies for the specific NWP. Next it is determined whether the proposed project may affect federally threatened or endangered species or cultural resources listed in the National Register of Historic Places. If so, the project will require consultation with the appropriate federal agencies. A certification or waiver for CWA Section 401 is the next requirement. Last, USACE sends a

[29] NOAA provides a detailed overview of exception activities and species-specific jurisdiction. https://www.fisheries.noaa.gov/topic/laws-policies#marine-mammal-protection-act

verification letter with applicable special conditions to the permitee. Work may proceed subject to the general, regional, and special conditions of the NWP.

This avenue of permitting separate from FERC possibly is unknown or it is new enough that few developers have tried it. ORPC was issued an NWP 52 for its in-stream RivGen® turbine project at Igiugig Village on the Kvichak River in Alaska. ORPC also took advantage of the Verdant Exception for the project because the energy generated was not placed on the national grid. Whether they needed both of these avenues within the law to proceed with the project is uncertain. Reaching out to the USACE through the Freedom of Information Act may prove fruitful to get an idea how many developers have attempted or succeeded in using the NWP permitting path.

1.1.3.3 The Jones Act and Other Significant Maritime Vessel Laws

The Merchant Marine Act of 1920—also called the Jones Act after the U.S. Senator who introduced the law—governs maritime commerce. Section 27 of the Jones Act governs cabotage or coastwise trade and, in certain instances, creates requirements for vessels supporting marine hydrokinetic construction and operation.

The Jones Act has not yet been applied to MHK consistently because few projects reach the later stages of construction. Snohomish County Public Utility District (Snohomish PUD) found that complying with provisions of the Jones Act would add $2 to $3 million to the cost of building a new barge to replace the European vessel designed for device deployment.[30] U.S. Customs and Border Protection (CBP) officials declined to provide a Jones Act waiver to Snohomish PUD based on the claim that installation of the turbines would constitute "oceanographic research." The proposed vessel was deemed to have "… no purpose related to the study of the sea; rather, it is an installation vessel."[31] [32]

Ports or "Points"

The Jones Act applies to transportation of merchandise (broad term) between "points" in the United States. This includes all U.S. ports in addition to any place within 3 nm of the coast. While the original Act uses the term "ports," the OCSLA extended this meaning to "points" such as stationary offshore oil and gas platforms.

Tidal and wave energy deployments within territorial seas will therefore fall under Jones Act jurisdiction, thus triggering reviews. If no waiver is provided, the Jones Act will possibly require that U.S. vessels be used in MHK deployments during initial construction of a facility and likely in operations and maintenance as well.

Beyond the territorial seas boundary, Jones Act implementation is less clear.[33] Governance of the OCS falls under OCSLA. Regulators have ruled that a stationary foreign vessel can be used in U.S. waters for pile driving and the creation of a construction platform. After a pile is installed, however, it is not clear whether this pile would be considered a "point" under OCSLA. There is precedent for an established oil

[30] *Clearing Up*, Edition No. 1666, issued October 3, 2014. See "[9] DOE Jumps Ship, Sinking Snohomish PUD Tidal Project," pp. 9-10.
[31] US Customs and Border Protection Ruling H196496, March 2012. https://rulings.cbp.gov/hq/2012/h196496.doc (last accessed August 23, 2017)
[32] US Customs and Border Protection Ruling H214719, March 2012. https://rulings.cbp.gov/hq/2012/h214719.doc (last accessed August 23, 2017)
[33] Papavizas, C. 2012. The Jones Act and Offshore Wind Farms. North American Clean Energy. Vol. 6 Issue 5. (http://www.nacleanenergy.com/articles/14346/the-jones-act-and-offshore-wind-farms; accessed 12/30/2016).

rig (or even a single pile attached to the sea floor) being considered a "point." The Jones Act is applied to ships carrying equipment from a U.S. port to that oil rig (CBP Ruling HQ 113113); however, whether or not an installed wave energy converters (WEC) or tidal turbine would be considered a "point," similar to an oil rig, under OCSLA has not been tested yet.

There is reason to think that the Jones Act may not apply to MHK development in the OCS. MHK as well as offshore wind construction activities may not fall with the purview of the Jones Act because the original scope of OCSLA is limited to mineral resources only. OCSLA has been interpreted to pertain to oil and gas and other resource extraction activities. Renewable energy facilities may be a special case because drilling or removal of ocean bottom materials such as sand do not occur. However, the offshore wind industry to date has presumed Jones Act jurisdiction and has designed compliant construction activities accordingly (USCBP Ruling HQ 105415). As a result, this question has not been tested. Additionally, CBP has held in the past that pile driving does not constitute trade or transportation (USCBP Rulings HQ 109817; HQ 111412). This decision was recently upheld for installation of a meteorological tower by a foreign-flagged vessel related to offshore wind (USCBP Ruling HQ 105415). It is important to note that the materials were shipped from a U.S. port on a U.S.-flagged vessel to the construction site where the foreign-flagged vessel was waiting.

Maintenance activities would likely trigger the Jones Act in relation to transport of materials and workers to an MHK device to perform the work. The vessel would likely leave a U.S. port, go to the turbine (a "point" under the OCSLA interpretation of the Jones Act), perform work, and return to U.S. port. It is uncertain if a floating offshore wind platform that is not rigidly attached to the sea floor—as with a mono-pile or oil rig—would be considered a "point."

Merchandise

The definition of merchandise is important for the implementation by the CBP. While the Jones Act applies to most merchandise, there are several notable exceptions. The most important for the MHK industry is the exception of "vessel equipment." which has been interpreted to mean items "… necessary to carry out a vessel's functions." This would include items related to a construction (e.g., pile driving) vessel or even a maintenance vessel, but not necessarily the specific items associated with an MHK device such as blades or generator units.

Without a specific ruling from CBP, what is defined as "equipment" or "merchandise" is unknown for MHK applications. Additionally, definitions are often contentious. For example, the controversial CBP Ruling HQ 046137 interpreted a major piece of oil wellhead equipment (known as "Christmas Trees") often is moved from ports to oil rigs as "vessel equipment." In January 2017, CBP proposed changes in what constitutes "vessel equipment," but the proposed changes were withdrawn in May 2017.[34] In another example, regulators have determined that placing underwater cables is not "unloading" merchandise; therefore, the Jones Act does not apply to cable deployment.[35]

[34] Customs and Border Protection, General Notice 19 CFR Part 177. *Proposed Modifications and Revocation of Ruling Letters Relating to Customs Application of the Jones Act to the Transportation of Certain Merchandise and Equipment between Coastwise Points.* January 2017. https://www.cbp.gov/sites/default/files/assets/documents/2017-Jan/Vol_51_No_3_Title.pdf (last visited June 29, 2017).

[35] Papavizas, C. 2011. Clarifying the Jones Act for Offshore Wind. North American Wind Power. June issue (reprint referenced). (http://cdn2.winston.com/images/content/8/6/v2/862/Windpower-Papavizas.pdf; referenced 12/30/2016).

Foreign Vessels and Waivers

There are potential exceptions to Jones Act requirements. The obvious exception could be using foreign-flagged vessels that never enter a U.S. port and perform all work and transport from foreign ports. If each installed device is deemed a "point" in U.S. waters, there is a possibility that moving from one MHK device to another without first returning to a foreign port may constitute movement between "points," and then the Jones Act may apply. This has not yet been tested. Additionally, there are waivers for certain circumstances that can be requested from the Secretary of Defense, usually only for national security reasons.[35] Currently, there are no vessels in the United States that are qualified for certain tasks such as constructing the offshore wind turbine platforms in Block Island, Rhode Island. In that instance, a foreign-flagged ship was allowed to install the turbines because it remained on station at the installation site and never entered a U.S. port or touched a U.S. point in the territorial seas or OCS. As described above, the materials or cabotage had to be transported from a U.S. port on a U.S.-flagged vessel as this constitutes "coastwise trade" and triggers the Jones Act.

Other Acts

Additional laws could apply to MHK activities with similar effects as the Jones Act. The Passenger Vessel Services Act (46 U.S. Code; Chapter 551; Section 55103) requires a U.S.-flagged vessel for passenger transport between ports or places. The Towing Statute (46 U.S. Code; Chapter 551; Section 55111) also requires a U.S.-flagged vessel for towage between ports and places. The Dredging Act (46 U.S. Code; Chapter 551; Section 55109) requires the use of U.S.-flagged vessels for dredging and certain pipe and cable laying activities that use certain mechanical devices. Similar to the Jones Act, they are likely to be fully implemented within the territorial seas. Only the Towing Statute, at present, is maintained outside of the territorial seas.[36]

In summary, component delivery from a foreign port to a U.S. port for delivery would not involve the Jones Act. However, once these components are delivered to a construction site offshore from a U.S. port, the Jones Act would apply. The Towing Statute would require U.S. vessels to be used if the components were barged. The installation and assembly phase is not considered transport of "merchandise" from previous rulings and would not involve the Jones Act (USCBP Rulings HQ 109817; HQ 111412). The maintenance of MHK devices offshore would likely involve the Jones Act as the vessel would be leaving a U.S. port with merchandise (repair components), going to the device (possibly a "point"), and returning to a U.S. port. The Passenger Services Act might be applicable to the people on board as well.[36]

1.2 States

Each coastal state has authority over the use of the seafloor and waters extending seaward out to 3 nm, described in this document as state territorial waters.[37] The area between 3 nm and 12 nm falls under federal jurisdiction, and both state territorial waters and federal waters are within the U.S. territorial sea. (33 CFR 2.22 – definition Territorial Sea)[38] A revenue sharing boundary, or 8(g) zone, exists between 3 nm and 6 nm. Any energy production in this zone is charged rent, and revenue generated from resources is collected by the federal government, which may be shared with the coastal state for projects within the

[36] Burnett, D. and Hartman, M. 2010. The Jones Act- One more variable in the offshore wind equation. Article from Squire, Patton, Boggs Law Firm. September. (http://www.lexology.com/library/detail.aspx?g=8c337776-bfcf-4956-b603-83d9c922ce5b; accessed 12/30/2015).

[37] There are exceptions. For example, Florida (in the Gulf) and Texas have authority of waters extending seaward out to 9 nm (or 3 leagues). Great Lakes states have authority seaward to the U.S.-Canada International boundary. See *State Coastal Zone Boundaries* (February 2012) https://coast.noaa.gov/czm/media/StateCZBoundaries.pdf

[38] https://www.law.cornell.edu/cfr/text/33/2.22

zone.[39] An Exclusive Economic Zone extends from 3 nm to 200 nm. As established by the 1982 United Nations Convention on the Law of the Sea, this zone provides the sovereign right to explore, exploit, conserve, and manage the natural resources of both the seafloor and waters and jurisdiction to develop, research, and protect the marine environment.[40] Figure 5 graphically shows the various U.S.marine boundaries.

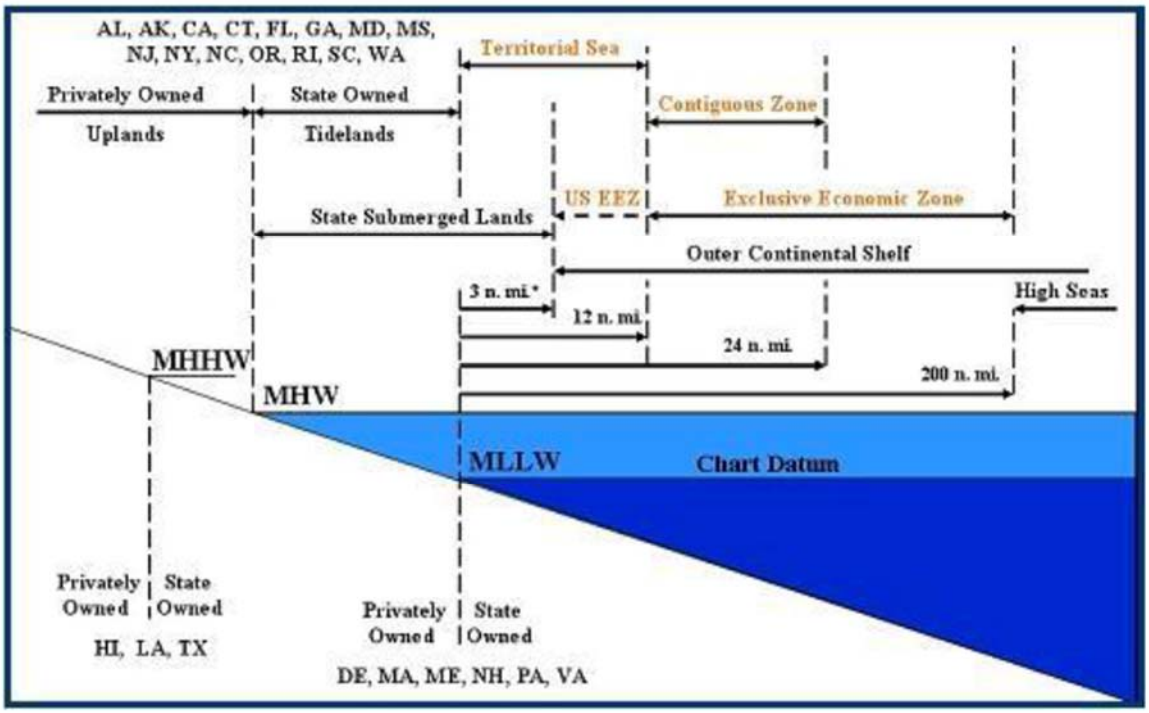

Figure 5. Diagram of Marine Boundaries[41]

To complement the detailed descriptions of state regulatory processes provided in the *Handbook of Marine Hydrokinetic Regulatory Processes*, this section highlights cross-cutting approaches, leadership, or regulatory innovations specifically related to MHK.

1.2.1 State Influence in Federal Waters

With state territorial waters generally extending to 3 nm, states have developed regulatory tools to ensure their influence within federal waters. Strategies include conducting marine spatial planning (MSP), adopting a federally approved program under the CZMA, and coordinating with federal agencies. There is no standard approach among states, although several of the methods have been used by coastal states.

1.2.1.1 Marine Spatial Planning

States may elect to undertake an MSP policy or program to coordinate increasing activities conducted in the marine environment, both for ongoing activities such as shipping, fishing, and recreation and to accommodate the potential for new uses such as MHK and offshore aquaculture. MSP is a framework to manage existing and potential uses in a coordinated manner and provide recommendations to plan and

[39] https://www.marinecadastre.gov/SiteCollectionDocuments/SoWhat_MarineBoundaries_final_template.pdf
[40] http://www.un.org/Depts/los/convention_agreements/texts/unclos/unclos_e.pdf
[41] https://www.marinecadastre.gov/SiteCollectionDocuments/SoWhat_MarineBoundaries_final_template.pdf

manage uses in the marine environment. This may include designating areas or specific marine uses or exclusionary zones or helping to manage areas that are environmentally sensitive. While there is no standard definition of MSP, the 2010 National Ocean Policy (NOP) defines MSP as a "… comprehensive, adaptive, integrated, ecosystem-based, and transparent spatial planning process, based on sound science, for analyzing current and anticipated uses of ocean, coastal, and Great Lakes areas."[42] While MSP occurred before the 2010 NOP, the NOP did create an incentive for states to develop plans and increase coordination at all levels of government through MSP. The NOP also created a framework for developing regional planning bodies to develop MSP on a scale broader than just at the state level. While the NOP Executive Order was repealed in 2018, thus dissolving these incentives, states have continued with MSP and some regional planning bodies hope to continue their work through different mechanisms.

Between 2010 and 2018, several coastal states developed or initiated processes to develop marine spatial plans that address MHK development, either indirectly or directly. In 2010, Rhode Island produced an Ocean Special Area Management Plan that provides a management and regulatory tool to plan for uses using an ecosystem-based approach and designates an area best suited for wind energy development. Oregon updated its Territorial Sea Plan in 2013 to include a Part 5 that designates areas for renewable energy development. In 2015, Massachusetts updated its Ocean Management Plan and included offshore wind development areas. In 2018, Washington finalized an MSP to help coordinate management of ocean uses and the potential for new uses, including MHK and offshore wind energy.

The following sections describe various state MSP approaches with regard to MHK.

Washington Marine Spatial Planning

In 2010, Washington enacted the Marine Waters Planning and Management Act (MWPMA), which dictates guidelines for developing an MSP to coordinate how resources and activities are managed.[43] As defined in the MWPMA, MSP would consist of a public process that would analyze and allocate spatial and temporal distribution of human activities in marine areas to reduce conflicts among users and environmental impacts and to align management decisions. The push for creating the Washington plan arose from the potential for MHK development and a need for guidance for new uses such as MHK. Therefore, the MWPMA specifically called out marine renewable energy (e.g., wave, tidal, offshore wind, etc.) as an emerging new use that may create management challenges, and required that the state plan include a framework for coordinating state and local review of proposed renewable energy development uses and ensuring protection of sensitive resources and minimizing impacts to existing uses.

The Washington plan, which was finalized in 2018, covers the Pacific Coast of Washington from Cape Flattery to Cape Disappointment and offshore to a depth of 700 fathoms. The plan includes maps that summarize locations with high potential for marine renewable energy and minimal potential for conflicts with existing uses and sensitive environments, a framework for coordinating local and state agency review of proposed marine renewable energy projects, and a roadmap for new ocean uses including the application and review process and standards specific to MHK.[44]

While the Washington plan is a non-regulatory document, it will be used to inform recommendations made by the state, and it includes enforceable policies for state and local agencies to use in their regulatory process. It also does not give state jurisdiction in federal waters or alter regulatory programs

[42] https://obamawhitehouse.archives.gov/the-press-office/executive-order-stewardship-ocean-our-coasts-and-great-lakes
[43] https://apps.leg.wa.gov/rcw/default.aspx?cite=43.372&full=true
[44] https://fortress.wa.gov/ecy/publications/documents/1706027.pdf

for federal waters, but it will be submitted to NOAA for approval and then added into the Washington Coastal Zone Management Program.

Additionally, it was thought that the plan would be used as part of the West Coast Regional Planning Body process through the NOP. With Washington having developed a plan ahead of the regional process, it was possible that the regional process could be coordinated with the plan. Although the NOP has been repealed, the West Coast Regional Planning Body intends to continue its work through a different mechanism.

Oregon Territorial Sea Plan

Oregon first adopted a Territorial Sea Plan in 1994 to provide guidance to state and federal agencies for planning, managing, and regulating uses that occur within state waters. Part 5 of the Territorial Sea Plan, adopted in 2013, focuses on the development of renewable energy facilities (e.g., wind, wave, current, thermal, etc.) and describes a process for decision-making in state waters.[45] Through MSP, the Oregon Land Conservation and Development Commission has designated areas within state waters that are appropriate for renewable energy facilities development and has established review standards for siting such projects. For the designated areas, there are special conditions that apply based on six designations. These standards range from renewable energy permit areas (i.e., sites that have existing authorization for development) and renewable energy facility suitability study areas i.e., sites where development is anticipated to have the lowest potential adverse effect on resources and uses) to resources and uses conservation areas (i.e., sites where facilities could be sited, but there is a high potential most projects would have a significant adverse effect on resources and uses) and renewable energy exclusion areas (i.e., special management areas where uses have exclusive rights/authority and facilities cannot be sited).

In 2018, a Court of Appeals decision invalidated the 2013 Part 5 amendment, including the designated areas listed above.[46] The Land Conservation and Development Commission is currently revising the 2013 version. During this process, the 2009 Territorial Sea Plan, which does not include any designations for MHK, is the currently approved plan.

Massachusetts Ocean Management Plan

Under the Massachusetts Oceans Act of 2008, the Executive Office of Energy and Environmental Affairs was directed to develop a comprehensive Ocean Management Plan.[47] Maps of the plan area are shown in Figure 6.

The Massachusetts Ocean Management Plan, led by the Office of Coastal Management (within the Executive Office of Energy and Environmental Affairs), was then produced in 2009 and subsequently updated in 2015. The plan provides a "… blueprint for the protection and sustainable use of state ocean waters, protects critical marine habitat and important water-depended uses and sets standards for new ocean-based projects."[48] The management framework laid out in the Massachusetts plan is implemented through existing regulations and includes coordination of review and approval of proposed ocean projects between relevant agencies.

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[45] https://www.oregon.gov/lcd/OCMP/Documents/Part_5_FINAL_1008

[46] https://www.oregonocean.info/index.php/tsp-home/108-territorial-sea-plan-part-5-marine-renewable-energy-development

[47] https://malegislature.gov/Laws/SessionLaws/Acts/2008/Chapter114; https://www.mass.gov/service-details/overview-and-index-czm-ocean-management-program

[48] https://www.mass.gov/service-details/massachusetts-ocean-management-plan

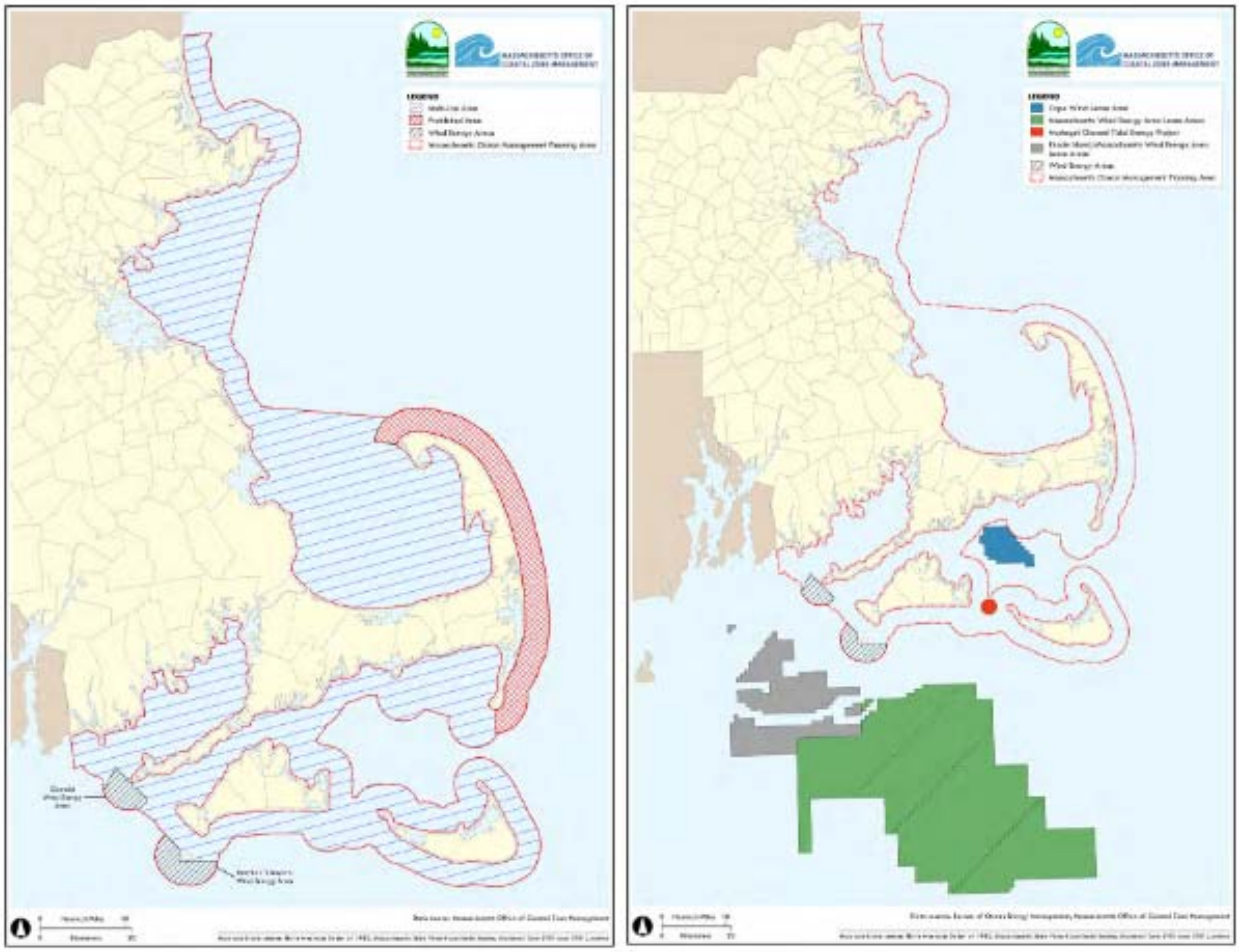

Figure 6. Maps Showing the Designated Areas in the Massachusetts Ocean Management Plan. Left: The different designated areas including Multi-Use Areas, Prohibited Area, and Wind Energy Areas. Right: The renewable energy areas, both in the Massachusetts planning area and those in federal waters.

Regarding marine renewable energy, the plan calls out offshore wind energy, tidal energy, and wave energy. For offshore wind energy, it designates two Wind Energy Areas as the only locations within the planning area that are suitable for commercial-scale wind energy development. However, the 2015 update calls for additional evaluation of both Martha's Vineyard Wind Energy Area and Gosnold Wind Energy Area and confirms exclusionary areas for commercial-scale development within both areas. For tidal energy, the plan does not designate specific areas, but it does note that there is the potential for harnessing tidal energy in Massachusetts and identifies several areas with such potential. Alternatively, although wave energy projects have been proposed at pilot scale, and one demonstration was deployed, the plan states that the prospect for commercial-scale development is limited.

Rhode Island Special Area Management Plan

Rhode Island developed an Ocean Special Area Management Plan (Ocean SAMP) that was approved by the Rhode Island Coastal Resources Management Council in 2010. A map of the area covered by Ocean SAMP is shown in Figure 7.

