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Incentivizing Ocean Energy

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On behalf of Oregon Wave Energy Trust

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Oregon Wave Energy Trust (OWET) is a nonprofit public-private partnership funded by the Oregon Innovation Council. Its mission is to support the responsible development of wave energy in Oregon. OWET emphasizes an inclusive, collaborative model to ensure that Oregon maintains its competitive advantage and maximizes the economic development and environmental potential of this emerging industry. Our work includes stakeholder outreach and education, policy development, environmental assessment, applied research and market development.

Abstract

The goal of the Incentivizing Ocean Energy project was to study methods of bridging the gap between the cost of ocean energy and the price it can command in the marketplace, especially for early-stage technologies. Robert K. Harmon details strategies to reduce the cost of ocean energy, gain political support, advocate for favorable treatment in regulatory markets and make the best use of voluntary markets. Methods include building alliances, focusing on grants, how to benefit from tax incentives, preferential siting, working collaboratively with other sectors and more. This report is a go-to guide on how early-to-mid stage businesses will best profit from ocean energy devices in both the short and long term.

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Introduction

This report is designed to supplement the Oregon Wave Energy Trust (OWET) Utility Market Initiative (UMI) report released in December of 2009 and other work already undertaken by OWET, such as the *Economic Impacts of Wave Energy to Oregon's Economy* report. The UMI report addresses several early-stage characteristics of the ocean energy industry and how those characteristics relate to bridging the gap between the cost of ocean energy and the price it can command in the marketplace. Several of those characteristics are worth mentioning here, although a deeper analysis of them is beyond the scope of this report. In general, this report does not address the research, development and deployment needs of the industry. This report focuses on the regulatory and non-regulatory incentives available, or potentially available, to address the above market price of electricity produced by ocean energy. Further, this report looks at the various markets, both regulatory and voluntary, which ocean energy could enter to sell its energy and environmental outputs.

The emerging ocean energy industry can provide substantial economic and environmental benefits to Oregon. Energy industry stakeholders and policymakers in Oregon should embrace this emerging industry and support its current phase of development, recognizing that investments at this stage are likely to create the greatest rewards for Oregon's economy over time. One need only look at the thriving wind power industry to see the revenue and employment benefits that come with a successful clean power technology. Just 15 years ago, large-scale wind power development in Oregon was simply a dream. Today, thousands of megawatts of wind power have been installed in Oregon, supporting thousands of jobs and generating millions of dollars in annual tax payments and land leases.[1] Oregon's transmission infrastructure, excellent ocean energy resources, environmental sensibilities and entrepreneurial spirit put Oregon in a position to become a world leader in ocean energy development.

As was true for wind energy in the 1980s, ocean energy is in the exciting, but risky, early stage of its technological development. Like wind in the '80s, the cost of energy from ocean energy facilities today is well above what the traditional energy markets will bear and prices will likely stay high until the industry moves through additional research, development and demonstration (RD&D). The time to join the technological ocean energy race is now rather than later, when other geographic competitors will have gained significant technological, market and infrastructure leads.

It is too early to know precisely how much utilities will pay for ocean energy; however, there is a good argument that it should be worth more than wind energy. Ocean energy should be more predictable; it will be generated west of the mountains, where most or Oregon's electricity demand is found; it is a winter-peaking resource; and it should add a "diversity benefit" to the region, because ocean energy should peak at different times of day than wind will. Ultimately, these values should accrue for the sellers of ocean energy.

Based on the information in the UMI and *Economic Impacts of Wave Energy to Oregon's Economy* reports, we have assumed for purposes of our analysis that the cost of ocean energy will be $250/MWH. We have also assumed that the industry has a goal of installing 500 MW of ocean energy along the Oregon coast. We have assumed that existing tax incentives and relatively generous power purchase contracts signed under the Public Utility Regulatory Policy Act of 1978 (PURPA) would together cover approximately $100/MWH, leaving a shortfall of $150/MWH to be covered either by new incentives, or by the market's willingness to pay above market prices for ocean energy.

The $150/MWH gap between what ocean energy will cost and what wholesale power markets will pay is a vexing challenge. Ocean energy has essentially two products to sell: electricity, and ocean energy's environmental and social benefits. These benefits are variously referred to as Renewable Energy Credits or Blue Tags. Given that the term "RECs" has become an industry standard, and given that the industry now refers to RECs from solar systems as SRECs, we have coined the phrase "Ocean Renewable Energy Credit," or "OREC," which we use throughout this report. ORECs represent the environmental benefits of ocean energy.

While ORECs should clearly command a premium in the marketplace and strategies to increase that premium are worthy of pursuit, it is unreasonable to assume that OREC premiums will cover the entire $150/MWH gap. Inexpensive RECs, primarily from wind and biomass, are widely available. Those RECs offer customers many of the same benefits offered by ORECs. Through skillful marketing, there may be some demand for ORECs over other RECs; however, the demand will be limited and will not support the large-scale development of ocean energy at these prices. Efforts to lower the cost of generation must remain the focus. This report looks both at demand drivers for ORECs, as well as existing and potential incentives to lower the cost of ocean energy generation. If the cost of generation can be significantly reduced, it is much more likely that customers can be found for large quantities of ORECs.

Section 1: Reducing the Costs of Ocean Energy

Section 1A: Revenue-Targeted Financial Incentives

The most direct method of addressing ocean energy's above-market energy cost is to acquire financial incentives in the form of cash or reduced tax burdens to provide the revenue necessary for ocean energy development. These revenue-targeted financial incentives vary from the simple, such as a direct grant, to the complex, such as a bundle of tax incentives that maximize a project's revenue potential. At the current development stage of ocean energy – where most device designs remain untested concepts and those that have been tested in the water are not yet in large arrays – financial incentives in the form of grants and tax incentives can have the greatest impact on the emerging industry by providing the funding needed for research and experimentation into the most promising methods of utilizing energy derived from the ocean.

Grants

There are a variety of renewable energy grants offered by federal, state and local governments, utilities and nonprofit organizations. As direct cash outlays with no burden of repayment, grant programs are the most direct method of subsidizing renewable energy development. Given the variety of available grants—ranging from those offered under competitive solicitations by state and federal agencies to those sourced from nonprofit organizations funded charitably or through states' public benefits funds—a single project can typically qualify for multiple incentives. Stipulations on these awards vary, but often restrict participation based on resource type, project size, company size, project location and other similar factors. The majority of federal grant programs for renewable energy have added ocean energy as an eligible participating technology. However, for reasons of geography or limited public awareness, ocean energy technologies are not included in many of the available grant programs at the state and local levels. Table 1 below identifies the estimated number of grants offered for renewable energy in the United States and the specific grants that are ocean energy eligible.

Table 1: Renewable Energy and Ocean Energy Grants

Issued By	Total Grants	Ocean Energy Eligible Grants	Total Ocean Energy Grants
Federal	7	• **U.S. Department of Energy (DOE):** Water Power Program Funding Opportunity Announcements* • **U.S. Small Business Administration:** Small Business Innovation Research/Small Business Technology Transfer Grants* • **U.S. Department of Defense:** Strategic Environmental Research and Development* • **U.S. Treasury:** Renewable Energy Grants • **U.S. Department of Agriculture:** Rural Energy for America Program Grants	5
State, Local & U.S. Territories	42	• **Alaska:** Renewable Energy Grant Program • **Connecticut:** On-Site Renewable Distributed Generation Program • **Maine:** Voluntary Renewable Energy Resources Grants • **North Carolina:** Green Business Fund • **Oregon:** Community Renewable Energy Feasibility Fund Program • **Oregon:** Custom Renewable Energy Projects • **Rhode Island:** Renewable Energy Fund Grants • **Texas:** Renewable Energy Demonstration Pilot Program	8
Utilities	6	• **None**	0
Nonprofit Organizations	4	• **Oregon Wave Energy Trust:** Match funding for DOE-funded ocean energy projects*	0
Total	**59**		**13**

Source: The Database of State Incentives for Renewables and Efficiency (DSIRE). Grant Programs for Renewable Energy. Date Accessed: March 2, 2011. http://www.dsireusa.org/incentives/index.cfm?SearchType=Grant&EE=0&RE=1

Federal Grants

As shown in Table 1 above, there are an estimated 7 federal renewable energy grant programs, of which 5 are eligible for ocean technologies. The most direct federal funding for ocean energy is the U.S. Department of Energy (DOE)'s Water Power Program, which awards grants specifically for marine hydrokinetic research, development and demonstration. The funding opportunity announcements (FOAs) issued by the Water Program are dependent upon DOE funding and research and development priorities. In 2010, the program dedicated more than 70% of its $48 million budget to marine and hydrokinetic activities, focusing primarily on technology development.[2] National Marine Renewable

* This incentive was not identified in the Database of State Incentives for Renewables and Efficiency.

Energy Centers in Oregon, Hawaii and Florida have been established with DOE Water Program funding to serve as world premier research centers on ocean energy.[3] Over the next three years, the program plans to award another $38 million for ocean energy research and development.[4]

The Small Business Administration's Office of Technology administers the Small Business Innovation Research (SBIR) Program and the Small Business Technology Transfer (STTR) Program. The two programs jointly award $2 billion to small businesses that are developing innovative technology solutions.[5] The SBIR and STTR programs award renewable energy projects through federal agencies, such as DOE, the National Ocean and Atmospheric Administration and the U.S. Department of Defense (DOD). The 2010 SBIR/STTR Phase I grant solicitation identified advanced water power technologies as one of several eligible technical topic areas.[6]

The DOD offers its own set of technology development and deployment grants through the Strategic Environmental Research and Development Program (SERDP).[7] The program—a joint endeavor of DOD, DOE, the U.S. Environmental Protection Agency and the Environmental Security Technology Certification Program (ESTCP)—provides funding opportunities for distributed generation renewable energy development.[8] The SERDP grant is ocean energy eligible.

In 2009, with the global economic downturn, the federal government issued a short-term economic stimulus package, the American Recovery and Reinvestment Act (ARRA). The Renewable Energy Grants program, funded by ARRA and managed by the U.S. Treasury, provides renewable energy projects with the option to receive a direct cash grant instead of the investment tax credit in 2009, 2010 and 2011.[9] Ocean energy projects are one of several renewable energy technologies eligible for the grant, so long as they are implemented by a tax-paying entity and construction begins in 2011. This program is discussed further in the Tax Incentives section below.

The U.S. Department of Agriculture (USDA)'s Rural Energy for America Program (REAP) grant supports renewable energy development in rural communities and encourages ocean energy projects to participate. REAP grants provide an additional source of deployment funding, valued at up to 25% of a project's cost.[10]

These federal grant programs tend to focus on renewable energy development that relates to the agency's overall mission or specific goals. SBIR/STTR funding aims to support experimentation within the private sector, while the DOE Water Power Program FOAs are focused on laying the groundwork for commercialization. The DOD SERDP is typically concerned with defense operations and military base energy provisions, while USDA REAP specifically supports rural communities. Although not all federal grants will be appropriate for a given project, the various opportunities involve a great deal of overlap and present ocean energy developers with a range of funding sources. A key benefit of the federal grant programs available to ocean energy is that they provide funding for various early stages of technology development and thus assist ocean energy developers as they lay the ground work for eventual deployment of devices ready for commercial use.

State and Nonprofit Grants

As shown in Table 1 above, there are an estimated 42 renewable energy grant programs offered by states, local governments and U.S. territories. Of these, 8 are open to ocean technologies. All 8 ocean energy grants are offered at the state level by state government agencies and charitable trusts and funds. State agency grants may also be focused on economic development, either providing direct funding for local manufacturing installations or project deployment in specially targeted areas. For example, Texas offers the Renewable Energy Demonstration Pilot Program grant to assist rural and low-income communities in developing renewable energy projects that also stimulate economic development and public health.

Several approaches are used to capitalize trusts and funds to support renewable energy grants. Direct disbursements from legislatures and other state funds, like OWET, are one method of funding grant programs. Another way to continuously fund an incentive program is through the use of a public purpose charge (PPC), or other arrangement with utilities. An example of this is the Energy Trust of Oregon, which is a PPC-funded program. Finally, carbon credit trading programs—such as the New York State Energy and Research Development Authority (NYSERDA), which receives a portion of its funding from the Regional Greenhouse Gas Initiative credit auctions—are alternative funding methods. These nonprofit entities offer grants that range from as low as $5,000 for grant writing[11*] to multi-million dollar support of pilot-scale ocean technology deployments.[12†]

Energy nonprofits in 18 states and the District of Columbia have joined together to form the Clean Energy States Alliance (CESA), which seeks to coordinate state and federal activities to promote renewable energy development.[13] CESA is funded through the National Renewable Energy Laboratory to coordinate the State/Federal Marine Energy Technology Advancement Partnership with various state-level stakeholders, industry groups and the DOE Water Program.[14] This initiative has been designed to increase state and federal cooperation, provide support for the development of marine test centers and develop a process for the joint funding of demonstration projects. The Energy Trust of Oregon is a member of CESA.

Oregon's Grants

Oregon offers two ongoing grants that provide a financial incentive available to ocean energy, shown in Table 1. The first of these is the Community Renewable Energy Feasibility Fund Program (CREFF), which provides up to $50,000 for feasibility studies for project development conducted by commercial, nonprofit, educational and other institutions, as well as local, state and tribal governments.[15] The granting program is aimed at both small and large projects, and eligibility is generally reserved for projects that produce between 25 kilowatts (kW) and 10 megawatts (MW) of energy. The Energy Trust of Oregon is the second ongoing program, which offers the Custom Renewable Energy Project grant for diverse kinds of renewable energy assistance designed to serve customers of Portland General Electric (PGE) and PacifiCorp, both Investor Owned Utilities (IOU) headquartered in Portland Oregon. This funding supports grant writing, feasibility studies or technical assistance. This grant provides a maximum of $40,000 and, in return, the Energy Trust of Oregon receives a portion of the project's renewable energy credits, making the grant similar to an investment stake.

In addition, OWET began offering an ocean energy matching grant program in 2010. Tasked explicitly with developing a wave power industry in Oregon, OWET provides a 20% match up to $100,000 for projects sited in Oregon that are competitively selected for DOE funding.[16] The OWET match policy provides Oregon's ocean energy developers with a reliable source of supplemental funding to help

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[*] The Maine Technology Institute (MTI) offers this grant for grant-writing programs, among others. http://www.mainetechnology.org/fund/sbir-sttr-funds

[†] NYSERDA is funding Verdant Power's multi-MW tidal turbine demonstration project in New York's East River. http://www.nyserda.org/Press_Releases/2010/PressReleas20100503.asp

provide cost-share to standard DOE solicitations. The program expired in April 2011 but, contingent on funding, OWET plans to extend the program.[17]

Analysis of Grant Incentives

In contrast to production-dependent incentives, such as feed-in tariffs or production tax credits, grants are decoupled from actual energy production. As such, they can provide crucial financial support in the early stages of renewable technology development. For startup companies that lack the resources to independently fund the research, development and testing activities necessary to bring a new technology to commercial operation, incentives for energy production fall short of supporting immediate research and development needs. Grants help fill this gap and imply a "vote of confidence" that can act as "anchor" funding to help attract private investment as well as venture capital.

As a technology or device developer progresses towards commercial maturity, grant funding becomes both less impactful and less available. For a grant to have an impact at the deployment stage, it must be large (often in the millions of dollars) in order to offset a meaningful portion of project costs. This stands in contrast to the relatively muted tens or hundreds of thousands of dollars needed by earlier stage companies to test and develop new technology. As deployments scale up in cost, the relative contribution of a grant funding to overall project costs declines rapidly. However, the role that grants play in later-stage projects can still be valuable, even if their impacts are lower. For later-stage deployment projects, grant funding provides a capital base from which a renewable energy developer can secure lower interest financing. The grant funding reduces necessary external funding, lowering investor risk and decreasing the cost of debt in the form of interest rates. The availability of cash provided by the grant also reduces the amount of equity financing needed to fund the project.

Grants are an excellent means to provide direct cash flow or liquidity for ocean energy projects. However, the distribution of risk and proper oversight are important considerations for successful grant programs. Grants do not eliminate the risks associated with new technology development, but instead shift risk from the recipient to the entity providing the grant. Grant programs may have fewer means to ensure that a project achieves desired end results. Grant funding also carries the risk of dependency. Without a proper incentive structure or the due diligence necessary to move technologies through the commercialization process, recipients can remain dependent on grant-based funding or simply fade away without reaching commercial competitiveness. The due diligence required to select only the most promising recipients adds financial burden for the grant maker.

Policy Solutions for Grants

With grants playing such a pivotal role in financing emerging technology concepts, the process needs to be refined to achieve maximum effect. Certain grant-making procedures have proven to be consistently effective. At a most basic level, expanding grant program eligibility to ocean energy technologies is the clearest first step to support the industry, as only a limited number of existing grant programs explicitly include or target marine technologies. In addition, providing a grant incentive that is tailored to early-stage technologies would be highly suitable to supporting near-term ocean energy development, experimentation and demonstration projects. The Energy Trust of Oregon's Custom Renewable Energy Projects is an excellent example of a grant aimed at funding early-stage project needs, such as grant writing, feasibility studies, design, permitting and utility interconnection activities.[18] Particularly for broader solicitations, expanding grant programs to concurrently support economic development, or community-owned generation projects, is a great way to encourage ocean energy projects with additional community benefits. For example, Texas's Department of Rural Affairs offers the Renewable

Energy Demonstration Pilot Program to assist renewable energy demonstration projects in rural and low- to moderate-income counties in order to support economic development, health and safety, and innovative projects that can be exported to other communities.

There are two excellent policies that can be used to enhance the effectiveness of a grant program. The first successful grant policy is phased, performance-dependent tranche funding, which helps to address the issue of dependency. The federal SBIR/STTR program is an excellent example of this approach. SBIR/STTR applicants are directed through two phases of funding. Phase I supports a technology concept with $150,000. Phase II requires an additional application and is only open to projects selected in Phase I, but provides up to $1,000,000 for selected applicants. This approach is generally superior to lump-sum funding, as less successful projects can be abandoned without sacrificing obligated funding. A potential downside is the extra financial and time burdens placed on the small businesses applying for each phase of the SBIR. State energy funds can fill this gap with competitive grants for the specific purpose of grant writing to offset the burden of applying to public or private solicitations.

Grant matching, where an organization matches the grant given by a second organization is another effective procedure. As of October 2010, OWET took this approach, awarding $296,000 to four applicants that successfully won awards from a DOE FOA.[19] This level of coordination reduces the overhead costs of making grants as the federal solicitation review process significantly reduces the level of due diligence necessary by the matching organization. Coordination ultimately improves the effectiveness of grants by both providing more direct capital and giving a thorough review to potential ocean energy projects. It is on this premise that CESA and the DOE Water Program have partnered to provide some forms of joint funding to future ocean technology solicitations. However, even broader coordination between state grant makers and federal entities will deepen the effectiveness of grant funding. One particularly promising area is coordination between state sources and other federal agencies, particularly the SBIR program and DOD's ESTCP solicitation process. Directly coordinating with these federal entities will broaden the potential for the identification and support of innovative emerging technologies, which may not necessarily fall under a standard DOE technology program FOA.