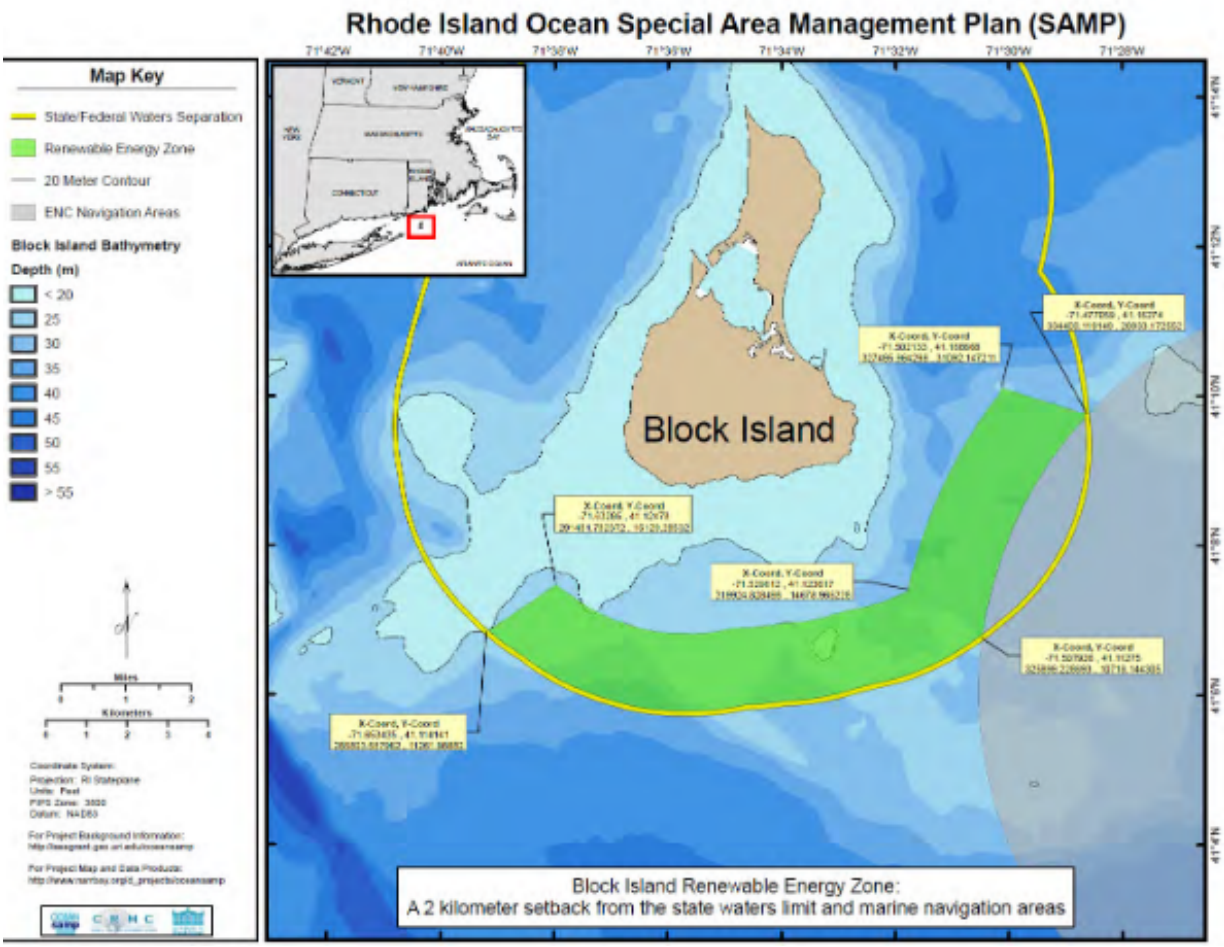

Figure 7. Renewable Energy Zone near Block Island as Designated by the Rhode Island Ocean Special Area Management Plan

The Ocean SAMP uses MSP to plan and manage uses within the Ocean SAMP area, which includes both state and federal waters, through an ecosystem-based management approach.[49] The driving force behind developing the Ocean SAMP was the need to invest in and develop offshore wind farms to achieve the Governor's mandate that offshore wind resources produce 15% of state's power by 2020. Based on this, the Council suggested developing the Ocean SAMP to engage the public and provide policies and recommendations for offshore renewable energy development. Overall, Ocean SAMP is a "… community-based public effort that is an active and federally recognized coastal management and regulatory tool."

The Ocean SAMP focuses on offshore wind development and designates a Renewable Energy Zone located to the south of Block Island. The zone was selected because it is the most suitable for offshore wind development within state waters (where the Council is authorized to license or permit uses).

In 2016, Smythe et al.[50] assessed the Ocean SAMP, and in particular permitting of the Block Island Wind Farm using the Ocean SAMP. They found that having this management and regulatory tool in place

[49] https://www.crc.uri.edu/download/RI_Ocean_SAMP_V11.pdf

[50] https://www.researchgate.net/publication/311066149_The_Rhode_Island_Ocean_Special_Area_Management_Plan_2008_-_2015_From_Inception_through_Implementation/stats

allowed for more efficient siting and permitting of the wind farm. The developer had an area already identified for the project and, through robust public engagement process for the Ocean SAMP, stakeholders who supported the development. Similarly, permitting agencies found having the Ocean SAMP in place made permitting more effective by offering alterative permitting options (such as a "less time-consuming and resource-intensive option of an EIS"), made data and information needed for permitting easily accessible, and allowed agencies to be confident in findings, designations, and data from the process as many were involved through the development of the Ocean SAMP.

1.2.1.2 Coastal Zone Management Programs

States also have exercised authorities within the CZMA to make sure they have oversight in managing resources and activities within federal waters. Under the CZMA, coastal states and territories can voluntarily partner with NOAA to address national coastal issues through the National Coastal Zone Management Program. A key incentive for states to develop a Coastal Zone Management Plan is the provision for "federal consistency" under the CZMA. This provision mandates that federal actions that may have a "… reasonably foreseeable [effect] on coastal uses and resources" must be consistent with state policies under approved Coastal Zone Management Plans. Federal actions include agency activities, license or permit activities, federally authorized nonfederal actions, and financial assistant and federally funded nonfederal activities. Thus, states with Coastal Zone Management Plans are better equipped to be involved in decision-making processes that may affect the state's coastal uses or resources.

Many states have used this mechanism to consult on MHK decisions for projects outside state waters. All 35 coastal and Great Lakes states have developed Coastal Zone Management Plans except for Alaska, which previously had a program but withdrew in 2011. States such as Oregon, through its Territorial Sea Plan, and Rhode Island, through the Ocean SAMP, have designated Geographic Location Description areas for which responsibility for state consultation for federal consistency reviews is transferred to the federal agencies. Examples of how states have ensured they are included in federal decision-making follow.

Washington

The Washington Coastal Management Program was approved by NOAA in 1976 and was the first federally approved program. As detailed in the section above on MSP, Washington developed an MSP to better manage the potential for new uses in the marine environment. While the Washington plan does not provide additional regulatory authority for the state, it will be submitted to NOAA for approval and then added into the Washington plan. As part of the Washington Coastal Zone Management Plan, the policies and recommendations included in the plan will be used for the Washington Department of Ecology to review federal actions under the CZMA federal consistency provision.

Oregon

The Oregon Coastal Management Program was approved by NOAA in 1977. Part 5 of the Territorial Sea Plan detailed that the Department of Land Conservation and Development will review federal consistency under the CZMA for siting of renewable energy facilities in federal waters. In addition, the Oregon Coastal Management Program includes a Geographic Location Description that specifies that any marine energy development seaward to the 500-fathom contour would automatically require federal consistency review from the Department of Land Conservation and Development.[51]

[51] https://coast.noaa.gov/czm/consistency/media/or.pdf

Rhode Island

The Rhode Island Coastal Management Program was approved by NOAA in 1978. Through the Rhode Island Ocean SAMP, Rhode Island has a Geographic Location Description for federal waters including the entire Ocean SAMP area, extending seaward to 30 nm.[52] In addition to federal consistency reviews based on Rhode Island's federally approved Coastal Zone Management Program, Rhode Island must be consulted for activities that occur within the Geographic Location Description area.

1.2.1.3 Coordination with Federal Agencies

More directly, states have worked in partnership with federal agencies to coordinate on decisions. As described previously, the two principal federal agencies with governance over MHK are BOEM and FERC. States have thus partnered on BOEM Intergovernmental Renewable Energy task forces and MOUs with FERC.

As noted in Table 4, states that have had a BOEM Intergovernmental Renewable Energy Task Force include Delaware, Massachusetts, New Jersey, Rhode Island, and Virginia (all established in 2009); Maine, Maryland, and New York (all established in 2010); Oregon and North Carolina (both established in 2011); Hawaii and South Carolina (both established in 2012); Florida (established in 2014); and California (established in 2016). BOEM task forces are partnerships between state, local, and tribal governments and federal agencies that aim to improve planning and coordination, including efficient reviews of requests for licenses and permits, and to provide information for decision-making processes. With the exception of Florida and Oregon, these state task forces focus exclusively on development of wind energy. Florida focuses on ocean current energy, and Oregon focuses on both wind and wave energy development. Massachusetts, Rhode Island, and New York are the only states with task forces that have conducted meetings as recently as 2018.

Of note, the Massachusetts Intergovernmental Renewable Energy Task Force worked together with BOEM to develop the Massachusetts Wind Energy Area for wind energy development.

As detailed in section 1.1.1., several states have signed MOUs with FERC, including Washington, Oregon, California, and Maine. While each MOU is different, some common aspects of these MOUs include notifying one another when either is aware of potential applicants, agreement on a schedule for reviews, and coordinating environmental reviews and consulting with stakeholders.

Aspects that differ by state:

- In California, the 2013 MOU with FERC specifies that California would develop MHK siting recommendations. Once those recommendations have been completed, FERC will consider incorporating these guidelines for permits or licenses.
- In Maine, the 2009 MOU with FERC specifies that FERC must take into consideration the extent to which proposed tidal projects are consistent with the pertinent comprehensive plan.

1.2.2 State Marine Energy Development Practices

In addition to state interactions with federal authorities and federal waters, several states have adapted permitting authorities and established policies expressly focused on MHK energy development.

[52] https://coast.noaa.gov/czm/consistency/media/ri.pdf

1.2.2.1 Working Groups and Policies

California

California established a Marine Renewable Energy Working Group to address marine renewable energy development in the state.[53] The working group has focused on addressing uncertainties in the regulatory process, addressing information needs to inform potential impacts and user conflicts, and facilitating increased coordination of state and federal permitting processes. In 2011, the California Ocean Protection Council and the working group promulgated licensing and permit processing guidance for early MHK and offshore wind projects. The state's jurisdiction over both state waters and activities in federal waters is established in this guidance.[54] This document aims to guide potential developers through the permitting process for early test and pilot projects and make coordination between the state and federal agencies more efficient.

The California Coastal Act of 1976 established the role of the California Coastal Commission as the agency responsible for planning and regulating the use of the coastal zone, including environmentally sustainable development.[55] The Commission issues permits for offshore activities and also reviews CZMA federal consistency for all of California except for San Francisco Bay under the California Coastal Program. Additionally, the California State Lands Commission is responsible for leasing state lands (e.g., leasesing land for development of oil and gas resources). Oil and gas development in California may have lateral lessons for MHK. For instance, two offshore oil platforms are located on federal lease lands and require leases by BOEM, but the submarine power cable providing electricity to the platforms is leased through California state leases.[56]

Maine

Maine has taken a different path than other states in encouraging and managing MHK development. In 2008, because of an increase in the price of oil, the Governor created an Ocean Energy Task Force to find solutions that would help overcome obstacles to ocean energy development (i.e., wind, tidal, and wave).[57] The task force developed recommendations that included more accelerated, efficient, and coordinated permitting processes at both the state and federal levels as well as encouraging tidal and wave power development by facilitating permitting and development opportunities.

In 2009, the Maine legislature passed An Act to Facilitate Testing and Demonstration of Renewable Ocean Energy Technology, which streamlines and coordinates state permitting and leasing requirements.[58] The goal was to allow Maine to be an international proving ground for new renewable ocean energy technologies by more readily allowing demonstration projects. Following this, the legislature passed An Act to Implement the Recommendations of the Governor's Ocean Energy Task Force in 2010. [59] This act stated the state's policy to encourage appropriately sited tidal and wave energy

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[53] http://www.opc.ca.gov/2010/05/offshore-wave-energy-development/

[54] http://opc.ca.gov/webmaster/ftp/project_pages/energy/CA%20Ocean%20Energy%20Guidance%20Paper_Final_12-15-11.pdf

[55] https://www.coastal.ca.gov/whoweare.html

[56] https://documents.coastal.ca.gov/reports/2008/1/Th6-1-2008.pdf

[57] https://umaine.edu/offshorewindtestsite/wp-content/uploads/sites/303/2017/02/OETF_FinalReportAppendices.pdf

[58] https://www.maine.gov/dep/land/dams-hydro/documents/is_tidal_wave_reg.html)

[59] Maine Revised Statutes, Title 38: Waters and Navigation, Ch. 5, Subchapter 1, Article 1, Subarticle 1-B: Permits for Hydropower Projects. §631, 3. Encouragement of tidal and wave power development. It is the policy of the State to encourage the attraction of appropriately sited development related to tidal and wave energy, including any additional transmission and other energy infrastructure needed to transport such energy to market, consistent with all

developments and to encourage permitting and siting of tidal and wave energy projects and research and manufacturing facilities.

Washington

To support businesses navigating state permitting requirements, Washington established a Governor's Office for Regulatory Innovation and Assistance, which is routinely used for permitting activities in the marine or water-based environment. In fact, to emphasize that permitting in state waters is uniquely complicated and involves multiple agencies, the first options that appear on the office landing page for permitting are "permit a mooring buoy" and "repair your dock," and on the Joint Aquatic Resources Permit Application page, "shellfish aquaculture."[60] This office supported early MHK permitting for the Admiralty Inlet project.

1.2.2.2 Demonstration Projects and Test Facilities

Pilot Project

Alaska Igiugig

Since 2013, ORPC has been working in the remote Village of Igiugig, Alaska, to develop an in-stream tidal turbine to provide renewable power as an alternative to the currently used diesel generator.[61] ORPC first deployed its RivGen Power System in Igiugig in 2014, and then deployed the system again in 2015 to continue the technology demonstration; both deployments delivered energy to the microgrid, demonstrated the ability to operate and maintain the device, and provided an important opportunity for environmental monitoring around the turbine, which found no known negative impacts.[62]

In November 2018, on behalf of the Village of Igiugig,, ORPC submitted a pilot project license application to FERC to operating the RivGen Power System in the Kvichak River (P-13511).[63] In December 2018, FERC issued a Federal Register notice that the application had been filed.[64] On February 21, 2019, FERC issued an EA for the project.[65] As detailed in section 1.1.1, a pilot license allows for an expedited licensing process.

Test Facilities

Hawaii Wave Energy Test Site

The U.S. Navy Wave Energy Test Site (WETS) at Kaneohe Marine Corps Base Hawaii on Oahu is the first grid-connected wave energy test site in the United States.[66,67] A map of the WETS site is shown in Figure 8.

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state environmental standards; the permitting and siting of tidal and wave energy projects; and the siting, permitting, financing and construction of tidal and wave energy research and manufacturing facilities."

[60] https://www.oria.wa.gov/site/alias__oria/347/Permitting.aspx

[61] http://www.orpc.co/markets/remote-communities

[62] http://www.islandinstitute.org/sites/default/files/3.Alaska%20Chris%20Sauer.pdf

[63] http://www.orpc.co/media/milestones

[64] https://www.federalregister.gov/documents/2018/12/06/2018-26457/igiugig-village-council-notice-of-application-accepted-for-filing-soliciting-motions-to-intervene

[65] FERC Accession No. 20190221-3004.

[66] http://hinmrec.hnei.hawaii.edu/nmrec-test-sites/wave-energy-test-site/

[67] https://openei.org/w/images/9/90/SNL_US_WEC_TestSiteCatalogue_2ndEdition_Part1.pdf

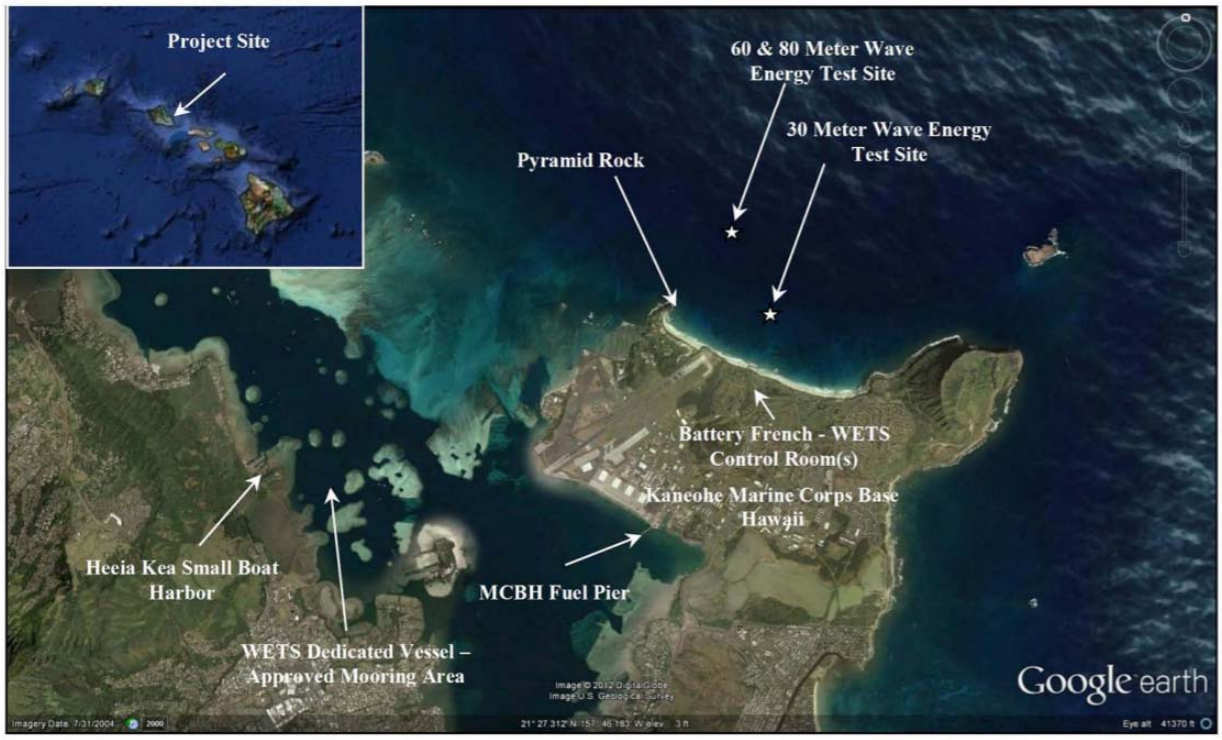

Figure 8. Map of the Hawaii Wave Energy Test Site at Kaneohe Bay, Oahu.[68]

The site initially was included a 30-m shallow berth. Subsequently, two deep water berths at 60 and 80 m were added in 2015. The berths are permitted for testing two types of wave energy devices, point absorbers and oscillating water column devices, but developers will still submit applications for device-specific Categorical Exclusions and a USACE permit. The Naval Facilities Engineering Command operates the site, including permitting, and has set up a Cooperative Research and Development Agreement or a Navy contract for users. The Hawaii National Energy Institute provides device performance analysis, environmental monitoring, and outfits an at-sea platform. Funding from the Navy and DOE has allowed for five devices to be tested at WETS, providing important opportunities to test pre-commercial devices.[69]

Florida Atlantic University Southeastern National Marine Renewable Energy Center

Florida Atlantic University's (FAU) goal in developing the Southeastern National Marine Renewable Energy Center (SNMREC) is to offer small-scale, open-ocean testing for ocean current systems and ocean thermal energy conversion devices and to reduce deployment barriers and environmental impacts of these technologies.[70] Regulatory efforts for permitting SNMREC were focused mostly on federal authorities, such as working with BOEM on the EA to fulfill NEPA requirements.[71] State authorities were applied in a limited fashion, but the Florida Department of Environmental Protection was included for consistency with Florida's Coastal Management Program.

[68] http://www.hawaii.edu/arl/wp-content/uploads/2017/08/Wave-Energy-Test-Site.pdf
[69] https://www.hnei.hawaii.edu/sites/www.hnei.hawaii.edu/files/Wave%20Energy%20Test%20Site.pdf
[70] http://coet.fau.edu/index.html
[71] http://coet.fau.edu/focus-areas/regulatory-framework.html

1.2.2.3 State Regulations Expressly for MHK

Oregon

Oregon is one of the few states with regulations specifically developed for MHK. In 2008, the Department of Land Conservation and Development was directed to develop mandatory policies for state and federal agency approvals for MHK that would be included in the Territorial Sea Plan.[72] Therefore, the addition of Part 5 to the Territorial Sea Plan lays out policies and regulations for development of MHK in state territorial waters.[43] Among other aspects regulating MHK development is a financial assurance compliance plan that assures sufficient funds will be available to cover incidents such as lost or damaged parts or accidental damages to third-party vessels or equipment, removal or recovery of the project, and decommissioning and removal at the end of a project. While Part 5 is the basis for these rules, there is some question about its legal standing due to the 2018 Court of Appeals decision (see section 1.2.1.1).

The Oregon Department of State Lands has requirements related to MHK development. One is a Temporary Use Permit, which is required for research or demonstration deployments. Another is an Oregon Energy Facility Lease, which is required for commercial MHK generation. In 2015, Senate Bill 319 consolidated the review and permitting for MHK projects in state territorial waters under the Department of State Lands.[73] Senate Bill 319 also removed the requirements for water rights and hydroelectric licenses that are administered by the Oregon Water Resources Department.

[72] https://www.oregonocean.info/index.php/ocean-policy/61-territorial-sea-plan-advisory-committee
[73] https://olis.leg.state.or.us/liz/2015R1/Downloads/MeasureDocument/SB319/Enrolled

2.0 Case Studies

2.1 Tidal

Tidal energy generation is one of the most demonstrated MHK technologies domestically and relevant regulatory processes are well established. Three case studies that illustrate developer-applicant and utility-applicant approaches and Pacific and Atlantic regulatory regimes are described below. All three case studies used the FERC PPLP approach, and each case study includes a more extensive discussion of one or two unique issues that arose in the licensing process.

2.1.1 Roosevelt Island

Verdant Power operated a six-turbine, 1.05 megawatt tidal energy demonstration from 2006 to 2008 (**Error! Reference source not found.** and Table 5).[74]

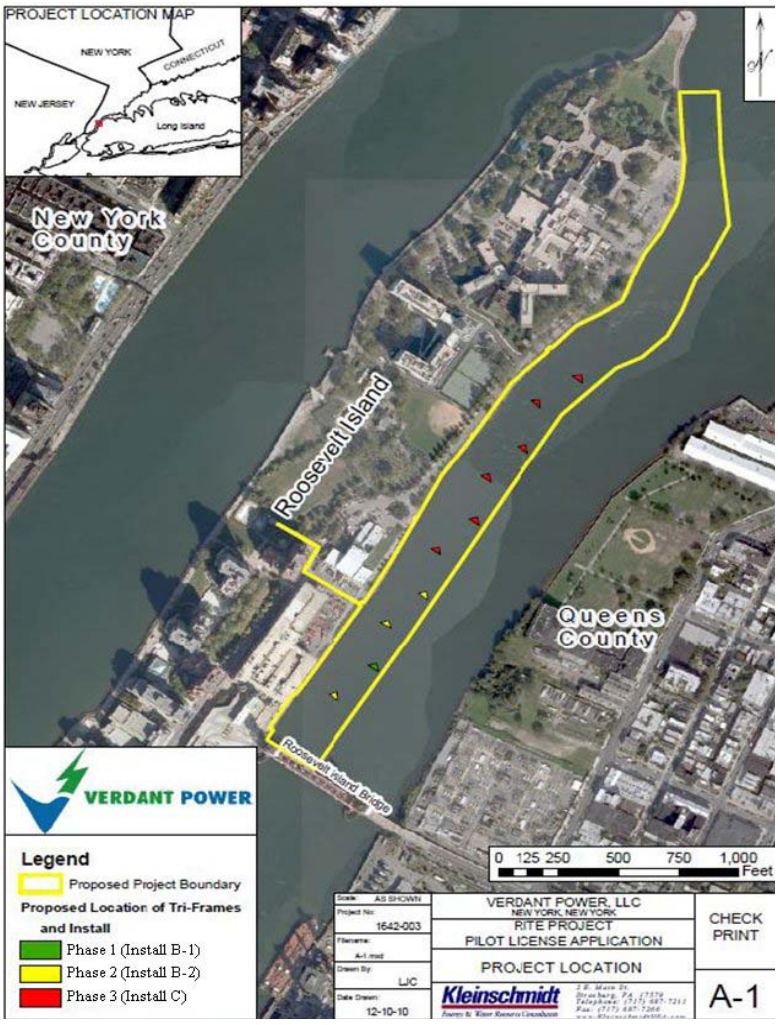

Figure 9. Location of the RITE Project (Source: FERC Environmental Assessment)

[74] www.verdantpower.com

Table 5. RITE Demonstration Project Timeline

Date	Action
5/30/2002	Verdant Power submitted a preliminary permit application to FERC.
9/9/2002	A preliminary permit was issued.
10/27/2003	Verdant Power submitted Initial Consultation Document.
12/2/2003	Verdant Power invited stateholders to a joint agency/public meeting to obtain comments and responses regarding the proposed project.
2/2/2005	Verdant Power submitted Declaration of Intention that included a petition for relief from the requirements of hydropower licensing under the FPA.
4/14/2005	FERC declared that Verdant Power was relieved from licensing under Part 1 of the FPA. This action allowed Verdant Power to install devices without a license because it was for demonstration purposes only. Subsequent permitting for the project fell to the USACE and the New York State Department of Environmental Conservation.
12/12/2006	The RITE Demonstration Deployment #1 (two Gen4 turbines) was initiated.
12/20/2006	Verdant Power distributed 11 study plans for an Environmental Study Meeting.
2/13/2006	Verdant Power submitted information to interested parties in support of initiating study activities. Environmental monitoring followed.
4/18/2007	RITE Demonstration Deployment #2 (four Gen4a turbines; total of 6) was initiated.
9/11/2008	RITE Demonstration Deployment #3 (two existing Gen4 turbines retrofitted with improved Gen5 rotors) was initiated.
9/1/2009	The demonstration was completed, and the turbines were decommissioned.

To develop and deploy the RITE project, Verdant Power led development of a new regulatory process that had no precedent. Jurisdictional discussions with FERC and stakeholders ultimately led to the eponymous 2005 Declaratory Order, known as the "Verdant Exception," that described the conditions under which such a project demonstration would not fall under FERC's jurisdiction.[75]

After a successful demonstration including the three deployments, Verdant Power pursued a pilot project license with FERC in the same location with an increase in planned turbine deployment (Table 6). The demonstration deployment under the Verdant Exception precluded commercial sale of electricity whereas the PPLP would allow such a sale.

[75] *Verdant Power LLC*, 111 FERC ¶ 61,024 (2005), *Order on Clarification*, 112 FERC ¶ 61,143 (2005). Available at https://www.ferc.gov/whats-new/comm-meet/041305/H-6.pdf (last visited June 28, 2017).

Table 6. RITE Pilot License Project Timeline

Date	Action
12/1/2008	Notice of Intent (NOI) for waiver of ILP regulations and implementing pilot license.
2/17/2009	Preliminary permit issued.
12/29/2010	Final Pilot License application submitted.
1/13/2011	Pilot License Application has been accepted and solicitation for comments, etc.
1/13/2011	Letter to National Marine Fisheries Service (NMFS) stating that there is no need for ESA consultation; so only an EA was prepared.
5/3/2011	RITE EA published.
1/23/2012	Pilot License issued; followed by news release.
	Proposed deployment beginning 2019 will be three stages: 1) one tri-frame and three turbines, 2) three tri-frames and 12 turbines, 3) six tri-frames and 30 turbines.
1/23/2022	Pilot License expiration.

2.1.1.1 Verdant Exception

The FPA requires FERC to issue licenses for water power projects that have a federal nexus (see previous section on FERC Jurisdiction). In 2005, FERC issued a decision known as the "Verdant Exception,. The exception allows certain demonstrations of innovative technologies to be considered non-jurisdictional. The three criteria for this exception are listed below:

> We conclude that in order to find that facilities such as those proposed by Verdant are not required to be licensed, we must make the following three findings: (1) the technology in question is experimental, (2) the proposed facilities are to be utilized for a short period for the purpose of conducting studies necessary to prepare a license application, and (3) power generated from the test project will not be transmitted into, or displace power from, the national electric energy grid.
>
> [111 Commission 61,024, April 2005, P-12178]

Verdant Power, the original petitioner, requested subsequent clarification. It argued that its demonstration must connect to the grid in order to run the full suite of tests required, but that it planned to compensate the utility for the small amount of power. Consolidated Edison, the interconnected electric utility, submitted a letter to FERC supporting the demonstration project. FERC therefore clarified that because the utility was "made whole," regardless of the physical fact of electricity displacement, no interstate commerce occurred that would trigger FERC licensure.

> Under Verdant's proposal as modified in its request for clarification, although electricity from the grid would physically be displaced by power produced from the test project, Verdant would make the entities that otherwise would have provided that power whole. Given those circumstances, Verdant's activities would effectively have no net impact on the grid or on interstate commerce. Therefore, Verdant may test its facilities, under the conditions set forth in the April 14 Order, as clarified in this order, without a license under Part I of the FPA.
>
> [112 Commission 61,143, July 2005, P-12178]

The result of these decisions is that if an MHK project 1) is experimental, 2) is deployed for a short term, and 3) does not cause interstate commerce, it is not FERC jurisdictional and does not require a license in order to operate.

There is little case history beyond the Verdant decision, because non-jurisdictional projects do not need to request permission from FERC to deploy a device. Therefore it is difficult to know how many deployments of what type and characteristics have occurred under the Verdant Exception. There are at least two examples of the Verdant Exception documented in FERC records. One is a proposed deployment by Maine Maritime Academy to deploy and test hydrokinetic devices in the Bagduce River and estuary in coastal Maine. FERC issued a preliminary permit to the Academy in 2007, but in 2009, the Academy submitted a petition for jurisdictional relief under the terms of the Verdant Exception. In 2010, the Director of the Office of Energy Projects issued a Declaratory Order finding the project non-jurisdictional because it met the three established criteria.[76] The second example is ORPC's Igiugig river in-stream energy conversion deployment. A June 2014 telephone record indicates that staff from FERC's Division of Hydropower Licensing advised ORPC that "… developers aren't required to file a Declaration of Intention for testing a hydrokinetic project in the water before license issuance when the developer is confident that the project meets the criteria set forth in the Verdant Power Declaratory Order (111 Commission¶ 61,024)."[77]

The three criteria established in the Verdant Exception are still applicable today. Tidal, wave, or other MHK energy capture deployment is sufficient to meet the first criterion, that the technology is experimental. The second criterion's original requirement—that the purpose of the short-term deployment must be studies in preparation of a license application—is not strictly enforced. "Short term" could mean a deployment longer than 18 months (which was allowed under the Verdant example), but there is no supporting documentation available that provides other data points on the relationship between deployment term and qualification for the exception.[78]

The third criterion is based on the premise that new generation would cause a displacement of electricity on the interstate grid, which effectively causes interstate commerce. There is no qualifying minimum threshold for interstate commerce. However, in the precise example argued by Verdant Power and clarified by the FERC in 2005, if the affected utility judges themselves "made whole" by the project, FERC stated that no interstate commerce would occur, and the project would not require a license. In this instance, Verdant Power proposed to compensate the utility for the power supplied by the tidal project, though this specific means to making the utility "whole" is not expressly required in the 2005 order.

2.1.2 Admiralty Inlet

In 2007, Snohomish PUD District #1 was awarded preliminary permits for seven potential tidal energy development sites in Puget Sound (http://www.snopud.com/PowerSupply/tidal.ashx?p=1155). Because of its suitable bathymetry and consistently strong currents, Admiralty Inlet was chosen as the project site (see Figure 10 and Table 7). After site selection, Snohomish PUD reviewed several technology types before deciding to deploy two 300 kW axial-flow turbines manufactured by OpenHydro Ltd. The project was designed to interconnect to Puget Sound Energy's system on Whidbey Island.

[76] *Maine Maritime*, 130 FERC ¶ 62,234 (2010). P-12777.
[77] FERC Issuance 20140611-0044, P-13511.
[78] The criterion's additional requirement that the purpose must be linked to studies in preparation of a license application is treated in the *Maine Maritime* case. The order finds that "the Academy's intention to deploy hydrokinetic devices to provide educational experiences for students and a testing laboratory for technology developers is consistent with the remaining component of the second prior finding, which states that the purpose of the facilities is to conduct studies necessary to prepare a license application." The FERC Director found that requiring studies for license application preparation and the educational work proposed by the Academy was, in this instance, reasonably consistent.

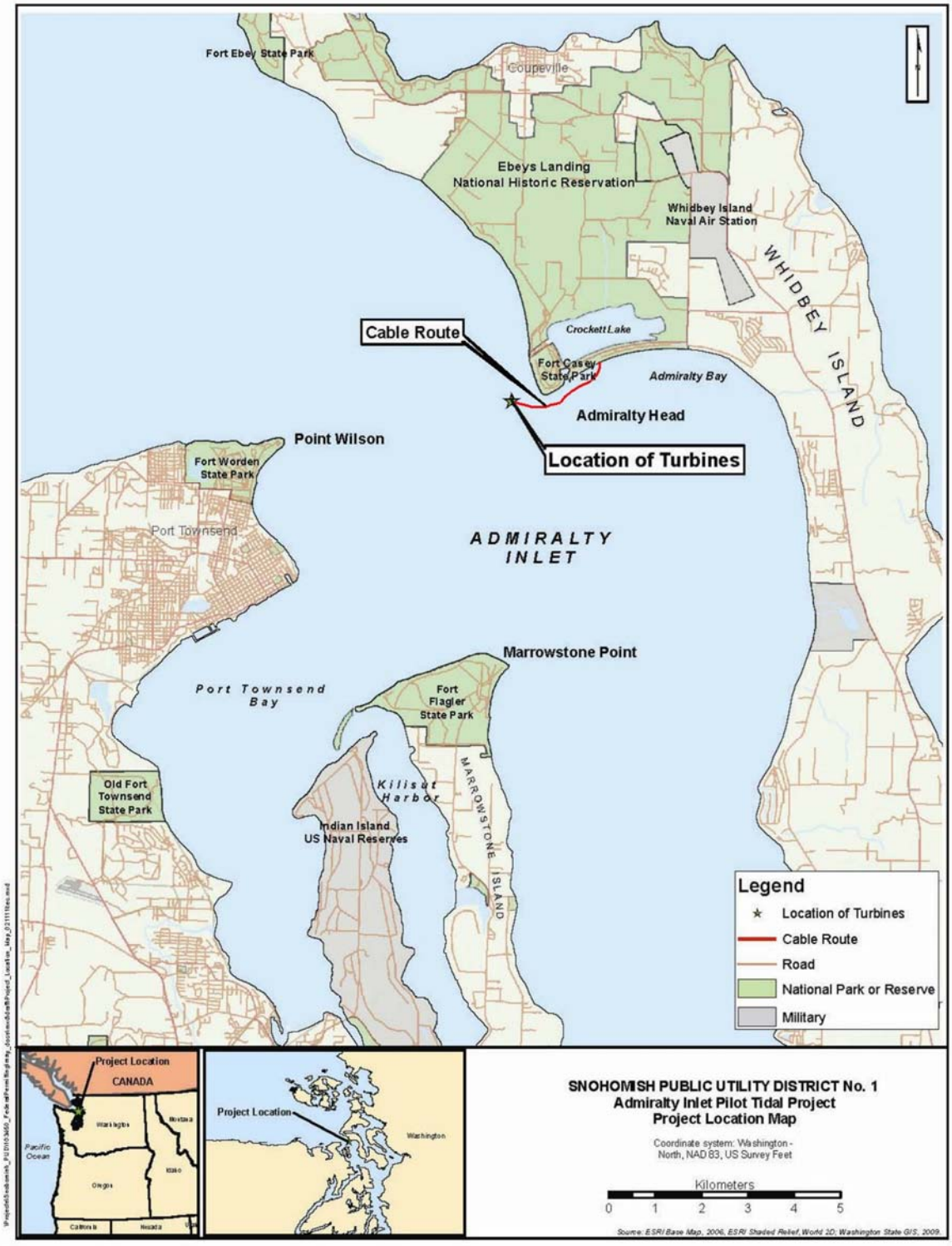

Figure 10. Location of the Admiralty Inlet Pilot Tidal Energy Project (Source: Snohomish County Public Utility District #1; Admiralty Inlet, Puget Sound, Washington)

Table 7. Admiralty Inlet Pilot Project Timeline

Date	Action
3/9/2007	Preliminary permit issued to Snohomish PUD
12/28/2009	Snohomish PUD submitted NOI and Draft Pilot License Application (DPLA)
3/4/2010	Notice for technical meeting; discussion of pilot license details (e.g., monitoring)
5/6/2010	Letter informing Snohomish PUD that FERC will delay additional information requests; based on Snohomish PUD's request for more time to complete discussions with stakeholder's concerns
7/8/2010	Subsequent preliminary permit issued
3/1/2012	Snohomish PUD submitted final pilot license application
1/15/2013	Notice of availability of Draft Environmental Assessment
8/9/2013	Notice of availability of Final Environmental Assessment and Finding of No Significant Impact (FONSI)
12/3/2013	NMFS submitted ESA 7 Biological Opinion "Not Likely to Adversely Affect" determination
3/20/2014	Pilot license issued; included associated news release
12/4/2015	Snohomish PUD submitted Application for Surrender of License
3/21/2016	Order Accepting Surrender of License

FERC created the PPLP option in August 2009. In December 2009, Snohomish PUD submitted an NOI to pursue a PPL instead of a long-term commercial license, and the PUD was awarded a 10-year PPL in March 2014. The license was notable for its early, expansive stakeholder engagement process that included agencies, tribal governments, non-governmental organizations, and members of the public. These engagements led to general presentations and discussions and finally extensive consultations for specific animal species interactions. Snohomish PUD established a Marine Aquatic Resources Committee and environmental monitoring programs, including studies of underwater noise, characterization of benthic habitat, trawling for invertebrates and fish, studying hydroacoustics for fish, conducting marine mammal surveys, and characterization of water quality. These engagements and process achievements are documented in the Snohomish PUD's final technical report.[79]

Another significant aspect of project development was the presence of a telecommunications company, Pacific Landing Corporation (PC Landing) (now Pacific Crossing [http://www.pc1.com/]) related to its trans-Pacific seafloor cable. PC Landing challenged several aspects of the administrative process and sought rehearing of the license order. This is discussed in greater detail in section 2.1.2.1. Snohomish PUD surrendered its license in December 2015, citing outsized unanticipated costs for a temporary research deployment.

2.1.2.1 Cable Interactions

Tidal energy projects are intentionally sited in highly energetic waters with potential for environmental and other user interactions. For the Admiralty Inlet project, interactions of greatest concern included marine mammals, essential fish habitat, tribal fishing access, and a fiber-optic cable near the proposed installation site.

[79] Admiralty Inlet Pilot Tidal Project, Final Technical Report. Snohomish PUD, September 2015. Submission to US DOE under DOE Award Number: DE-EE0003648.

Concerned entities filed motions to intervene in the FERC process, but only one, PC Landing, filed a motion in opposition to the project. PC Landing stated concerns that its trans-Pacific fiber-optic cable near the proposed installation site could be damaged and recommended relocating the project. The existing cable has a limited linear (i.e., 6-inch wide) seafloor right-of-way, with minimized associated state leasing fees. PC Landing indicated potential difficulties in repairing its cable from tidal turbine obstruction and concerns that project construction activities, such as the unplanned release of a turbine or an anchor during installation or monitoring, could harm the cable.

PC Landing's concerns were extensive. Following is text from the FERC EA:[80]

> In addition, PC Landing asserts that the turbine foundations may not be adequately designed because of the uncertainty in the composition of the sediment immediately beneath the cobble pavement at the project installation area. PC Landing is concerned that without an adequate foundation, differential settling of the turbine may cause the turbine to topple or list, requiring corrective action by Snohomish PUD and increasing the potential for damaging the PC-1 North cable. PC Landing is also concerned that the weight of the turbines could penetrate the cobble pavement to expose the softer sediments underneath, more readily mobilizing the softer sediments and resulting in scour several hundreds of meters away, exposing the buried PC-1 North cable and making it more vulnerable to damage. PC Landing councils that a greater separation (750 to 1,000 meters) between the turbines and the PC-1 North cable are necessary to reduce the risk to PC-1 North.

To resolve the dispute, FERC held a technical conference with the Federal Communications Commission (FCC) and PC Landing in August 2012. The FCC filed comments not opposing the project as long as certain conditions were included in the license.

In response to the conflict with PC Landing, Snohomish PUD moved the proposed deployment from 328 to 558 feet away from the cable, which eliminated the concerns of the FCC and the Naval Seafloor Cable Protection Office. The PUD also committed to the following requirement:

> [T]o avoid harming the PC Landing's international fiber-optic cable (PC-1 North) located near the site, conduct turbine installation and monitoring using "live-boat" techniques (i.e., without anchoring) and prepare and implement a Hazard Identification and Risk Assessment, developed in consultation with the Corps, Coast Guard, and PC Landing, prior to marine operations that includes: (a) setting criteria for weather and wave conditions that must exist before marine operations occur; (b) using industry-approved equipment and redundancy in the use of equipment and vessels (e.g., tugboat with back-up engine; back-up tugboat for emergencies; towing gear, barge, winches, winch wire, and hydraulic lifting tools new or certified based on industry standards); (c) setting criteria for aborting operations; and (d) identifying an established "port of refuge," located away from PC-1, in the event of unanticipated adverse weather or other events that would cause installation or operations to be aborted.[80]

After significant review and analysis, FERC determined that the actions proposed by the PUD were reasonable, and additional setbacks requested by the cable company should not be required of the project.[80] In response to license issuance in March 2014, PC Landing filed a request for rehearing stating that the license violated NEPA, the FPA, and the CZMA. FERC issued a thorough response and denied rehearing in December 2014.[80]

[80] FERC Environmental Assessment for the Admiralty Inlet Tidal Project, P-12690. Issued August 9, 2013. P. 32

Further legal action became unnecessary when the PUD surrendered its license in December 2015. The question of the appropriate proximity between the tidal energy project and a subsea cable was never settled to the mutual satisfaction of all parties.

2.1.2.2 Communications Security, Reliability, and Interoperability Council

The Communications Security, Reliability, and Interoperability Council (CSRIC) is a federal advisory committee to the FCC.[81] Its CSRIC IV, operating from 2013 to 2015, included a workgroup that focused on submarine cable protection and issued a report in 2014. Membership of the workgroup did not include members of the MHK industry; however, the workgroup did include FERC staff.

In the Admiralty Inlet proceeding, PC Landing recommended that Snohomish PUD follow the recommendations of an international industry association, the International Cable Protection Committee (ICPC). ICPC recommendation 13 No. 2 for offshore wind farms is referenced in the CSRIC IV workgroup report on submarine cable protection.[82] This recommendation would have required a default spatial separation of 500 meters on either side of the cable from proposed MHK device installation location in depths of 75 meters or less. In the case of Admiralty Inlet, moving the turbines to comply with this recommendation would have exposed them to higher vessel traffic and complicated implementation of the Marine Mammal Mitigation and Monitoring Plan.

The CSRIC report discusses the risks to the cable industry proposed by MHK and offshore wind projects as well as the need for greater understanding of the spatial requirements for submarine cables and their maintenance. Among other recommendations, the report recommends that the FCC with other federal, state, and local governments endorse zones around existing cables that would categorically exclude offshore energy projects regardless of technological application, unless the submarine cable owner agrees to the development. Absent these zones or other specific methods, the report recommends the FCC endorse a default distance between energy developments and cables following the ICPC guideline of "… a default separation distance of 500 meters in water depths of less than 75 meters and the greater of 500 meters or two times the depth of water in greater water depths."[82]

2.1.2.3 Prospective Cable Interaction Research

In 2017, the National Renewable Energy Laboratory (NREL) completed a study that identifies competing-use areas for MHK and wind development, and existing seafloor and subsea cables (power and telecommunications).[83] This analysis uses setback distances as defined by the cable industry (the greater of 500m or 2× the water depth) to quantify overlap areas. The NREL report also includes a summary of other potential competing-use issues and concerns, and data-layers that quantify them.

[81] https://www.fcc.gov/about-fcc/advisory-committees/communications-security-reliability-and-interoperability-1

[82] CSRIC IV Submarine Cable Routing and Landing Working Group, Working Group 8 (WG8). 2014. Final Report-Protection of Submarine Cables through Spatial Separation; https://transition.fcc.gov/pshs/advisory/csric4/CSRIC_IV_WG8_Report1_3Dec2014.pdf, last viewed 6/29/2017.

[83] Best, B.D, and L.F. Kilcher. 2017. *Submarine Cable Analysis for U.S. Marine Renewable Energy Development.* www.ecoquants.com/nrel-cables/report.docx.

2.1.3 Cobscook Bay

ORPC[84] operated a single, grid-connected, horizontal-axis turbine (TidGen® Power System), 180-kW demonstration from 2012 to 2013, with one month of operation (see Figure 11 and Table 8). In addition, ORPC successfully pursued a PPL, which was issued in 2012. At this time, Cobscook Bay is a licensed operation but there are no plans for commercial development at the site. Novel elements of this project included pioneering the new licensing process and developing adaptive environmental monitoring programs. ORPC utilized an adaptive management framework for environmental monitoring that reduced developer risk and monitoring intensity by including all stakeholders at an early stage and building consensus through science-based data collection.

Another significant achievement at Cobscook Bay was a power purchase agreement approved by the Maine Public Utilities Commission (PUC). This step suggested that tidal developments can serve as viable renewable energy providers to local electricity systems.

After the TidGen demonstration project, ORPC deployed a mooring test in Cobscook Bay to support the move from a pile-attached support frame to gravity anchors with flexible cable attachments. This new mooring and anchoring strategy proved to be preferable and decreased installation and removal costs. ORPC plans for a follow-on demonstration deployment of their improved TidGen® Power System in Cobscook Bay as well as continued exploration in a nearby preliminary permit (P-14743) site in Western Passage, Maine.

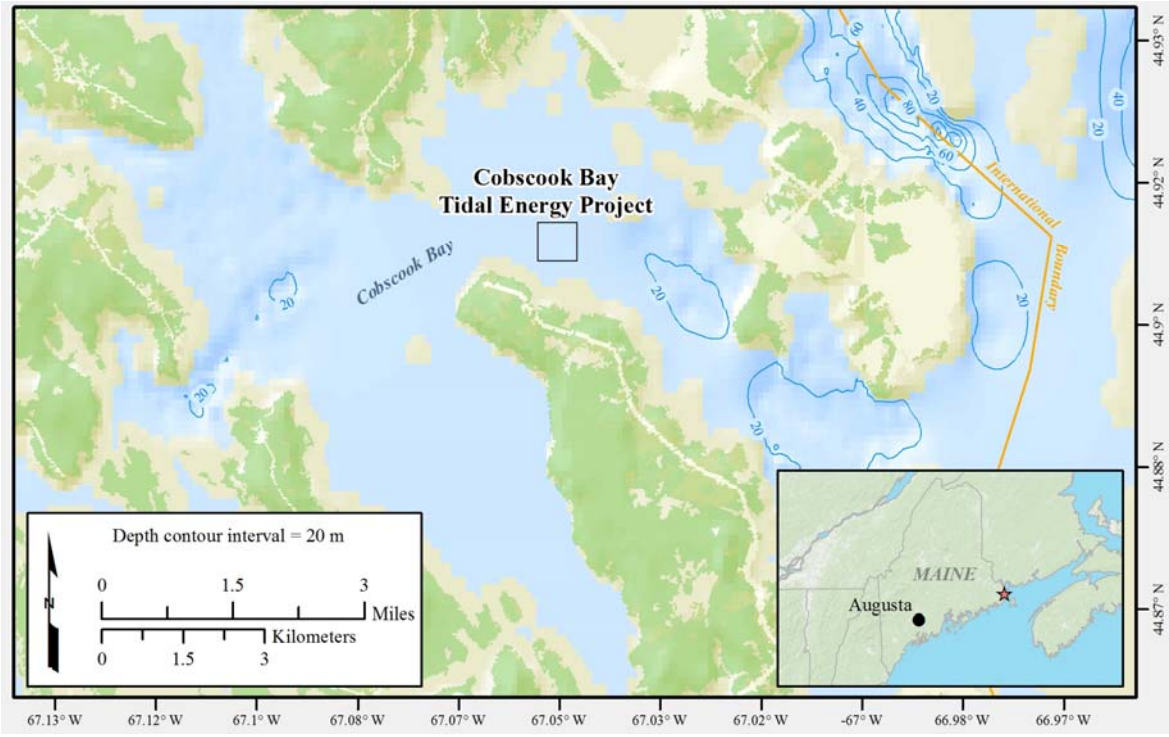

Figure 11. Cobscook Bay Tidal Energy Project. (Source: ORPC; Cobscook Bay, Maine)

[84] http://www.orpc.co/

Table 8. Cobscook Bay Pilot License Timeline

Date	Action
7/7/2006	ORPC submitted preliminary permit application
7/23/2007	Preliminary permit issued
6/20/2008	ORPC requested use of PPLP
8/18/2009	FERC and Maine signed MOU; Maine Department of Environmental Protection becomes lead on state level; adds efficiency to licensing process
1/13/2011	Subsequent preliminary permit issued
9/1/2011	ORPC submitted pilot license application
2/27/2012	FERC issued pilot license for 8 years
4/4/2012	License amended to allow expansion of time window for pile driving; otherwise significant delay of construction activities
7/24/2012	Adaptive Management Plan (AMP) approved; required consultation with USFWS, NMFS, USACE, Maine Department of Environmental Protection, Maine Department of Marine Resources, considered regulatory best practice
9/13/2012	Beginning of commercial operation of TidGen®
3/25/2013	Demonstration completed
7/15/2013	Turbine removed; bottom support frame remained
10/29/2013	Approval of ORPC's request for temporary variance (project hold); repeated over next several years for research and development
12/16/2015	FERC extends pilot license for 2 years
3/14/2017	ORPC filed NOI not to relicense the project; site lacks commercial viability but will continue as demonstration site until license expiration

2.1.3.1 Adaptive Management

Article 404 of ORPC's PPL required the development of an AMP. The plan was created in consultation with USFWS, NMFS, USCG, Maine Department of Environmental Protection, Maine Department of Marine Resources, and several technical advisors creating the Adaptive Management Team (AMT). Modification of the plan within the project timeline was based on the likelihood that proposed studies would improve subject knowledge over time. This learning process brought agencies and industry to a common point where they have the tools or are developing the tools to confidently address the permitting needs of commercial tidal turbine development.[85]

Initial requirements of the PPL[86] included monitoring for acoustics, benthic and biofouling, fisheries and marine life interactions, hydraulics and scour, marine mammals, and sea and shorebirds. Through the AMP process, ORPC along with the AMT were able to successfully use the framework to modify license monitoring requirements by clarifying monitoring plans, and in some cases reducing the frequency of monitoring surveys based on improved knowledge from empirical data collection and analysis.

One notable example is related to the acoustics monitoring requirement.[87] Article 402 of the PPL restricted ORPC from conducting pile driving for bottom support frame installation from April 10 through November 11 due to the migration of juvenile Atlantic salmon (*Salmo salar*). However, under the

[85] ORPC. 2013. Cobscook Bay Tidal Energy Project; 2012 Environmental Monitoring Report

[86] *Ocean Renewable Power Company Maine, LLC*, 138 FERC ¶ 62,168, (2012), *Order Issuing Pilot Project License (Minor Project),* Docket 12711.

[87] *Ocean Renewable Power Company Maine, LLC*, (2012), 139 FERC ¶ 62,012, *Order Amending Articles 402 and 403*, Docket 12711.

acoustics monitoring plan (article 405), if it can be shown that the sound levels produced by pile driving outside of this restricted time window do not exceed the limits established by NMFS for ESA take of salmon (high sound levels can cause permanent damage to the hearing of fish), then this restriction can be removed. By working with the AMT through the proposed AMP in the pilot license, ORPC was able to collect empirical data showing pile driving sound levels were below the NMFS threshold. These results were presented to NMFS, Maine Department of Environmental Protection, Maine Department of Marine Resources, and FWS as proposed in the AMP. During consultation with NMFS, they commented to allow pile driving to continue during the restricted time after April 10 so long as the sound levels continued to be maintained below acceptable levels. FERC issued a license modification allowing pile.

2.1.3.2 Power Purchase Agreement

Under the state Ocean Energy Act,[88] the state legislature directed the Maine PUC to conduct a competitive process for long-term energy contracts of offshore wind and tidal energy. In the initial solicitation, Statoil's Hywind offshore wind facility and ORPC's Cobscook Bay tidal energy project (5 MW) were selected for contracts. To apply, ORPC was required to demonstrate that the project created economic benefits as well as commitment to invest in related manufacturing in Maine. In April 2012, the Maine PUC approved a term sheet outlining the conditions under which a contract for power must be designed for the tidal facility. In December 2012, the PUC approved the agreement between ORPC and two of the three investor owned utilities—Bangor Hydro-Electric Company and Maine Public Service Company—to sell the output of the TidGen® device. The rate of 21.5 cents per kilowatt-hour, which was more than twice the average rate currently paid by Maine utility customers, was an incentive to support early stage demonstration projects.[89]

2.2 Wave

2.2.1 Makah Bay

AquaEnergy Group, later Finavera, was granted the first FERC license for a wave energy project. The license issued in December 2007 was for a proposed project offshore of Makah Bay on the northwest point of the Olympic Peninsula (see Figure 12 and Table 10). The project would have consisted of four 250-kW AquaBuOYs, but no device was ultimately installed.

The Makah Bay jurisdictional review in 2002 was a seminal proceeding for establishing FERC jurisdiction over projects within state territorial waters, as these are "navigable waters" under the FPA and the project would use water power and connect to the interstate electric grid. Additionally, the 2007 Makah Bay license was unique as a "conditioned license," meaning that construction was not authorized and could not commence until certain conditions (e.g., state water quality certification) were met. FERC granted a five-year term for the Makah Bay conditioned license.