Tax Incentives

Renewable energy developers, like all other U.S. businesses, are subject to an elaborate system of federal, state and local taxation. Taxes increase the cost of developing and installing a renewable energy system. While taxes are not the source of ocean energy's above-market cost, preferential tax treatment in the form of offsets and credits can substantially reduce the cost of a project.

Tax incentives for renewable energy include corporate, personal, sales tax and property tax incentives. These can be issued by the federal, state or local government, as well as U.S. territories. Five tax incentives are widely used to provide financial support for the development of renewable technologies:

- **Production tax credits** allow investors to earn a fixed credit against their tax burden for each unit of renewable energy produced.
- **Investment tax credits** allow a specified portion of the investment in the renewable technology to offset a portion of the recipient's tax burden.
- **Sales tax exemptions** allow the exemption from state or local sales taxes of certain classes of goods and services, such as the materials and labor used to construct renewable energy devices.
- **Property tax exemptions** allow property owners to claim exemption from some state and local property taxes for installing qualifying renewable energy generation.

- **Accelerated depreciation schedules** allow investors to recover lost asset value from a renewable energy technology at a faster pace.

Table 2 below identifies tax incentives for renewable energy in the United States, as well as those for which ocean energy is eligible.

Table 2: Tax Incentives for Renewable Energy and Ocean Energy in the United States

Tax Incentive Types	Issued By	Total Renewable Energy Tax Incentives	Ocean Energy Eligible Tax Incentives	Total Ocean Energy Tax Incentives
Corporate Tax	Federal	4	• **Federal:** Renewable Electricity Production Tax Credit • **Federal:** Business Investment Tax Credit	2
	States & U.S. Territories	37	• **Maryland:** Clean Energy Production Tax Credit • **Oregon:** Business Energy Tax Credit[‡]	2
Personal Tax	Federal	3	• **None**	0
	States	39	• **Maryland:** Clean Energy Production Tax Credit	1
Sales Tax	States, Local, & U.S. Territories	39	• **Puerto Rico:** Sales & Use Tax Exemption for Green Energy • **Washington:** Renewable Energy Sales & Use Tax Exemption	2
Property Tax	State, Local, & U.S. Territories	71	• **Connecticut:** Property Tax Exemption for Renewable Energy Systems • **Hawaii:** Real Property Tax Exemption for Alternative Energy Improvements • **New Jersey:** Property Tax Exemption for Renewable Energy Systems • **Puerto Rico:** Property Tax Exemption for Solar & Renewable Energy Equipment	4
Total		**193**		**11**

Source: The Database of State Incentives for Renewables and Efficiency (DSIRE). Financial Incentives for Renewable Energy. Date Accessed: March 4, 2011. http://www.dsireusa.org/summarytables/finre.cfm

Federal Tax Incentives

As shown in Table 2 above, there are an estimated seven federal renewable energy tax incentive programs, of which two are eligible for ocean technologies. Both federal incentives relevant to ocean technologies are corporate tax incentives. One is an investment tax credit (ITC) and the other is a production tax credit (PTC). The federal Renewable Electricity PTC is a $0.011 per kWh credit to be earned for the first 10 years of operation.[20] Eligibility for the PTC is restricted to commercial and industrial producers at grid-connected facilities. In the case of ocean technologies, the PTC results in a

[‡] This incentive was identified in the Database of State Incentives for Renewables and Efficiency, but ocean energy is not listed as an eligible technology. The Oregon Department of Energy confirmed that ocean energy is now eligible for this tax credit.

minimum capacity of 150 kW—roughly the size range of a single, full-scale ocean device. The federal Business Investment Tax Credit carries its own eligibility requirements, but provisions of the American Recovery and Reinvestment Act (ARRA) extended the Business ITC eligibility to any Renewable Electricity PTC-eligible installation.[21] Since ocean energy is eligible under the federal PTC, it is now also eligible for the federal ITC.

There is another federal tax incentive that was not identified in Table 2 because ocean energy projects are not currently eligible for participation. The federal Modified Accelerated Cost Recovery System is an accelerated depreciation scheme that provides a five-year accelerated depreciation schedule for renewable energy technologies.[22]

State Tax Incentives

On top of the base federal tax incentives, states, local governments and U.S. territories have a variety of renewable energy incentives. However, ocean energy is typically excluded from eligibility. Of the estimated 147 renewable energy tax incentives offered in the United States, only 9 are ocean energy applicable, as shown in Table 2 above. Maryland is the only state that currently offers both a personal and corporate PTC that is eligible for ocean energy.[23] According to the Database of State Incentives for Renewables and Efficiency, there are no states that currently offer an ITC for ocean energy.[24] However, Oregon recently made its ITC,[§] the Business Energy Tax Credit, eligible for ocean energy, along with several other renewable energy technologies.[25] .[26] At this time the Oregon legislature is currently debating legislation that would overhaul the states Business Energy Tax Credit (BETC) program. There is no reason to believe that Oregon legislators will exclude any of the currently eligible renewable energy technologies. Washington and the U.S. territory of Puerto Rico both offer sales and use tax exemptions for renewable energy that allow ocean energy technology to participate.[27] Finally, Connecticut, Hawaii, New Jersey and Puerto Rico offer property tax exemption incentives that allow ocean energy to participate, making property tax incentives the most common ocean energy tax incentives.[28] The lack of ocean energy support is in part a function of both limited geographic suitability and the relatively low public profile of the emerging renewable energy ocean technologies.

Oregon's Tax Incentives

As mentioned above, Oregon currently offers the Oregon Business Energy Tax Credit—an ITC that provides support for renewable energy projects, including up to $20 million for the construction of a manufacturing facility or $10 million for other direct project costs.[29] Ocean energy technologies can now partake in this tax incentive. Oregon has no PTC for ocean energy.

Analysis of Tax Incentives

Within the patchwork of U.S. renewable energy incentives, not all policies and incentives are equally effective for every technology or each stage of project development. With only three states currently generating a combined ocean energy capacity of 0.14 MW,[30] the ocean energy industry is rightly focused on launching, testing, piloting and demonstrating projects that may not have significant production or

[§] The Database of State Incentives for Renewables and Efficiency lists the Oregon Business Energy Tax Credit, but has not yet been updated to reflect ocean energy's eligibility for the tax incentive.

performance certainty. Tax incentives that support early-stage ocean energy development may provide optimal support for moving the industry forward, as they can provide immediate or at least near-term support for an industry that still requires experimentation to determine the most compelling energy extraction designs. With upfront or near-term incentives that are decoupled from performance, the technology developer can put a device in the water at a fraction of its actual costs, quickly gain operational and design experience from pilot-scale testing, and revise the design to be commercially competitive.

A number of tax incentives are specifically beneficial to early-stage experimentation and pilot-scale testing. Sales tax exemptions, investment tax credits, and accelerated depreciation schedules are all excellent ways to incent early-stage ocean energy development. Sales tax exemptions directly reduce the cost of ocean devices by exempting sales tax on equipment purchases, while investment tax credits and accelerated depreciation incentives significantly reduce capital costs by decreasing an ocean energy developer's total tax burden in the near term.

Given the unique features and emerging state of the ocean energy industry, not all tax incentives will impact overall cost. These young technologies, particularly at the device testing and pilot scales, cannot rely on cost reductions from a PTC because their energy production is uncertain. The development of operations and maintenance best practices and the refinement of component design for survivability are the lessons derived from setbacks, such as component failures, which temporarily halt or reduce production. This performance unpredictably lowers the likelihood that current ocean energy technologies can take full advantage of a state or federal PTC. As the industry matures, a PTC will provide the consistent incentive necessary to refine and advance the industry's most successful designs. In the meantime, a different incentive structure is needed to lower the cost of testing and demonstrating ocean energy.

The realization of full subsidy from tax incentives also requires an entity to have an adequate tax appetite in order for the incentives to subsequently offset costs. This can give rise to complex financing arrangements between the initial project developer and later investors.[**] Traditionally, this has been accomplished through a "flip" ownership structure where—in the simplest cases— large, outside investors become the active owners. This scenario allows for tax incentives to pass back to a parent company's aggregate tax burden while tax incentives are accrued during the production period and/or during the eligible years of asset depreciation. Once the tax-based incentives have expired, ownership flips back to the initial investors who have a lower tax burden and, without utilizing the flip ownership, would not have been able to take full advantage of the tax incentives. For these reasons, flip investment structures have been widely used in the recent expansion of U.S. wind power,[31] and generally in merchant generator development. It is likely that these structures will also be used for ocean energy development.

Even complex arrangements such as these cannot allow tax-exempt entities, such as public power utilities, to leverage tax incentives (because they have no tax burden to offset). Therefore, tax-exempt utilities interested in supporting ocean energy development will likely enter into a power purchase

[**] During the early stages of technology development, the project developer is also the developer of the ocean energy device. Later, as the industry matures and the technology becomes commercially viable, the developer can be a limited liability corporation. The later investors are typically what are referred to as "tax equity" investors, who invest in projects where they can gain a key financial advantage by making use of the tax incentives.

agreement with private ocean energy developers that are eligible to use the tax incentives and then potentially assume ownership once the tax incentive expires.

Policy Solutions for Tax Incentives

Despite structural barriers, there are a clear set of tax incentives and related policies that have the potential to considerably reduce the installed cost of ocean energy. Generally, tax incentives that attract private investors and give developers an incentive that is not tied to production supports early-stage ocean energy technology development and the valuable lessons of in-water testing of design concepts without needing long-term production for the full-receipt of their credit.

A sales tax exemption, while less generous than the PTC or ITC, can unambiguously lower the cost of a project, and can be effective for tax-exempt entities. Oregon has no sales tax.

The extension of existing tax incentive policies to ocean energy technologies is another straightforward method of furthering ocean technology development. In Oregon, expanding the Oregon Business Energy Tax Credit (OBETC) to include ocean technologies was an important step. The Oregon BETC has two levels of funding:

- Up to $20 million for constructing a manufacturing facility.
- Up to $10 million for other direct project costs.

The $10 million project incentive cap is scaled appropriately to provide meaningful support to pilot-scale ocean energy deployments. The $20 million manufacturing facility incentive could help ensure that pilot devices and future production runs can provide economic benefits to the state.

The implementation of various tax credits and incentives can also be altered to better suit the needs of ocean energy. Three tax credit provisions help offset structural barriers associated with these incentives: carry forward, refundability and pass through. When a tax incentive exceeds the recipient's tax burden, carry forward allows the excess credit to be claimed in later years, within some statutory limit. Conversely, refundability refunds the excess credit to the recipient in cash. Tax credit refunds would be the preferred stipulation for ocean technologies, as they completely remove the issue of tax-burden adequacy. However, tax-exempt entities still would not be able to participate. Pass through enables tax-exempt entities to "pass" the tax exemption onto a tax-liable partner. This means the tax-exempt entity must find a willing partner with adequate tax revenues. Another option would be to turn existing PTCs into a cash payment performance incentive—this modification would then allow tax-exempt producers to receive the same benefit as their corporate counterparts.

Maryland provides an innovative template for lowering the costs of investing in promising technologies via tax incentives. Diverging from other ITC architectures, the Maryland Biotechnology ITC (in addition to being set at a generous 50%) is available for investing in a *company*—other ITCs are restricted to investment in *project* capital costs.[32] Making this distinction is important on two fronts. First, it lowers the cost of research and development to create innovative ocean energy devices, as the ITC is no longer linked to a concrete, in-the-ground project. Second, in cases of private development, the Maryland Biotechnology approach can help offset the need for flip financing structures, as the large investors gain the tax benefit at the time they take an equity position in the development project or device developer. The cap on the Maryland ITC is set at $250,000, making it a more effective incentive for the research and development stage, which is understandable as the policy's target is biotechnology. However, a larger cap could ease the financing burden associated with deploying pilot ocean devices.

Section 1B: Financing-Targeted Incentives

Grants and tax credits issued by government entities for renewable energy development are subsidies for renewable energy in that they provide a direct cash transfer with the aim to promote the industry and technology. In addition, there are a variety of financing incentives, such as loans and bonds, for renewable energy that help address the availability of investment capital to further ocean energy project development. Currently, there are 189 renewable energy bonds and loans available in the United States at the federal, state and local levels of government.[33] Ocean energy projects are eligible for eight of these bonds and loans.[34] Table 3 below identifies the loans and renewable energy bonds available in the United States for renewable energy projects, in addition to the financing programs that are specifically open to ocean energy projects.

Table 3: Renewable Energy and Ocean Energy Bonds and Loans in the United States

Issued By	Total Renewable Energy Bonds & Loans	Ocean Energy Eligible Bonds & Loans	Total Ocean Energy Bonds & Loans
Federal	4	• **Federal:** Clean Renewable Energy Bonds • **Federal:** Qualified Energy Conservation Bonds • **Department of Energy:** Loan Guarantee Program • **Department of Agriculture:** Rural Energy for America Program Loan Guarantees	4
State, Local, & U.S. Territories	108	• **Alaska**: Power Project Loan • **Maryland**: Jane E. Lawton Conservation Loan Program • **North Carolina**: Local Option - Financing Program for Renewable Energy & Energy Efficiency • **Rhode Island:** Renewable Energy Fund Loans	4
Utilities	67	• **None**	0
Nonprofit Organizations	9	• **None**	0
Total	**188**		**8**

Source: The Database of State Incentives for Renewables and Efficiency (DSIRE). Financial Incentives: Loans. Date Accessed: March 4, 2011. http://www.dsireusa.org/incentives/allsummaries.cfm?SearchType=Loan&&re=1&ee=0http://www.dsireusa.org/incentives/allsummaries.cfm?SearchType=Loan&&re=1&ee=0

Loans and Loan Guarantees

Loan incentives include both direct lending and loan guarantees, which are the explicit backing of a debtor by a government. With a government-guaranteed loan, in the event that the debtor defaults on the loan, the government assumes the debt. In the case of renewable energy development, both emerging technologies and technologies perceived as high-risk have difficulty finding willing lenders, and must otherwise rely on equity to finance their projects. Equity investors demand higher rates of return to match the higher risk of direct investment in a project. Replacing this higher-cost "equity capital" with debt capital reduces the price at which a developer must sell their power to meet their investor's requirements. By providing the loan, or guaranteeing to repay the loan in the event of default, the loan guarantor—or in this case, the government—is reducing risk to an investor. Therefore, these loan incentives provide renewable energy project developers with access to cheaper debt capital by providing loan funding and reducing the interest rates at which developers must repay their debts. This lowers the cost of the project and its sale price for power.

Federal Loans

The federal government provides two types of loan guarantee programs for renewable energy for which ocean energy projects are eligible, as identified in Table 3 above. The U.S. Department of Energy's (DOE's) Loan Guarantee Program prioritizes large-scale and large-investment projects (over $25 million total cost) that reduce greenhouse gases and/or utilize innovative and emerging technology, including ocean energy projects.[35] Nearly every type of entity and organization is eligible for this program. The U.S. Department of Agriculture offers guaranteed loans through the Renewable Energy for America Program. These loans are applicable for commercial and agricultural projects—including ocean energy projects—and provide a loan guarantee of up to $25 million.[36]

State Loans

Four states—Alaska, Rhode Island, Maryland and North Carolina—offer loans or financing programs for renewable energy that are open to ocean energy projects, as identified in Table 3 above.[37] Alaska maintains a pool of dedicated funding, administered by the Alaska Energy Authority, to provide financial support for small-scale energy facilities developed by local utilities, businesses and political authorities. The Rhode Island Economic Development Corporation runs a loan program that provides up to $750,000 in loans for renewable projects. Maryland offers a loan program that provides up to $500,000 for larger projects that are evaluated on a case-by-case basis. This program is eligible for tidal energy. North Carolina has a state-level loan program, and has also authorized cities and counties to provide loans to renewable energy projects if they so choose.

Oregon's Loans

Oregon offers two renewable energy loan programs for both small and large projects. However, neither loan is eligible for ocean energy. The Oregon Small-Scale Energy Loan Program (SELP), administered by Oregon's DOE, was established in 1981 to support small-scale and local energy projects.[38] Although the program does not cap the size of a loan, loans typically range from $20,000 to $20 million. The state government funds the loan program through periodic sales of bonds. As of March 2011, the program has provided $454 million in loans, with an average loan amount of $54,000.[39] Oregon's second loan program for renewable energy, the Green Street Lending Program, is solely for residential and small business solar installations.[40]

Analysis of Loans

Subsidized financing can be extremely beneficial in renewable energy development under the appropriate circumstances. Directly providing loans and guaranteeing debt issuances help address an ongoing problem in the renewable energy industry—access to the necessary capital required for large-scale deployments at a reasonable interest rate. Access to capital was a crucial issue following the 2008 financial crisis. Currently, even under improved market conditions, access to interested investors may be difficult for ocean energy developers. Even creditworthy companies with successful business models may be overlooked due to a lack of widespread knowledge about the technology.

Loan incentives tend to support demonstration and pilot-scale units, as well as initial production facilities, but they provide more limited support in the experimental and research and development phases of technology development. The core drawback of financing incentives from a developer perspective is simply that they must be paid back on defined schedules. Unlike grants and tax credits, which rely on proper partnership structuring to offset direct costs, financing incentives still rely on the developer to produce enough energy, and subsequently generate enough income, to meet the repayment requirements. Current ocean technologies lack revenue and have uncertain prospective income in the near future. This is not an inherent attribute of ocean technologies; it is simply the reality of the current state of the technology, which is focused on single-device or small-scale array testing. Forcing the long-term generation of energy to repay debts could result in the premature commercial deployment of what may be sub-optimal energy extraction devices. Given the vast potential of ocean energy, it is important to avoid the premature convergence on commercial designs that could ultimately stunt industry success and growth.

A related drawback and constraint on the use of loan incentives for ocean technologies with limited production certainty is repayment risk. One important aspect of DOE's loan program is that recipients are required to compensate the federal government for the risk associated with the guarantee upfront. This payment, the credit subsidy cost, adds an effective screen to eliminate projects without viable business models. For ocean energy demonstration projects that are not primarily aimed at commercial production, the cost of compensating the government for risk may preclude the use of these loan-based incentives by developers. Current-stage ocean developers that attempt to replace the needed equity for their demonstration and pilot projects with debt may simply reshuffle the financing problems to a later date. At that future date, in the absence of adequate operating income from energy sales, the startup would have to pay off the loan principal by attracting equity investors. In this case, they may be required to seek even more funding, given the accrual of loan interest.

Policy Solutions for Loans

Despite the immediate limitations of loans and guarantees for emerging technologies, implementing the proper incentives for commercial ocean energy will provide the financing environment needed to support commercial-scale deployments as the industry matures. While their progress and success are unpredictable, extending the eligibility of already-successful programs to include ocean technologies is essential to ensure that commercial-scale development is not delayed. Relevant federal loan incentives, such as DOE's Loan Guarantee Program, are already properly structured and include ocean technologies. However, state-level policies can be realigned over the next few years to provide a financing base for ocean energy deployments. Oregon has a particularly clear opportunity to provide incentives for the commercial deployment of ocean energy by expanding the SELP to include ocean technologies. Oregon may also consider developing a loan program that is specific to ocean energy technologies, much like their Green Street Loan Program for solar.

In terms of loan structure, North Carolina's city- and county-level revolving loan programs feed both the principal and debt repayments back into the fund, perpetuating the program's ability to provide future financing support to renewable energy developers. This is an ideal structure for long-term renewable energy development; success builds on success and provides more resources to fund innovative technologies.