[88] Maine Revised Statutes, Public Law Chapter 615, Section A-6.

[89] State of Maine Public Utilities Commission Docket No. 2010-00235. See the final Agreement Related to Capacity Resource between Bangor Hydro Electric Company and ORPC Maine, LLC, under Order Approving Contract, December 21, 2012.

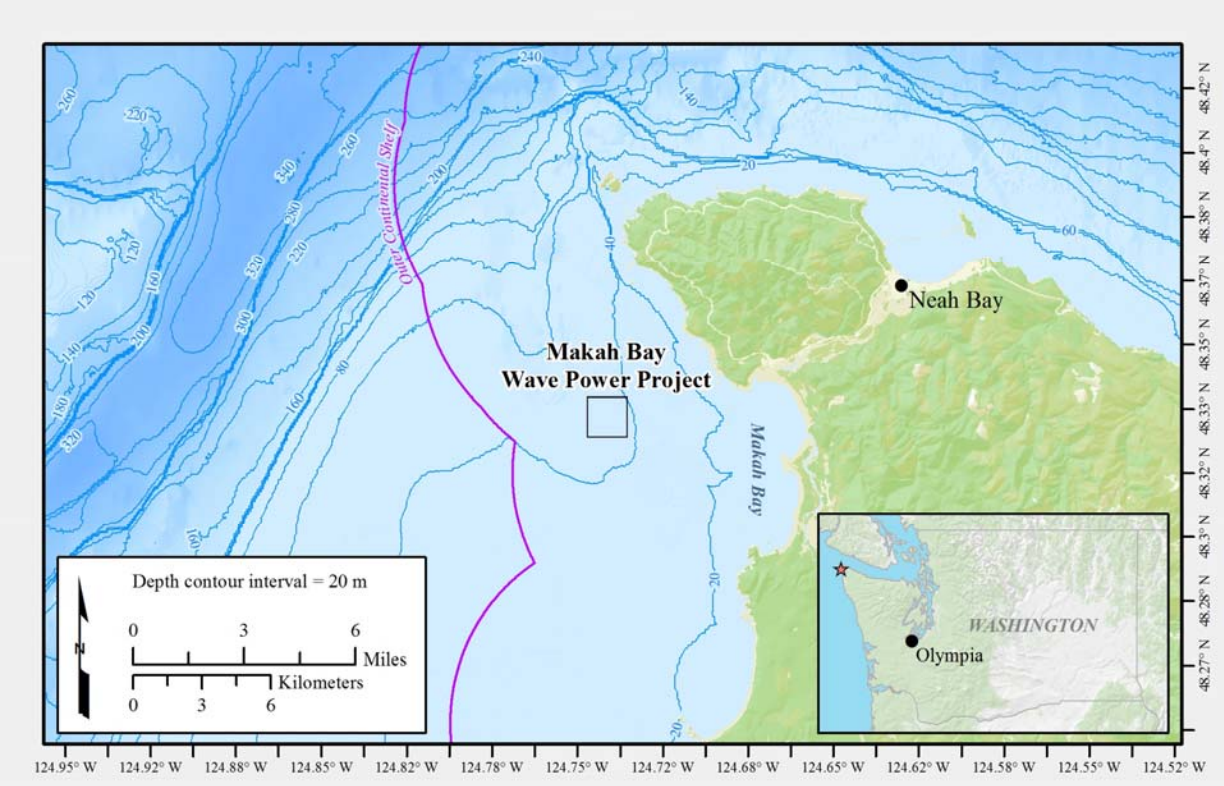

Figure 12. Makah Bay Offshore Wave Energy Project. (Source: Finavera Renewables Ocean Energy; 2 nm offshore from Makah Bay, Washington; FERC Docket P-12751 and DI02-3)

Table 9. Makah Bay License Timeline

Date	Action
4/23/2002	AquaEnergy filed declaration of intent and requested review whether licensing is required under FPA
10/3/2002	Order ruling from FERC that the project requires licensing under the FPA (DI02-3)
7/10/2003	AquaEnergy submits license application; requests ALP
9/4/2003	ALP granted from FERC
12/15/2006	AquaEnergy submits license application
5/31/2007	Notice of EA availability from FERC
6/1/2007	AquaEnergy changes name to Finavera
12/21/2007	Order issuing conditioned license to Finavera for 5 years
1/18/2008	Request for rehearing of conditional license submitted by the Washington Department of Ecology based on lack of Section 401 and CZMA consistency
3/20/2008	FERC issues rehearing order confirming the practice of conditional licensure
7/18/2008	Order clarifying rehearing on NOAA authority for license conditions related to National Marine Sanctuary
4/21/2009	FERC issues order accepting license surrender

In its initial application, AquaEnergy proposed that FERC would not have jurisdiction over the project because it was located in state waters (less than 3 nm), the shoreside equipment would be located on the Makah Indian Reservation, and offshore equipment would be located within the Olympic Coast National Marine Sanctuary. Another assumption was that the local public utility district would be the "offtaker" and would all of the power produced, which would not trigger interstate commerce. On October 3, 2002, FERC ordered that the project would require a license.[90] On November 1, 2002, AquaEnergy filed for a rehearing, even making adjustments to the project design and location to strengthen its case that licensing was not required. This rehearing was subsequently denied on February 28, 2003, with FERC confirming that offshore waters still constituted "navigable waters" under the FPA. The order further claimed jurisdiction by considering the power buoys to be "powerhouses" under the terms of the law.[91]

The Makah Bay project received a conditioned license in December 2007, one year after Finavera (the new name for AquaEnergy) filed its license application. Just one month before, in November 2007, FERC had issued a policy statement describing its intent and procedure for conditioned licenses, a faster regulatory track for hydrokinetic devices. [92] Still, the Makah Bay conditional license issuance was challenged by the Washington Department of Ecology. Under the CZMA and CWA, the agency argued that any license from FERC could not be issued until the state had provided a water quality certification and federal concurrence. FERC disagreed, stating that because a conditioned license "… did not authorize any onsite construction or installation activities," it was not required to wait until state permits were secured. By the time the rehearing order was issued, the Department of Ecology had provided these authorizations, which in FERC's view rendered the issue moot.[93]

The license was surrendered in April 2009. Finavera cited an unfavorable economic climate and capital restrictions necessary to continue project development.

2.2.2 WaveConnect

PG&E initiated a program called WaveConnect that was intended to develop long-term commercial deployments of wave energy off the coast of California (see Figure 13 and Table 10). In its first phase of the program, PG&E intended to develop sites for short-term demonstrations to evaluate device designs before selecting for commercial-scale development in both state waters and the OCS. Under this program, the utility pursued a pioneering set of sites for preliminary permits. The dockets for these permits provided the initial forum for clarifying the role of preliminary permits in open-water marine energy authorizations; and for OCS jurisdictional debates between FERC and DOI. Although PG&E pursued a PPL for its Humboldt site, it ultimately surrendered the effort. PG&E submitted a comprehensive report on the WaveConnect project, including lessons learned on the regulatory process.[94]

[90] 101 FERC ¶ 62,009 Docket DI02-3. Order Ruling on Declaration of Intention and Finding Licensing Required. (2002)
[91] 102 FERC ¶ 61,242 Docket DI-02-3. Order Denying Rehearing. (2003).
[92] 121 FERC ¶ 61,221; Docket No. PL08-1. Policy Statement on Conditioned Licenses for Hydrokinetic Projects (2007).
[93] 122 FERC ¶ 61,248. Docket No. P-12751. Order on Rehearing and Clarification and Amending License. (2008)
[94] Dooher, B.P., Cheslak, E, Booth, R., Davy, D., Faraglia, A., Caliendo, I. Morimoto, G. and Herman, D. 2011. *PG&E WaveConnect Program Final Report.* DOE/GO/18170-1. Pacific Gas and Electric Company, San Francisco, CA, December 2011. Available on Tethys: https://tethys.pnnl.gov/publications/pge-waveconnect-program-final-report Last visited January 3, 2018.

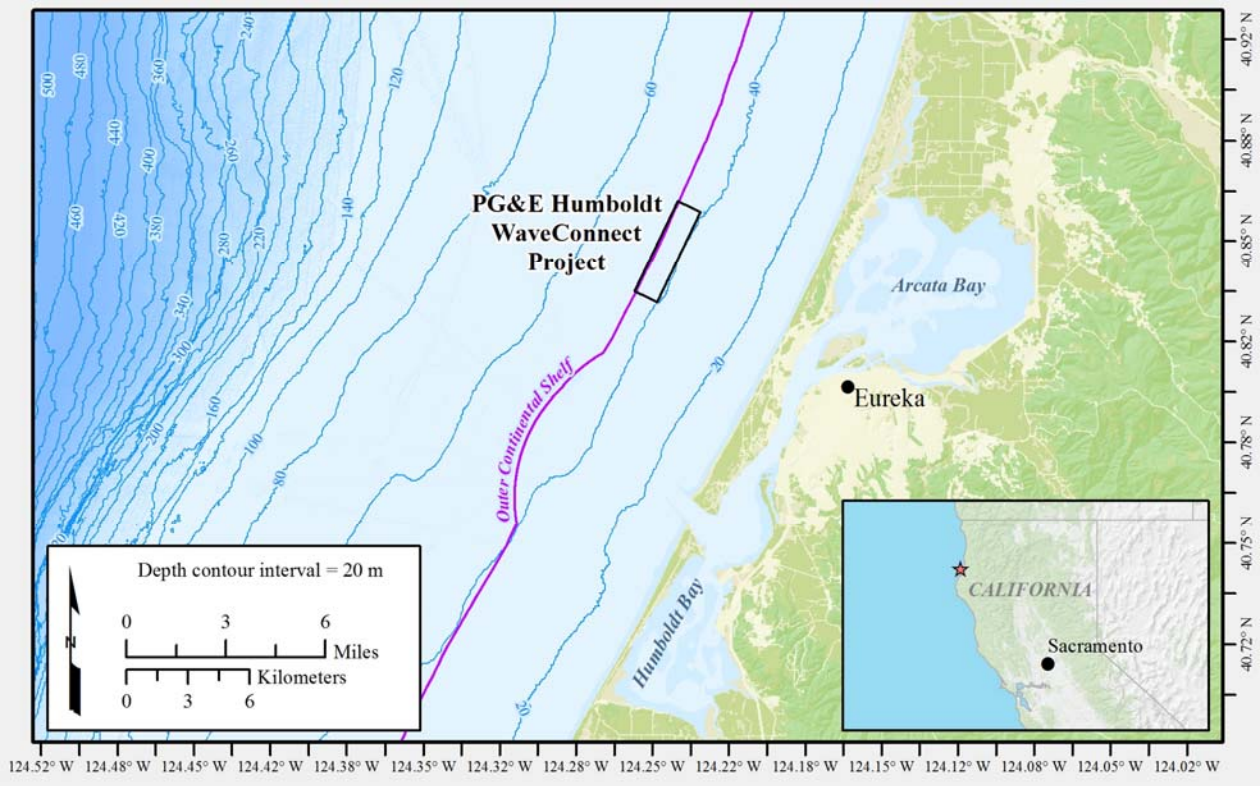

Figure 13. Humboldt WaveConnect Project. (Source: Pacific Gas and Electric Company, Offshore Humboldt County, California)

Table 10. Humboldt WaveConnect License Timeline

Date	Action
3/13/2008	Preliminary permit issued
10/16/2008	FERC order on rehearing of PG&E projects; asserting jurisdiction on OCS in contention with Interior for MHK projects
7/31/2009	Preliminary permit boundary adjusted to exclude OCS submerged lands
3/1/2010	PG&E filed Draft Pilot License Application
5/5/2010	Notice for Technical Meeting for monitoring needs
11/30/2010	PG&E withdrew its application

As a major utility, PG&E is familiar with the FERC licensing process for traditional hydropower projects. Realizing the uncertainty in the new MHK industry, PG&E chose the PPLP approach based on the premise that it would allow them to quickly license the area designated in the preliminary permit. However, resource agencies still required data and permits that did not scale down to the PPLP; rather the high degree of uncertainty about ocean conditions and device interactions created more challenges. Substantial permitting requirements for the state remained in place, especially the California Environmental Quality Act. The extensive permitting process along with the limiting short term and small scale of a PPLP led PG&E to abandon the process.

As described in Section 1.1 above, DOI submitted a rehearing request challenging FERC's jurisdiction over the OCS. FERC had previously asserted its jurisdiction in state waters and to some degree to the OCS in the docket for Makah Bay Offshore Wave Energy Project (see previous case study; Docket DI02-3). In the case of WaveConnect, the proposed project location was in both California state waters and the OCS, which indicated governance from DOI's offshore regulator, BOEM, then MMS. DOI challenged FERC's jurisdiction on the grounds of the definition of "navigable waters" and the passage of the EPAct, which amended the OCSLA and granted DOI jurisdiction of the OCS related to renewable energy.

In its order denying rehearing, FERC defined state waters as well as those on the OCS as "navigable waters" under the FPA and continued to state that the EPAct does not limit or narrow the scope of FERC's authority of hydroelectric licensing under the FPA.[95] PG&E subsequently removed the OCS footprint from the proposed project in June 2009, leaving only FERC jurisdiction and state waters. This action eliminated DOI from the regulatory process and avoided continuing conflicts over jurisdiction.

The draft pilot license application (along with monitoring and AMPs) was filed in March 2010 and was promptly followed up by over 300 comments from regulators and stakeholders. This prompted FERC to request additional information related to these comments and revised monitoring and AMPs by August 30, 2010, less than 6 months after filing the draft license application. Further, the California State Lands Commission would have required a full analysis of the project under the California Environmental Quality Act, which would add at least 12 months of analysis and significant upfront costs to PG&E. These difficulties along with the short term of the pilot license led to the conclusion that the project was not financially feasible.

According to the final report, PG&E described the following regulatory "lessons learned":

- As long as WECs remain in the iterative design phase and firm information about device specifications are not possible, agencies and stakeholders will have concerns about MHK projects. Until device interactions and effects are known, they will be conservative in their recommendations and requirements.
- Agencies outside of FERC have not adjusted their procedures to demonstration or pilot-scale reviews, and in some instances, may not be able to do so. As a result, using the full-scale process with a long license term may be the more efficient approach. Without certainty or experience around device types and environmental interactions, the PPLP is unlikely to be successful.

2.2.3 Reedsport

In August 2012, the Reedsport project was the first wave energy project in the country to receive a full-scale commercial license to operate (see Figure 14and Table 11). In October 2006, the Governor of Oregon designated the OPT (http://www.oceanpowertechnologies.com) Reedsport Wave Energy Project as an Oregon Solutions project. This provided support for facilitated stakeholder involvement within the state and was seen as a way to provide valuable information for follow-on wave energy projects along the Oregon Coast. This designation also helped create a timeline and subgroups for the management of the regulatory and permitting process. The comprehensive settlement which supported the license issuance was heavily back loaded with adaptive management procedures and framework.

[95] 125 FERC ¶ 61,045, Order on Rehearing. (2008).

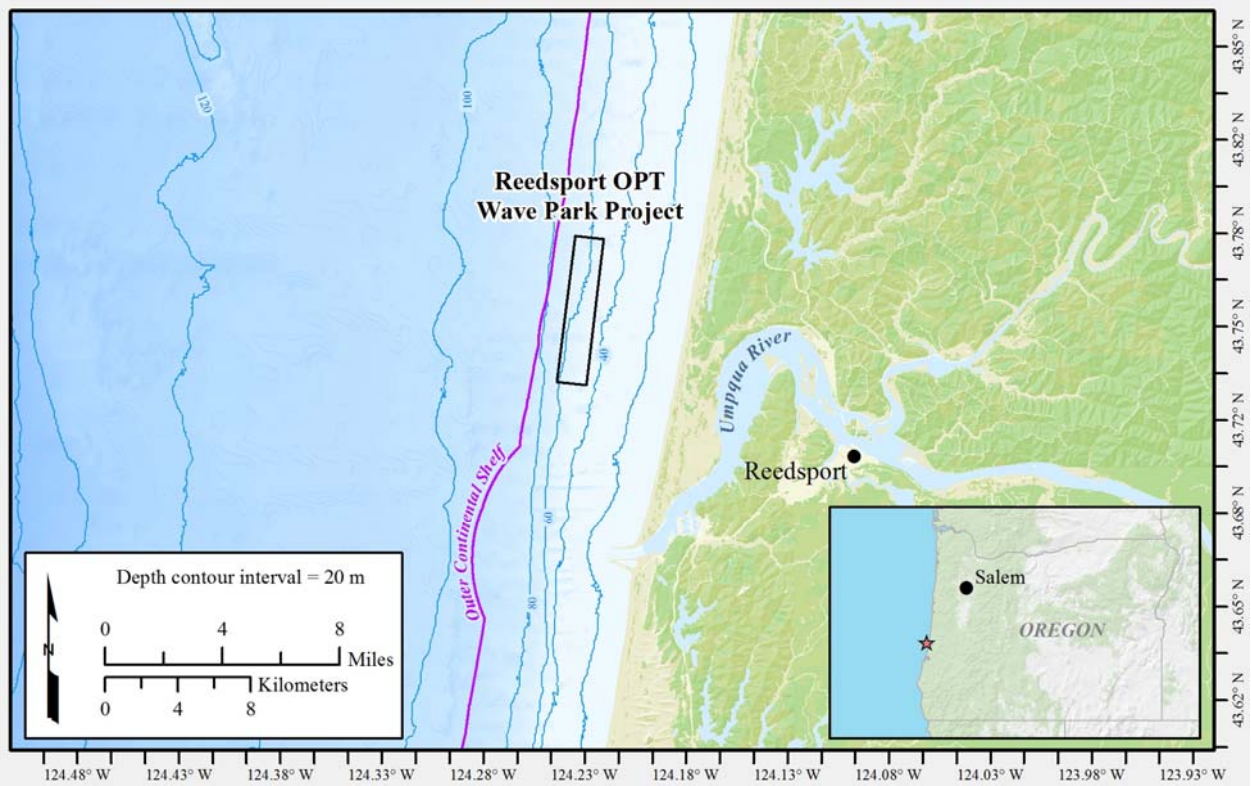

Figure 14. Reedsport OPT Wave Park Project. (Source: OPT; Offshore Reedsport, Oregon; FERC Project No. P-12713)

Table 11. OPT Wave Park License Timeline

Date	Action
2/16/2007	Preliminary permit issued
7/2/2007	OPT files NOI and Preliminary Document
8/31/2007	Notice of NOI and Preliminary Application Document (PAD); authorizes TLP procedure
10/4/2007	Joint Agency and Public Meeting and site visit
7/15/2008	OPT distributed a Draft License Application for review and comment
1/29/2010	OPT submits license application
4/8/2010	Public meeting for NEPA scoping document
7/28/2010	Settlement Agreement filed
8/10/2010	Notice of Settlement Agreement with intervenors
12/3/2010	Notice of availability of Environmental Assessment
8/13/2012	FERC issues license to OPT
5/30/2014	OPT surrenders license
6/27/2014	OPT submits Decommissioning Plan
8/14/2014	FERC accepts OPT's license surrender
10/7/2016	FERC accepts OPT's schedule for anchor removal

Ultimately a few project elements were built, including a spar for the OPT buoy, and an anchor and mid-column buoy with a marker buoy on the surface were deployed. These were retrieved after the marker buoy drifted off station and the seals on the mid-column buoy failed and it sank to the seafloor.

OPT made a major management and planning decision to use the TLP for their application to FERC. To shorten the time most developers spend in the pre-license stage of the ALP, they back loaded all of the regulatory uncertainty into the creation of a settlement agreement with regulatory agencies and other stakeholders. The purpose of the agreement states that all parties have entered into the agreement "… for the purposes of resolving all issues that have or could have been raised by the parties in connection with a FERC order issuing a license for construction and operation of the Project…." This refers to all authorities under the FPA as well as others like the ESA.

The settlement agreement included the following entities in addition to OPT:

- FWS
- NMFS
- U.S. Forest Service
- Oregon Department of State Lands
- Oregon Department of Environmental Quality
- Oregon Department of Land Conservation and Development
- Oregon Water Resources Department
- Oregon Department of Fish and Wildlife
- Oregon Parks and Recreation Department
- Oregon Department of Energy
- Oregon State Marine Board
- Oregon Shores Conservations Coalitions
- Surfrider Foundation
- Southern Oregon Ocean Resource Coalition.

There was no opposition to this agreement and it included an extensive Adaptive Management Process for the implementation of monitoring studies and measures that would be required to address unanticipated effects of the project. This created a large list of responsibilities and license requirements that are typically scoped out prior to the submission of the final license application. Requirements of the settlement agreement included environmental studies on cetaceans, electromagnetic fields, pinnipeds, fish and invertebrates, offshore birds, and wave, current, and sediment transport.

In addition to the environmental studies to be developed alongside agencies, there were protection, mitigation, and enhancement measures that detailed further responsibilities that OPT would have during construction, operation, and decommissioning. The measures are listed below:

1. Spill prevention control and countermeasure plan
2. Equipping PowerBuoys with devices or materials to prevent pinniped haul-out
3. Implementing an emergency response and recovery plan
4. Implementing a crabbing and fishing plan
5. Implementing a marine use/public information plan
6. Lighting PowerBuoys in accordance with USCG regulations to protect seabirds and fishing vessels
7. Installing the transmission line through the existing effluent discharge pipe to eliminate effects of crossing nearshore, intertidal, and dune habitats
8. Burying subsea cable to minimize hazards to navigation and fishing
9. Installing the terrestrial portion of the transmission cable underground within the existing effluent pipe easement to minimize potential visual, cultural, and environmental effects

10. Locating subsurface floats at depth of 30 to 50 feet to avoid vessel strikes
11. Conduct a visual assessment review
12. Implementing an interpretive and education plan.

The parties to the settlement agreement agreed to use an AMP to "… avoid or minimize adverse effects to aquatic resources, water quality, recreation, public safety, crabbing and fishing, terrestrial resources, and cultural resources." Last, it will be used to identify and implement additional studies that may be required for a proposed future expansion of the project that would also require a FERC license amendment.

The concept of adaptive management is not viewed the same by all developers. This case study provides an example of the use of adaptive management and the FERC TLP approach to expedite issuance of a license by deferring environmental permitting. Unfortunately, this method was not be truly tested as the license was surrendered before the process could be applied in a full project timeline. Another option used by developers is the ALP, which puts most of the NEPA environmental scoping in the early stages of the licensing process. This requires early and full engagement of all agencies and stakeholders. The ALP approach envolves engaging all interested parties to identify environmental concerns and required monitoring requirements upfront with all interested parties, and the conclusive monitoring plan is included in the license application to FERC.

OPT surrendered the license because of the expense and complexity of the regulatory process.[96]

2.2.4 PMEC-SETS (now PacWave)

Oregon State University (OSU) is one of three universities partnered into the NNREREC (see Figure 15 and Table 12),97 one of three DOE-funded university marine renewable energy research centers in the United States. As of June 2018, OSU announced a renaming of the project from PMEC-SETS to PacWave, and then renamed the NNMREC as PMEC, or Pacific Marine Energy Center. This case study does not reflect the name changes.

In December 2016, OSU) was selected by the Water Power Technologies Office to pursue a grid-connected offshore test facility for wave energy devices.[98] The project, called PMEC-SETS will be located 6 nm off the coast of Newport, Oregon, occupying an area of approximately 2 nm^2 at approximately 70 meters depth. The project will consist of four test locations (berths) that are grid-connected and allow the testing of up to 20 commercial-scale devices. Buried subsea cables will transmit power and data back to shore. OSU filed a draft license application in April 2018 for a 25-year authorization with an installed capacity not to exceed 20 MW. If successful, this will be the first grid-connected, FERC-licensed marine energy project beyond state waters in the OCS.

[96] In news articles, an OPT spokesman indicated that the costs, complexity, and difficulty of the regulatory process were the causes of project surrender. See Oregon Public Broadcasting *Wave Energy Developer Pulls Plug on Oregon Project.* Mar 5 2014. https://www.opb.org/news/article/wave-energy-developer-pulls-plug-on-oregon-project/

[97] http://nnmrec.oregonstate.edu/

[98] https://www.energy.gov/articles/energy-department-announces-investment-wave-energy-test-facility. In addition, WPTO maintains a project website: https://www.energy.gov/eere/water/pacific-marine-energy-center-south-energy-test-site-pmec-sets

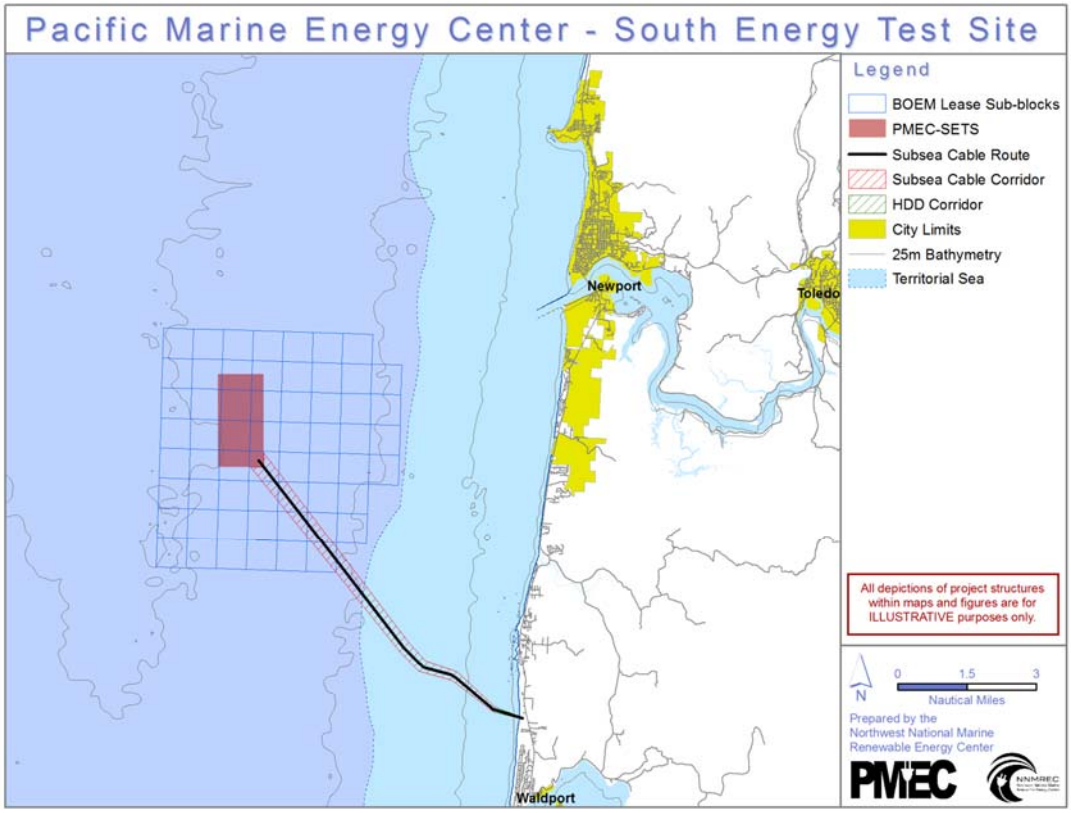

Figure 15. Pacific Marine Energy Center South Energy Test Site (PMEC-SETS). (Source: OSU Northwest National Marine Energy Center located 6 nm offshore from Newport, Oregon; FERC Project No. P-14616)

Table 12. PMEC-SETS Application Timeline

Date	Action
10/29/2013	OSU submitted Unsolicited Request for Renewable Energy Research Lease to BOEM
4/13/2014	Full day meeting of Collaborative Workgroup (CWG); voted unanimously for communications protocol for FERC
4/15/2014	NOI, pre-application document, and request for use of ALP to FERC
5/22/2014	Community open house meeting in Newport for outreach and education of the project
5/27/2014	FERC approved NOI, PAD, and use of ALP
6/5/2014	FERC issued notice of scoping meeting; NEPA Scoping Document 1 and proposed studies filed with FERC and distributed to stakeholders
6/20/2014	BOEM issued Notice of Determination of No Competitive Interest for the PMEC-SETS project
7/9/2014	OSU held stakeholder scoping meeting
9/16/2014	OSU submitted NEPA Scoping Document 2 based on meeting and comments to FERC
11/8/2014	OSU deployed wave and current measuring instruments
4/24/2015	Preliminary draft EA distributed to the CWG
12/21/16	DOE announces its selection of PMEC-SETS for test facility funding
4/20/18	Draft license application filed at FERC

Unlike OPT, OSU selected the ALP approach for licensing. As a result, most of the scoping and engagement work was conducted upfront. Consultation through the CWG consisted of 9 federal agencies, 7 state agencies, and 10 other key stakeholder groups. The ALP takes a "bottom-up" approach allowing flexibility for project-specific planning and scheduling relative to the extensive stakeholder list and required engagement. This planning advantage can be time consuming, but it also potentially saves future time and complications by allowing the coordination of timing of application submittals to FERC. Within the various agencies included in the CWG, a number of review sequences are required along with several environmental documents. The ALP made this challenge easier by allowing OSU to align the agency reviews and consolidate the environmental documentation (e.g., a single EA for FERC, BOEM, and USACE).