Finally, it is crucial to couple revenue and demand-side policies to optimize the effectiveness of financing solutions. Clear, early-stage revenue streams will reduce the risk associated with lending, therefore lowering the risks for lenders or debt guarantors. Revenue from tax incentives and renewable energy sale incentives can avoid, in the case of the federal loan guarantee program, the high credit subsidy cost associated with revenue uncertainty. Because businesses that qualify for Oregon's SELP often qualify for Oregon's Business Energy Tax Credit (BETC), expanding the SELP, as well as the BETC, to also include ocean technologies provides a natural coupling of revenue incentives and financing incentives for ocean technologies that attain initial commercial readiness.

Renewable Energy Bond Incentives

Like a loan, a bond is also a debt instrument. However, the two differ in that bonds are a debt *security* and can thus be traded. Generally, bonds also feature a different repayment structure than loans. Bonds pay interest at fixed intervals and the principal is redeemed at the date of bond maturity. Both government entities—including the federal government, states and municipalities—and corporations issue bonds to fund long-term operations or infrastructure projects.

Renewable energy bonds (REBs) are issued in the same manner as standard bonds, except they are only issued by a non-federal government entity. While an issuer of a REB repays the principle obligation of the debt, REBs pay low or zero interest. The low or zero interest makes REBs more beneficial to the issuer in the form of lowered financing costs. The government issuing a REB benefits from a low- or zero-interest payment to the lender that purchased the bond, and allows the government entity to develop a desired project with minimal financing costs. Instead of interest, the lender receives tax credits making REBs attractive to investors. REBs allow government entities to support renewable energy projects with little additional financing costs, while incentivizing private-sector investment with tax benefits.

Federal Renewable Energy Bonds

The federal government offers two renewable bond incentives that are applicable to ocean energy projects—the Clean Energy Bond (CREB) and the Qualified Energy Conservation Bond (QECB).

CREBs can be issued by states, DC, tribal governments and any political subdivisions of those entities (e.g., counties, municipalities), public power utilities, electric coops and CREB lenders (specified as an entity with loans to 100 or more public power utilities or coops). Although the U.S. government allocated a total of $2.4 billion in CREBs (with American Recovery and Reinvestment Act [ARRA] of 2009 funding included), the federal CREB expired in November 2010.[i] Prior to expiring, it allowed state, local and tribal governments, as well as public power utilities to issue bonds that paid zero interest, but instead provided federal tax credits. The most recent CREB issued paid tax credits at rates equivalent to between 7.5 and 8 percent interest. However, the credits themselves are treated as income and subject to taxation at the investor's marginal tax rate.

In contrast, only state (and DC), tribal and local governments can issue QECBs; utilities are not eligible. The QECB has a total federal allocation of $3.2 billion (including ARRA funding) and is still being offered.[ii] Similar to the CREB, the QECB bond principal must be paid back in full by the issuer. Additionally, QECB provides a tax credit from the federal government rather than interest on the bond. QECBs were issued to states based on their population, rather than an application process managed by the U.S. Department of Treasury.

State Renewable Energy Bonds

Numerous U.S. states issue bonds to finance renewable energy or energy efficiency incentive programs. However, these are not the same as the "renewable energy bonds" described above. Instead, states tend to use standard bond sales to finance other renewable energy incentives, such as loans or grants. For example, New Mexico has a $20 million bond authority that is used to issue loans to municipalities, universities and other public entities to conduct energy efficiency upgrades.[iii] Oregon issues bonds on an as-needed basis to fund SELPs.[iv] Only three states—Idaho, Illinois, and New Mexico—offer REB incentives at the state level.[v] Some states, such as Oregon, may consider utilizing REBs to directly fund renewable energy projects in lieu of standard bonds because REBs provide cheaper debt capital due to low-to-zero interest on the REB.

Analysis of Renewable Energy Bonds

A REB issued directly by a public authority to provide the capital required to construct a renewable energy project has benefits similar to a loan guarantee. The public entity issuing the REB lowers the cost of the project by paying low-to-zero interest.

Because the existing federal REB incentive programs are targeted only to public entities, the risk associated with repayment is less for REBs than for loan incentives to private developers. For a public entity—most likely a municipality or public power authority—the uncertain production from the ocean energy installation is likely not the entity's sole source of bond payment funding. The entity's other revenues, such as tax revenue or public power sales, can cover the necessary repayment of the REB principal if necessary.

Currently, private developers are not eligible for REB incentives. However, this is not currently, and may not ever, be much of a concern. Bond issuance is typically a feature of public and corporate finance, not project finance. In the current state of ocean energy development, experimental ocean energy technologies are often pioneered by smaller startup companies, as opposed to large and already-established merchant generators. Startup companies are less likely to possess the assured revenue streams or corporate assets required to back the issuance of even subsidized bonds.

Similar concerns apply to loans and loan guarantees. As ocean technologies near commercialization, larger generating companies with the financial stability to make use of REB incentives may become interested in pursuing ocean energy development. However, even large-scale, privately-developed renewable energy projects are typically pursued under project finance structures. A potential caveat to this general lack of applicability is the development of ocean energy projects by investor-owned utilities (IOUs). Once ocean technologies have reached commercial competitiveness, an IOU may look to build an ocean energy project with a rate-based finance or corporate-finance structure. In this situation, an IOU would benefit from issuing REBs with zero interest.

The second type of REB described above uses REB incentives to fund state and local renewable energy development incentives, such as loans or grants. This reduces the cost of providing government support to ocean energy development projects. For example, a state agency that issues REBs to create a pool of capital used to disburse grants can fund renewable energy projects without financing costs. Where a standard bond used to fund a grant program would require the state to pay both the amount of the grant and the accrued interest on the bond, a REB-funded program can provide grants while paying little to no additional interest. In effect, a REB-funded program can support renewable energy development at a lower cost.

Policy Solutions for Renewable Energy Bonds

States, where possible, should attempt to utilize federal incentive programs to issue REBs to minimize the cost associated with supporting ocean energy development. Necessarily, the continued use of these programs requires their extension. (The CREB program expired in November 2010.) For states and municipalities seeking to further ocean technologies, the expiration of REB incentives has eliminated a crucial source of support for their endeavors.

CREB and QECB have some disadvantages for incenting ocean energy. However, these disadvantages can often be resolved by instituting specific policy changes. The first-come-first-serve nature of the CREB application process may allow sub-optimal projects to receive support instead of more promising projects. In addition, the CREB first-come-first-serve process may unintentionally favor certain types of renewable energy technologies or sources. The population-based issuance of QECBs may disadvantage ocean energy, as the spatial distribution of ocean energy on the northern coasts is not aligned well with the spatial distribution of the U.S. population. Reserving or “carving out” a certain portion of federal REB allocations for ocean energy projects would help ensure that REBs are available when needed to provide direct or indirect support to ocean technology development.

Section 1C: Funding Mechanisms for Financial Incentives

Funding is required to ensure the long-term, continued support of financial incentives to develop renewable energy projects. Many of these programs are often funded via the appropriations process. States often fund their own incentive programs through taxed revenues, appropriations and the sale of debt in the form of bonds. In this sense, federal REB programs are also funding mechanisms, in addition to being financial incentives. Additionally, many organizations that provide support to ocean energy developers, such as the Maine Technology Institute and OWET, are funded out of various legislative or regulatory provisions, such as utility settlements, lottery revenues or directly-mandated legislative funding. While there are many methods of funding renewable energy financial incentives, public benefits funds (PBFs) are the most widely-used method at the state level. This section provides a detailed look at PBFs in the United States.

Public Benefits Funds and Public Purpose Charges

Many states have established PBFs to fund efforts that are deemed to be in the public's best interest, including the promotion of renewable energy and energy efficiency.[41] PBFs are typically mandated by state legislators and funded through a public purpose charge (PPC), which is a small, mandatory charge assessed as an increase in rates (or as a fixed fee) on a customer's electricity bill. The total funding generated by the PPC is used to create dedicated funding for renewable energy, energy efficiency, and low-income energy projects. PBFs and their associate programs are often administered by a third-party organization that was identified or created by the state. In some cases, utilities or local governments establish a PBF.[42] A PBF with dedicated funding for renewable energy provides financial support for a variety of programs, such as grants, rebates, loans, education, and research and development efforts for renewable energy.[43] These programs help ensure that renewable energy is incentivized for project developers, public consumers and utility suppliers. In addition to mandatory PPCs, a handful of voluntary contribution programs are available across the country—these exclude voluntary utility "green power purchase" programs that will be discussed in Section 3 below. Table 4 below identifies the U.S. states with PBFs for renewable energy, estimates each state's level of funding for 2010, and presents total cumulative estimated funding through 2017.

Table 4: States with Public Benefits Funds for Renewable Energy

Issued By	Total Public Benefits Funds	Funding Estimates in 2010 (by amount)	Total Estimated Funding by 2017
States & Washington, D.C.	18	• California: $363.7M • New Jersey: $41.7M • Connecticut: $30M • Massachusetts: $25M • Minnesota: $19.5M • New York: $15.6M • Oregon: $14.2M • Wisconsin: $8.2M • Michigan: $7M • Illinois: $5.5M • Vermont: $4.3M • Delaware: $3.6M • Hawaii: $2.6M • Ohio: $2.5M • Rhode Island: $2.5M • Washington, D.C.: $2M • Maine: $1.3M • Montana: $1.2M • Pennsylvania: $800K	$7.2B by 2017

Source: The Database of State Incentives for Renewables and Efficiency (DSIRE). Public Benefits Funds for Renewables Map. February 2011. Date Accessed: March 7, 2011. http://www.dsireusa.org/documents/summarymaps/PBF_Map.ppt

Federal Public Benefits Funds and Public Purpose Charges

There is no nation-wide PPC or voluntary contribution mechanism. All federal incentives are financed through taxes collected by the U.S. Treasury.

State Public Benefits Funds and Public Purchase Charges

As of February 2011, 18 states and the District of Columbia had adopted PBFs for renewable energy. When combined, they represent an estimated $7.2 billion in funding through 2017.[44] Table 4 above identifies the U.S. states with PBFs, estimates each state's level of funding for 2010 and presents total cumulative funding through 2017. Twelve states—California, Connecticut, Illinois, Massachusetts, Minnesota, New Jersey, New York, Ohio, Oregon, Pennsylvania, Rhode Island and Wisconsin—developed the Clean Energy States Alliance, which manages and coordinates its members' public investments in renewable energy.[45]

Oregon's Public Benefits Fund and Public Purpose Charge

Under authorization from Senate Bill 1149, Oregon mandated a 3% PPC on the customer bills of two large utilities—Pacific Corp and Portland General Electric. The funds are pooled in a PBF administered by the Energy Trust of Oregon and are used to fund projects that benefit the customers of these utilities.

The Energy Trust of Oregon is expected to receive $200 million in total funding from 2001–2017, making it the fifth largest PBF in the United States after California ($4,556 million), New Jersey ($534 million), Connecticut ($445 million) and Minnesota ($327 million).[46] Of the available funds in Oregon's PBF, roughly 56% are used for residential and commercial energy efficiency, 17% for renewable energy projects and power plants, 12% for weatherization in low-income households and 10% for energy efficiency in K–12 schools.[47] The Energy Trust of Oregon's Custom Renewable Energy Projects grant program is eligible for ocean energy. The program provides up to 50% of a project's costs for grant writing, feasibility studies, design, permitting and utility interconnection.[48]

Analysis of Public Benefits Funds and Public Purpose Charges

PBF support can be crucial during the development of an emerging technology, as illustrated in the deployment of ocean technologies. The New York State Energy Research and Development Authority (NYSERDA) is funded primarily with a PPC, also known as a system benefits charge. The PPC provided NYSERDA with 45% (or $335 million) of its total 2010–2011 budget.[49] A NYSERDA effort to support renewable energy and energy storage technology innovation has provided grant funding to Verdant Power for multiple phases of the globally-recognized Roosevelt Island Tidal Energy project.[50] The use of PPC to fund PBFs can provide various and critical types of support to renewable energy developers that help move an emerging industry from early-stage experimentation to commercial-scale technologies.

Although PPCs and PBFs have generally consistent frameworks and purposes, a diverse set of stakeholders shape the character of a state's PPC-funded PBFs. The magnitude and direction of a PPC and PBF may be subject to competing public policy goals. In the case of Oregon's PPC, large customers that use more than 1 megawatt (MW) can choose to self-direct the use of their PPC's. These large business customers can then subtract the costs of energy efficiency projects or on-site renewable energy projects from their PPCs .

Another possible hurdle for PBFs to is the low-income advocacy community, which is tasked with defending the interest of low-income electricity consumers in Public Utility Commission proceedings. These groups, present in most states, are generally resistant to increasing the electricity rates of those that are least able to pay. Accordingly, PBF programs often reflect the concerns of both low-income and large-electricity consumers.

Policy Solutions for Public Benefits Funds and Public Purpose Charges

Oregon meets many PPC best practices. However, ocean energy could benefit from a handful of specific alterations to the Energy Trust of Oregon's PPC. First, ocean energy could be more prominently incented by cordoning off a certain portion of PBF funds for ocean technology development. The existing PPC funds that can be used to fund any renewable energy project under the CREP program is capped at 20 MW, which is consistent with a legislatively-mandated focus on community renewable energy development. In the near term, this limitation has no immediate impact on ocean energy pilot projects, as installations will likely remain under 20 MW in the near future. In the long term, if it is determined that PPC support is the best continual source of funding for ocean technologies, the 20 MW ceiling will prove too restrictive for future commercial deployments. To support the direct commercial deployment of ocean technologies, this ceiling would need to be raised, or an alternative program that provides support to larger innovative ocean energy projects would need to be created by the Oregon legislature.

Voluntary customer charge programs provide an alternative to extending PBF funding and scope. These programs are discussed in Section 3.

Section 1D: Addressing Deployment Barriers and Non-Technology Costs

In addition to targeting the financial side of ocean energy's above-market cost, a number of other issues, policies and processes contribute to the competitiveness of emerging ocean technologies. Until recently, there was insufficient interest in or knowledge of ocean energy technologies within the regulatory apparatus of all levels of government and in the utility sector. Although there is increasing experience with ocean energy potential, federal, state and local governments have yet to adequately address the unique regulatory barriers and non-technology costs of ocean generation. Specifically, the processes for siting and permitting ocean energy projects are complex, time-consuming, redundant and can cause expensive project delays. Together, these issues may increase barriers to project financing due to added uncertainty. Three important areas can be addressed to lower the deployment barriers and non-technology costs faced by the ocean energy industry. First, the permitting process at all levels of government can be streamlined and coordinated to reduce time and costs to project developers. Second, integrated planning efforts can help ensure that optimal ocean energy sites are available for responsible development. Finally, interconnection policies for ocean energy technologies need to be understood and treated equitably when connecting to the electrical grid.

Table 5: FERC Hydrokinetic Preliminary Permits Issued by State as of April 2011

State of Permit	# of Permits Issued	Authorized Capacity (kW)
AK	11	2,302,640
AZ	1	15
CA	6	3,311,000
HI	1	2,700
LA	27	1,346,920
MA	1	20,000
ME	8	43,560
MI	1	19,800
MO	1	76,040
MS	14	1,872,800
NH	1	0
NJ	3	3,240
NY	4	7,296
OR	2	103,000
TN	7	1,110,080
WA	2	7,400
Grand Total	**111**	**10,226,491**

Source: Federal Energy Regulatory Commission. Issued Hydrokinetic Projects Preliminary Permits: Updated 4/6/11. Date Accessed: April 12, 2011. http://www.ferc.gov/industries/hydropower/indus-act/hydrokinetics.asp

Table 6: FERC Hydrokinetic Preliminary Permits Issued by Type of Project as of April 2011

Permit Project Type	# of Permits	Authorized Capacity (kW)
Hydrokinetic-Inland Permit	55	4,426,045
Hydrokinetic-Tidal Permit	26	2,393,496
Hydrokinetic-Wave Permit	9	3,406,950
Grand Total	**111**	**10,226,491**

Source: Federal Energy Regulatory Commission. Issued Hydrokinetic Projects Preliminary Permits: Updated 4/6/11. Date Accessed: April 12, 2011. http://www.ferc.gov/industries/hydropower/indus-act/hydrokinetics.asp

Permitting Processes

In order to legally begin operation, energy generation technologies with broad physical footprints, such as ocean power, require a series of permits and environmental assessments. Permitting for renewable energy and ocean energy projects is one aspect within the siting process. Siting for renewable energy is the comprehensive process to determine where a renewable energy installation can and should occur, while permitting is a process that seeks formal approval to build on the identified site. Ocean energy technology permitting exists in a complex web of federal, state and local regulations that cover the management of coastal and marine environments. An ocean energy project may require numerous permits from a variety of federal, state, and local agencies. Until recently, these regulatory agencies have had little experience assessing and permitting ocean energy projects. The permitting process for ocean energy developers can require significant time and resources.

Federal Permitting Processes

In 2002, the Federal Energy Regulatory Commission (FERC) established jurisdiction "over ocean, tidal and other hydrokinetic projects pursuant of the Federal Power Act (FPA)."[51] Currently, FERC is the federal agency primarily responsible for administering and approving permits for hydrokinetic energy projects, with the exception of projects developed by the Bureau of Reclamation and the Army Corps of Engineers.

FERC issues three types of permits for hydrokinetic ocean energy and in-stream projects, including the following:

- A six-month pilot demonstration license to explore a new technology.
- A three-year preliminary permit to study a hydrokinetic project.
- A 30- to 50-year license to construct and operate a hydrokinetic facility that generates electricity.[52]

A hydrokinetic project must first receive a preliminary FERC permit in order to be eligible to apply for a long-term license. Table 5 and Table 6 above identify the number of FERC preliminary permits for hydrokinetic projects by state and by project type, as of January 2011.

As of March 2011, California, Maine, Washington and Oregon have signed Memorandums of Understanding (MOUs) with FERC to coordinate the regulatory processes for marine hydrokinetic projects.[53] The MOU allows FERC and these states to coordinate their regulatory processes and indicates state support for FERC's efforts to develop a pilot permit for ocean projects.

In addition to the FERC, many other federal agencies retain some element of regulatory jurisdiction over ocean energy projects, depending on the specific location of the project and interaction with other ocean uses, such as commercial fishing, recreation and wildlife habitat. OWET developed a document to help ocean energy developers navigate the licensing and permitting process, which identifies approximately eight federal permits and licenses that an ocean energy project may require. [54] Each permit can take between 45 days and 3 years to approve.[55]

State and Local Permitting Processes

States, tribal governments, counties and cities also play a role in evaluating potential ocean energy projects under various jurisdictions, such as land, water, fish and wildlife, conservation, development, environmental quality, energy, and parks and recreation. Beyond complying with the multilayered legal environment, it may be necessary for a project to receive numerous permits and licenses from several state agencies. Each of these permitting processes have their own requirements that may oblige a project developer to duplicate efforts to supply the information required by each separate entity. These redundant burdens can necessitate additional time, labor, and administrative and professional services that add to the costs faced by ocean energy developers.

Oregon's Permitting Processes

For an ocean energy project in Oregon, the OWET identified approximately eight different state-level permits and licenses that can take between 45 days and 1 year to process and approve. [56] This does not include the time needed to prepare a permit or license application.

While the FERC holds primary responsibility for issuing federal hydrokinetic permits in Oregon, the MOU between the state and the FERC recognizes the need for efficient processes to support the permitting and development of ocean energy in Oregon, and provides an added level of permitting coordination between the FERC and Oregon. The MOU gives special attention to short-term, experimental projects that may benefit from pilot-project licensing to gather data and determine externalities prior to an application for a comprehensive license. In some cases, both parties agree that experimental projects to test new technologies may not require a license from the FERC.

Currently, there are two active ocean energy projects in Oregon that possess preliminary FERC hydrokinetic wave permits.[57] Coos Bay Opt Wave Park—which is being developed in the Pacific Ocean by the Oregon Wave Energy Partners, LLC—has a planned capacity of 100 megawatts (MW). The second project, Douglas County Wave and Tidal Energy—which is being developed on the Umpqua River by Douglas County—has a planned capacity of 3 MW. Both permits were established in 2007 and have a three-year period of performance. The Douglas County project is applying for the 50-year FERC license.[58] A third project, Oregon Coastal Wave Energy, received a preliminary FERC permit, but was surrendered due to project difficulties.[59] A fourth permit application for a 50 MW wave park in Reedsport, Oregon, was submitted by Ocean Power Technologies and is currently under consideration by the FERC.

Analysis of Permitting Processes

The multilayered and often redundant regulatory permitting process adds significant cost and time to the development of ocean energy projects. These additional costs, particularly in the case of initial research and pilot deployments, add financial burdens to developers. Once ocean energy is ready for commercial-scale deployments, a fractured and redundant regulatory process adds additional risk. Investors prefer funding projects with predictable returns. Unfavorable outcomes from the permitting process, such as delay or operational constraints, motivate investors to seek a higher rate of return to compensate for this uncertainty, which raises project costs. While development concerns, such as streamlining the regulatory process, may not play an immediate role in moving ocean technologies towards commercialization, ignoring the significant impact they can have on financing and wide-scale deployment will unnecessarily burden the first commercial wave energy installations.

There are several approaches that would further support the deployment of ocean energy technologies. One is the proper characterization of environmental effects. Defining potential environmental interactions, engaging relevant stakeholders, and ensuring regulatory compliance prior to project development is essential. This problem has plagued recent onshore wind projects where a lack of clearly binding, or at least mandated, regulation has resulted in legal action and constraints on plant operations. Beech Ridge Energy, LLC developed a wind project in West Virginia and did not initially account for the potential impacts the project would have on the local bat population. A colony of endangered Indiana bats resided nearby, and the company has since been forced, post-construction completion, to seek the appropriate permit from the U.S. Fish and Wildlife Service.[60] Meanwhile, the operation of the company's wind plant is constrained at various hours until the permit is obtained.

Policy Solutions for Permitting Processes

Typically, reducing regulatory stringency is an option that, while potentially beneficial to wave energy developers, may prove undesirable for the vast majority of ocean energy stakeholders, such as environmental or recreational activists. Accordingly, one method to reduce the cost and time associated with permitting an ocean energy project is to harmonize the various regulatory processes—local, state and federal—which include a great deal of overlapping requirements. The Oregon-FERC MOU is an excellent first step towards regulatory harmonization as an expression of coordination between federal and state organizations, which may not otherwise work together, but further improvement is possible. Looking at broader improvements to the ocean energy siting and permitting processes, an integrated resource and environmental assessment framework will provide the foundation for full commercial deployment of ocean energy technologies. Such siting processes will be covered in the following section.

Preferential and Integrated Siting Considerations

Siting is the determination of and approval for the location of a renewable energy project. Given the geographical inflexibility of most renewable energy types, the first siting consideration is the presence and availability of the renewable energy resource. Numerous other factors can have a significant impact on whether the resource location can be developed economically and without significant disruption to society or the environment. Siting and permitting overlap in key ways and are best addressed in an integrated fashion.

Following are four important barriers for siting renewable energy projects after resource availability:

- Public opposition to the project and/or project location.
- Regulatory constraints and processes.
- Environmental issues and impact.
- Electrical grid system and infrastructure barriers.[61]

Each of the abovementioned siting barriers for renewable energy can pose significant, costly and time consuming hurdles for a project. Currently, renewable energy projects are regularly sited and considered for siting by regulatory agencies on a case-by-case basis.

In contrast to siting a renewable energy project on a case-by-case or site-by-site basis, preferential siting is a coordinated planning process that requires significant analysis of the economic, social, environmental, aesthetic, legal and grid infrastructure characteristics of locations with renewable energy resource availability. Preferential siting is conducted by a regulatory agency (or set of regulatory agencies) that seeks to identify the most promising sites for renewable energy development. Upon conclusion of a comprehensive analysis, the regulatory agency identifies preferential regions or locations for renewable energy development, and then develops a set of regulations and incentives to streamline the process and attract developers to those areas. An efficient siting process shortens approval times and reduces costs to renewable energy project developers. Additionally, the process ideally lessens the negative environmental and social impacts of the project.

Federal Siting Policies

In 2009, President Obama created the Interagency Ocean Policy Task Force to evaluate a national oceans policy and signed a Presidential Memorandum that requested the task force to develop recommendations on "a framework for effective coastal and marine spatial planning (CMSP)."[62] The Interim Report of the Interagency Ocean Policy Task Force recognizes the need for a more efficient and effective means to coordinate ocean policy and recognizes the complexity of current regulation by stating, the "United States government and management of [the ocean] span hundreds of domestic policies, laws, and regulations covering international, Federal, State, tribal, and local interests…Challenges and gaps arise from the complexity and structure of this regime."[63] A national effort to streamline ocean energy permitting processes through coordination between federal, state and local agencies would be a significant benefit to the emerging industry in terms of time and cost.

The National Oceanographic and Atmospheric Association is coordinating ongoing national efforts at CMSP, which is a key prerequisite of establishing integrated and preferential siting policies for ocean energy technologies. CMSP generally attempts to assess and plan out the varying uses of ocean "real estate." CMSP also attempts to plan out the optimal mixture of recreational, economic (e.g., fishing) and environmental uses of ocean "real estate" while actively engaging the appropriate stakeholders, regulators and developers in ocean energy uses.

State Siting Policies

All U.S. ocean states and Great Lakes states[††] possess a vested interest in ocean energy technologies due to the potential impact CMSP has on them. Oregon and Washington both have active research programs for marine spatial planning. However, as of January 2011, Washington's program will remain idle until adequate funding becomes available.[64]

Oregon's Sitting Policies

Oregon has a vigorous, ongoing CMSP research effort led by the Territorial Sea Plan Working Group.[65] The planning efforts would amend Oregon's Territorial Sea Plan to accommodate the widespread deployment of wave devices in areas deemed optimal through the use of CMSP. The varied uses of Oregon's territorial water necessitate deliberate analysis and careful distribution of ocean resources between recreational, commercial, environmental and energy uses. In addition, California, Oregon and Washington joined together in 2006 to form the West Coast Governors' Agreement on Ocean Health.[66] The purpose of the effort is to coordinate a regional approach to ocean and coastal health and resource management along the West Coast. In 2009, the group met in Seattle, Washington to conduct the Marine Spatial Planning for Renewable Energy on the West Coast workshop in order to support the development of a Coastal Siting Report to "inform decision-makers, industry, and stakeholders about the feasibility for renewable energy in the state and federal waters off Washington, Oregon, and California."[67] This effort is an excellent example of an attempt to collaborate across government agencies and jurisdictions to analyze the potential for siting of ocean energy.

Analysis of Siting Policies

CMSP is not only essential in determining where promising ocean energy resources are located, but it is also important in determining which resources are viable and acceptable for development, given the highly complex interplay between competing end uses. For decades, a variety of ocean users and associated stakeholders have competed for access and protection, and the introduction of a new and potentially spatially expansive use may require a realignment of ocean priorities.

In addition to ensuring that ocean space is available for wave deployments, integrated planning and siting efforts can reduce ocean energy costs on multiple fronts. First, the pre-identification of optimal wave energy resources via resource assessments and planning efforts is of immediate assistance to developers, both reducing survey costs and streamlining permitting through stakeholder and regulatory

[††] **U.S. ocean states include:** Washington, Oregon, California, Texas, Mississippi, Alabama, Florida, Georgia, South Carolina, North Carolina, Virginia, Maryland, New Jersey, Delaware, New Jersey, Connecticut, Massachusetts, and Maine. **U.S. Great Lakes states include:** Michigan, Pennsylvania, Ohio, Illinois, Iowa, New York, Wisconsin, and Minnesota.

agency engagement. Second, the optimal siting of ocean energy technologies will result in improved performance, lowering the cost of producing energy relative to a less appropriate site. Through the identification of competing uses, the very best locations for wave energy deployment can be determined. Third, the comprehensive, pre-deployment analysis of environmental and societal factors helps ensure that approved sites will have fewer environmental and public opposition "surprises" when a project is deployed. Finally, for all of the reasons listed, preferential sitting provides an increased level of certainty for a project, removing financial barriers and reducing risk.

Policy Solutions for Sitting

While Oregon's effort to develop coordinated planning is an excellent first step towards an integrated development strategy, further action is necessary. In particular, an explicit understanding of ocean energy's infrastructure needs, as well as preemptive stakeholder engagement, can help speed the siting and permitting processes and increase a project's ultimate likelihood for success. Klickitat County, located in Washington, provides a template for how preferential siting can support the removal of barriers for renewable energy siting and address valid environmental, economic and societal concerns. Klickitat developed a Comprehensive Plan for establishing an Energy Overlay Zone for the development of its abundant wind resources.[68] The plan allowed the county to strategically and efficiently analyze ideal locations for wind energy development based on resource availability, environmentally sensitive areas and infrastructure constraints for transmitting wind energy. Through the county's careful analysis and citizen engagement process, it identified southern and eastern portions, known as the Energy Overlay Zone, where wind developers were automatically approved for projects within a 1,000-square-mile area.[69] The plan was approved in 2006, and over the next four years, 624 wind turbines were erected in the Energy Overlay Zone. Numbers are expected to reach 1,000.[70]

While the environmental and stakeholder issues for wind energy and ocean technologies are different in many ways, the methodology employed to create a preferential siting area in Klickitat County demonstrates an effective effort at streamlining the renewable energy development and siting process. Siting ocean technologies can be addressed in a similar fashion by performing a comprehensive set of environmental studies, engaging with coastal communities and stakeholders and identifying the key resource areas where ocean device deployments can produce the highest share of renewable energy. When considering its plan, Klickitat County recognized that reviewing energy projects on a site-by-site basis was inefficient and could lead to poor planning. The Klickitat Comprehensive Plan for the Energy Overlay Zone provided a means for the county to analyze the diverse and competing concerns regarding energy development, helping it determine the best possible locations for energy and economic development to occur with the minimal environmental, social and aesthetic impacts. In this way, Klickitat moved its renewable energy regulatory process from a time-consuming and fragmented case-by-case basis into a comprehensive, integrated and efficient process that supported both significant wind energy development and significant economic development. The Klickitat method focused on five criteria:

- Pre-study, high-potential sites.
- Pre-study impacts on species/ecosystems of high concern.
- Early civic engagement.
- Pre-study transmission system.
- Net impact to reduce strain on applying companies during permitting process.

Given the success of the Energy Overlay Zone, full-scale CMSP in Oregon and follow-on efforts to include the explicit consideration of ocean technology infrastructure needs, such as transmission interconnection and port accessibility, could prove to be a highly effective means to leverage funds to support the development of an ocean energy industry.

These Oregon-centric considerations remain relevant even if ocean developers begin to push past Oregon's territorial three-mile sea border. While the arrays themselves will eventually lie in federal waters administered by the Bureau of Ocean Energy Management, the critical interconnection and support infrastructure will remain solidly within Oregon's CMSP zone. This dual jurisdiction adds particular urgency to extending the regulatory coordination efforts identified in the previous section to CMSP.

Interconnection and Operations

"Interconnection" typically refers to the physical connections between energy generating facilities and the grid. "Operations" typically refers to the set of policies and regulations surrounding the actual exportation of power from those facilities. Both interconnection and operations are significant concerns for renewable energy developers and the utilities that own, operate and manage grid infrastructure. Where traditional electricity is generated in large, centralized facilities at constant and controllable rates, renewable energy sources supply power intermittently from distributed or decentralized locations. For example, wind plants can endure large swings in production as wind speeds change. Utilities are concerned that renewable energy sources pose a challenge to grid reliability and quality of power and safety.[71] In response, utilities have established policies for renewable energy that requires a technology to include controls on how production feeds the grid and mechanisms for shutting generation down in specific or emergency circumstances. Implementing these controls and complying with utility interconnection policies are both complicated and costly for renewable energy technology producers and project developers. On top of requirements for implementing renewable energy technology safety mechanisms, utilities may charge additional fees for interconnecting, a renewable source or both to offset the additional infrastructure and ancillary service expenditures for renewable energy.

Federal Interconnection Policies

In May 2005, FERC issued an interconnection standard for small generators (Order Nos. 2003, 2003-A, 2003-B, and 2003-C) of renewable and distributed resources, including ocean energy, with a capacity of up to 20 MW.[72] The FERC standard provides a "division of labor" with states so that FERC standards apply to transmission-level interconnection and state standards apply to distribution-level standards for virtually all sectors. While an external disconnect switch is not currently required by systems under the FERC standard, liability insurance for "all reasonably foreseeable direct liabilities" for a specific system is required.[73] Generators larger than 20 MW are required to follow FERC's large generator interconnection standards.

Regarding operations, FERC recognizes that the impact of variable generation is relevant. Therefore, because ocean energy generators' production is more predictable than that of wind generators, different fee structures are appropriate and should be pursued.

State Interconnection Policies

Forty-four states and Puerto Rico have adopted some formal standard for the interconnection of renewable energy generation systems.[74] Alabama, Alaska, Idaho, Mississippi, North Dakota, Oklahoma, Rhode Island and Tennessee have not.

Oregon's Interconnection Policies

Oregon has issued three interconnection standards for different types of systems and system sizes, as well as specific standards for the largest investor-owned utilities, municipalities and electric cooperatives.[75] However, Oregon has not identified ocean power as a type of renewable energy technology within these standards. OWET established the Utility Market Initiative (UMI) to coordinate and accelerate ocean energy development in the state. UMI conducted significant research and provided a detailed report—Integrating Oregon Wave Energy into the Northwest Power Grid—that outlines tools, resources and recommendations for the interconnection of ocean energy in Oregon.[76]

Analysis of Interconnection Policies

The establishment of uniform interconnection and operations policies at the state and federal levels is the culmination of long-term operating experience. The analysis of device and array performance has allowed policy makers to begin defining the costs and requirements of integrating variable renewable generation onto the grid. These costs and requirements are typically "ancillary services" provided to the grid, such as the energy needed to smooth out renewable fluctuations and the capacity necessary to operate stand-by generation when unforecasted changes in generation occur.

The issue of paying for ancillary services, such as balancing energy or synchronized reserves, is resolved in the marketplace in competitive electricity market environments. In service territories that lack market instruments to reflect the added costs of balancing variable renewables, system operators may elect to add a surcharge to the interconnection, operations of variable installations or both. Particularly relevant to Oregon, the Bonneville Power Administration (BPA) has sought to add surcharges for the integration of wind energy into its system. In its 2010 rate case, BPA argued that a $12/MWH fee be charged to wind energy imported into BPA to account for the ancillary services necessary to accommodate the variable renewable generation.[77] While this rate was ultimately negotiated down to $5.70/MWH, BPA's concern about renewable integration was clearly evident. This concern may grow as the amount of wind, and possibly an increasing amount of ocean generation, in the BPA system continues to expand.

BPA's current experience with interconnecting and operating wind and hydroelectric power is an example of the challenges a utility faces with renewable energy. Between 2005 and April 2011, BPA's wind capacity grew from 250 MW to 3,500 MW. The growth in BPA wind capacity outstripped its territory's demand growth for electricity, but certainly helped California utilities purchase the power necessary to meet both its growing demand and the state's aggressive RPS policy.[78] In order to balance the variation in electricity supply and demand, BPA must substitute hydroelectric power and wind power when one source is producing too little or too much. However, reducing hydroelectric power from dams requires allowing freshwater to flow freely through spillways, which can have a negative impact on fish species BPA is required by law to protect. In addition, the spring season poses a special challenge—both rain and snow melting increase hydroelectric power, and spring storms simultaneously intensify wind generation. BPA finds itself in a position where it is generating more electricity than its consumers need, and in June of 2010, BPA was nearly forced to pay other utilities to shutdown their plants and buy BPA power instead. Had BPA experienced "negative pricing," where it was paying other utilities more to shut down than it made from selling power, it would have been costly. In addition, it would have been costly for wind producers that lose tax benefits and RECs when wind power is reduced.[79] As wind capacity continues to grow in BPA's territory, there are significant concerns among stakeholders about the interconnection of wind and other renewable energy sources.

In western Oregon coastal transmission and distribution assets are predominately owned and operated by[80] publicly owned utilities in cooperation with the Bonneville Power Administration or PacifiCorp. In general, coastal transmission capacity in western Oregon is somewhat constrained. Thus, in addition to interconnection application fees, as well as costs for feasibility, system and facilities impact studies and NEPA studies ocean energy developers looking to sell power to the states IOU's (where avoided costs would be highest) could also expect to pay wheeling charges.

Policy Solutions for Interconnection

In the near term, revising interconnection and operations policies to scale equitably with installation size would be highly beneficial to the current and future generations of ocean energy pilot projects. Recently, the California Independent System Operator revised its interconnection policies to lower costs of the initial phases of the interconnection process, particularly for smaller deployments.[81]

Existing, as well as proposed near-term, ocean energy facilities are small and should pose little danger to grid stability. These initial deployments offer device developers and system operators the opportunity to carefully observe the variable characteristics of ocean energy generation. Ocean power is likely to be more predictable than wind, but establishing how and the extent to which this is true requires reliable observations and data from a successive series of demonstration, pilot and research projects. A beneficial policy, at this point in the development of ocean energy technologies, would be to exempt developers and operators from the surcharges associated with variable renewables until appropriate baseline data can be collected from which to form an economically rational method of valuing the impacts of ocean technologies on grid stability.

From a long-term perspective, regulated and independent system operators can begin to build an information architecture of ocean technology interconnection policies. Once adequate performance data is available, these polices can charge in relation to ocean technology's impact on the electrical system. Automatically grouping ocean energy into a category with onshore wind for reasons of simplicity and risk-aversion may create unnecessary financial and regulatory hurdles for the ocean energy industry.

Section 1E: Analysis of Pros and Cons

No analysis of pros and cons would be relevant without an acknowledgment that budget constraints at the federal and state levels will create significant limitation on what sorts of incentives are possible under current economic conditions. Incentives that do not require outlays of public money are more likely to be embraced than those that require public money. Incentives that leverage private capital are more likely than outright grants in many cases. Incentives that have clear employment benefits are gaining in popularity.