One requirement within the ALP is to communicate, prior to NOI submission to FERC, with all stakeholders that would be affected by the proposal and to gain their support on a set of communication protocols. Numerous resource agencies, Indian Tribes, and citizen groups were contacted to fulfill this requirement, leading to formation of the CWG. The CWG concluded that the ALP was the best path forward and through several meetings determined the required set of communication protocols. Currently, over 30 members make up the CWG, but the following were included in the first round of meetings prior to DOI/PAD submission to FERC.

- BOEM
- U.S. Environmental Protection Agency
- FERC
- NMFS − West Coast Region
- NOAA Office of General Council − Northwest Section
- USACE
- DOE
- FWS
- Office of the Governor of Oregon
- Oregon Department of Energy
- Oregon Department of Environmental Quality
- Oregon Department of Fish and Wildlife
- Oregon Department of Land Conservation and Development
- Oregon Department of State Lands
- Oregon Parks and Recreation Department
- City of Newport
- Confederated Tribes of the Siletz Indians
- Port of Toledo
- Oregon Wave Energy Trust
- Surfrider Foundation

As an indicator of collaborative success with other ocean users, a new navigational agreement had to be struck to avoid conflicts with the PMEC-SETS location. As documented in the preliminary draft EA, OSU used the Sea Grant Program to develop agreeable routes.

> To avoid conflicts between commercial crab fishermen and ocean going tugs that are towing barges, the Washington Sea Grant program helped broker an agreement that provided navigable towboat and barge lanes through the crabbing grounds between Cape Flattery and San Francisco. Based on the Washington Sea Grant Tow Lane Charts, the PMEC-SETS would be located in the southern corner of the existing tow lane off the coast of Newport, however, OSU has been working with the crabbers and tow boat operators and has secured a provisional agreement to adjust the tow lanes so they avoid PMEC-SETS.[99]

While marine energy development usually requires some imprecision in the development plan because of technology evolution, a developer can provide reasonable ranges of specifications regarding devices, inter-array cabling, and export cable scale and pathway strategies. As a test site, PMEC-SETS faced substantial uncertainties regarding devices that might use the berths. OSU conducted a technology survey to understand the range of specifications of potential test devices. The innovation was to describe specification ranges that would be meaningful in a permitting process, rather than the usual technology specifications regarding efficiency, power, and energy. These challenges led to an envelope approach, in which OSU created a box within which individual devices could be deployed and not trigger new reviews, but if boundary conditions that defined the box were exceeded, OSU could seek approval for an adjustment to its permits.[100]

PMEC-SETS will be built in federal waters on the OCS, beyond the 3-nm boundary of state waters, which brings BOEM into the permitting process. An Intergovernmental Taskforce for Oregon was created for marine energy on the OCS in 2011. While this process often leads to BOEM and the state designating specific locations for the bidding of leases for marine energy, PMEC-SETS was sited in a location that ultimately received a Determination of No Competitive Interest[101] after an Unsolicited Request[102] was submitted, precluding any bidding process. The lack of competitive interest allows OSU to submit their PAD to FERC prior to a BOEM lease. If it was a bid parcel on the OCS, they would have to wait for a BOEM lease to submit their PAD to FERC, potentially lengthening the permitting process. This combination of a BOEM lease and a FERC license was a point of jurisdictional contention until an MOU between the two entities was created in April 2009. Complications arising from this combination of jurisdictions have been initially addressed with a guidelines document[103] from 2012.

The PMEC-SETS project, if successful, will put the MOU agreement into practice as well as the printed guidelines. Other issues have the potential to arise after actual deployment of devices and license lease requirements begin to be addressed. For instance, both FERC and BOEM require decommissioning assurance to ensure the ocean floor is returned to its pre-installation condition. BOEM's requirement is specific and can be found at 30 C.F.R. 585.511-537 while FERC's is determined on a case-by-case basis.

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[99] See page 3-162 of the Preliminary Draft Environmental Assessment, April 2018. FERC Accession No. 20180420-5237 (32851208).

[100] See page A-7 of the Draft License Application, April 2018. FERC Accession No. 20180420-5237 (32851207).

[101] Notice of Determination of No Competitive Interest for the Pacific Marine Energy Center South Energy Test Site Project Offshore Newport, Oregon MMAA104000. 2014 BOEM, Interior. https://www.boem.gov/79-FR-35377/ (9.25.2017)

[102] Unsolicited Request for Renewable Energy Research Lease. 2013. https://www.boem.gov/NNMREC-Unsolicited-Lease/ (9.25.2017)

[103] BOEM/FERC Guidelines on Regulation of Marine and Hydrokinetic Energy Projects on the OCS. 2012. https://www.boem.gov/BOEM-FERC-staff-guidelines/ (9.25.2017)

The text of the guidelines[104] provided by BOEM states that "The financial assurance requirements of the BOEM lease and Commission license will be coordinated." To a developer, the quoted text does not remove uncertainty, and it may be challenging to provide two forms of financial assurance for a single project. Additionally, information related to inspection procedures is described as requiring development as MHK projects are authorized, with neither entity being identified as the sole or lead on this topic. Again, a developer would likely find two inspection procedures burdensome, especially in the early stages of research and development.

2.2.5 Florida Atlantic University-Southeast National Renewable Energy Center

The FAU-SNMREC[105] issued a 5-year BOEM Interim Policy Lease (OCS-A 0495) on June 1, 2014, off the coast of Dania Beach, Florida (see Figure 16 and Table 13). This was the first BOEM renewable energy lease for MHK technology testing. As originally proposed, a test site location would be developed allowing the testing of scaled experimental turbines by lowering them into the Gulf Stream current in the Florida Straits. The test site would have consisted of a total of three installed mooring and telemetry buoys (MTB) with a single point mooring. These buoys were planned to act as a sensor and measurement platform and a connection point for mooring a vessel from which a test turbine could be lowered into the current. Test data from the turbine and associated sensors could then be streamed back aboard the deployment vessel. Turbine data would then be correlated to the resource data collected from the MTB. Additionally, tow tests would be included as part of the turbine device testing procedures and would occur prior to MTB deployment. These were added to the revised EA after the public comment period. However, unfavorable seafloor conditions were discovered during exploratory multibeam echosounder surveys that found rubble with sand veneer which was incompatible with the anchor system proposed for the MTBs. Thus, this lease was relinquished on May 31, 2016. FAU is still moving forward with the proposed actions at present and progressing toward permitting and finding industry partners.[106]

A lease through BOEM as the lead agency was required because funding for a large part of the FAU-SNMREC research was provided by DOE. This triggered a required NEPA process because it qualified as a federal action. The lease that BOEM granted to FAU-SNMREC was specific to the Interim Policy Rules[107] that only allowed technology research and ocean measurement activities. Final BOEM Lease Rules were developed later and published in June 2009. Unfortunately, there was no option for fee waivers per block of ocean floor. Originally, the plan encompassed 21 blocks, but leasing at this scale was cost prohibitive. FAU elected to downscale the request to three blocks and then eventually to three aliquots. It is interesting to note that BOEM has a research lease option that allows rental costs to be waived. However, the state of Florida designates universities as public corporations so BOEM recognized FAU as a corporation. This forced FAU to take the interim policy route for gaining access to the OCS rather than a research option.

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[104] BOEM/FERC Guidelines on Regulation of Marine and Hydrokinetic Energy Projects on the OCS, Version 2, Chapter 6, 19 July 2012. https://www.boem.gov/BOEM-FERC-staff-guidelines/ (last accessed 9 October 2017)

[105] http://snmrec.fau.edu/

[106] FAU maintains a website documenting key reports and progress points in the lease process. See: http://coet.fau.edu/focus-areas/regulatory-framework.html

[107] "Request for Information and Nominations of Areas for Leases Authorizing Alternative Energy Resource Assessment and Technology Testing Activities Pursuant to Subsection 8(p) of the Outer Continental Shelf Lands Act, as Amended", 72 Federal Register 214 (6 November 2007), pp. 62673 - 62675.

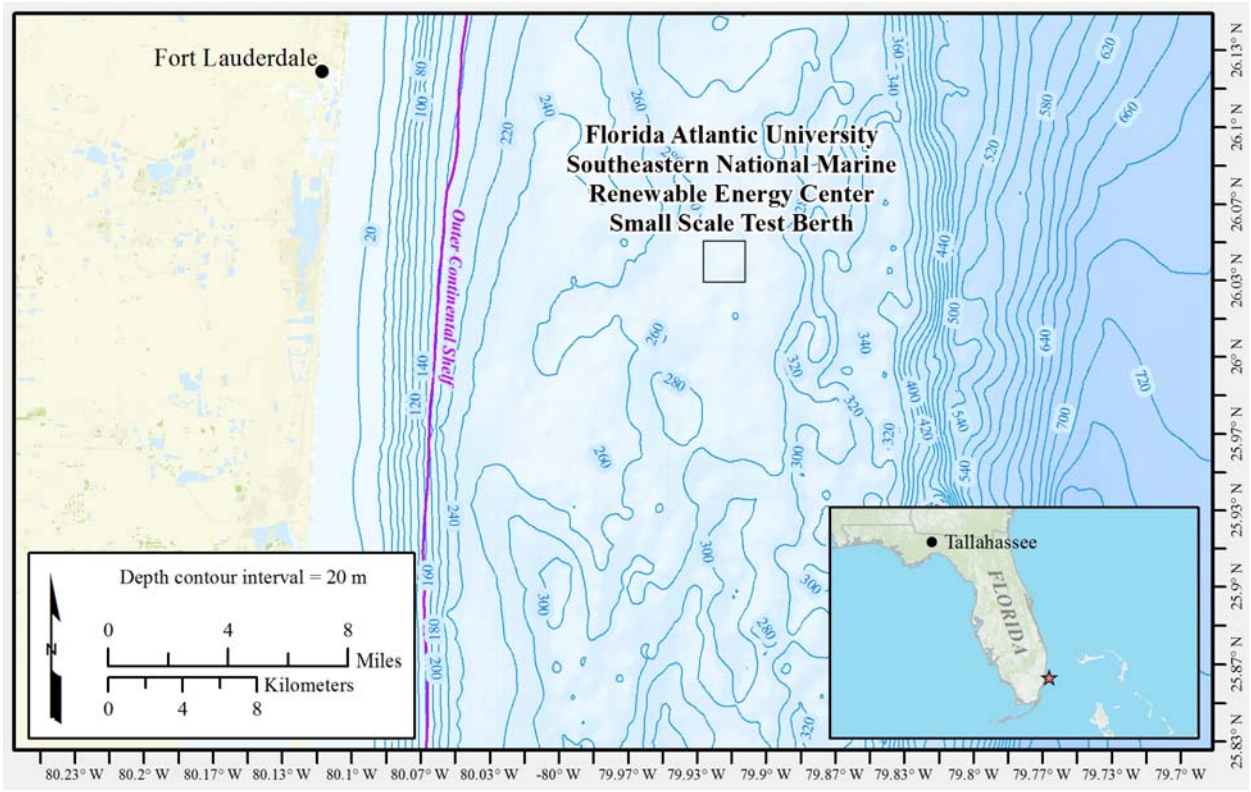

Figure 16. OCS Renewable Energy Program. (Source: OSU; Florida Atlantic University-Southeast National Marine Renewable Energy Center; Offshore Dania Beach, Florida; BOEM Interim Policy Lease OCS-A 0495)

Table 13. FAU-SNMREC Application Timeline

Date	Action
05/24/2011	NOI to prepare EA
02/13/2012	FAU-SNMREC submitted final lease application
04/15/2012	BOEM issued EA and comment period including a public info meeting
05/15/2012	FAU-SNMREC changed scope of proposed activities
08/8/2013	BOEM issued revised EA and FONSI based on revisions and comments
06/3/2014	BOEM issued 5 year Interim Lease; OCS-A 0495
12/11/2014	First Florida Intergovernmental Renewable Energy Task Force Meeting
05/31/2016	FAU-SNMREC relinquished lease

This project is responsible for the first NEPA EA and FONSI for a MHK project on the OCS.[108] The USACE, USCG, and DOE all took part in the NEPA process as cooperating agencies. In fact, BOEM (referred to as BOEMRE at the time of the MOU) has a MOU[109] with the DOE Office of Energy Efficiency and Renewable Energy related to mutual cooperation to make offshore MHK research and development on the OCS as successful as possible. Findings in the EA stated that impacts would be negligible to minor (small size and short duration). Impact levels were based on four-level classifications from the Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the OCS.[110]

The principal issue identified in the EA is the likely presence of sensitive benthic habitat due to the presence of high slope hardbottom areas in portions of two lease blocks. As a result, BOEM's preferred alternative was to issue a lease to three blocks with the exception of one aliquot as more than 50% of the aliquot contained high slope hardbottom areas.

Since relinquishing the BOEM lease in May 2016, FAU indicated plans to move forward without BOEM as the lead agency. Instead, FAU will use USACE NWP 5, or seek a Categorical Exclusion for scientific measurement equipment, whereas NWP 52 would lead to a "MHK device" NEPA process. DOE will lead the NEPA process using Categorical Exclusion for measurement equipment.

[108] *Lease Issuance for Marine Hydrokinetic Technology Testing on the Outer Continental Shelf Offshore Florida: Revised Environmental Assessment.* BOEM 2013-01140. https://www.boem.gov/Florida-Revised-EA-FONSI-August2013/

[109] Memorandum of Understanding between the United States Department of the Interior Bureau of Ocean Energy Management, Regulation, and Enforcement and the United States Department of Energy Office of Energy Efficiency and Renewable Energy for the Coordinated Deployment of Offshore Wind and Marine and Hydrokinetic Energy Technologies on the United States Outer Continental Shelf. 2010.

[110] U.S. Department of the Interior (USDOI), Minerals Management Service (MMS). 2007. Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf, Final Environmental Impact Statement, October 2007. OCS Report MMS 2007-024.

3.0 Regulatory Processes in Related Industries

Other energy extraction or user industries exist in the marine environment and provide opportunities for lateral lessons. Such industries include hydropower, offshore wind, submarine cables, and offshore oil and gas wells.

3.1 Hydropower

Regulatory reform or licensing reform for FERC oversight of hydroelectric projects has been the subject of extensive discussion for over 30 years. In 2010, DOE, DOI, and the the Department of the Army (through USACE) signed the MOU for Hydropower, and in 2015 extended the MOU for another 5 years. The Hydropower MOU is intended to help "… meet the nation's needs for reliable, affordable, and environmentally sustainable hydropower by strengthening a long-term working relationship, prioritizing similar goals, and aligning ongoing and future renewable energy development efforts between the agencies." The Hydropower MOU established 13 overarching goals for sustainable hydropower generation and identified a specific set of activities that the DOE, DOI, and USACE collectively would undertake to elevate the goal of increased hydropower generation. These commitments were designed to represent a new approach to hydropower development that would result in clean, renewable power generation while avoiding or reducing environmental impacts.[111]

More recent advances in hydroelectric licensing reform have focused on process efficiency. Examples of success include a coordinated timeline for FERC and USACE Section 404 permit development in 2016[112] and the implementation of the Hydroelectric Regulatory Efficiency Act of 2013,[113] which exempted certain conduit facilities from the FPA and directed FERC to pilot a 2-year licensing process for closed-loop pumped storage projects and development at non-powered dams, among other actions. FERC staff reported to Congress that a 2-year process is feasible under current regulations and that "Staff remains convinced that site selection, a well-defined project proposal, thorough pre-filing consultation, and a complete application are the most important elements to ensuring a project is authorized in an expeditious manner."[114] Staff further recommended updating its website as a way to support applicants in this respect.

Commission members and staff may testify in Congress on mechanisms for licensing improvements. In June 2018, the Director of FERC's Office of Energy Projects, which oversees hydroelectric licensing, testified that the Commission had entered into the One Federal Decision MOU with several other federal agencies to implement the provisions of Title 41 of the Fixing America's Surface Transportation Act (FAST-41) of 2015 and Executive Order 13807, "Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure Projects," of 2017. The One Federal Decision MOU is intended to streamline the processing of environmental reviews and authorization decisions for proposed major infrastructure projects. The Director testified that "… the processes envisioned by FAST-41, Executive Order 13807, and the One Federal Decision MOU parallel the Commission's own processes to improve early consultation and to increase transparency of project review. The Commission has for many years worked closely with other federal and state agencies to

[111] https://www.energy.gov/eere/water/downloads/hydropower-memorandum-understanding
[112] See presentation from Tim Welch, Commission staff, in July 2016: https://www.ferc.gov/media/news-releases/2016/2016-3/07-21-16-A-3-presentation.pdf
[113] https://www.ferc.gov/industries/hydropower/indus-act/efficiency-act.asp
[114] "Report on the Pilot Two-Year Hydroelectric Licensing Process for Non-Powered Dams and Closed-Loop Pumped Storage Projects and Recommendations Pursuant to Section 6 of the Hydropower Regulatory Efficiency Act of 2013," May 2017. Available at https://www.ferc.gov/legal/staff-reports/2017/final-2-year-process.pdf

complete reviews of all infrastructure projects in an expeditious, coordinated, and transparent manner. The One Federal Decision MOU, which calls for a goal of completing action on all governmental approval decisions within two years, should encourage agencies to redouble their efforts in actively participating in environmental reviews and communicating their analysis needs to each other, and project sponsors, so that the review process is more predictable and transparent."[115]

The DOE Water Power Technologies Office *Hydropower Vision Report* (2016) includes a discussion of regulatory reform opportunities, though none of these are germane to marine energy (basin-scale approaches, for example, to address river connectivity).[116]

3.2 Offshore Wind

3.2.1 Offshore Wind Resource Assessment Instrumentation

Through the Wind Energy Technologies Office, PNNL has commissioned and deploys two buoys designed to remain on station for 1 year to capture and make data publicly available to support evaluation of offshore wind resource potential. The buoys are outfitted with a full set of marinized instruments to record a spectrum of data, including water, wind, and solar information.[117]

PNNL's work to deploy the light detection and ranging (LIDAR) buoys requires permitting from various agencies for temporary offshore installation. Lighting, communication protocols, monitoring, and effects on the buoy from long-term deployment are all of interest to the MHK sector. Some examples of permits and reviews required for the LIDAR buoy include the USACE Nationwide Permit 5, USCG Private Aid to Navigation, a NEPA Categorical Exclusion, and New Jersey Waterfront Development Permit.

The USACE Nationwide Permit 5 is required for Scientific Measurement Devices.[118] The USACE uses Nationwide Permits as a type of general permit that allows for similar activities that may only cause minor effects to waters and wetlands under USACE jurisdiction to be permitted, avoiding a lengthy process of applying for an individual permit.[119] As defined by USACE, the Nationwide Permit 5 includes any device used to measure and record scientific data and requires that the device and any structure associated with it must be removed and the site restored once data collection has finished. This permit includes conditions such as no more than minimal adverse impacts on navigation and no substantial disruptions of indigenous or migratory species.

[115] https://www.ferc.gov/media/cong-affairs/2018/06-07-18-turpin.pdf
[116] *Hydropower Vision*, Department of Energy, 2016. https://www.energy.gov/eere/water/articles/hydropower-vision-new-chapter-america-s-1st-renewable-electricity-source
[117] https://wind.pnnl.gov/lidarbuoys.asp
[118] https://www.swt.usace.army.mil/Portals/41/docs/missions/regulatory/NationwidePermits/Nationwide%20Permit%2005%20-%20Scientific%20Measurement%20Devices.pdf?ver=2017-03-31-150714-880
[119] https://www.federalregister.gov/documents/2017/01/06/2016-31355/issuance-and-reissuance-of-nationwide-permits

Under the USCG, any Private Aids to Navigation require authorization from the USCG, including any navigational aids in federal waters that are operated by anyone other than the federal government.[120]

To be compliant under NEPA regulations, PNNL sought a Categorical Exclusion for the New Jersey LIDAR buoy. A Categorical Exclusion allows an agency, after going through a Categorical Exclusion Review that ensures environmental protection for that activity, to comply with NEPA without completing an EA or EIS.[121] While previous LIDAR buoy deployments had separate project-specific Categorical Exclusions, PNNL prepared a generic or site-wide Categorical Exclusion for small-scale MHK research and development and pilot projects in aquatic environments for the New Jersey LIDAR buoy and all future deployments and future MHK projects in aquatic settings.

Under New Jersey regulations, any development activities affecting New Jersey's riparian rights and occurring within the waterfront area or waterward of the mean high water line require a Waterfront Development Permit. The New Jersey Department of Environmental Protection issued a Waterfront Development Permit to PNNL in 2009.

3.2.2 National Offshore Wind Strategy

In 2011, BOEM produced the 2011 National Offshore Wind Strategy. As part of efforts to update the 2011 document, DOE and DOI held a 2015 National Offshore Wind Strategy Workshop. The workshop aimed to understand stakeholder challenges and potential solutions for offshore wind energy development and inform efforts to both update the 2011 document and facilitate future development of the offshore wind industry.[122] Two of the main topics for the workshop were siting and permitting processes, where stakeholders suggested implementing mandatory timelines for permitting, taking into account offshore wind development risks in the permitting process, improving the availability of information, and enhancing coordination across jurisdictions and agencies to streamline permitting. Recommendations and feedback from the workshop directly informed the action areas and corresponding actions developed for the update.[123] Based on this workshop and additional feedback processes, DOE through its Wind Energy Technology Office and DOI through BOEM jointly developed the 2016 National Offshore Wind Strategy.

The 2016 National Offshore Wind Strategy aims to better understand changes in the industry since 2011 as well as key challenges for the industry and potential pathways. The report established a framework for federal action to facilitate offshore wind development.[109]

Two relevant action areas are 1) ensuring efficiency, consistency, and clarity in the regulatory process and 2) managing key environmental and human-use concerns. For improving the regulatory process, the report discusses re-evaluating DOI requirements (such as Site Assessment Plans that detail initial activities to characterize a lease site, resource assessment survey, or technology testing activities with bottom-mounted facilities[124]), considering alternate approaches to improve the BOEM plan review process, evaluating a project design approach for construction and operation plans, providing a regulatory roadmap, and collaborating with relevant agencies to standardize review processes. For better management of key concerns, the strategy recommends collecting environmental data and supporting monitoring or mitigation technologies at first-generation projects, synthesizing environmental impact data, and providing guidance to clarify information needs and data collection requirements.

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[120] https://www.ecfr.gov/cgi-bin/retrieveECFR?gp=&SID=27c61822c6507e16c32c1d82c0c20ac5&mc=true&n=pt33.1.66&r=PART&ty=HTML

[121] https://www.energy.gov/nepa/categorical-exclusion-determinations-b518

[122] https://www.energy.gov/sites/prod/files/2016/06/f33/National-Offshore-Wind-Strategy-Workshop-Summary.pdf

[123] https://www.boem.gov/National-Offshore-Wind-Strategy/

[124] https://www.boem.gov/Final-SAP-Guidelines/

3.2.3 Project Design Envelope

One of the key advances in permitting offshore wind development at BOEM is the "project design envelope" approach. By applying regulatory requirements to an envelope—describing a reasonable range of project designs that allows for flexibility related to technological developments, project complexity, and unpredictability of the environment[125]—imprecisions in innovative project development and unknown site-based interactions can be better accommodated. This envelope-based approach was pioneered in the United Kingdom ("Rochdale Envelope"), used in the PacWave project licensing process, and moves toward a risk-based regulatory approach that can be more effective at managing dynamic systems and significant unknowns.

In 2018, BOEM published draft guidance on using a Project Design Envelope approach for construction and operation of offshore wind energy facilities.[111] A Project Design Envelope is a planning approach that is the result of case law and allows flexibility in applications for a given project.[126] Key aspects of the approach include the need for details and clearly defined parameters that enable EAs while also acknowledging that a project may evolve over time and accommodating for such changes during the application process and different project phases. The BOEM draft guidance document provides lessees the option to submit construction and operation plans that use a Project Design Envelope approach. This provides flexibility throughout the project development process while allowing BOEM to assess the environmental impacts. It also offers the potential to reduce or fully eliminate the need for additional reviews based on BOEM's EA and gives BOEM the opportunity to begin NEPA evaluation earlier in the development project. BOEM is in the process of gathering stakeholder comments on the draft document and will issue final guidance in 2019.