With that said, each incentive possesses benefits and drawbacks. However, some incentives designed to reduce the cost of ocean energy are clearly superior at this phase of early-stage development. Table 7 below summarizes the pros and cons of each incentive discussed in Section 1. As a later player in the renewable energy market, ocean energy has a distinct advantage. Policy best practices are becoming increasingly clear, and many of the starts and stops seen in other clean tech industries can be avoided by laying the appropriate policy framework for ocean energy. Providing this framework, even in its early-stage of development, helps remove barriers to widespread commercial deployment of ocean energy.

Grants and performance-decoupled tax incentives will provide the necessary capital for researching, testing and experimenting to refine device designs. Funding for feasibility studies and proof-of-concept designs are efficient ways to identify promising device configurations in a broad spectrum of technologies that can begin to move the industry towards one, or a small set, of standard device profiles. This period bears great similarity to the 1980s experimentation phase of wind energy development. The three-bladed, up-wind design that ultimately emerged as the industry standard has allowed for the targeted research and development necessary to dramatically improve survivability and efficiency. The natural sifting out of less promising technologies is a contributing factor in increasing cost-parity and proliferation of wind power. Ocean energy technologies sit at this point now, and policy must reflect that reality.

In addition to grants, a number of policies and incentives can pave the way for ocean energy's maturation. Integrated siting and permitting processes must be identified and pursued. Ocean energy developers must be eligible for proper tax incentive policies; specifically, a sales tax exemption (where sales taxes exist), an accelerated depreciation schedule and well-designed investment tax credits to attract early stage investors who can help fund R&D.

As projects become larger, attract private investment, and begin commercial deployments, production-decoupled tax incentives such as the Investment Tax Credit (ITC) become increasingly effective. Additional financing support will also be necessary to shepherd the first commercial installations through an emerging technology's developmental "valley of death." This support should include loans and renewable energy bonds.

As these technologies mature, achieve a measure of production and performance certainty, and are deployed at utility scales, incentives such as the Production Tax Credit (PTC) and loans and loan guarantees become the policy tools of choice to support renewable energy. Because ocean technologies can take lessons from the history of other renewables, implementing necessary policies in advance can streamline their progression from concept to large-scale deployment.
Coordinating these policy mechanisms and queuing them up to go into effect as they are needed will be essential to jumpstarting and maintaining an ocean energy industry moving toward commercialization.

Table 7: Pros and Cons Analysis of Incentives and Policies to Reduce the Cost of Ocean Energy

Incentive	Pros	Cons
Grants	▪ Most direct method of incenting ocean energy development as it reduces immediate and upfront costs ▪ For earlier-stage technologies with uncertain production performance, grants are more effective than tax incentives or loans that are contingent on production performance	▪ Lack of performance requirements can raise concerns over risk-sharing ▪ Poorly administered grant funding may not lead to self-sustaining projects or industry growth, locking particular recipients into a dependency on additional government funding ▪ Future uncertainty in funding availability for state and federal grants
Tax Incentives	▪ Tax incentives reduce the total cost of an ocean energy project ▪ Because performance is uncertain, investment tax credits (ITCs) are preferred over production tax credits (PTCs) ▪ Quick recovery of asset value means ITCs supports technical experimentation ▪ With more mature technology, PTC is preferred as it provides an incentive for performance ▪ Accelerated depreciation highly effective for capital-intensive technologies	▪ Limits the number of eligible participants ▪ Non-taxable entities are not eligible ▪ Without provisions for pass through or credit refunds, tax incentives are contingent upon the presence of adequate taxable revenues ▪ Property tax is largely irrelevant as offshore energy typically falls under leases in lieu of property taxation
Loan Incentives	▪ Renewable energy pilot projects otherwise ignored by lenders gain access to debt capital ▪ Reduces financing barriers to creditworthy companies and industries that the market fails to finance	▪ Limited use for early-stage technology, as performance and reliability is necessary to guarantee cash flow to pay off debts ▪ Issues of risk-sharing can add considerable cost to a loan guarantee
Renewable Energy Bonds	▪ Direct lending gives ocean energy technologies direct access to debt capital ▪ Tax incentive provisions lower the interest rate below that of a loan guarantee	▪ Borrowers must still meet payments for loan duration, an uncertain proposition without performance certainty ▪ Existing distribution methods (application, allocation by population) may not be ideal for ocean energy technologies
Public Purpose Charges	▪ Provides consistent funding for renewable and ocean energy programs and incentives	▪ Increase in electricity rates can often elicit opposition by non-developer stakeholders ▪ Typically confined to those projects that provide benefit to customers of an IOU ▪ Competing uses for public benefits funds programs limit the pot of benefits available to ocean energy
Preferential Siting & Permitting	▪ Reduces time and cost to government and project developers ▪ Encourages all variables to be analyzed with minimal integrated impacts	▪ Requires significant preplanning resources ▪ Delicate balancing act with environmental concerns
Interconnection	▪ Revisions to existing interconnection policies can reduce technical and financial barriers to ocean energy development	▪ The lack of operating data for ocean energy technologies makes system operators hesitant to interconnect without "wind-like" regulations

Section 1F: Recommendations for Reducing the Costs of Ocean Energy

(Note: Many of the cost reductions needed in the Ocean Energy industry relate to research development and deployment, which are beyond the scope of this report.)

There are important financial incentives, supported with policy mechanisms that we recommend the ocean energy industry pursue. Coordinating these policy mechanisms and queuing them up to go into effect as they are needed will be essential to jumpstart and maintain an ocean energy industry moving toward commercialization.

Build Alliances

As an emerging renewable energy technology, ocean energy will need substantial economic incentives to reach commercialization and become competitive in the energy sector. Gaining the political support for such incentives will require a well-organized, thoughtfully planned and tenaciously pursued strategy. In the current economic climate, it is essential that this strategy focus not on the future environmental benefits of renewable energy, but on near-term local economic development and job creation. This will require building durable, mutually beneficial relationships within the manufacturing sector. This sector has much to gain from a strong ocean energy industry and manufacturing jobs are essential to Oregon's economy. Hence, a strategy that improves manufacturing in the state is much more likely to be supported by state economic policy.

In addition, much of the economic activity ocean energy will create in the state will utilize private sector, rather than government dollars. Policies that leverage large amounts of private investment with smaller amounts of public investment are much more likely to meet with the approval of policy-makers. Therefore, the ocean energy community should work to build strong, mutually rewarding alliances with the investment community in the Northwest. Members of this community are well aware of the types of incentives that attract private investments in new technology. Working collaboratively on *specific* legislative proposals should be a high priority for the ocean energy industry.

Finally, According to the May 6th Edition of Clearing UP:

> *The Port of Walla Walla and the Southeast Washington Economic Development Association (SEWEDA) have joined forces to promote the development of renewable energy industries in five counties in SE WA. These two groups formed the Southeast Washington Renewable Energy District (SEWRED) late last month as an economic development alliance. Its goal is to help business development in renewable energy industries by offering assistance with "site selection, planning, workforce recruitment and training, permitting, licensing, and access to research and financial resources," according to the group's website. The alliance's near-term focus will be the wind resources in the five counties, which currently host 10 projects in various stages of development. "The buzz words are 'the supply chain,'" said Duane Wollmuth, SEWEDA's executive director.*

This approach in Oregon coastal communities could be highly successful. Exploration is recommended. In addition, we recommend working with leaders in the coastal communities where the economic benefits of ocean should be most prevalent. Working collaboratively on specific legislative proposals that benefit both ocean energy and the coastal communities should be a high priority.

Section 2: Regulatory Markets for Ocean Energy

Past experience with emerging renewables makes it clear that addressing the above-market cost of emerging energy technology through policy best practices and financial incentives is essential, but insufficient to commercialize ocean energy. There must also be a demand for ocean energy in order for commercialization to be successful.

There are two approaches to driving demand: regulatory drivers and voluntary drivers. Regulatory drivers are discussed in this Section. Voluntary drivers are discussed in Section 3.

Section 2A: Regulatory Policy to Stimulate Ocean Energy Demand

There are three mechanisms through which regulatory demand can be stimulated: renewable energy portfolio standards, feed-in tariffs and power purchase agreements. Renewable energy portfolio standards and feed-in tariffs are clear and effective government policies that can stimulate the demand for ocean energy power generation. Power purchase agreements are a product of policy and provide a vehicle for transforming policy through market mechanisms that support the purchase of renewable power.

Renewable Portfolio Standards

A renewable portfolio standard (RPS) is a policy tool that the majority of state legislatures have used to ensure the production of electricity from renewable sources. A state RPS is a requirement—either voluntary or mandatory—that requires utilities to produce or purchase a certain amount of renewable energy in a given timeframe. For example, a RPS may require that 20% of power generation be acquired from renewable energy by the year 2020. These policies typically cover large, investor-owned utilities (IOUs), and can extend to municipal electric authorities and electricity cooperatives.

RPS-eligible generation is tracked through renewable energy credits (RECs), which are a commoditized measure of renewable energy production. Typically, 1 REC is created by 1 MWH of renewable generation. (For a more detailed discussion of RECs, please see Section 3.) To ensure proper compliance and accuracy of renewable generation reporting, RECs are usually tracked and certified by specialized systems, such as the Western Electricity Coordinating Council's Western Renewable Energy Generation Information System[82] or PJM's Generation Attribute Tracking System.[83] (For a more detailed discussion of tracking systems, please see Section 3.) The presence of these systems allows a standardized method for recording renewable generation and facilitates the trading of RECs between and within states on a consistent basis.

State RPS provisions can be designed to support specific types of renewable energy technology. One method is to provide a multiplier incentive in the RPS policy. A multiplier incentive allocates "bonus" accounting credits to the buyer of RECs from applicable technologies. Each MWH of energy produced continues to receive only 1 REC, but eligible technologies receive additional accounting "credit" toward the RPS. For example, a state RPS might issue a 2-1 ocean energy multiplier incentive. Under this policy, each MWH of ocean energy produced would provide 1 Ocean Renewable Energy Credit (OREC). The purchaser of this OREC would be allowed to count 2 MWH of ocean energy toward the state RPS target. The multiplier incentive is a state policy tool for encouraging particular types of renewable energy technology.

A separate RPS tool used to favor technologies is a "carve out" provision, which requires a certain share of the RPS target be met by RECs from a specific technology. For example, a state RPS might require that 5% of the RPS target is achieved with ORECs.

RPS targets can be divided into tiers. Each tier has its own compliance mandate and consists of renewable energy from various sources and vintage (installation) dates. In all current RPS policies that identify ocean energy technologies as eligible for achieving the RPS target, ocean energy is considered a Tier 1 resource. Typically, Tier 1 is the main RPS tier with the highest procurement requirements, but most expansive eligibility.

State RPS provisions also identify non-compliance penalties or alternative compliance payments (ACP) for utilities that do not achieve the set targets. In some cases where renewable energy generation is expensive, a utility may opt to pay the ACP instead of generating or purchasing the required levels of renewable energy.

Federal Renewable Energy Standard

With the majority of U.S. states enacting a RPS for renewable energy, utilities spanning multiple states, like Oregon-based PacifiCorp, face complex regulatory and compliance environments regarding renewable energy power generation. There is some support to create a federal RPS that would at least set a minimum standard for all states to achieve, but these efforts are contentious and are not likely to become law in the near future.

In 2009, two bills were proposed in U.S. Congress that called for a federal RPS. Both bills required utilities to produce 25% renewable energy by 2025, a renewable energy target identified previously by President Obama.[84] Both bills also included ocean energy among several eligible renewable resources. In 2010, another bill was proposed for a clean energy standard (CES), which moved beyond the federal RPS proposal to include nuclear energy and clean coal, in addition to other renewable energy sources.[85] In the recent State of the Union Address, President Obama presented an ambitious new target of 80% renewable energy by 2035.[86] To date, none of these bills have been passed. Currently, Senator Jeff Bingaman [D-New Mexico] and Senator Lisa Murkowski [R-Alaska], originators of previous bills on RPS and CES respectively, have joined together to engage legislators on drafting a passable federal CES.[87] However, uncertainty still exists about if and when an energy bill will be passed in Congress, and about what ultimate provisions may be included for types of clean energy sources, technology carve outs and the extent that state/regional differences will be recognized.[88] The nature of these provisions in a federal RPS or CES will have important consequences for whether a federal standard would stimulate the market and financing for renewable energy, and if so, what types.

State Renewable Portfolio Standards

As of March 2011, 36 states and the District of Columbia have some form of RPS. Of these RPSs, seven are voluntary programs, typically referred to as Renewable Portfolio Goals (RPG).[89] Eighteen states and the District of Columbia allow ocean energy in their RPS provisions.[90] Table 8 below identifies the states with RPS provisions that include ocean energy as an eligible renewable energy source.

Table 8: States with Renewable Portfolio Standards with Ocean Energy Provisions

State	Renewable Portfolio Standard Stringency	Renewable Portfolio Standard Target	Eligible Ocean Energy Technologies
California	Mandatory	20% by 2010; 33% by 2020 expired with Governor Schwarzenegger's term	Wave, Tidal, and Thermal Gradients
Connecticut	Mandatory	At least 23% by 2020	Wave, Tidal, and Thermal Gradients
Delaware	Mandatory	25% by 2025	Wave, Tidal, and Thermal Gradients
District of Columbia	Mandatory	25% by 2020[91]	Wave, Tidal, and Thermal Gradients
Maine	Mandatory	At least 40% by 2017	Tidal Only
Maryland	Mandatory	18% from Tier 1 sources and 2% from solar by 2022	Wave, Tidal, and Thermal Gradients
Massachusetts	Mandatory	15% from new Class 1 resources by 2020	Wave, Tidal, and Thermal Gradients
Michigan	Mandatory	10% by 2015, plus an additional 1,100 MW of capacity from the two largest utilities by 2015	Wave and Tidal
New Hampshire	Mandatory	Acquire RECs equivalent to 23.8% by 2025	Wave, Tidal, and Thermal Gradients
New Jersey	Mandatory	22.5% by 2021	Wave and Tidal
New York	Mandatory	30% of consumption by 2015	Wave, Tidal, and Thermal Gradients
North Carolina	Mandatory	12.5% by 2021	Wave and Tidal
Oregon	Mandatory	25% by 2025	Wave, Tidal, and Thermal Gradients
Rhode Island	Mandatory	16% by 2019	Wave, Tidal, and Thermal Gradients
Texas	Mandatory	5,880 MW by 2006; 10,000 MW by 2025	Wave, Tidal, and Thermal Gradients

Utah	Subject to Cost-Effectiveness Test	20% by 2025	Wave, Tidal, and Thermal Gradients
Virginia	Voluntary	15% by 2025	Wave and Tidal
Washington	Mandatory	15% by 2020	Wave, Tidal, and Thermal Gradients
Wisconsin	Mandatory	10% by 2015	Wave and Tidal

Source for State RPS policies with ocean energy eligibility (Columns 1, 2, and 4 in Table 8): The Database of State Incentives for Renewables and Efficiency (DSIRE). Quantitative RPS Data Project: RPS Data Spreadsheet January 2011. Date Accessed: March 4, 2011. http://www.dsireusa.org/rpsdata/index.cfm
Source for State RPS targets (Column 3 in Table 8): American Council on Renewable Energy. Renewable Energy in America: Markets, Economic Development and Policy in the 50 States. Spring 2011 Update. Date Accessed: March 9, 2011. http://www.acore.org/publications/50states

Oregon's Renewable Energy Portfolio Standard

In 2007, Oregon passed the Oregon Renewable Energy Act (Senate Bill 383), which established a mandatory RPS for state utilities of all sizes.[92] Oregon's RPS requires large utilities to meet 25% of their generation needs with RPS-eligible technologies by 2025, (shown in Table 8 above), with a number of intermediary targets. A large utility is defined as one serving more than 3% of Oregon's generation needs. Smaller utilities (serving between 3% and 1.5% of Oregon's generation needs), and the smallest utilities (serving less than 1.5% of Oregon's generation needs) are subject to targets of decreasing stringency at 10% and 5% of generation by 2025, respectively. Oregon has no carve out provisions, but does include a 2-1 multiplier incentive for solar RECs from facilities with capacities between 500 kW and 5 MW.

The trading, import and banking of RECs is allowed under the Oregon RPS, however, there is a condition regarding the use of bundled versus unbundled RECs. An unbundled REC is one that has been decoupled from the electricity produced, and thus only represents the 1 MWH of environmental and other benefits of renewable energy. Under Oregon's policy, an unbundled REC also signifies that the electricity was produced in a facility located in the Western Electricity Coordinating Council's territory in the United States, Canada or Mexico. A bundled REC is purchase along with the electricity with which it is associated. Oregon's RPS states that bundles RECS must be produced in a facility within the United States portion of the Western Electricity Coordinating Council's territory.[93] Oregon's RPS stipulates that large utilities can meet no more than 20% of their annual requirement with unbundled RECs.[94] Public utilities can achieve their annual requirement with up to 50% unbundled RECs. RECs from Public Utility Regulatory Policy Act of 1978 (PURPA) facilities are exempt from any limit.[95] In addition, Oregon's RPS policy states that unbundled RECs may only be traded through the Western Renewable Energy Generation Information System tracking and compliance platform.

Analysis of Renewable Energy Portfolio Standard

Utilities are generally unwilling (or unable due to regulatory policy) to pay the above-market costs to purchase renewable energy. This, in addition to decreased electrical loads experienced by many utilities, creates a demand constraint shared by all newer renewable generating technologies, such as wind and solar power. In the absence of an additional market for their generation, renewable energy producers find it difficult to sell power when cheaper fossil generation, such as that from natural gas and coal, is readily available. The market created by a RPS ensures that at least some percentage of renewable generation must be purchased.

Structurally, RPS provisions and the renewable energy market they create may not stimulate market demand for ocean energy. In current RPS stipulations, if ocean energy technologies are considered eligible, they are eligible as just another Tier 1 resource. This places ORECs in direct competition with the RECs of more mature, less expensive technologies, such as biomass and wind power. Even if these other resources did not exist, the extremely high costs of energy from pilot ocean projects means that these projects are largely unable to find buyers for the full cost of an OREC. For example, the Oregon Tier 1 Alternative Compliance Payment (ACP) for 2011 is $50/MWH. Initial arrays of wave devices are expected to produce energy at a cost of $200–$300/MWH.[96] At best, a market exists for ocean energy only at prices below the $50 ACP, and likely lower when the price-depressing effects of competitive wind generation are taken into account.

Current ocean technologies suffer from an additional constraint—to realize the benefits of any RPS, an ocean energy facility must produce power in order to sell RECs. While near-term ocean deployment will certainly produce some energy, the purpose of these deployments is experimentation, testing and refining processes and designs. The inevitable production uncertainty associated with pilot projects will further hinder ocean energy's ability to sign long-term REC contracts, and ultimately reduce the number of RECs the facility can sell relative to eventual commercialized designs. In fact, early –stage projects may not be connected to the grid at all and would hence generate no RECs.

This limitation is relevant to all production-related policy mechanisms for incenting renewable energy development, such as production tax credits, feed-in tariffs and voluntary green power purchasing. Until ocean energy developers can generate enough production to sign financially meaningful long-term contracts, they cannot distribute their fixed costs widely enough to bring down ocean energy prices.