3.2.4 Exclusions and Exceptions

Additional examples where offshore wind development has been facilitated are through exclusions or exceptions that help ease the permitting process. Under NEPA, there is a Categorical Exclusion for installation of a wind turbine. A Categorical Exclusion allows an agency, after going through a Categorical Exclusion Review that ensures environmental protection for that activity, to comply with NEPA without completing an EA or EIS. [127] For wind energy specifically, the Categorical Exclusion includes commercial wind turbines that generally do not number more than two, are not over 200 ft tall, are located within specific areas (such as located within previously disturbed or developed areas), and would not significantly impact on birds, bats, or humans. Another example is the New Jersey Department of Environmental Protection's exception for wind turbines from Waterfront Development Permits.[128] This states that installation of wind turbines under certain specifications, such as attached to a legally existing building and no more than 200 ft tall, do not require a Waterfront Development Permit.

3.3 Underwater Cables

Underwater cables are an important corollary industry for MHK. They represent large investments in high-value and permanent underwater installations, with some significant limitations on terrestrial landing (fiber-optic vaults in place of substations), that cross state territorial waters and involve a linear right-of-way from the project to the shoreside installation.

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[125] https://www.boem.gov/Draft-Design-Envelope-Guidance/

[126] https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2011/02/Advice-note-9.-Rochdale-envelope-web.pdf

[127] https://www.energy.gov/nepa/categorical-exclusion-determinations-b518

[128] https://www.nj.gov/dep/rules/rules/njac7_7.pdf

Because underwater cables have existed for well over a century in the United States, certain institutional lessons can be drawn from their regulatory treatment. The ICPC was formed in 1958 and works to address changes or challenges with submarine cables by developing recommendations for the international cable industry. The recommendations put forth by the ICPC guide all aspects of activities affecting cables such as recovery of cables, cable routing, repair operations, cable protection, and activities near cables (including offshore wind energy and seismic survey work).[129] These recommendations are intended only as guide to ensure reliability and safety for both cable owners and others using the sea bed.

To interface with federal oversight bodies in the United States, the Communications Security and Reliability and Interoperability Council was founded as a federal advisory council to provide recommendations to the FCC.[130] The Council has a working group that focuses partially on submarine cable resiliency and aims to recommend industry practices, government policies, and interagency coordination. Similar to the MHK industry, a challenge for the submarine cable industry is the expense and time requirements for permitting new cables. The working group came up with two focus areas for their recommendations, which were enhancing coordination among all levels of government agencies and increasing resiliency through working with other agencies.[131] The recommendations put forth in their Interagency and Interjurisdictional Coordination Report include encouraging timely information exchange and investigations to identify potential spatial conflicts; participating proactively in MSP activities, National Ocean Councils, and regional planning bodies; developing guidance for regulatory reviews for new cables; improving data management and accessibility; and streamlining permitting requirements.

At the state level, certain states have developed significant regulatory accommodations to attract the cable industry. For example, in Oregon, Territorial Sea Plan Part 4 provides a very narrow right-of-way through the state seafloor, which keeps seafloor leasing costs low. There is a provision in the governing rules of the Department of State Lands that allows the cable lessee to pay a fee to waive certain regulatory restrictions. To support interactions with the fishing community in Oregon, the Oregon Fishermen Cable Committee acts as an intermediary that manages a fund that pays recovery costs for equipment lost when a trawlers inadvertently interacts with a cable. These regulatory accommodations allow greater certainty and streamlined permitting at the state level for territorial sea and shoreside installations.[132]

3.4 Offshore Oil and Gas

Oil and gas platforms are stationary objects in the ocean with a highly developed regulatory regime, offering lateral lessons for MHK regulatory development.

Under Section 18 of the Outer Continental Shelf Lands Act, BOEM adminsters the leasing program for oil and gas resource extraction on the OCS on five-year intervals to "best meet national energy needs." Currently BOEM operates a 2017-2022 National OCS Program[133] with a supporting programmatic environmental impact statement (PEIS). The program should propose leases that "… balance the potential for environmental damage, the potential for the discovery of oil and gas, and the potential for adverse impacts on the coastal zone" (OCSLA Section 18(a)(3))).

[129] https://www.iscpc.org/publications/recommendations/
[130] https://www.fcc.gov/about-fcc/advisory-committees/communications-security-reliability-and-interoperability
[131] https://www.fcc.gov/file/11884/download
[132] https://www.oregon.gov/energy/Data-and-Reports/Documents/2015%20Marine%20Transmission%20Report.pdf
[133] https://www.boem.gov/2017-2022-OCS-Oil-and-Gas-Leasing-PFP/

3.4.1 Environmental Effects

The PEIS reviews environmental, social and economic impacts associated with operating the leasing program. According to BOEM, the issuance of a PEIS is up to the agency's discretion because the program itself does not constitute an irreversible and irretrievable commitment of resources; full compliance with NEPA is required for the leases themselves. Therefore, the PEIS addresses potential impacts that could occur under leases.

The impact-producing factors evaluated in a PEIS include:[134]

- Noise from geophysical surveys, ship and aircraft traffic, drilling and production operations, trenching, onshore and offshore construction, and explosive platform removals
- Traffic associated with the movement of ships and aircraft
- Routine discharges associated with the offshore and onshore disposal of liquid wastes, including ballast water and sanitary and gray wastewater generated by OCS-related activities
- Drilling, mud cuttings, and debris, including material removed from the well borehole (e.g., drill cuttings), solids produced with the oil and gas (e.g., sand), cement residue, bentonite, and trash and debris (e.g., equipment or tools) accidentally lost
- Bottom/land disturbance from drilling, infrastructure emplacement (e.g., platforms, pipelines, onshore infrastructures), and structure removal
- Air emissions from offshore and onshore facilities and transportation vessels and aircraft
- Lighting/physical presence associated with onshore and offshore facilities
- Visible onshore and offshore facilities from shore
- Space-use conflicts with onshore and offshore facilities, including oil tankers and barges, supply/support vessels and aircraft, and seismic survey vessels and aircraft
- Accidental oil spills, including those from loss of well control, production accidents, transportation failures (e.g., from tankers, other vessels, seafloor and onshore pipelines, and storage facilities), and low-level spillage from platforms.

In comparison, only a few of these factors have significance for MHK deployments—bottom-disturbance, visual and aesthetic effects, lighting and physical presence, space-use conflicts, and installation construction.

3.4.2 Bonding and Insurance

BOEM requires general bonds for lessees, and depending on the level of activity, the bond may be $50,000 to $3,000,000. In addition, BOEM may require a supplemental bond to support decommissioning and other activities. In addition to required bonds as a function of lease issuance, there also are federal regulations to ensure that lessees have the financial means to pay for cleanup and damage from oil spills (Oil Spill Financial Responsibility)[135], which includes provisions demonstrating adequate insurance and financial statements from the company applying for a lease.

[134] P.S-5, https://www.boem.gov/fpeis-volume1/
[135] https://www.boem.gov/Oil-Spill-Financial-Responsibility-OSFR/

3.4.3 Program Design

The BOEM approach to regulating oil and gas development on the OCS is fundamentally different than the MHK regulatory regime. In MHK, individual proposals to develop projects are submitted to FERC and to BOEM. These proposals must flow through the licensing and leasing process (similar to an unsolicited lease application) and may successfully achieve a permit if the cumulative study and mitigation requirements of oversight agencies are met.

The oil and gas program from BOEM runs ahead of the lease proposal process by pre-determining which areas of the OCS may be made available, and under what conditions. These decisions are made on a 5-year cycle that incorporates cumulative effects and long-term conditions. The currently operational National OCS Program extends from 2017 to 2022. Supporting analysis includes anticipated direct and indirect greenhouse gas emissions from development at proposed sites.

By Executive Order 13795 of April 28, 2017 and DOI Secretary's Order 3350 (May 2017), BOEM is currently redesigning its National OCS Program and anticipates approval and execution of a new 2019 to 2024 program. The Executive Order implements an "America-First Offshore Energy Strategy" that instructs the Secretary of the Interior to review the schedule of oil and gas lease sales to potentially accommodate annual lease sales within Planning Areas; supports "streamlined permitting" for evaluating the resource potential within the Planning Areas; restricts the Secretary of the Interior from establishing or expanding National Marine Sanctuaries without a full accounting of the space's energy potential and orders a review of all sanctuaries established within the previous 10 years; and instructs the review of several specific regulatory requirements, including financial assurance requirements, well control regulations, and proposed offshore air quality regulations, in order to "… ensure operator compliance with lease terms while minimizing unnecessary regulatory burdens." Notably, Section 9 and Section 10 of the Executive Order relate to expediting Incidental Take authorizations under the MMPA and, with regard to a NOAA Technical Memorandum (NMFS-OPR-55) *Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing*, "… take all steps permitted by law to rescind or revise that guidance."[136] The order makes no explicit reference to wave energy resources. It does, however, reference offshore wind as a source of energy that should be evaluated with respect to reviewing recent designations of National Marine Sanctuaries.

The relationship between BOEM's National Outer Continental Shelf Oil and Gas Leasing Program, the Programmatic EIS, selected sale areas, and individual leases is presented in Figure 17.[137] The diagram emphasizes NEPA review and state consultation (CZM) as a preliminary action for the sale, the work to evaluate the seafloor's suitability for development ("exploration plan and drilling") and the actual recovery of oil and gas ("development and production plan").

[136] https://www.federalregister.gov/documents/2017/05/03/2017-09087/implementing-an-america-first-offshore-energy-strategy
[137] https://www.boem.gov/BOEM-OCS-Oil-Gas-Leasing-Process/

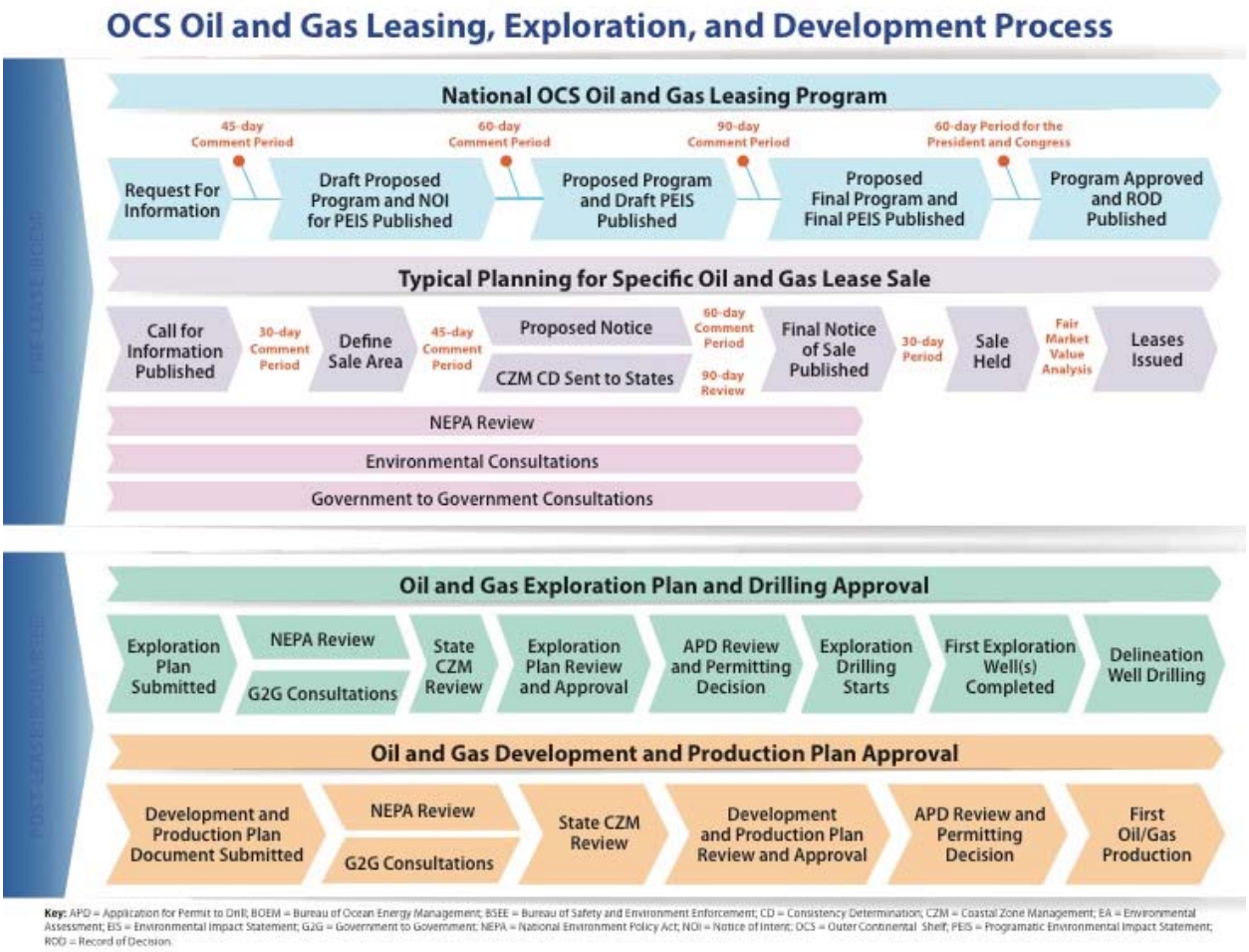

Figure 17. BOEM's Oil and Gas Leasing, Exploration, and Development Review Process

4.0 Existing Literature on Regulatory Recommendations

In the last 5 years, several reports have offered prospective adjustments to improve MHK regulatory conditions and efficiency. Many of these reports are focused on the philosophies of resource agencies as they apply environmental authorities in relatively unknown and dynamic circumstances, from a technology perspective, the marine environment, and the interaction between the two. A consistent premise of these reports is that the regulatory process as currently designed and executed is "long, drawn out, challenging, and expensive,"[138] with room for improvement.

In this section, the following four themes for solutions to these perceptions of the MHK regulatory process are discussed.

- Project Record – Circumscribing the field of inquiry by ensuring that study requests have close project nexus, are well-informed by existing knowledge, and take advantage of best practices.
- Mitigation – Using advanced approaches to mitigate uncertainty, anticipated impacts, and risks.
- Phasing and Understanding Device vs. Array Effects – Adapting regulatory processes to the likely development pathway for MHK, which includes phased development and a recognition of devices within arrays.
- Structural and Educational Mechanisms – Configuring authorities properly and ensuring adequate coordination among agencies.

As described at the beginning of this report, the literature review does not intend to cover the specific status of environmental effects, but rather relays the maturity of a technique to improve the regulatory process.

4.1 Project Record

4.1.1 Transferability of Environmental Interactions

In general, the state of knowledge about environmental interactions from wave energy and tidal energy conversion devices is lacking in the United States because there are installations that use those technologies. Lessons can be drawn from installations of the technologies in other countries and other structures within the marine environment; however, because of differences in site characteristics, especially ecological conditions and species presence, extrapolation and *transferability* of information may not always be credible. Absent any basis for understanding and predicting interactions, each siting process and installation proponent is then faced with conducting studies to demonstrate baseline conditions and holds the burden of proof to eliminate risks and impacts. Compounding the breadth of that burden is the inherent dynamics of ocean environments and other marine environment user communities, which are not uniform or stationary. Therefore, greater understanding regarding effects from installations at other sites—and thoughtful use of that understanding—can help prioritize issues, increase the accuracy of risk assessment, and focus study design in the regulatory process.

- [138] *Pacific Region Marine Renewables Environmental Regulatory Workshop Report*. Oregon Wave Energy Trust, PNNL, HT Harvey and Associates. March 2017. https://tethys.pnnl.gov/sites/default/files/publications/OWET-Workshop-Report-final.pdf

Several research efforts address the degree to which interactions from non-MHK installations in domestic waters, as well as MHK installations in international waters, can be related to MHK installations in U.S. waters. An objective of the DOE-sponsored Tethys program[139] is to maintain a comprehensive, current, and accessible knowledge base of scientific analysis on siting interactions and environmental effects, to facilitate transferability from site to site and advance best practices. The website organizes content by technology type, stressors, receptors, and topic areas. To aggregate the cumulative environmental knowledge from international installations, the 2016 Annex IV State of the Science report published a complete evaluation on interactions with marine renewable energy installations globally. The reports identifies primary concerns (e.g. collision risk for tidal turbines) and areas where the existing science suggests lower levels of concern (e.g. electromagnetic field [EMF] effects from submarine power cables). These efforts identified areas where impacts are most likely to exist, the respective severity of those impacts, and appropriate levels of study and responsive mitigation.

To complement the international focus, other reports have focused on whether interactions from U.S. surrogate structures could offer lessons to MHK installations. HT Harvey and Associates explored the extent to which structures similar those used for WEC installations and tidal energy conversion installations may interact with fisheries, either as artificial reefs or "fish aggregating devices" in the U.S. West Coast and Hawaii.[140] A key finding is that "… negative effects of WEC structures on special status fish species, such as increased predation of juvenile salmonids or rockfishes, are not likely" and that in certain instances the structures may increase fishery productivity, if fish respond to WECs in the same fashion as they respond to oil and gas platforms. These reports illustrate that impacts may be unlikely, and in some cases, interactions are positive, which should help inform the intensity and premise of site-specific study requirements.

Transferability can be complicated when interactions are species-specific or technology-specific, as the MHK industry still consists of a variety of technologies and device designs. Regulators have noted challenges with transferring data and studies from a horizontal-axis turbine to a vertical-axis turbine.[141] Interactions that are not species-specific are likely to be more easily transferable. For example, the EMF created by cables can be standardized by cable size, current, and other features; researchers can employ simple models or make assumptions about EMF from similar cables at different sites. However, applying EMF effects on species from one site to another site and between species poses challenges for regulators; for example, applying behavior effects of sharks to EMF from a European site to sturgeon at a U.S. site.[141]

4.1.2 Project Nexus in Study Design

Resource agencies may request studies that project proponents believe cross the boundary from examining project effects to fundamental research. Because studies can be an expensive, time-consuming, and heavily negotiated element of a regulatory process, ensuring that studies hew closely to project nexus is an important concept. "Project nexus" is also a term used within FERC hydropower licensing processes to illustrate whether a study proposal is germane to the licensing decision before the agency.

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[139] http://tethys.pnnl.gov

[140] Kramer, Sharon et al. *Evaluating Potential for Marine and Hydrokinetic Devices to Act as Artificial Reefs or FADs*, HT Harvey & Associates. May 2015. https://www.boem.gov/2015-021/

[141] PNNL interviews with New England resource agencies. Regulators indicated that they are unlikely to accept study results on fish behavior from one species and site to another, but that technology attributes, such as turbine specifications, may be acceptable to transfer (e.g. the rotation speed of a turbine is reliably predictable in a given resource, and its effect on striking the body of a 25 cm herring would also be reliably accepted as the same, but how herring behave around the turbine in two different locations might not be accepted and behavior of different species most certainly would not be accepted).

To describe the boundary between research and project nexus, the Oregon Wave Energy Trust hosted an environmental effects regulator workshop in Portland in 2016. In its summary report,[142] workshop managers PNNL and HT Harvey and Associates organized four areas of potential environmental impacts—acoustic output impacts, EMF emissions, physical interactions, and effects of MHK energy installations on the physical environment—and asked attendees to organize them by how well "known" they are. The results are listed below:

- "Known known" − Understood well enough from a science perspective
- "Known unknowns" − Research community has the ability to study but the impact and cost of a study are uncertain)
- "Unknown unknowns" − Not yet widely assessed and uncertain whether further study is appropriate.

The workshop attendees then discussed a "risk dashboard" that indicated whether increased sharing, improved modeling, monitoring, or new research was the appropriate focus to address the impact. These risk dashboards illustrated not just whether an impact was perceived to be more likely or more severe, but whether there is consensus demand for fundamental research to illustrate interactions in advance of requiring a site-based study.

4.2 Mitigation

4.2.1 Risk Management and Monitoring

The ability to assess risk is still limited by the lack of available data to account for potential interactions and impacts to marine environments.

Monitoring is one tool to address uncertainty and support adaptive management, but can also be a significant cost and overly conservative when weighed against risk severity and project nexus. A consistent element of these reports is assuring the appropriate use of monitoring to answer a question or meet an objective. An NREL workshop report[143] noted that regulatory processes must "… differentiat[e] between monitoring required for single or small-scale deployments and MHK impact research that, although important, goes beyond what is feasible or should be needed to meet specific project regulatory requirements but is appropriate for broader research and development." Table ES-1 of the NREL workshop report describes the applicability of monitoring depending on the stressor and the scale of development.

In the PNNL/HT Harvey and Associates workshop report mentioned above, workshop managers identified four pathways to addressing unknowns:

1. Increase sharing of existing information
2. Improve modeling of interactions
3. Acquire the monitoring data needed to verify findings
4. Conduct new research.

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[142] *Pacific Region Marine Renewables Environmental Regulatory Workshop Report*. Oregon Wave Energy Trust, PNNL, HT Harvey and Associates. March 2017. https://tethys.pnnl.gov/sites/default/files/publications/OWET-Workshop-Report-final.pdf.

[143] *A Review of the Environmental Impacts for Marine and Hydrokinetic Project to Inform Regulatory Permitting: Summary Findings from the 2015 Workshop on Marine and Hydrokinetic Technologies*, Washington D.C. National Renewable Energy Laboratory, 2016.

At this same workshop, developers and regulators showed a strong difference of opinion, with developers frustrated at studies that are outside the likely scope of impacts and regulators indicating that studies showing no effect are helpful in retiring risk. This disagreement illustrates the expected role of first-of-its-kind MHK deployments in addressing risks and interactions for all future developments. Another discussed option is to rely on test centers to conduct research and seek to retire risk, rather than requiring developers to do so on a technology-specific installation.

4.2.2 Adaptive Management

Adaptive management is an established regulatory technique. While a common term, adaptive management is applied in many ways in the site-specific regulatory process, which can transform a practice intended to offer flexibility into persistent uncertainty. A recent study for International Energy Agency Wind Task 34 (Working Together to Resolve Environmental Effects of Wind Energy) revealed the degree to which adaptive management practices and definitions vary on terrestrial wind and offered recommendations on best practices for future use.[144] These recommendations include:

- Adopt a universal definition of adaptive management that is coupled with an agreed-upon set of eligibility criteria and consistent with the regulatory context in which it is being applied.
- Optimize the spatial and temporal scales over which adaptive management is applied for their ability to reduce scientific uncertainty.
- Let the application of adaptive management be guided by the need to minimize undue financial pressure on projects while ensuring that the natural resources of the nation or region are protected.
- Establish formal processes and structures within national or regional regulatory bodies to make use of environmental impact data from existing projects to generate knowledge that can be applied to the planning and management of future projects.

Because of the likelihood of adaptive management in MHK authorizations (and an explicit design intent of the Reedsport license, as previously discussed as a case study), these recommendations are relevant to ensure that adaptive management is consistently and precisely applied.

4.3 Phasing and Understanding Device vs. Array Effects

In 2016, NREL published a workshop report that detailed the limitations of monitoring and evaluation of small-scale installations.[145] While only small array or one-device installations are proposed or under development, the scale of these facilities may not be suitable for extrapolation to impacts associated with arrays or full buildouts and should not be used to support extensive characterization and monitoring given their scale. While these installations increase our collective experience with environmental interactions, there is a limit to what can be learned and observed from them. Rather, regulatory requirements should be designed for the scale of deployment to be both commensurate with the potential impacts and appropriate to the scale of development and support phased future development. A clear example of the non-linear

[144] Hanna, L.; Copping, A.; Geerlofs, S.; Feinberg, L.; Brown-Saracino, J.; Gilman, P.; Bennet, F.; May, R.; Köppel, J.; Bulling, L.; Gartman, V. (2016). Assessing Environmental Effects (WREN): Adaptive Management White Paper. Report by Berlin Institute of Technology, Bureau of Ocean Energy Management (BOEM), Marine Scotland Science, Norwegian Institute for Nature Research (NINA), Pacific Northwest National Laboratory (PNNL), and U.S. Department of Energy (DOE). pp 46. https://tethys.pnnl.gov/publications/assessing-environmental-effects-wren-white-paper-adaptive-management-wind-energy

[145] A Review of the Environmental Impacts for Marine and Hydrokinetic Project to Inform Regulatory Permitting: Summary Findings from the 2015 Workshop on Marine and Hydrokinetic Technologies, Washington D.C. National Renewable Energy Laboratory, 2016.

relationship between project scale and effects is the impact of the MHK development on the physical environment, such as energy extracted from waves and tides, sediment mobility, and adjustments to the water column and seafloor condition. Small-scale developments may have no noticeable effect on the physical environment at all, whereas an array or field of MHK devices may cross a threshold and exhibit an effect. In these instances, extensive monitoring of the small-scale or single-device deployment does not advance understanding of larger array effects.[145]

Differentiating between monitoring appropriate for smaller-scale projects to inform site-specific risk and research and monitoring to understand potential impacts of larger-scale projects was a key findings from the NREL workshop report. The report expressly points to impacts that may occur within arrays that are not present within single-device installations so the effort to monitor at a single-device installation does not respond to the native concern.[145]

Strategic research could be conducted on small-scale projects to understand at what scales of development certain effects occur and help clarify risk indices at project scales, minimize uncertainty and elucidate actual risk. Most interactions and associated risks from single devices are unlikely to harm the marine environment; as larger arrays are deployed, additional monitoring and strategic research may be required to prepare for the commercial development of the industry.

4.4 Structural and Educational Mechanisms

In 2015, the Oregon Wave Energy Trust sponsored a summit to discuss how to advance MHK broadly. The resulting report from the Norwegian organization DNV-GL[146] discusses five major topics, including regulatory and permitting challenges (see table below).

Key Topics	Strengths	Challenges	Opportunities
Regulatory and Permitting	• Relative environmental risks from ocean energy • Global data on environmental impacts • Early local experience with regulatory processes • Available test sites	• Aligning regulatory agencies with a "big picture" perspective • Lack of acceptance for local transferability • The data before the deployment dilemma • Multiple agencies and different local requirements • Expectations beyond what is necessary • NOAA-NMFS challenges • Preliminary permit terminology misunderstanding	• Projects in the water • Better capitalization on learning from defunct projects • Multiple projects sharing permitted sites • Isolated micro-grids • Sharing lessons learned

[146] *West Coast Regional Strategies for Ocean Energy Advancement*, Oregon Wave Energy Trust and DNV-GL, 2015. https://pacificoceanenergy.org/wp-content/uploads/2016/01/West-Coast-Regional-Strategies-for-Ocean-Energy-Development-2015-1.pdf

In response, the summit summary report established the following industry goals and actions to address these challenges.