There are a number of RPS architecture modifications that could make such policies more hospitable to the creation of a market for ocean energy. Specifically, an RPS could include multiplier incentives and a carve-out incentive for ocean energy technologies. However, multiplier incentives and carve-outs are likely to meet opposition on various fronts. Carve-outs raise the costs of RPS compliance by virtue of segregating a share of the target for technologies too expensive to otherwise compete with standard Tier 1 RECs. Carve-outs also raise the political issue of preferentially favoring specific technologies and industries, which potentially prompts developers of less-favored technologies to either voice opposition against the proposed amendment or seek their own carve-out or additional incentive. Multipliers also suffer from this latter concern, with the added downside of reducing the total amount of renewable generation required to meet the compliance target.

Policy Solutions for Renewable Energy Portfolio Standard

The solar industry has used RPS provisions to great effect. It has faced the challenge of above-market costs, particularly for rooftop residential photovoltaic (PV) installations. However, this has not inhibited widespread adoption in certain areas of the country. Two states are national leaders in solar energy development, with California ranked first in installed solar capacity and New Jersey ranked second.[97] However, the success of solar in these states is born in part from different policies. California's solar development is largely incented by the state's 2009 feed-in tariff that is designed for small-scale solar generation,[98] while New Jersey's very significant addition of solar PV capacity is largely the product of an aggressive RPS solar carve-out. New Jersey's RPS requires major utilities to source 5,316 GWH of solar power per year by 2026.[99] Assuming a 15% capacity factor, the New Jersey generation target implies an installed solar resource base of more than 4 GW.

The strong and focused subsidization of solar power comes with a need to aggressively ensure compliance. In New Jersey, compliance is achieved by setting a very high price for solar's ACP. If a utility does not meet its target for solar, it is required to pay $658/MWH for a solar REC, with an average cost of roughly $600/MWH.[100] The high price for non-compliance has stimulated the rapid development of a solar industry. In 2010, New Jersey installed more than 100 MW of solar capacity, exhibiting the second largest growth in installed solar capacity in the country after California.[101] New Jersey's approach has not only resulted in significant PV installations, it has also created a robust new industry that is creating jobs in the state. According to the Solar Jobs Census 2010 (issued by the Solar Foundation), New Jersey's solar industry represents nearly 3% of all solar jobs in the United States and already employs more workers than the state's traditional power generation sector.[102] Nationally, New Jersey is ranked 11th in terms of the number of solar industry jobs in the United States.[103] In 2011, the state's solar industry is expected to grow the number of solar jobs by 27%.[104]

The applicability to ocean energy is clear in that targeted policy can stimulate the market for ocean energy. However, success also requires appropriate perspective and timing. The New Jersey RPS carve-out is situated within a global system of solar energy subsidization. New Jersey is a tiny fraction of the overall market, and the technologies being employed for RPS compliance were all fairly mature. Enacting a program of similar magnitude for emerging ocean energy technologies could have unintended consequences. Such a program would attract developers to Oregon's seas, but the economic motivation for improving what are only early-stage device designs could easily evaporate in the process. Similar in concept to the need for due diligence in the disbursement of grant funding, simply paying whatever is necessary for ocean energy can stifle the necessary innovation and competitive market forces that will create a self-sustaining ocean energy industry in Oregon.

Many states offer a multiplier incentive for technologies with characteristics deemed to be preferable. A multiplier incentive is a stipulation in a RPS that allocates "bonus" accounting credits to the buyer of RECs from applicable technologies. These bonus accounting credits are then applied toward the requirements of the RPS. The credits are an accounting mechanism. Each MWH of energy continues to receive only one REC, but some RECs receive additional accounting "credit" toward the RPS. For example, Oregon established a solar multiplier in 2009 that allocates 2 MWH of accounting credits for each 1 MWH of solar generated RECs through 2016.[105] Similarly, the Delaware is currently using multiplier incentives to add an additional layer of subsidy for forthcoming offshore wind installations. In Delaware, offshore wind generation counts for 350% of RPS compliance.[106] Both solar and offshore wind are relatively mature industries where technology performance has been verified in a way ocean technologies have not. Performance certainty and industry maturity allow solar in Oregon and offshore wind in Delaware to make good use of their multiplier incentive provisions.

The key takeaway for ocean technologies is that while RPS provisions, such as multipliers and carve-outs, can be highly effective at supporting industry growth and market demand, they must be used judiciously. The immediate effectiveness for ocean energy is limited given the research and development needs of an emerging industry and the nature of RPS compliance remaining linked to generation. As device concepts mature, appropriately crafted RPS provisions can provide critical support for reaching full-scale commercial cost parity.

Feed-In Tariffs

Feed-in tariffs are a policy tool that promotes the development of renewable energy generation by guaranteeing the purchase of renewable energy by electric utilities.[107] Typically, feed-in tariff policies ensure that generators of renewable energy have access to the power grid and long-term purchase contracts of 15–20 years. The specific rate offered to renewable energy projects is highly dependent on how a feed-in tariff is implemented. Feed-in tariffs are common across Europe. In a classic European feed-in tariff, a government body fixes the rate at a level deemed to create an appropriate incentive. However, in the United States, the Federal Energy Regulatory Commission's (FERC's) authority over wholesale electricity pricing severely constrains the ability of states to implement feed-in tariff programs.[108] Programs in the United States are structured differently than classical feed-in tariffs, and are often presented in more general terms, such as "standard offers" or "incentive payments," for renewable energy. Although these programs have considerably different architectures, feed-in tariffs are often referred to as "FITs." The U.S.-style FITs are better characterized as performance-based incentives (PBIs) with varying methods of delivering the renewable energy premium. Unless otherwise specified, feed-in tariff/FIT will be used in this report to refer to the entire umbrella of FIT-like programs in the United States.

Eligibility in these programs is usually capped in terms of capacity at the facility level and at the aggregate program level. Caps for facility size are often used to attract smaller generators and manage various legal issues with FERC jurisdiction over electricity pricing. Caps at the program level provide a limit on the total combined capacity of accepted applications, capping the potential impact on electricity rates and avoiding the subscription of more generation than was initially targeted. Thus, FITs pay producers for the renewable energy they "feed-in" at a price deemed necessary to make renewable energy development viable, or as is the case with the legally constrained FIT programs in the United States, at a price that is as close to the ideal as is jurisdictionally possible. Program structure determines who will pay the renewable premium. In classical European FITs and some of the programs in the United States, the costs are rolled into the rate base of utility customers. In others, the performance incentive mechanisms—such as tax credits, RECs or non-utility bonus payments—are drawn from state coffers or public benefits funds.

Federal Feed-In Tariff

The United States does not have a federal FIT.

State Feed-In Tariffs

In a classical sense, owing to FERC restrictions, no state in the United States has a FIT. However, 17 states offer state-level PBIs, which are similar in nature to FITs.[109] An additional 49 are offered by a variety of municipalities and utilities across the country.[110] California and Hawaii have the only state-level programs that allow ocean power to participate. Numerous states limit their FITs or PBIs to solar PV.

Oregon's Feed-In Tariff

Oregon initiated a pilot incentive program for solar PV systems in June 2009, which required three IOUs to pay a premium for commercial, industrial and residential solar generation over a 15-year timeframe.[111] The rate paid by utilities is evaluated every six months by the Oregon Public Utilities Commission (OPUC) and starts when the system becomes operational. The program was limited to systems of 500 kilowatts (kW) or less, and capped total solar installation at 25 MW across all three utilities.[112] The OPUC established the first set of rates in May 2010 between $0.55/kWh and $0.65/kWh.[113] On July 2, 2010, the day the program began accepting applications, the program was full within 15 minutes for 75 contracts.[114] The OPUC decreased the rate by 10% the following day.[115]

A unique feature of Oregon's solar incentive program is the ability for solar generators to consume the solar electricity they produce and receive a volumetric incentive payment for their displaced consumption, as long as their system size is only capable of providing their site's average consumption. The volumetric rate varied across utilities, system size and geographic zones. The new rate determined after July 2010 for a small system (10 kW or less) was between $0.495/kWh and $0.585/kWh, while the rate for a medium system (10 kW to 100 kW) was $0.495/kWh—regardless of utility and geographical zone.[116] Large systems (more than 100 kW) can also participate in a competitive bid process to determine rates once per year, however, the sum of all large systems cannot exceed 5 MW, underscoring Oregon's requirement that 75% of solar generation comes from small systems. Customers are paid the incentive rate minus the retail rate for electricity.

For the April 2011 enrollment window for the solar pilot program, the rates were again reduced by 20%.[117] Small systems received between $0.396/kWh and $0.468/kWh, while medium-sized systems received $0.396/kWh across the board.[118] Despite the rate reduction, the program was again full in a short timeframe.[119] For the October 2011 enrollment window, OPUC expects the program to move to a lottery system for awarding new participants.[120] Past and current rate reductions for the program were not applied retroactively, and only new participants in the program receive the lowered rate.[121]

Analysis of Feed-In Tariffs

Conceptually, FITs are an effective mechanism for incenting renewable energy development by selected generation technologies. By providing a guaranteed revenue stream for the projects output, a FIT policy helps stakeholders analyze a project's economic viability over time. FITs typically provide premiums with the goal of subsidizing renewable energy generation. Certainty regarding the price being paid for renewable energy coupled with the potentially generous FIT rate provides a solid financial basis from which to attract investors and develop renewable energy projects.

In addition to the primary goal of directly stimulating renewable energy generation, FITs provide financial security for investors. This can reduce barriers to market development and support the maturation of an industry. An indirect effect of a FIT policy may be a more efficient administrative process for project development, leading to a reduction in development costs, and over time, serving to lower the FIT rate accordingly.[122] Proper FIT policies can also support the acceleration and standardization of project deployment, which helps build the manufacturing, operations and administrative infrastructure needed to propel a technology to commercial competitiveness.[123] As an industry matures, it also develops a better understanding of technology, in addition to a familiarity with regulatory processes and the development of integrated supply chains. FIT policies that build capacity in a given location concurrently develop regulatory processes, supply chains and broad industry expertise that smooth the process for current and future deployments.

One major concern is that FIT programs must be properly designed to be successful. A low-rate design may garner a lack of interest and development, while an overgenerous FIT rate can result in "gold rush"-like conditions as investors race to take advantage of the program. Internationally, the latter case is best exemplified by the cautionary tale of Spain's solar FIT, which was established in 2007. Targeting 400 MW of solar by 2010, the Spanish government instead managed to incent the installation of over 3,500 MW.[124] The 25-year contract term and the overly generous payments locked the Spanish government into more than €126 billion—or USD $180 billion—in FIT obligations.[125]

Existing U.S. regulations severely limit the extent to which renewable generation can be supported with FITs. On July 15, 2010, FERC issued an order clarifying the boundaries of state authority to implement FIT-like policies. The order stemmed from a 2007 move by the California Public Utilities Commission to establish a FIT for Combined Heat and Power (CHP) stations. To do so, California attempted to couch the FIT as a mandate that utilities had to *offer* the FIT rate to the CHP generators. At least theoretically, the CHP generators could choose to decline. FERC ruled that California was violating the Federal Power Act, which delegates all authority in setting interstate transmission wholesale electricity prices to FERC. FERC did not find the mandatory offer terminology persuasive, rejecting the use of mandatory offer provisions as a FIT vehicle.[126]

The remaining avenue for California to set a renewable generation purchasing price for utilities is by leveraging its authority under PURPA to set the avoided cost rates (specifically for CHP in this case) at which utilities are required to purchase power from PURPA-defined qualifying facilities. A qualifying facility is a renewable energy or CHP installation of less than 80 MW owned by an independent power producer. All but the largest utility-scale renewables meet this definition. An avoided cost rate is the cost of an incremental unit of generation the qualifying facility is offsetting or avoiding. In the case of California, this avoided cost is the levelized cost of constructing a new natural gas combined cycle plant. Critically, it is this avoided cost ceiling that limits potential FIT incentives. Renewable facilities, and only those that are also qualifying facilities, would be paid at avoided cost rates, not the higher incentivized rates necessary to prompt the widespread deployment of renewable energy. This remains California's approach for its FIT program, but an alternative implementation of PURPA may be possible.

Following an October 2010 ruling, FERC has seemingly opened the interpretation of "avoided cost" based on state mandates, timing of generation (peak, off-peak) and other salient supply characteristics.[127] For example, a state could set a renewable avoided cost if a state mandate existed to purchase a certain share of renewable generation. Fossil generators would be ineligible, meaning that the installation of a renewable generating facility would be offsetting renewable, instead of least cost, generation. Thus the avoided cost of new generation to meet the state mandate would be set by other renewables. It is also possible that specific technology carve-outs (e.g. ocean energy) would set specific technology avoided costs. This strategy is untested and it is unclear what level of granularity FERC will allow in the specification of avoided cost.

Setting the rate is not necessarily the only way to incent renewable energy development. An alternative is to set a capacity or generation goal and utilize an auction format to determine the incentive rate. The regulatory authority loses the ability to directly set the FIT rate, but can still achieve the same end goal of incenting renewable energy development. California is also pursuing this method as an alternative to the classical FIT. California's renewable auction mechanism calls for the auction-based procurement of 1,000 MW of small (less than 20 MW) distributed generation assets.[128] A similar auction mechanism could be used to set a market-based price for ocean energy. However, the limited number of deployable technologies would introduce an element of market power for the ocean energy developers and would need to be carefully structured to avoid unnecessarily high auction prices

Policy Solutions for Feed-In Tariffs

While FERC's recent rulings have severely limited the ability of regulators and legislatures to deploy conventional FIT incentives, the commission clarified its initial ruling and opened the door to a new FIT policy mechanism.[129] FERC's clarification order recognized that where a state has a mandated RPS target, the FIT rate becomes the avoided cost of new renewable generation. While FERC did not fully allow for a classical FIT in the United States, it did provide the incentive necessary to see further renewable development. Enacting a FIT that mandates technology targets and the state authority to set avoided cost rates under PURPA creates a program that is self-regulating. As the cost of meeting the renewable energy requirements declines, so does the avoided cost FIT incentive. This inherent braking mechanism will avoid the worst excesses of overly generous renewable incentive policies, as experienced in Spain.

In the immediate-term regulatory upheaval, FIT architectures of uncertain legal validity will have little impact on the ocean energy industry. The current state of ocean technology development reduces the effectiveness of a FIT for ocean energy technologies due to production and performance uncertainty. Even when commercial-scale ocean arrays have the necessary production to take full advantage of performance-based incentives, the avoided renewable cost rate may be lower than the cost of producing ocean energy. FIT payments in California, Oregon and the remainder of the western United States will likely be set by more mature wind and concentrating solar technologies. A carve-out for ocean technologies would raise the ocean FIT rate and set the avoided cost within the ocean-restricted tier. This would ensure that funds remain available to ocean developers and that FIT rates are high enough to incent continued development. To achieve this under the existing FERC guidelines, a technology-specific auction or RPS carve-out type incentive would be necessary.

A FIT-related carve-out suffers from the same issues of planning and equitability that plagues RPS carve-outs on their own. Securing an ocean technology block of FIT funding could become problematic, and ocean energy may be better served by a more classical, or centrally determined FIT rate. Given the intricacies of FERC authority over various state energy-pricing functions, a classical FIT architecture could only be achieved through legislative reform to the Federal Power Act, or a change in FERC's view of the role it holds for enforcing PURPA and the Federal Power Act.

Section 2B: Contracting Mechanisms to Stimulate Ocean Energy Demand

Power Purchase Agreements

A power purchase agreement (PPA) is an agreement between a buyer and an electricity producer to supply a specified amount of energy over a certain period of performance. In addition to private-sector agreements with utilities or commercial and industrial buyers, PPAs can also take the form of partnerships between a government entity and a project developer. A PPA provides a guaranteed revenue stream that developers can use to help secure debt financing from potential investors. Given the above-market cost of ocean energy and the current stage of technology development, developers may not find a willing buyer for a PPA that reflects the full cost of ocean energy development. A combination of incentives and additional revenue streams, such as renewable energy credit (REC) sales, are necessary to reach price parity with other technologies. However, for pilot-scale projects with the goals of technology demonstration and evaluation, and not necessarily market competitive generation, a PPA can help offset some of the project costs. There are two regulatory policies that could facilitate the purchase of ocean energy: renewable portfolio standard (RPS) carve-outs (as previously discussed in Section 2A), or a government policy that mandates or incentivizes a PPA (either private or public) with an ocean technology project.

The Role of Policy to Create Demand for Purchase Power Agreements

PPAs are a contractual mechanism, not a law or regulation, and as such are different than feed-in tariffs (FITs) or RPSs. Where a FIT and RPS both provide an economic incentive to purchase ocean energy, PPAs are merely a market mechanism through which renewable energy developers sell their power to a buyer. Policy and incentives provide the financial justification for the developer and buyer to sign a PPA. By reducing ocean energy's above-market costs through grants and tax or financing incentives, these policies can help shift ocean technologies toward a competitive starting point where they can begin to negotiate a PPA at reasonable prices. On top of reducing costs, demand-based policies can add additional value streams, such as REC generation, to raise the value of ocean energy and attract PPA partners.

In the case of technologies with risks and costs—actual or perceived—that are simply too high to attract a buyer, demand can be created legislatively by mandating the construction of a specified quantity of ocean energy capacity or the purchase of a certain amount of renewable ocean energy. While this sort of action is typically accomplished through an RPS carve-out, some states have solicited for applications from specific technologies. This is the case for offshore wind generation in Delaware,[130] Rhode Island,[131] and potentially Maryland, where proposed legislation would produce a similar outcome.[132] For offshore wind, Delaware has a planned installation of 450 megawatts (MW) and Rhode Island has a planned installation of 1,000 MW. Maryland is seeking to build between 400 and 600 MW. These non-RPS strategies can involve the state Public Utility Commission (PUC) mandating utilities to purchase the energy produced by the solicited capacity.

An alternative to utility purchase mandates—whether they come in the form of RPS carve-outs or capacity targets—is for the state itself to become the buyer. A state would sign a PPA with a project developer to purchase renewable energy, which would be used to power government buildings and operations. This is occurring at the federal level, where the first green-energy supply contract for 120,000 MWH was recently signed by Constellation Energy and the U.S. Department of State.[133] If a similar proposal were to be executed at the state level, it would most likely take the form of a competitive solicitation for renewable energy. Given the existing above-market cost, ocean energy would either need to be the sole technology under consideration, or be included as a power purchase carve-out wherein the state would seek a certain amount of ocean energy within its overall renewable energy goals.

Proponents of these policies typically justify the mandates on the grounds of renewable energy generation and economic development. However, such approaches can elicit opposition from ratepayer or taxpayer stakeholders, utilities obligated to purchase the wind energy, and, in the case of Rhode Island, the PUC itself. The Rhode Island Wind Project required a second legislative intervention in order to win approval. [134]A smaller-scale mandate, for example, one designed for a few initial commercial-stage ocean deployments, may face less opposition than large gigawatt-scale offshore wind deployments. However, the risk of public opposition remains a real consideration.

It should also be noted that capacity-based mandates have fewer drawbacks when the technology is mature and hence costs are reasonably well known. This is not the current case for ocean energy.

The Role of Purchase Power Agreements in Reducing Costs

As either a market mechanism or policy mandate, a PPA can serve as a cost-reduction tool that enables complex ownership and sale arrangements to make full use of the myriad of incentives provided to renewable technologies. This is specifically applicable in the case of public entities, such as state organizations, municipalities, tribal authorities and public power utilities, which by virtue of being tax exempt, are rendered ineligible for a number of renewable energy incentives. Renewable energy developers that leverage these tax-dependent incentives experience cost reductions that can ultimately lower the cost of a generation. A PPA can then be signed by a public entity that would be otherwise unable to take advantage of the incentives afforded to private corporations. The end result is an overall reduction in the cost of renewable energy relative to the public entity pursuing development on its own.

Analysis of Purchase Power Agreements

Certain PPA-related policies, such as mandated solicitations for hundreds of MW of ocean energy, are simply impractical for ocean technologies due to their current inability to scale to the appropriate levels. The Rhode Island case also illustrates the danger of politically mandated projects. While the legislature backed its initial decision with follow-on guidance to the PUC, continued support for a project is not guaranteed in a legislative body, which is subject to electoral turnover.

Ocean energy technologies currently have unpredictable energy production, unknown long-term survivability, are deployed in small, relatively uneconomical arrays for testing and are not yet used for commercial purposes. Based on these limiting factors, the prospects of obtaining a PPA reflecting the full cost of the deployment is unlikely, even with subsidization or demand-based revenue streams like FITs and ORECs. Despite generation not being the primary purpose of grid-connected pilot projects, they can still utilize PPA mechanisms to offset a portion of their project costs. Ocean projects that are not intended for commercial viability can nonetheless sell electricity to partially reduce the cost of deployment, and PPAs can thus play some role in supporting current-stage ocean energy projects.

The primary benefit to ocean energy from PPA mandating or enabling policies will come as the technologies reach commercialization. While ocean energy matures as an industry, policy can be reshaped to enable or require the long-term purchase of power from commercial ocean installations by extending many of the incentive policies afforded to more mature renewable technologies. A full production tax credit and an accelerated depreciation schedule are particularly helpful as the industry matures.

Section 2C: Analysis of Pros and Cons

Ocean energy's above-market cost necessitates some form of market creation to drive initial, large-scale deployments. Neither a feed-in tariff (FIT) nor a renewable portfolio standard (RPS) can support the identification of promising device designs like a grant or tax incentive can. This is because FITs and RPSs are based on the energy output of normally commercial installations. However, once the industry has established commercialized devices, having ocean-energy-targeted provisions RPSs, FITs or both can draw funding into the ocean energy industry and provide the appropriate foundation for commercial deployment. Ultimately, some variant of these market creation policies will be necessary for ocean developers to secure adequate power purchase agreements, but neither policy is perfect. The pros and cons of each are summarized in Table 9 below.

Technology-specific provisions in a RPS raise concerns over the integrity of the standard (in the case of multipliers), the cost of the policy (in the case of carve-outs), and questions of equitability (as some technologies are favored over others). FITs themselves also elicit opposition on the basis of electricity cost and face a more daunting challenge from the highly constraining regulatory structure in the United States. Both FITs and RPSs can be used to great effect and can be used in conjunction with each other to avoid implementation barriers, as demonstrated by the New Jersey Solar renewable energy credit carve-out provision. Innovative policy to create markets for ocean energy will be necessary to aid in the development of ocean energy in Oregon and around the nation.

Table 9: Pros and Cons Analysis of Regulatory Policies and Contracting Mechanisms to Stimulate Market Creation for Ocean Energy

Incentive	Pros	Cons
Renewable Portfolio Standards	▪ Stimulate market demand for renewable energy power generation and technology ▪ A federal renewable portfolio standard could reduce complexities across varied state policies	▪ Carve-out provisions that can result in opposition from competing technologies ▪ Renewable energy credit accounting multipliers provide less environmental benefits because 1 MW of renewable power produced is counted more than once toward the RPS target ▪ RPS policies can result in increased electricity prices ▪ A federal RPS may fail to sufficiently take regional, state, and utility characteristics and preferences into account
Feed-In Tariffs	▪ Increase economic viability of renewable energy projects ▪ Reduce risk, uncertainty and financing barriers ▪ Production-dependent incentive that is best for serving mature technologies and industries	▪ Increase electricity rates ▪ Typically used with mature generation technologies ▪ Competition with cheaper renewable energy generation technologies would initially disadvantage ocean energy ▪ Uncertainty in future funding availability ▪ Difficult to implement with federal regulations
Purchase Power Agreements	▪ Provide increased certainty for a project's economic viability ▪ Provide partnership structures that maximize and capture available financial incentives	▪ Increase in electricity rates can often elicit opposition by non-developer stakeholders

Section 2D: Recommendations For the Regulatory Markets for Ocean Energy

Eventually, regulatory markets will play an essential role in the development of ocean energy. Ensuring that these regulatory markets work for ocean energy will not be difficult, but will require attention. However, advocating for especially favorable treatment in these markets is likely to meet significant resistance.

Power Purchase Agreements

It is essential that ocean energy generators find customers for the energy their projects produce. Most, if not all of those projects will likely meet the requirements for Qualifying Facilities under PURPA. This will essentially guarantee a market for the electricity, however it will not guarantee a market at the high price premiums that ocean energy will likely require. We recommend continuing the work OWET is undertaking to streamline the power purchase process. We do not recommend anticipating overly favorable treatment in the terms of power purchase agreements. These agreements are simply structured to purchase electrons, not to address above-market pricing.

REC Ownership

It is essential that ocean energy generators and developers understand REC ownership and the importance of receiving the highest possible value for their RECs. Regardless of how much value regulatory markets place on ORECs, ocean energy project owners should review contracts carefully to ensure that the ORECs belong first to them and then to whichever party purchases them.

Tracking Systems

Nearly every region of the U.S. is covered by a REC tracking system. In Oregon, that system is called WREGIS. It is essential that ocean energy project developers register their projects and their ORECs in these tracking systems.

Renewable Portfolio Standards and Feed-In Tariffs

While it is essential that ocean energy be included as a qualifying technology for any production-based incentives, such as RPSs and FITs, attempting to design those programs to preferentially benefit ocean energy over other renewable energy technologies would be a poor use of the industry's limited policy influence. In the near term, the ocean energy industry does not possess the history or the production volumes needed to demonstrate to investors that production-based incentives would generate adequate returns. Hence, investing political capital for such an incentive is ill advised at this time.

In addition, the legality of the FIT architecture is uncertain and reliance on uncertain incentives would add risk for investors who are already challenged by ocean energy's technology risks hurdles.
Ocean energy RPS set-asides and carve-outs will not materially assist ocean energy in raising needed investment capital, and such set-asides and carve-outs tend to pit one renewable energy technology against another to meet a limited amount of demand. Multipliers are also met with skepticism from the environmental community as they result in fewer renewable MWHs delivered under the RPS. These policies tend to divide natural allies, rather than building alliances. One multiplier incentive that might attract strong political allies is a multiplier for the use of Oregon labor, particularly labor at prevailing wage in local industries. For instance, RECs generated from projects built in Oregon might be provided double credit under the OR RPS. If this approach were attractive enough to industry, labor and the environmental community, it could create significant political support for such a policy to become law.

Generally, we recommend working with stakeholders representing other renewable energy technologies to build broad support for renewable energy as a sector with ocean energy as one of the participants in that sector, rather than attempting to advantage one particular technology when it comes to production incentives.

Build Relationships with Utilities

While the Qualifying Facility status of ocean energy projects more or less guarantees a sale of the electricity, it behooves ocean energy developers to build strong, mutually supportive relationships with potential utility customers. The region's utility community should frame energy sales as important research and development for utilities, which will likely need the power and the RECs in the future.

Section 3: Voluntary Markets for Ocean Energy

Section 3A: Overview of Voluntary Markets

Voluntary markets for renewable energy involve renewable energy sales to retail customers to meet their electricity needs. Green power options offered by local utilities or electricity providers have existed since the mid-1990s. Sales of RECs into the voluntary market began in 2000. Residential consumers who participate in these green power programs pay a premium for green power primarily to address environmental concerns, while other concerns including energy independence and support for clean energy technologies are secondary.

Although commercial and industrial green power customers may have the same environmental concerns as residential consumers, they may also be motivated by the desire to differentiate their brand or products, as well as to meet corporate environmental or sustainability goals.

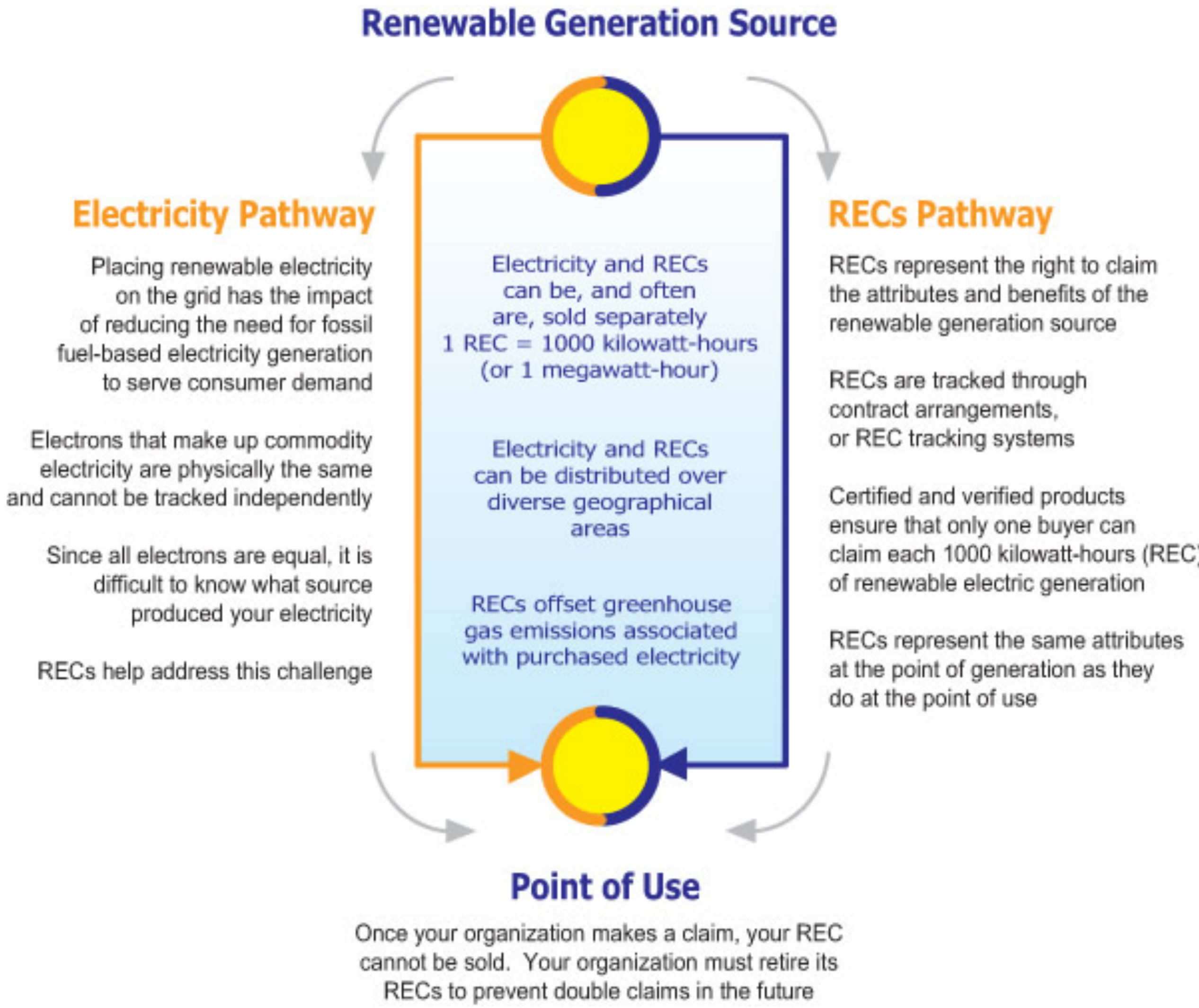
The EPA Green Power Partnership provides an online Guide for Purchasing Green Power.[135] (http://www.epa.gov/greenpower/documents/purchasing_guide_for_web.pdf)

Section 3B: Product Types in the Voluntary Markets

Renewable Energy Certificates

Any consumer can purchase green power through renewable energy certificates (RECs), also known as "Green Tags" or Renewable Energy Credits. RECs represent the "environmental attributes" of electricity generated from renewable energy-based projects. RECs are often referred to as "credits" in the regulatory market and "certificates" in the voluntary market. They are used interchangeably. Figure 1 contains an EPA Chart describing RECs.

Figure 1: EPA Green Power Partnership Renewable Energy Certificates (REC) Chart [136]



Renewable Energy Certificate Tracking Systems

REC certificate tracking systems have been established in different states and regions to issue and record the exchange of RECs, making REC markets even more accessible and verifiable. The Western Renewable Generation Information System (WREGIS) provides regional tracking services for RECs. Most WREGIS subscribers are public and private utilities, power generators, REC brokers, REC marketers and third-party REC providers.

Each renewable energy project registers with its regional tracking system. Each MWH of production from those facilities is then reported to the tracking system. The tracking system then assigns a unique number for each REC and places those RECs in the generator's tracking system account. As those RECs are sold, the tracking numbers are moved from the seller's account to the buyer's account until the RECs are retired. Retirement occurs when the RECs are used either to meet a regulatory standard such as an RPS, or sold to a voluntary customer.

Ocean energy projects can and should register their facilities and their ORECs with the appropriate regional tracking system.

Bundled Sales

Bundled sales of renewable energy are sales of both power and all the associated environmental attributes or RECs. One example of a bundled renewable energy sale is Xcel Energy, a regulated utility serving several states including Colorado and Minnesota, which offers retail customers its Windsource®[137] voluntary green power product.

This wind power option is sourced from several wind farms owned by Excel Energy in Colorado. The utility then takes the bundled wind energy into its system on behalf of its Windsource customers. The utility then integrates the intermittent power from these facilities into its basic service mix and retires the associated RECs on behalf of its Windsource customer base.

Unbundled Sales

Unbundled sales involve the separation of RECs from their underlying electricity. In these sales, RECs are sold directly to a buyer without the associated electrical energy. According to the National Renewable Energy Laboratory (NREL), in 2009, 76% of all retail green power sales were conducted using unbundled RECs.[138]

The electricity left behind when RECs are sold is referred to as "null" power. This null power, which is no longer considered green, is then assigned either to the emissions profile associated with the "system power" in the regional grid or some other factor determined by regulators.

The United States Environmental Protection Agency's (EPA's) Green Power Partnership (GPP) is a voluntary program that encourages governments and organizations to purchase green power (most commonly RECs). The Partnership has grown from 104 partners in May 2003 to 1,300 partners in February 2011. Purchases under the program have increased from approximately 83,400,00 kWh in May 2003 to more than 21 billion kWh as of March 2011.
Business green power purchases can meet 100% of a firm's electricity use or some fraction thereof. In 2009, Intel, the largest of the EPA Green Power Partners purchased RECs for 51% of their electrical usage. Large institutional REC buyers often use a competitive Request for Proposals (RFP) process for price discovery purposes. According to the NREL 2009 status report, these REC purchases often involve a number of renewable technologies including preferred resources such as wind and solar as well as other less desired resources such as low impact hydro and biomass.

Blended Products

Blended green power products, whether energy-based or REC-based, provide customers with power generated by a mix of renewable resources. The blend of generation resources can be based on consumer preferences for specific renewable technologies, locally based resources or both. Blended REC-based products are also useful as a price hedging strategy, allowing the provider the option of securing RECs from a variety of providers and securing the most cost-effective renewables available at given market conditions.

Large commercial and industrial customers like those participating in the EPA Green Power Partnership typically purchase RECs from a variety of renewable technologies as a hedging strategy and for cost containment purposes. These large business customers purchase RECs from third-party providers and tend to express little preference regarding the specific renewable power technology employed as long as the products meets national certification standards.

Stand-Alone Products

Stand-alone products are green power products, offered by utilities, which allow customers to buy power from specific renewable energy facilities and avoid the price fluctuations inherent in electricity from fossil fuel based products.

There are relatively few renewable power stand-alone products offered to retail energy customers. Several public utility green power programs like Austin Energy (AE)[139] or the Sacramento Municipal Utility [140]District (SMUD) do offer this type of product to customers willing to sign a multi-year contract. These stand-alone products, which are typically wind or solar resources, offer several different value propositions.

AE, a municipal utility in Texas, has offered its GreenChoice^{sm} voluntary green power program to customers since 2002. Under this program, customers can avoid variable monthly fuel charges by enrolling for wind power, which the utility purchases under a power purchase agreement (PPA) with wind farm developers in western Texas. Retail customer enrolled in this program sign multi-year agreements, which exempt them from fuel surcharges, which are otherwise charged to all non-participating customers.

AE's GreenChoice^{sm} program has been ranked #1 in the nation for total kWh sales of green power on NREL's listing of Top Ten Utility Green Pricing Programs since 2001. Because of its ability to provide a long term price hedge for potential future fuel surcharges, 90% of the participating customers have been very large commercial and industrial customers of the utility, including: AMD, 3M, Texas Instruments and Xerox.

April 2011 discussions with Carol Harkins, the former GreenChoice^{sm} program manager, indicate that formerly AE did not require participating customers to cover all programmatic costs including firming, shaping and integration, resulting in some cost shifting to non-participants. It should be noted that most regulated private utilities would be prohibited from "shifting" these program costs onto non-participating ratepayers.

Recently, AE has required GreenChoice^{sm} customer to pay all firming, shaping and integration costs for the program, which has resulted in a substantial increase in its premiums and a corresponding downturn in new GreenChoice^{sm} customer enrollments.

In Sacramento, the SMUD "Solar Shares" program involves sales of "shares" in a 1 MW utility-scale solar photovoltaic project to retail customers. While participants in this program do not actually receive green power in the form of energy bundled with REC's, customers do receive a fixed price for a portion of their energy needs based on their share of the systems monthly output.

Several other stand-alone public utility projects involve the use of large solar PV projects from which customers purchase a share of the system's monthly output. The City of Ellensburg, WA created an[141] electricity product based on a community solar project. The product allows local individuals and businesses to make financial contributions to the project. In return, these contributors receive direct credits on their electricity bills for the green power produced by the system. In 2008, the city expanded the system from 36 kW to 57 kW.

With the exception of the AE program, these stand-alone green power options involve relatively small numbers of participating customers who are willing to sign multi-year agreements, as well as up-front investments by a public entity or utility, which would likely prove un-economic or speculative for traditionally risk averse regulated utilities.

Long-Term vs. Short-Term Sales

REC transactions to serve the voluntary retail markets typically conform with the Green-e Energy National Standard that requires REC purchases to meet customer loads in a given calendar year to be generated in that year, the last half of the previous calendar year or the first quarter of the following year. Given the discretionary nature of most voluntary green power programs, which allow customers to drop their participation with 30 days notice, the majority of utility green power programs purchase RECs on a relatively short-term basis (1-3 years).

Large institutional and business who purchase RECs from third party providers can often enter into longer 3-5 year purchase agreements as a hedge against future price increases. (Regulated utilities, power marketers and governments engage in long-term REC purchases to satisfy various compliance obligations.)