- *Goal:* Achieve more top-down direction within regulatory agencies for local planning of ocean energy
  - Action: Escalate lobbying to more senior levels
  - Action: Better put into perspective the relative environmental risks
  - Action: Emphasize adaptive management and information sharing to senior officials
- *Goal*: To facilitate more productive interactions between the industry and NMFS
  - Action: Suggest and encourage the appointment of a designated MHK Science Coordinator within NMFS
  - Action: Further ocean energy focused communication between the DOE and NMFS
- *Goal*: To spread understanding of relative impacts to the public, and to get regulators to appropriately value relevant research and experience from other sectors
  - Action: Conduct formal studies and report on relative impact comparisons
- *Goal*: To spread information on permitting processes experienced across the region
  - Action: Develop a comprehensive guide to federal and state permitting.

These goals and actions are echoed in the proposals of the MEC, which is part of the National Hydropower Association. In its "Fiscal Year 2018 Budget/Program Recommendations for the DOE Water Power Technologies Office," the MEC points to the challenges that developers face in long deployment timelines and technical risk. The MEC then specifically requests that the DOE Water Power Technologies Office focus research on "… DOE-led interagency/interjurisdictional permitting support for MHK demonstration activities" and "… support initiatives that promote domestic coordination and communication, international partnerships and knowledge transfer, export funding and marketing."

Appendix A

FERC Marine Energy Permits

Appendix A – FERC Marine Energy Permits

Developer	Project Title	Document Type	Docket	Status
Verdant Power, LLC	Roosevelt Island Tidal Energy Hydropower Project	Preliminary Permit	12178	First FERC preliminary permit (PP) for hydrokinetics; began evolution of Verdant Exception and pilot project licensing.
Red Circle Systems Corporation	SeaGen Miami Project	Preliminary Permit	12497	Generation farm submerged twin rotor generating units 25 miles offshore in the Atlantic Ocean Gulf Stream.
Red Circle Systems Corporation/Ocean Renewable Power Co.	Ft Lauderdale OCGen Power/SeaGen Ft. Lauderdale Project	Preliminary Permit	12498	Confusing as ORPC on same docket; 03/04/2006 Red Circle System Corporation filed application to amend Preliminary Permit to add Ocean Renewable Power Co. as co-permittee to SeaGen Fort Lauderdale, SeaGen West Palm, et al.; Last Issuance on file 09/03/2008 P-12498-003
Red Circle Systems Corporation	SeaGen St. Lucie Project	Preliminary Permit	12499	Last progress report filed on 07/25/2007 by Red Circle Systems Corp under P-12498-000, P-12500-000, P-12497-000, P-12499-000, P-12502-000, P-12503-000, and P-12504-000
Red Circle Systems Corporation/Ocean Renewable Power Co.	SeaGen West Palm Beach Project	Preliminary Permit	12500	Confusing as ORPC on same docket; 03/04/2006 Red Circle System Corporation filed application to amend Preliminary Permit to add Ocean Renewable Power Co. as co-permittee to SeaGen Fort Lauderdale, SeaGen West Palm, et al.; Last Issuance on 09/03/2008
Red Circle Systems Corporation	SeaGen Cape Canaveral Project	Preliminary Permit	12501	09/19/2004 Red Circle Corporation withdraws Preliminary Permit applications for Cape Canaveral Sea Gen projects no. P-122501, P-12505, P-12506, P-12507, and P-12508
Red Circle Systems Corporation	SeaGen St. Sebastian Project	Preliminary Permit	12502	Last progress report under P-12498 filed on 07/25/2007; Gulf Stream in the Atlantic Ocean 25 miles offshore, near Indian River County, FL
Red Circle Systems Corporation	SeaGen Key Largo Project	Preliminary Permit	12503	Last progress reported filed on 07/25/2007; Gulf Stream in the Atlantic Ocean 25 miles offshore, near Monroe County, Florida
Red Circle Systems Corporation	SeaGen Tervernier Project	Preliminary Permit	12504	Last progress reported filed on 07/25/2007; Gulf Stream in the Atlantic Ocean 25 miles offshore, near Monroe County, Florida
Red Circle Systems Corporation	Jacksonville Sea Gen Project	Preliminary Permit	12505	Withdrawn on 09/20/2004 along with projects no. P-12501, P-12505, P-12506, P-12507, and P-12508
Red Circle Systems Corporation	St. Augustine Sea Gen Project	Preliminary Permit	12506	Withdrawn on 09/20/2004 along with projects no. P-12501, P-12505, P-12506, P-12507, and P-12508
Red Circle Systems Corporation	Titusville Sea Gen Project	Preliminary Permit	12507	Withdrawn on 09/20/2004 along with projects no. P-12501, P-12505, P-12506, P-12507, and P-12508
Red Circle Systems Corporation	Daytona Sea Gen Project	Preliminary Permit	12508	Withdrawn on 09/20/2004 along with projects no. P-12501, P-12505, P-12506, P-12507, and P-12508

Developer	Project Title	Document Type	Docket	Status
Florida Hydro Inc.	Gulf Stream Energy Project	Preliminary Permit	12519	Last progress report filed on 09/18/2007; Gulf Stream in the Atlantic Ocean approximately 3 mi off shore
Florida Hydro Inc.	Miami-Dade Gulf Stream Energy Project	Preliminary Permit	12520	10/09/2004 filed withdrawal of projects no. P-12520 and P-12521
Florida Hydro Inc.	Broward Gulf Stream Energy Project	Preliminary Permit	12521	10/09/2004 filed withdrawal of projects no. P-12520 and P-12521
Golden Gate Energy Company	San Francisco Bay Tidal Energy Project	Preliminary Permit	12585	06/21/2012 granted extension to file application due on 12/01/2012; no subsequent filings on record
Verdant NYC	Roosevelt Island Tidal Energy Project	Preliminary Permit	12611	Granted as different docket; 2nd Preliminary Permit; Led to successful Pilot License 12611-005
Tacoma Power	Narrows Tidal Energy Hydroelectric Project	Preliminary Permit	12612	Last documentation filed on 06/12/09: memo discussing review of temporary EAP for the Lake Dorothy Project under P-12168-000, P-12653-000, P-12661-000, P-12654-000, P-12612-000, and P-12379-000
TRC Environmental Corporation/Great Salt Plains Hydro, LLC	Great Salt Plains Dam Project	Preliminary Permit	12663	12/03/2004 filed Notice of Surrender of PP to Symbiotics, LLC, Prosser Creek Hydro, LLC, McCloud Hydro, LLC under P-11798, P-12037, P-12191, P-12195, P-12226, P-12237, P-12242, P-12243, P-12263, P-12268, P-12277, P-12278, P-12281, P-12294, P-12634, and P-122417
New Hampshire Tidal Energy Company/Hannibal Hydro, LLC	Hannibal L&D Hydroelectric Project	Preliminary Permit	12664	Surrendered on 04/02/2009
New York Tidal Energy Company	Astoria Tidal Energy Project	Preliminary Permit	12665	01/07/2015 docket closure filed; 2nd permit issued 01/10/2011
Maine Tidal Energy Company	Kennebec Tidal Energy Hydroelectric Project	Preliminary Permit	12666	Surrendered on 06/11/2009
Maine Tidal Energy Company	Penobscot Tidal Energy Project	Preliminary Permit	12668	Surrendered on 05/08/2009; Tidal in-stream conversion
Massachusetts Tidal Energy Company	Cape and Islands Tidal Energy Project	Preliminary Permit	12670	Surrendered on 05/08/2009; Tidal in-stream conversion
Oregon Tidal Energy Company	Columbia Tidal Energy Project	Preliminary Permit	12672	Surrendered on 03/19/2008; located at the mouth of the Columbia River in Clatsop County
ORPC Alaska, LLC	Resurrection Bay OCGen™ Power Project	Preliminary Permit	12678	Surrendered on 6/20/2007
ORPC Alaska, LLC	Cook Inlet Tidal Energy Project	Preliminary Permit	12679	Surrendered on 03/08/2013
ORPC Maine, LLC	Western Passage Project	Preliminary Permit	12680	Denied 3rd subsequent PP on 07/02/2014

Developer	Project Title	Document Type	Docket	Status
SnoPUD 1 (Public Utility District No. 1 of Snohomish County, Washington/Washington Tidal Energy Company)	Deception Pass Tidal Energy Project	Preliminary Permit	12687	12/31/2012 last progress report (#5) filed; SnoPUD 1 and Washington Tidal Energy Company filed competing preliminary permits for the Deception Pass in Puget Sound, in Island and Skagit Counties, permit issues to SnoPUD
SnoPUD 1 (Public Utility District No. 1 of Snohomish County)	Rich Passage Tidal Energy Project	Preliminary Permit	12688	Surrendered on 10/07/2008; Rich Passage in Puget Sound, Kitsap County; Tidal In Stream Conversion (TISEC)
SnoPUD 1 (Public Utility District No. 1 of Snohomish County)	Speiden Channel Tidal Energy Project	Preliminary Permit	12689	Last filing on 01/31/2011; Speiden Channel, Jan Juan Islands, San Juan County, Washington; Tidal In Stream Conversion (TISEC)
SnoPUD 1 (OpenHydro)/Public Utility District No. 1 of Snohomish County, Washington and the City of Port Townsend, Washington	Admiralty Inlet Tidal Energy Project	Preliminary Permit	12690	SnoPUD surrendered on 03/21/2016; SnoPUD and City of Port Townsend submitted competing applications; Tidal In Stream Energy Conversion (TISEC); 2nd permit issued 7/8/2010
SnoPUD 1 (Public Utility District No. 1 of Snohomish County)	Agate Passage Tidal Energy Project	Preliminary Permit	12691	Last filing on 01/31/2011; Agate Passage, Puget Sound, Kitsap County, WA; Tidal In Stream Energy Conversion (TISEC)
SnoPUD 1 (Public Utility District No. 1 of Snohomish County)	San Juan Channel Tidal Energy Project	Preliminary Permit	12692	Last filing on 01/31/2011; San Juan Channel, San Juan Islands, San Juan County, WA; Tidal In Stream Energy Conversion (TISEC)
Alaska Tidal Energy Company	Kachemak Bay Tidal Energy Project	Preliminary Permit	12694	Surrendered on 05/09/2008; Kenai Peninsula Borough, Alaska; Tidal In Stream Energy Conversion (TISEC)
Tidewalker Associates	Cutler Tidal Power Project	Preliminary Permit	12694	Initial applications filed on 05/08/06 & Half Moon Cover Tidal Energy Project 12704 on 06/28/2006; last submittal 07/22/2009
Alaska Tidal Energy Company	Icy Passage Tidal Energy Project	Preliminary Permit	12695	Surrendered on 03/06/2009; Icy Passage and Icy Straight, Skagway-Hoonah-Agoon Borough, AK; Tidal In Stream Conversion (TISEC)
Alaska Tidal Energy Company	Gastineau Channel Tidal Energy Project	Preliminary Permit	12696	Surrendered on 03/19/2008; Gastineau Channel, Juneau Borough, AK; Tidal In Stream Conversion (TISEC)
Alaska Tidal Energy Company	Wrangell Narrows Tidal Energy Project	Preliminary Permit	12697	Surrendered on 03/06/2009; Wrangell Narrows, Wrangell-Petersburg Borough, AK; Tidal In Stream Energy Conversion (TISEC)

Developer	Project Title	Document Type	Docket	Status
SnoPUD 1 (Public Utility District No. 1 of Snohomish County, Washington/Washington Tidal Energy Company)	Guemes Channel Tidal Energy Project	Preliminary Permit	12698	Last filing on 01/03/2011; Guemes Channel, Straight of Juan de Fuca, Skagit County, WA; Tidal In Stream Energy Conversion (TISEC)
Tidewalker Associates (Tidewalker)	Half Moon Cove Tidal Energy Project	Preliminary Permit	12704	Third PP denied on 05/21/2014; Half Moon Cove, Cobscook Bay, Washington County, ME; Adjacent to Pleasant Point Reservation and the Passamaquoddy Tribal lands
Alaska Tidal Energy Company	Central Cook Inlet Tidal Energy Project	Preliminary Permit	12705	Surrendered on 09/04/2009; Central part of Cook Inlet; Tidal In Stream Energy Conversion (TISEC)
Passamaquoddy Tribe at Pleasant Point Reservation	Passamaquoddy Tribe Tidal Energy Project	Preliminary Permit	12710	Surrendered on 05/27/2010; Western Passage off of Pleasant Point and Kendall Head, Washington County, ME
ORPC Maine, LLC	Cobscook Bay Project	Preliminary Permit	12711	Cobscook Bay, Washington County, ME; Originally filed with Western Passage area included which conflicted with the Passamaquoddy tribe's project, and tribe amended its permit application; Led to successful Pilot License 12711-005
Ocean Power Technologies (OPT)	Reedsport Wave Park	Pilot License	12713	Surrendered on 08/14/2014
Natural Currents Energy Services, LLC	Wards Island Tidal Power Project	Preliminary Permit	12718	Canceled 09/18/2008; East River, off of south point of Wards Island in Hell's Gate, New York County, New York; hybrid project using solar, wind, and tidal power generators
UEK Corporation	Piscataqua Tidal Hydrokinetic Energy Project	Preliminary Permit	12722	Surrendered on 04/02/2009; Piscataqua River, Rockingham County, New Hampshire, and York County, ME
Lincoln County Oregon	Lincoln County Wave Energy Project	Preliminary Permit	12727	Application dismissed on 04/04/2008 due to lack of response for additional information
Natural Currents Energy Services, LLC	Willipa Bay Tidal Power Project	Preliminary Permit	12729	Canceled on 7/28/2009; Pacific Ocean, Willapa Bay, Pacific County, Washington; TISEC
Natural Currents Energy Services	Knick Arm Tidal Energy Plant Water Power Project	Preliminary Permit	12730	PP issued on 04/17/2007 to ORPC Alaska, LLC as Natural Currents Energy Services, LLC filed on 08/28/2006, and ORPC filed on 05/30/2006
Natural Currents Energy Services	Angoon Tidal Energy Plant Water Power Project	Preliminary Permit	12731	Last document filed on 11/10/2010 was letter indicating intent to reapply for permit
Natural Currents Energy Services	Long Island Sound Tidal Energy Project	Preliminary Permit	12732	Canceled on 09/03/2009; Suffolk County, New York
Orient Point Tidal Energy Inc./Natural Currents Energy Services, LLC/Fishers Island Tidal Energy, Inc.	Long Island Sound Tidal Energy Project	Preliminary Permit	12738	Natural Currents Energy Services, LLC, Orient Point Tidal Energy, Inc., and Fishers Island Tidal Energy, Inc. all applied for PP; PP awarded to National Center for Education Statistics on 06/14/2007
Fischer's Island Tidal Energy, Inc.	Long Island Sound Tidal Energy Project	Preliminary Permit	12739	Natural Currents Energy Services, LLC, Orient Point Tidal Energy, Inc., and Fishers Island Tidal Energy, Inc. all applied for PP; PP awarded to NCES on 06/14/2007

Developer	Project Title	Document Type	Docket	Status
City of Port Townsend, Washington	Admiralty Inlet Tidal Energy Project	Preliminary Permit	12742	Admiralty Inlet, Puget Sound, Jefferson, Kitsap, and Island Counties, WA; Tidal In Stream Energy Conversion (TISEC); SnoPUD 1 awarded PP on 01/25/2008
Douglas County, OR		Preliminary Permit	12743	Surrendered on 05/29/2013
Chevron Technology Ventures, LLC	Central Cook Inlet Tidal Energy Project	Preliminary Permit	12744	Surrendered on 04/13/2009
Ocean Power Technologies (OPT)	Coos Bay Wave Park	Preliminary Permit	12749	Surrendered on 06/11/2013
Ocean Wave Energy Partners	Newport OPT Wave Park Project	Preliminary Permit	12750	Surrendered on 04/15/2009
Finavera Renewables	Makah Bay	Conditioned License	12751	Surrendered on 04/21/2008
Finavera Renewables	Coos County Offshore Wave Energy Power Project	Preliminary Permit	12752	Canceled on 06/26/2008
Finavera Renewables	Humboldt Co Offshore Wave Energy Project	Preliminary Permit	12753	Surrendered on 02/13/2009
Maine Maritime Academy	Tidal Energy Device Evaluation	Preliminary Permit	12777	Terminated on 05/05/2010 because they gained an exception for experimental/educational purposes
PG&E	Humboldt Project	Preliminary Permit	12779	Application withdrawn on 01/13/2011; submitted NOI but no actual application
Fairhaven Ocean Power, LLC	Fairhaven Wave Power Station	Preliminary Permit	12780	Preliminary permit awarded to PGE on 03/13/2008; Fairhaven OPT Ocean Power, LLC project filed after PGE Project and was denied
PG&E	Mendocino Project	Preliminary Permit	12781	Surrendered on 06/11/2009
Energetech America LLC	Florence Oregon Ocean Wave Energy Project	Preliminary Permit	12793	Withdrawn on 03/26/2008
Natural Currents Energy Services	Cape Cod Tidal Energy Plant	Preliminary Permit	12794	Canceled on 05/26/2010
Green Hydropower Inc.	Tidal Hydropower and Evaporation Project	Preliminary Permit	12800	Permit application rejected on 07/25/2007; Santa Monica Bay, California/Death Valley National Park, California)Tidal Hydropower Project
Natural Currents Energy Services	Nantucket Tidal Energy Plant Water Power Project	Preliminary Permit	12802	Permit awarded to Edgartown municipality on 03/31/2008; Natural Currents Energy Services, LLC filed 12802-000, and the Town of Edgartown, Massachusetts filed 13015-000, Edgartown municipality granted preference under Section 7(a) of the FPA, 16 U.S.C. 800 (a).
Green Hydropower Inc.	Turnagain Arm et al Tidal Hydropower Project	Preliminary Permit	12803	Permit application rejected on 07/25/2007 for failure to conform to FERC regulations; Turnagain Arm, Alaska Passage Canal, AK

Developer	Project Title	Document Type	Docket	Status
Chevron California Renewable Energy, Inc.	Northern California Wave Energy Project	Preliminary Permit	12806	Withdrawn on 08/31/2007; Northern California
Natural Currents Energy Services, LLC	Housatonic Tidal Energy Plant	Preliminary Permit	12810	Surrendered on 12/18/2008
Free Flow Power Corp	Duncan Point Project	Preliminary Permit	12817	Surrendered on 06/28/2013; West Baton Rouge & East Baton Rouge, LA
Free Flow Power Corp	Reliance Light Project	Preliminary Permit	12828	Surrendered on 06/28/2013; Iberville, LA
Free Flow Power Corp	Greenville Bend Project	Preliminary Permit	12829	Surrendered on 06/28/2013; Jefferson & Orleans, LA
Free Flow Power Corp	Carrollton Bend	Preliminary Permit	12833	Surrendered on 06/28/2013; Jefferson & Orleans, LA
Free Flow Power Corp	Brilliant Point Project	Preliminary Permit	12842	Surrendered on 06/28/2013; Convent, LA; Current/Tidal
Free Flow Power Corp	White Alder Project	Preliminary Permit	12843	Surrendered on 06/28/2013; Iberville, LA
Free Flow Power Corp	Point Pleasant Project	Preliminary Permit	12844	Surrendered on 06/28/2013; Mississippi River
Free Flow Power Corp	Thirty-five Mile Point Project	Preliminary Permit	12845	Surrendered on 06/28/2013; St. Charles, LA
Free Flow Power Corp	Algiers Light Project	Preliminary Permit	12848	Surrendered on 06/28/2013; Orleans, LA
Free Flow Power Corp	Live Oak Tidal Energy Project	Preliminary Permit	12849	Surrendered on 06/28/2013; Plaquemines, LA
Free Flow Power Corp	Goulds-boro Bend Project	Preliminary Permit	12851	Surrendered on 06/28/2013; Jefferson & Orleans, LA
Free Flow Power Corp	St. Rose Bend Project	Preliminary Permit	12853	Surrendered on 06/28/2013; St. Charles, LA
Free Flow Power Corp	Fashion Light Project	Preliminary Permit	12854	Surrendered on 06/28/2013; St. Charles, LA
Free Flow Power Corp	Forty-Eight Mile Point Project	Preliminary Permit	12858	Surrendered on 06/28/2013; St. James & St. John the Baptist, LA
Free Flow Power Corp	Fort Jackson Project	Preliminary Permit	12859	Surrendered on 06/28/2013; Mississippi River
Free Flow Power Corp	Scottland-ville Bend Project	Preliminary Permit	12861	Surrendered on 06/28/2013; West Baton Rouge & East Baton Rouge, LA
Free Flow Power Corp	Twelve Mile Point Project	Preliminary Permit	12862	Surrendered on 06/28/2013; Orleans & St. Bernard, LA
Free Flow Power Corp	Project 17	Preliminary Permit	12865	Mississippi River; Rehearing denied for permits filed in 2007 and 2008; 01/03/2008 permits would be expiring and Free Flow and Northland filed competing applications. Free flow filed 129 permits and Northland filed 40 permits in the same area.
Free Flow Power Corp	Project 10	Preliminary Permit	12866	Permit issued on 03/20/2012 and surrendered on 06/28/2013; Mississippi River
Free Flow Power Corp	General Hampton	Preliminary Permit	12869	Surrendered on 06/28/2013; Ascension & St. James, LA

Developer	Project Title	Document Type	Docket	Status
Hydro Green Energy, LLC	Maine 1 Project	Preliminary Permit	12876	Surrendered on 05/12/2009
Hydro Green Energy, LLC	Alaska 35 Project	Preliminary Permit	12882	Surrendered on 05/14/2009
Free Flow Power Corp	Project 59	Preliminary Permit	12916	Last documentation filed on 05/28/2010; Mississippi River
Free Flow Power Corp	Project 60	Preliminary Permit	12917	Last documentation filed on 05/28/2010; Mississippi River
Free Flow Power Corp	Sara Bend Project	Preliminary Permit	12918	Surrendered on 06/28/2013; West Feliciana & Pointe Coupee, LA
Free Flow Power Corp	Cat Island Project #36	Preliminary Permit	12919	Surrendered on 06/28/2013; East Carroll, LA; Issaquena, MS
Free Flow Power Corp	Kempe Bend Project #32	Preliminary Permit	12921	Surrendered on 06/28/2013; Tensas, LA; Jefferson, MS
Free Flow Power Corp	Newton Bend Project #61	Preliminary Permit	12924	Surrendered on 06/28/2013; Tensas & Madison, LA; Warren, MS
Free Flow Power Corp	Malone Field Light Project #39	Preliminary Permit	12925	Surrendered on 06/28/2013; Desha, AR; Bolivar, MS
Free Flow Power Corp	Ashley Point Project #62	Preliminary Permit	12930	Surrendered on 06/28/2013; Lee, AR; Tunica, MS
Free Flow Power Corp	Plum Point Project #63	Preliminary Permit	12931	Surrendered on 06/28/2013; Mississippi, AR; Tipton, TN
Free Flow Power Corp	Williams Point Project #64	Preliminary Permit	12932	Surrendered on 06/28/2013; New Madrid, MO; Lake, TN
Free Flow Power Corp	Hickman Bend Project #65	Preliminary Permit	12933	Surrendered on 06/28/2013; Fulton, KY; Mississippi, MO
Free Flow Power Corp	New Madrid Bend Project #66	Preliminary Permit	12934	Surrendered on 06/28/2013; Pemiscot, MO; Lake, TN
Free Flow Power Corp	Project 56	Preliminary Permit	12935	Mississippi River; last documentation filed on 05/28/2010.
Free Flow Power Corp	Little Prairie Bend Project #67	Preliminary Permit	12936	Surrendered on 06/28/2013; Pemiscot, MO; Lake, TN
Free Flow Power Corp	Huffman Light Project #68	Preliminary Permit	12937	Surrendered on 06/28/2013; Mississippi, AR; Dyer, TN
Free Flow Power Corp	Hope Field Project #69	Preliminary Permit	12938	Surrendered on 06/28/2013; Crittenden, AR; Shelby, TN
Free Flow Power Corp	Gale Light Project #52	Preliminary Permit	12939	Surrendered on 06/28/2013; Mississippi River
Free Flow Power Corp	Bar Field Bend Project #44	Preliminary Permit	12941	Surrendered on 06/28/2013; Mississippi, AR; Lauderdale, TN
Free Flow Power Corp	Project 70	Preliminary Permit	12942	Surrendered on 06/28/2013; Mississippi River
Town of Edgartown	Nantucket Tidal Energy Plant Water Power Project	Preliminary Permit	13015	Second permit issued on 8/2/2011; Competing PP application for the Nantucket Tidal Plant Water Power Project
Natural Currents Energy Services, LLC	New Bedford Tidal Energy Plant	Preliminary Permit	13045	Application rejected on 04/21/2008 due to insufficient information provided on application.
Natural Currents Energy Services, LLC	Alexandria Bay Hydroelectric Plant	Preliminary Permit	13046	Application rejected issued on 04/21/2008 due to insufficient information provided on application.

Developer	Project Title	Document Type	Docket	Status
Tillamook Intergovernmental Development	Wave Energy Power Project	Preliminary Permit	13047	Surrendered on 06/18/2010
Green Wave Energy Solutions, LLC	Green Wave San Luis Obispo Wave Park	Preliminary Permit	13052	Project No. 13052-002 and 13053-003 preliminary permits were canceled due to failure the NOI in a timely manner on 09/23/2010; requested rehearing and was denied on 10/26/2010
Green Wave Energy Solutions, LLC	Green Wave Mendocino Wave Park	Preliminary Permit	13053	See 13052; rejected due to failure to file NOI in a timely manner
Grays Harbor Ocean Energy Company	Grays Harbor Ocean Energy Project	Preliminary Permit	13058	Canceled on 9/21/2010
Jefferson County Public Power	Instream Hydro Array	Preliminary Permit	13061	Permit applications for 13060 and 13061 (Watertown 1 and 2 Projects) were dismissed on 02/02/2009 as applications filed on 11/03/2007 had insufficient information which was not subsequently provided
Keys Hydropower	Newfound Harbor Water Project	Preliminary Permit	13062	Permit applications (P-13062, P-13063, P-13064, P-13069, P-13070, and P-13071) were rejected due to failure to provide sufficient information (did not specify technology to be employed). Original filing was on 11/09/2007, additional information filed on March 13, 2008, but was insufficient, and applications rejected on 05/16/2008.
Florida Keys Hydropower Research Corp.	Northwest Channel Project	Preliminary Permit	13063	See 13062; permit rejected on 03/13/2008
Florida Keys Hydropower Research Corp.	Fleming Key Cut Water Power Project	Preliminary Permit	13064	See 13062; permit rejected on 03/13/2008
Florida Keys Hydropower Research Corp.	Vaca Cut Water Power Project	Preliminary Permit	13065	FERC notified applicant of deficient applications (P-13062, P-13063, P-13064, P-13065, P-13066, P-13067, P-13068, P-13069, P-13070, P-13071, P-13072, P-13073, P-13074, & P-1383) on 02/06/2008. An amended application was filed for P-13065 on 03/13/2008. No further activity reported.
Florida Keys Hydropower Research Corp.		Preliminary Permit	13066	Florida Keys Hydropower Regulatory Commission filed a withdrawal of permit applications for P-13066, P-13067, P-13068, P-13069, P-13010, P-13073, P-13074, and P-13083 on 03/19/2008.
Florida Keys Hydropower Research Corp.		Preliminary Permit	13067	See P-13066, withdrew permit application on 03/19/2008
Florida Keys Hydropower Research Corp.		Preliminary Permit	13068	See P-13066, withdrew permit application on 03/19/2008
Florida Keys Hydropower Research Corp.	Vaca Cut	Preliminary Permit	13069	See 13062; permit rejected on 03/13/2008
Florida Keys Hydropower Research Corp.	Bahia Honda	Preliminary Permit	13070	See 13062; permit rejected on 03/13/2008

Developer	Project Title	Document Type	Docket	Status
Florida Keys Hydropower Research Corp.	Man of War	Preliminary Permit	13071	See 13062; permit rejected on 03/13/2008
Florida Keys Hydropower Research Corp.		Preliminary Permit	13072	See P-13066, withdrew permit application on 03/19/2008
Florida Keys Hydropower Research Corp.		Preliminary Permit	13073	See P-13066, withdrew permit application on 03/19/2008
Florida Keys Hydropower Research Corp.		Preliminary Permit	13074	See P-13066, withdrew permit application on 03/19/2008
California Wave Energy Partners LLC	Centerville OPT Wave Energy Park	Preliminary Permit	13075	Surrendered on 06/12/2009
Sonoma County Water Agency	Sonoma Coast Wave Project	Preliminary Permit	13076	Preliminary permit application rejected on 04/07/2009 for failure to provide technology specifications and project boundary limits as requested on 02/01/2008. Incomplete information was filed on 02/29/2008.
Florida Keys Hydropower Research Corp.		Preliminary Permit	13083	See P-13066, withdrew permit application on 03/19/2008
RI Energy Group	Sakonnet River Hydrokinetic Project	Preliminary Permit	13092	Canceled on 7/28/2010
Hydro Green Energy, LLC	New York I Project	Preliminary Permit	13112	Surrendered on 08/20/2009
MARMC Enterprises, LLC	Belair Project	Preliminary Permit	13125	Canceled on 03/30/2011; Plaquemines Parish, LA
Tidewalker Associates	Quoddy Roads Tidal Power Project	Preliminary Permit	13140	Withdrawn on 11/21/2008; Tidewalker Associates decided to concentrate efforts on project 12704
Mananook Associates	Grand Manan Channel	Preliminary Permit	13144	Surrendered on 01/31/44; Grand Manan Channel
Coastal Power Inc	Hell Gate Tidal Project	Preliminary Permit	13232	Canceled on 09/04/2009
ORPC Alaska, LLC	OCGen River Turbine-Generator Unit (TGU) Power Project	Preliminary Permit	13233	Surrendered on 10/20/2010
UEK Delaware LP	Old River Outflow Channel Project	Preliminary Permit	13245	Canceled on 03/04/2011
Natural Currents Energy Services	Kingsbridge Marina Tidal Energy Project	Preliminary Permit	13247	Successive permit denied on 05/22/2013
UEK Corporation	Green River Lake Dam Hydro Project	Preliminary Permit	13253	Last submission was 5th 6-month progress report on 07/08/2011; Old River Outflow Channel
Natural Currents Energy Services, LLC	Cuttyhunk/Elizabeth Islands Tidal Energy Project	Preliminary Permit	13276	Canceled on 10/28/2009
Natural Currents Energy Services	Rockaway inlet/Queens Tidal Energy Project	Preliminary Permit	13277	Canceled on 10/28/2010
Natural Currents Energy Services	Fisher's Island Tidal Energy Project	Preliminary Permit	13278	Canceled on 02/01/2010

Developer	Project Title	Document Type	Docket	Status
Natural Currents Energy Services	Ventura Ocean Energy Project	Preliminary Permit	13279	Canceled on 10/28/2009
UEK Corporation	Atchafalaya River Hydrokinetic Project II	Preliminary Permit	13280	Last filing was the sixth progress report filed on 02/22/2012; Concordia Parish, LA
Alaska Village Electric Cooperative, Inc.	Port Clarence Hydrokinetic Project	Preliminary Permit	13298	Surrendered on 06/10/2011
Whitestone Power and Communications	Microturbine Hydrokinetic River In-Stream Energy Conversion Project	Preliminary Permit	13305	Surrendered full license on 4/18/2016
Grays Harbor Ocean Energy	New Jersey Ocean Energy Project	Preliminary Permit	13306	Application dismissed on 04/17/2009
Grays Harbor Ocean Energy	Hawaii Ocean Energy Project	Preliminary Permit	13307	Application dismissed on 04/17/2009
Grays Harbor Ocean Energy	San Francisco Ocean Energy Project	Preliminary Permit	13308	Application dismissed on 04/17/2009
Grays Harbor Ocean Energy	Ventura Ocean Energy Project	Preliminary Permit	13309	Application dismissed on 04/17/2009
Grays Harbor Ocean Energy	Cape Islands Ocean Energy Project	Preliminary Permit	13310	Application dismissed on 04/17/2009
Grays Harbor Ocean Energy	New York Ocean Energy Project	Preliminary Permit	13311	Application dismissed on 04/17/2009
Grays Harbor Ocean Energy	Rhode Island Ocean Energy Project	Preliminary Permit	13312	Application dismissed on 04/17/2009
Town of Wiscasset	Tidal Resources Project	Preliminary Permit	13329	Last filing was a 6-month progress report filed on 11/01/2011
Natural Currents Energy Services, LLC	Gastineau Channel Tidal Energy Project	Preliminary Permit	13341	Permit application dismissed on 06/19/2009 due to failure to comply with request sent on 05/08/2008 to reduce project boundary or more realistically represent actual project footprint.
Shearwater Design Inc.	Homeowner Tidal Power Electric Generation Project	Preliminary Permit	13345	Canceled on 01/13/2014
Ocean Renewable Power Co.	Ft. Lauderdale	Preliminary Permit	13361	MOU filed on 04/09/2009 between the U.S. Department of Interior and FERC, FERC agrees not to issue preliminary permits for hydrokinetic projects located on the OCS. Preliminary permits P-13361 and P-13362 dismissed on 04/30/2009.
Ocean Renewable Power Co.	OCGen Power Project	Preliminary Permit	13362	See 13361, Preliminary Permit dismissed on 04/30/2009
Sonoma County Water Agency	Sonoma Coast Hydrokinetic Energy Project Del Mar Landing	Preliminary Permit	13376	Order canceling permit filed 08/04/2011; Sonoma County Water Agency filed in 3rd 6-month progress report potential delay due to funding, and letter was issued stating permit would be canceled if the NOI and draft application were not filed by 07/08/2011.

Developer	Project Title	Document Type	Docket	Status
Sonoma County Water Agency	Sonoma Coast Hydrokinetic Energy Project Fort Ross (North)	Preliminary Permit	13378	Order canceling permit filed 08/04/2011; Sonoma County Water Agency filed a progress report potential delay due to funding with intent to file on 07/08/2012, and letter was issued stating permit would be canceled if the NOI and draft application were not filed by 07/08/2011.
City of San Francisco	San Francisco Oceanside Wave Energy Project	Preliminary Permit	13379	Application dismissed due to location on the Outer Continental Shelf on 04/30/2009
Natural Currents Energy Services	Wrangell Narrows Tidal Energy Project	Preliminary Permit	13427	Application dismissed due to non-compliance with requests on 06/23/2009
Natural Currents Energy Services	Icy Passage Tidal Energy Project	Preliminary Permit	13428	Application dismissed due to non-compliance with requests on 06/23/2009
Free Flow Power Corp	FFP Iowa I, LLC	Preliminary Permit	13437	Withdrew applications for P-13437 and P-13438 on 06/14/2013
Free Flow Power Corp	FFP Iowa II, LLC	Preliminary Permit	13438	Withdrew applications for P-13437 and P-13438 on 06/14/2013
Free Flow Power Corp	FFP Iowa III, LLC	Preliminary Permit	13441	Last documentation filed was a 6-month progress report filed on 08/31/2012; Miscopy River, Muscatine, Iowa and Rock Island County, Illinois
Free Flow Power Corp	Mississippi Lock and Dam No. 18	Preliminary Permit	13455	Last filing was 9/4/2012
Free Flow Power Corp	Mississippi Lock and Dam No. 17	Preliminary Permit	13456	Last filing was a request to use traditional licensing process filed on 07/21/2011; New Boston, IL and Jefferson, IA
Free Flow Power Corp	Point Menior Project #61	Preliminary Permit	13471	Surrendered on 06/28/2013; West Baton Rouge & East Baton Rouge, LA
Free Flow Power Corp	Raccourci Island Project #62	Preliminary Permit	13472	Surrendered on 06/28/2013; Point Coupee & West Feliciana, LA
Free Flow Power Corp	Springfield Bend Project #60	Preliminary Permit	13473	Surrendered on 06/28/2013; West Baton Rouge & East Baton Rouge, LA
Free Flow Power Corp	Palmetto Point Project #64	Preliminary Permit	13475	Surrendered on 06/28/2013; Concordia, LA; Wilkinson, MS
Free Flow Power Corp	Jackson Point Project #65	Preliminary Permit	13476	Surrendered on 06/28/2013; Concordia, LA; Adams, MS
Free Flow Power Corp	Bondurant Chute Project #67	Preliminary Permit	13477	Surrendered on 06/28/2013; Tensas, LA; Claiborne, MS
Free Flow Power Corp	Davis Island Bend Project #68	Preliminary Permit	13478	Surrendered on 06/28/2013; Tensas, LA; Claiborne, MS
Free Flow Power Corp	Fort Adams Project #63	Preliminary Permit	13479	Surrendered on 06/28/2013; Concordia, LA; Wilkinson, MS
Free Flow Power Corp	Breeze Point Project #69	Preliminary Permit	13480	Surrendered on 06/28/2013; Concordia, LA; Wilkinson, MS
Free Flow Power Corp	Matthews Bend Project #71	Preliminary Permit	13482	Surrendered on 06/28/2013; Chicot, AR; Washington, MS
Free Flow Power Corp	Miller Bend Project #72	Preliminary Permit	13483	Surrendered on 06/28/2013; Chicot, AR; Washington, MS

Developer	Project Title	Document Type	Docket	Status
Free Flow Power Corp	George-town Bend Project #73	Preliminary Permit	13484	Surrendered on 06/28/2013; Chicot & Desha, AR; Bolivar, MS
Free Flow Power Corp	Old Town Bend Project #75	Preliminary Permit	13485	Surrendered on 06/28/2013; Phillips, AR; Coahoma, MS
Free Flow Power Corp	Burke Landing Project #76	Preliminary Permit	13486	Surrendered on 06/28/2013; Phillips, AR; Coahoma, MS
Free Flow Power Corp	Cow Island Bend Project #77	Preliminary Permit	13487	Surrendered on 06/28/2013; Crittenden, AR; Shelby, TN
Free Flow Power Corp	Island 35 Bend Project #78	Preliminary Permit	13488	Surrendered on 06/28/2013; Mississippi, AR; Tipton, TN
Free Flow Power Corp	Barfield Point Project #79	Preliminary Permit	13489	Surrendered on 06/28/2013; Mississippi, AR; Lauderdale, TN
Fieldstone Energy Company, Inc.	Rock Island Energy Project Lock No. 15	Preliminary Permit	13496	Permit rejected on 07/02/2009 as it patently fails to comply with regulation requirements
Free Flow Power Corp	Saint Catherine Bend #66	Preliminary Permit	13497	Surrendered on 06/28/2013; Concordia, LA; Adams, MS
Scientific Apps and Research Assoc. (SARA)	Catalina Green renewable energy project	Preliminary Permit	13498	Surrendered on 11/29/2010
Fieldstone Energy Company, Inc.	Fountain City, Wisconsin Project Lock No. 5A	Preliminary Permit	13501	Last filing on 07/02/2009 stating permit is patently deficient and therefore rejected; TISEC
University of New Hampshire	Little Bay Bridges Tidal Energy Project	Preliminary Permit	13503	Surrendered on 03/19/2012
Little Susitna Construction Company	Turnagain Arm Tidal Electric Generation Project	Preliminary Permit	13509	Last progress report filed 01/29/2016; preliminary permit application accepted on 07/18/2013
Igiugig Village (ORPC)	Igiugig Hydrokinetic Project	Preliminary Permit / Pilot License	13511	Prefiling documentation and plan filed on 08/17/2015. Pilot license filed 11/15/18; EA issued 2/21/19.
Alaska Power and Telephone Company	Port Frederick Hydroelectric Project	Preliminary Permit	13512	Surrendered on 04/28/2011
Oceanlinx Hawaii, LLC	Oceanlinx Maui Wave Energy Project	Preliminary Permit	13521	Canceled preliminary project permit on 01/13/2012
Natural Currents Energy Services	Gastineau Channel Tidal Energy Project	Preliminary Permit	13605	Canceled on 02/12/2013
Natural Currents Energy Services	Gastineau Channel Tidal Energy Project	Preliminary Permit	13606	Last progress report filed on 12/28/2012
Pacific Gas and Electric Company	Central Coast WaveConnect Project	Preliminary Permit	13641	Surrendered on 05/03/2011
The Power Company Inc.	Damariscotta Tidal Energy Project	Preliminary Permit	13646	Canceled on 07/28/2011
Ocean Power Technologies (OPT)	Reedsport Wave Park Phase III	Preliminary Permit	13666	Filed canceled project proceedings (Vacation of Non-Essential Project Power Site Withdrawals) on 06/29/2015. Projects included are: P-477, P-11910, P-13666, P-13858, P-13860, P-13881, P-13882, P-14060, P-12751, P-13848, P-13850, P-13885, and P-14397.

Developer	Project Title	Document Type	Docket	Status
JD Products LLC	San Onofre Electricity Farm Project	Preliminary Permit	13679	Successive permit denied on 07/16/2014
Natural Currents Energy Services	Hoffman's Marina Tidal Energy Project	Preliminary Permit	13682	Surrendered on 09/26/2011
Natural Currents Energy Services, LLC	Fischer's Island Tidal Energy Project	Preliminary Permit	13683	Preliminary permit dismissed on 02/01/2010 due to failure to file required 6-month progress reports. Final notification filed on 04/29/2010.
Natural Currents Energy Services, LLC	Shelter Island Tidal Energy Project	Preliminary Permit	13684	Dismissed on 04/29/2010
Current Connection, LLC	St. Clair River Hydrokinetic Project	Preliminary Permit	13694	Permit relinquished on 11/26/2013; Current Connections, LLC and Vortex Hydro Energy, LLC both filed and CC was awarded the permit
Hydro Green Energy	Green Wave Project	Preliminary Permit	13711	Preliminary Permit application rejected as there was a permit conflict that is held by the City of Quincy for 13331
Douglas County, Oregon	Douglas County Wave and Tidal Energy Project	Preliminary Permit	13722	Permit filed for project 12743 expired on 03/31/2010, P-13722 was subsequently filed on 03/05/2010 and treated by FERC as a successive hydrokinetic permit.
Natural Currents Energy Services	Highlands Tidal Energy Project	Preliminary Permit	13725	Surrendered on 01/11/2012
New York Tidal Energy Company	Astoria Tidal Energy Project	Preliminary Permit	13730	Last progress report filed on 12/31/2013
ORPC Maine	Kendall Head Tidal Energy Project	Preliminary Permit	13801	Surrendered on 01/02/2013
ORPC Alaska	East Foreland Tidal Energy Project	Preliminary Permit	13821	Surrendered on 12/14/2015
Natural Currents Energy Services	Killisnoo Tidal Energy Project	Preliminary Permit	13823	Canceled on 03/12/2013
Free Flow Power	Cape Cod Tidal Energy Project	Preliminary Permit	13828	Surrendered on 02/03/2012
DuPage County Center	Elmhurst Quarry Pumped Storage Project	Preliminary Permit	13841	Preliminary permit issued on 03/04/2011; last filing was Douglas County notification of posting an RFP for partners to develop the project with anticipated post date of 10/2014.
Natural Currents Energy Services	Salem Tidal Energy Project	Preliminary Permit	13849	Canceled on 08/03/2013
ORPC Alaska	Nenana RivGen Power Project	Preliminary Permit	13883	Surrendered on 03/12/2013
Pennamaquan Tidal Power	Pennamaquan Tidal Power Plant Project	Preliminary Permit	13884	Last filing was a 6-month progress report filed on 09/23/2016
Natural Currents Energy Services	Cohansey River Tidal Energy Project	Preliminary Permit	14127	Surrendered on 02/22/2013
Natural Currents Energy Services	BW2 Tidal Energy Project	Preliminary Permit	14222	Surrendered on 02/22/2013

Developer	Project Title	Document Type	Docket	Status
Natural Currents Energy Services	Maurice Tidal Energy Project	Preliminary Permit	14223	Surrendered on 02/22/2013
Natural Currents Energy Services	Margate Tidal Energy Project	Preliminary Permit	14224	Canceled on 02/14/2013
Natural Currents Energy Services	Avalon Tidal Energy Project	Preliminary Permit	14228	Surrendered on 02/22/2013
Natural Currents Energy Services	Cape May Tidal Energy Project	Preliminary Permit	14232	Surrendered on 02/22/2013
Natural Currents Energy Services	Port Norris Tidal Energy Project	Preliminary Permit	14234	Surrendered on 02/22/2013
Free Flow Power Corp	Wax Lake Outlet Project #8	Preliminary Permit	14254	Surrendered on 06/28/2013; St. Mary, LA
Green Wave Energy Solutions	Green Wave Mendocino Wave Park Project	Preliminary Permit	14291	Application denied on 07/19/2012
ORPC Maine	Treat Island Tidal Energy Project	Preliminary Permit	14330	Surrendered on 01/02/2013
ORPC Maine	Lubec Narrows Tidal Energy Project	Preliminary Permit	14331	Surrendered on 01/02/2013
Natural Currents Energy Services	Orient Point Tidal Energy Project	Preliminary Permit	14333	Canceled on 12/30/2013
Natural Currents Energy Services	Highlands Tidal Energy Project	Preliminary Permit	14393	Application Rejected 07/09/2012
Natural Currents Energy Services	Massachusetts Cape Cod Canal Tidal Energy Project	Preliminary Permit	14394	Application Rejected 07/03/2012
Natural Currents Energy Services	Fishers Island Tidal Energy Project	Preliminary Permit	14395	Canceled on 1/23/2014
Natural Currents Energy Services	Alexandria Bay Hydroelectric Project	Preliminary Permit	14415	Canceled on 8/21/2013
Natural Currents Energy Services	Salem Tidal Energy Project	Preliminary Permit	14469	Permit rejected on 12/14/2012
Hydro Green Energy	Fort Ross Pumped Storage Hydroelectric Project	Preliminary Permit	14543	Last progress report filed 07/07/2017; permit issued on 01/30/2014
Hydro Green Energy	Vandenberg West Hydroelectric Project	Preliminary Permit	14544	Last project report filed on 05/02/2017; permit issued on 05/14/2014
Archon Energy	Morro Bay Wave Park Project	Preliminary Permit	14562	Permit rejected on 02/20/2014 due to project placement on the OCS per MOU between FERC and the U.S. Department of Interior.
Archon Energy	Purisima Point Wave Park Project	Preliminary Permit	14563	Preliminary permit application rejected on 07/15/2014 due to application and amended application deficiencies (reduction of proposed geographic area covered).

Developer	Project Title	Document Type	Docket	Status
Archon Energy	Morro Bay Wave Park Project	Preliminary Permit	14565	Permit rejected 07/15/2014 due to inconsistent geographic boundary information
ECOsponsible	Caughdenoy Lock Hydro Project	Preliminary Permit	14583	Preliminary permit canceled 09/18/2015; cancelation rescinded on 09/24/2015. Last documentation filed 03/09/2017 regarding selection of chief dam safety engineer selection.
Dynergy Estero	Dynegy Point Estero Wave Park	Preliminary Permit	14584	Surrendered on 10/04/2016
Dynergy Estero	Dynegy Estero Wave Park	Preliminary Permit	14585	Surrendered on 10/04/2016
Vortex Hydro Energy	St. Clair River Hydrokinetic Project	Preliminary Permit	14587	Last documentation filed was a 6-month update submitted on 02/16/2017
Oregon State University	Pacific Marine Energy Center - South Energy Test Site	License	14616	NOI issued on 05/27/2014
Cyclo Ocean Greyshock, Paul	Fort Pierce Pilot Hydroelectric Project	Preliminary Permit	14620	Application rejected on 10/29/2014
Cyclo Ocean	Spillway S-65 Hydroelectric Project	Preliminary Permit	14621	Application rejected on 10/29/2014 due to deficient information
Cyclo Ocean	St. Lucie Hydroelectric Project	Preliminary Permit	14622	Application rejected on 10/26/2014
Greyshock, Paul / Cyclo Ocean Inc.	Ft. Pierce Pilot Hydro Project	Preliminary Permit	14650	Surrendered on 12/07/16
ORPC Maine	Western Passage Tidal Energy Project	Preliminary Permit	14743	Latest progress report filed on 07/07/2017; granted as different docket since 12680 was denied on 3rd application
Marine Renewable Energy Collective of NE	Cape Cod Canal and Bourne Tidal Test Site Project	Preliminary Permit	14775	Latest documentation filed on 03/07/2017; notification of overdue progress report
Verdant NYC	Roosevelt Island Tidal Energy Project	Pilot License	12611-005	10 year license term; Kinetic Hydropower System device was successfully deployed and tested; last documentation filed on 04/25/2017
SnoPUD 1 (OpenHydro)	Admiralty Inlet Tidal Energy Project	Pilot License	12690-005	Surrendered on 3/21/2016 (P-12690-015); 10 year license term
ORPC Maine	Cobscook Bay Tidal Energy Project	Pilot License	12711-005	Last documentation filed on 06/06/2017; 8 year license term; TidGen successfully deployed and tested
Whitestone Power and Communications	Microturbine Hydrokinetic River In-Stream Energy Conversion Project	Pilot License	13305-005	Surrendered 4/18/2016

https://elibrary.ferc.gov/idmws/search/fercgensearch.asp

Appendix B

Relevant Federal Laws

Appendix B – Relevant Federal Laws

The document *A Review of the Environmental Impacts for Marine and Hydrokinetic Projects to Inform Regulatory Permitting: Summary Findings from the 2015 Workshop on Marine and Hydrokinetic Technologies, Washington, D.C.* (NREL 2016)[1] contains a list of the applicable federal laws and Executive Orders relevant to permitting and licensing MHK projects in the United States. That list is included below.

- National Environmental Policy Act (https://www.epa.gov/laws-regulations/summary-national-environmental-policy-act)
- Endangered Species Act (https://www.fws.gov/international/laws-treaties-agreements/us-conservation-laws/endangered-species-act.html)
- Marine Mammal Protection Act (https://www.fws.gov/international/laws-treaties-agreements/us-conservation-laws/marine-mammal-protection-act.html)
- Magnuson-Stevens Fishery The Magnuson-Stevens Fishery Conservation and Management Act Conservation and Management Act (https://www.fisheries.noaa.gov/topic/laws-policies?title=&field_region_vocab_target_id=All&webdam_inserts=&page=1)
- Marine Protection, Research and Sanctuaries Act (https://www.epa.gov/laws-regulations/summary-marine-protection-research-and-sanctuaries-act)
- National Marine Sanctuaries Act (https://sanctuaries.noaa.gov/about/legislation/)
- Executive Order 13186 (Migratory Birds) (https://www.fedcenter.gov/Bookmarks/index.cfm?id=694
- Coastal Zone Management Act (https://coast.noaa.gov/czm/act/)
- Clean Air Act (https://www.epa.gov/clean-air-act-overview)
- Clean Water Act (https://www.epa.gov/laws-regulations/summary-clean-water-act)
- Executive Order 13547 (Stewardship of Oceans, Our Coasts and the Great Lakes) (https://obamawhitehouse.archives.gov/the-press-office/executive-order-stewardship-ocean-our-coasts-and-great-lakes)
- Ports and Waterways Safety Act (https://coast.noaa.gov/data/Documents/OceanLawSearch/PortsandWaterwaysSafetyAct.pdf
- Rivers and Harbors Appropriation Act (https://www.fws.gov/laws/lawsdigest/riv1899.html)
- Resource Conservation and Recovery Act (https://www.epa.gov/laws-regulations/summary-resource-conservation-and-recovery-act)
- National Historic Preservation Act (https://www.nps.gov/history/local-law/nhpa1966.htm)
- Archaeological and Historical Preservation Act (https://www.nps.gov/archeology/tools/laws/ahpa.htm)

[1] *A Review of the Environmental Impacts for Marine and Hydrokinetic Projects to Inform Regulatory Permitting: Summary Findings from the 2015 Workshop on Marine and Hydrokinetic Technologies, Washington, D.C.* is available at https://tethys.pnnl.gov/sites/default/files/publications/Baring-Gould-et-al-2016-Workshop.pdf.

- American Indian Religious Freedom Act (https://coast.noaa.gov/data/Documents/OceanLawSearch/Summary%20of%20Law%20-%20American%20Indian%20Religious%20Freedom%20Act.pdf)
- Federal Aviation Act (https://www.gpo.gov/fdsys/pkg/STATUTE-72/pdf/STATUTE-72-Pg731.pdf
- Federal Power Act (https://energylaw.uslegal.com/government-regulation-and-programs/act-1920/)
- Executive Order 13007 (Indian Sacred Sites) (https://www.fedcenter.gov/Bookmarks/index.cfm?id=698&pge_id=1606)

Other relevant federal laws not listed above include:

- Electric Consumers Protection Act (ECPA) of 1986 (https://energylaw.uslegal.com/government-regulation-and-programs/ecpa/)
- Outer Continental Shelf Lands Act (OCSLA) (https://www.boem.gov/OCS-Lands-Act-History/)
- Merchant Marine Act of 1920 (Jones Act) (46 U.S. Code; Chapter 551; Section 55102) (http://uscode.house.gov/view.xhtml?path=/prelim@title46/subtitle5&edition=prelim)
- Passenger Vessel Services Act (46 U.S. Code; Chapter 551; Section 55103) (https://www.cbp.gov/sites/default/files/documents/pvsa_icp_3.pdf)
- Towing Statute (46 U.S. Code; Chapter 551; Section 55111) (https://www.law.cornell.edu/uscode/text/46/55111)
- Dredging Act (46 U.S. Code; Chapter 551; Section 55109) (https://www.law.cornell.edu/uscode/text/46/55109)

Pacific Northwest
NATIONAL LABORATORY

www.pnnl.gov

902 Battelle Boulevard
P.O. Box 999
Richland, WA 99352
1-888-375-PNNL (7665)

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