While long-term or multi-year trades may be possible, most private utilities are required by their regulators to employ risk reduction strategies that preclude long-term REC purchases for discretionary green power programs.

Co-Lateral Ecosystem Services and Benefits

In the late 1990's, PGE pioneered its "Salmon Friendly Power"[142] program that allowed its retail customers to purchase 100 kWh blocks of wind power and contribute $2.50 to For the Sake of the Salmon, a non-profit provider of salmon habitat restoration services. Because the region's hydro power system was associated with declines in native salmon, offering a renewable power option with a critical ecosystem service like habitat restoration was thought to increase customer appeal.

In 2002, Oregon's Portfolio Advisory Committee recommended that both PacifiCorp and PGE offer a similar renewable power option combined with a habitat restoration offering to its residential and small business customers. Today a salmon habitat restoration option is offered to green power customers of both PGE and PacifiCorp.

Today there are over 10,000 PGE renewable power customers participating in the Habitat Support option (formerly Salmon Friendly Power). These purchases support the restoration of native salmon habitats through a donation of $2.50 per month. On an annual basis this generates approximately $300,000. Funds collected from PGE's Habitat Support customers are passed through directly to the Oregon Nature Conservancy.

Ocean energy facilities, when sited in areas designated as "marine sanctuaries," may also result in additional ecosystem services, including preservation of breeding grounds for endangered marine species or protection of endangered marine habitats. While secondary to the generation of pollution-free renewable power, these benefits could also serve as additional attractors for environmentally conscious consumers. This would provide benefits to utilities or REC marketers offering such a product and could generate significant funds for ocean energy development. Such a product could either include ORECs as available or RECs from another resource such as wind. Customers might look quite favorably on a product that allowed them to green their power with wind, while at the same time, investing in "the next generation of renewable energy, developed with the environment in mind."

Voluntary Non-REC-Based Donation Programs

Voluntary customer charge programs provide an alternative to extending public benefit fund (PBF) funding and scope. While voluntary programs typically do not bring in the same volume of funding as mandatory public purpose charges (PPCs), the additional voluntary funding can be used to provide essential, small-scale support for various startup companies. Currently, Seattle City Light—the Municipal Utility for Seattle, Washington—offers an innovative voluntary contribution program. In addition to green power purchasing programs, which are commonly offered by utilities, Seattle City Light customers can elect a voluntary charge of at least $3 per month to help finance grants and loans for solar demonstration projects at public locations, such as schools, libraries and parks.[143] Seattle City Light provides an excellent incentive structure by linking a voluntary customer program with funding for renewable energy projects on public infrastructure. A similar program could be considered for funding ocean energy projects in Oregon. However, stand-alone donation programs offered by IOUs could well be met with customer skepticism. While voluntary program may not garner adequate funding to support million dollar demonstration projects, they may provide a channel for Oregonians to support the initial costs of local projects, such as feasibility studies, grant writing and permitting. While OWET and the Energy Trust of Oregon already offer these functions, additional small-scale funding provided voluntarily by electricity consumers could help jumpstart innovative device concepts or play other roles in ocean energy project development.

Voluntary programs are not a panacea and are typically funded at far lower levels than government mandates. However, under the proper program structure, an aggregation of voluntary renewable energy payments could provide an additional outlet for interested parties to fund high-risk, high-reward projects that develop innovative ocean technologies.

Section 3C: Sales Channels to Voluntary Markets

Regulated Utility Green Pricing Programs

Consumers and businesses in regulated utility markets may have the option to purchase renewable energy through their electric utility. Regulated utility green pricing programs or "green power programs" are offered by more than 860 utilities, or about 25% of U.S. utilities. According to the National Renewable Energy Laboratory,[144] "utility green electricity programs continued to show growth on a year over year basis, with sales volume increasing approximately 7% in 2009."

Most utility green pricing programs employ REC-based programs and use one or two retail product configurations, covering either all or a portion of a customer's electricity purchase.

The majority of utilities offering a green pricing product provide customers with a fixed monthly amount or "block" of green kWh. Most commonly, these blocks represent 100 kWh per month. Blocks are sold for a fixed price. Often these customers can purchase multiple blocks if they wish to make sure their total monthly energy use is from renewables.

Some utilities offer "usage-based" products, which provide renewable power that is matched on a per kWh basis with the customers' electrical usage. When supported by adequate marketing by the utility, usage-based products can be the most popular retail offerings among residential and small business customers wishing to support renewables.

The renewable generation technology used in supplying RECs for these programs is predominantly utility scale wind, followed by landfill gas and biomass. Table 10 illustrates the breakout of renewable resources sold through these utility green pricing programs.

Table 10. Renewable Energy Generation and Capacity Supplying Green Pricing Programs

	Landfill Gas	Wind	Solar	Hydro	Geothermal	Biomass	Other
Percentage of Total Sales	7%	86%	0.04%	1%	1%	5%	0.03%

Market research has demonstrated that residential green power customer and new customer prospects have a preference for wind and solar resources and are somewhat less price sensitive than large organizations. In these research studies, subjects are typically presented with a list of existing renewable resources such as biomass, wind, solar and geothermal and asked for preferences; these market research studies have not yet examined ocean energy as a renewable resource for green pricing programs.

Northwest Utility Green Pricing Programs

A relatively small number of utility programs continue to dominate in national green power sales and customer rankings. Portland General Electric and PacifiCorp, both Oregon-based investor-owned utilities, are ranked #1 and #2 for total green power customers by the U.S. Department of Energy's National Renewable Energy Labs in 2010.[145]

The Renewable Northwest Project (RNP), a renewable power non-profit advocacy organization, reports that participation in the Northwest's 40 voluntary green power programs increased 5.8% in 2009.[146] These utilities enrolled an additional 9,200 green power customers in 2009, bringing the total number of ratepayers who voluntarily participate in a Northwest utility green power program to nearly 170,000. These ratepayers purchased more than 1.7 billion kilowatt-hours (kWh) of green power in 2009, an 8.6% increase over 2008, and more than 73 times as much green power as was purchased in 2000.

According to the RNP survey, "If growth rates return to their pre-recession levels, the Northwest could be seeing 20% participation rates in as little as five years."

Customer research indicates residential consumers who participate in green power programs pay a premium for green power to address their environmental concerns, including air pollution. Energy independence and support for domestic energy production are secondary motivators.

Table 11 contains the results of a market research report on reasons for customer participation in PGE's green power programs from a presentation made to the Oregon Portfolio Options Committee on April 26, 2007.[147]

Table 11. Main Reason for Choosing PGE's Renewable Program

	Residential	Commercial
Base: Total respondents	273	27
Product Reasons (Net)	**79**	**92**
- Cleaner Electricity/Less Pollution/For A Better Environment/ Renewable Energy	70	84
- Helps Prevent Global Warming/Climate Change	3	0
- Reliable Source Of Electricity/Security/Safety	3	4
- Uses U.S./Domestic Sources Of Energy (Not Foreign Oil)	3	4
Other Reasons (Net)	**21**	**8**
- Sales Experience/Agent Was Great	3	4
- Had No Choice/Only One Available	3	0
- Recommended By Friend/Relative	3	0
- Price Wasn't That Much More Than Basic Service	3	0
- Fixed Rate/Locked In Price	2	0
- Someone Else In Household/Company Signed Us Up	2	0
- Other (e.g. Impulse buy; A rep asked me; Was able to sign up gradually, in stages)	5	4

Although the utilities commercial and industrial green power customers may have the same environmental motivations as residential consumers, they may also be motivated to differentiate their brand or products, or to meet corporate environmental or sustainability goals.

Competitive Green Power Markets

In competitive (or restructured) retail electricity markets, consumers have the opportunity to purchase electricity generated from renewable sources by switching to an alternative electricity supplier that offers green power.

About one-quarter of U.S. states have restructured their electricity markets for retail competition. Currently, electricity consumers in Connecticut, Delaware, Illinois, Maine, Maryland, Massachusetts, Michigan, New Jersey, New York, Pennsylvania, Rhode Island, Texas and D.C. can purchase competitively marketed green power offerings. In addition, under Oregon SB 1149 large commercial and industrial customers of PGE and PacifiCorp can purchase power from competitive providers.

Initially, buying green power in competitive retail markets entailed switching electricity service from the incumbent utility to a green power supplier. In some markets, there has been very limited switching, and, as a remedy, a number of states now require default suppliers (which are often the incumbent distribution utilities) to offer green power options to their customers. These load-serving entities typically provide customers with underlying electricity generation, combined with a choice of several REC-based green products offered by competing REC marketers.

Several east coast utility suppliers have voluntarily teamed with a single green power marketer to offer a green power option to their customers. Such programs are now offered in Connecticut, Massachusetts, New Jersey, New York, Pennsylvania and Rhode Island.

State Mandated Green Power Programs

Seven states have mandated green power options. The scope of these legislative mandates varies significantly from state to state.[148] The mandate in Colorado applies only to municipal utilities with over 40,000 customers, while Oregon's mandate requires only the two investor owned utilities (IOUs) to offer a green power option. Washington requires all electric utilities serving more than 25,000 customers to offer customers the option of purchasing renewable energy. In New Mexico the requirement is placed only on the state's IOUs. In Iowa all electric utilities, including those not regulated by the Iowa Utilities Board, are required to offer green power options to customers. In 2009, the Legislature in Maine required the Public Utilities Commission (PUC) to develop a program offering green power as an option to residential and small commercial customers in the state.

Only four of these seven states—Minnesota, Oregon, Virginia and Washington—include ocean energy technologies as eligible renewable resources for these mandated green power programs. Eligible resources in all four include tidal power. Oregon, Virginia and Washington also include wave power with Oregon also recognizing ocean thermal energy.[149]

Government Power Marketers

The Bonneville Power Administration (BPA) has offered a renewable power product called [150]Environmentally Preferred Power (EPP) since 2001. EPP is available to any BPA customer. Customers can choose to designate any portion (up to 100 percent) of their BPA subscription purchase as EPP. A Green Energy Premium appropriate to the specific EPP product selected by the customer is charged in addition to the customer's rate for BPA power. According to the 2000, BPA Power Products Catalogue, "by purchasing EPP, BPA's customers acquire the marketing flexibility to meet the needs of their environmentally conscious retail consumers."

Currently, BPA has more than 127 public power customers including Public Utility Districts, Municipal Utilities and Rural Electric Cooperatives. These public utility customers can purchase EPP for a portion of their basic service mix or they can offer the product as a voluntary, premium priced, green power offering.

Retail REC Sellers

There are several retail REC sellers active in the NW that may be interested in purchasing ORECs. The Bonneville Environmental Foundation, 3 Degrees, and Green Mountain Energy deliver RECs to retail customers and also to the region's utility programs. A full list of Green-e certified REC providers can be found on the Green-e Energy National Standard website.[151]

REC Brokers

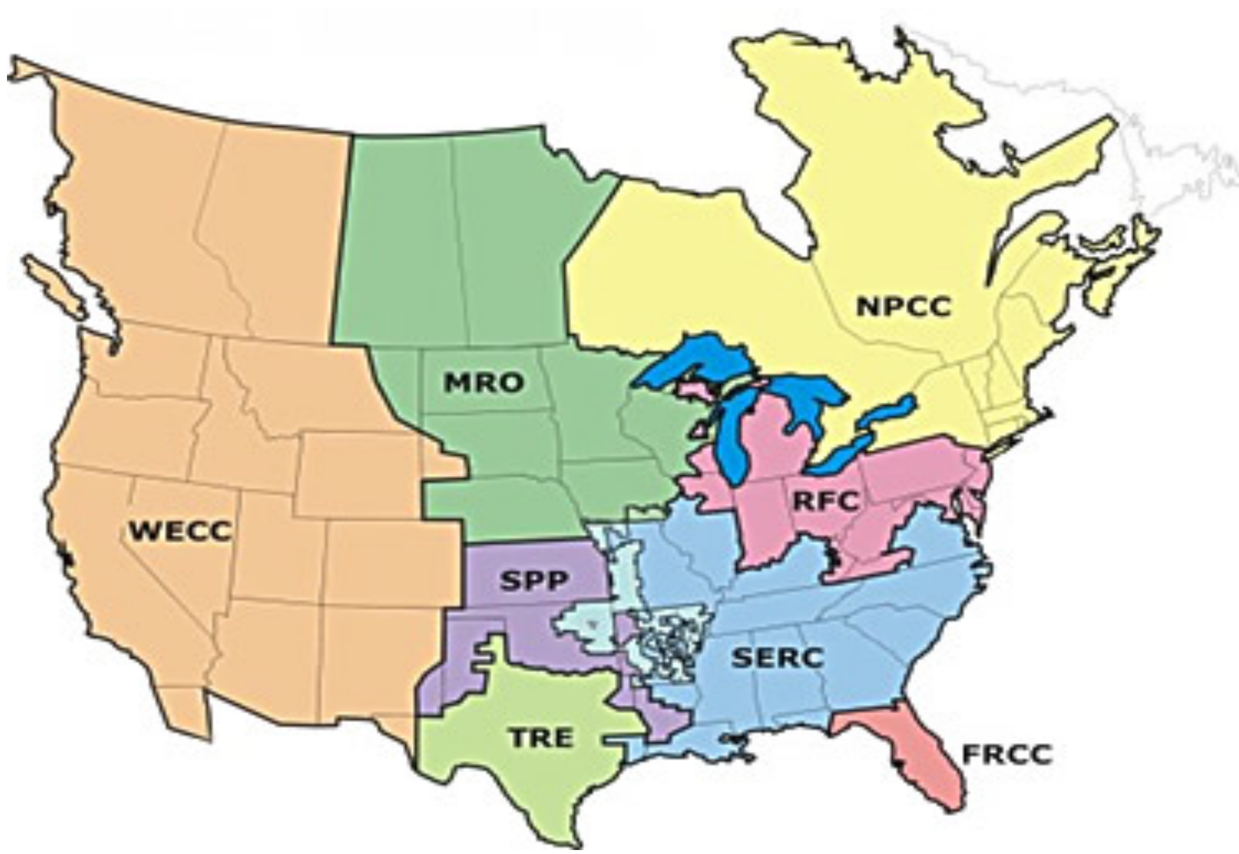
Since the late 1990s, private firms trading in the energy and emissions sector including government entities like the BPA, larger publicly owned utilities and many regulated utilities have established trading desks that actively trade RECs. In addition, many private energy developers including Next Era (formerly FPL), Iberdrola, NRG and other power marketers have added REC trading to their business model.

Private REC brokers facilitate bilateral trades for both short and long term buyers in both compliance and voluntary green power markets. Public and private utility traders focus first on meeting their utility's compliance obligations, and then on the marketing of any surplus RECs.

While RECs from any region of the United States represent the generation of 1 MWH of renewable generation, market demand for both voluntary and compliance RECs shows significant variation by region. In the Western Electricity Coordinating Council (WECC) grid, RECs used for both compliance and certified for voluntary programs typically trade at a significant premium to similar RECs originating from some other regions.

Current REC prices in the WECC range between $6-8 MWh, while REC prices in neighboring areas of the U.S. including ERCOT and MRETS can trade at discounts of as much as 89% or $0.85 MWh. RECs in the Northeast, where regulatory demand is strong and supply is weak, often reach prices well above $30.

Figure 2: U.S. Electric Grids[152]



Direct Sales to Industry Partners

One interesting option for ocean energy producers in Oregon is to sell ORECs under long-term contracts to industry partners. For instance, there are likely several manufacturing companies in Oregon that would undertake significant new business building ocean energy devices. Those companies might be interested in buying RECs associated with ocean energy as a way to guarantee the sale of ocean energy's above market priced RECs. There is some precedent for this approach. In the early 2000, the Bonneville Environmental Foundation wanted to find a way to support local, small-scale solar development with the sale of RECs. Those RECs were priced at over $100, approximately 10 times the price of wind RECs. One set of customers which chose to purchase solar RECs was solar panel and inverter manufacturers, who recognized that if they could help absorb some of the above market cost of the product, they would sell more product. Both of the companies that signed up agreed to a 3-year contract, which blended 95% (inexpensive) wind RECs with 5% (expensive) solar RECs. This kept their average price reasonably low, allowed them to replace all of their electricity with renewables, and incentivized the market for their products.

Direct Sales to Government Partners

Another option for ocean energy producers in Oregon is to sell ORECs under long-term contract to government buyers interested in supporting ocean energy. For instance, Oregon might be interested in agreeing to buy RECs from ocean energy facilities at a fixed price, for a fixed number of years. This approach could also be taken with local governments, particularly along the coast. It is likely that the number of ORECs would need to be capped for budgeting purposes. This approach would guarantee ocean energy a market for its ORECs once they were produced. It would also cap the total government expenditure, as those expenditures would be tied to actual energy production. This approach essentially mimics a production incentive.

Section 3D: Green Power Certification Organizations

Green-e is the U.S.'s leading independent consumer protection program for the sale of renewable energy and greenhouse gas reductions in the retail market.[153] Green-e certification is widely used by utilities and marketers of greenhouse gas mitigation products.

The Green‐e Energy National Standard identifies the criteria renewable energy products must meet to be certified. Green-e's most recent version of the National Standard (2.1) specifies that renewable power must come from eligible sources of supply, such as wind, solar, geothermal, biomass or "low‐impact" hydropower.[154] Only new renewable facilities built since 1997 qualify. Electricity used to fulfill a state renewable energy goal cannot also be used for Green-e certified products as this is considered "double counting."

While the latest version of the Green-e National Standard does not address ocean energy as an eligible resource, a excerpt from page 2 of the standard indicates that: "Green-e Energy will consider adopting ocean-based resources and will review these technologies as they mature and as practical application reaches near term."

Certification of ocean energy technologies as a Green-e certified resource would be a pre-requisite for sales into nearly all voluntary green power markets.

Section 3E: Consumer Labeling Issues

There has been a huge increase in the number of eco-labels over the last few years. Consumer labeling could create benefits for ocean energy producers. In one example, a number of wind energy stakeholders recently launched "WindMade™."[155] This certification "will provide qualifying companies the ability to effectively communicate to consumers a commitment to wind energy that differentiates their brand, and signals a strong commitment to renewable energy."

While there may be some advantages to using such a label, we recommend taking a cautious approach when it comes to consumer labeling. Administering such certification is expensive and those costs, if not covered by grants or other outside sources would likely absorb a significant portion of any profits generated by the sale of ORECs.

There are also important legal considerations. The Federal Trade Commission (FTC) has begun prosecuting firms that administer potentially misleading certification processes.[156] While it is unlikely that advocates of an ocean energy consumer label would intentionally mislead the public, consumer protections laws generally place the burden of proof on the party making the claim (in this case those providing or claiming the certification). Therefore, it is essential that such a certification by adequately "policed" by a diverse group of stakeholders. The more diverse the group of stakeholders the more credible it will be. However, such diverse groups are notoriously for creating processes that are difficult and expensive to administer.

We do not recommend that OWET pursue an ocean energy consumer label. Rather, we recommend that OWET pursue a relationship with Green-e, the nation's leading renewable energy consumer protection program. If OWET chooses to pursue its own consumer label, we recommend an in-depth look at the FTC's recently updated version of its Green Guidelines.[157] These guidelines are currently in draft form, the comment period is closed and the final guidelines are due out in late 2011.

Section 3F: Recommendations for the Voluntary Market for Ocean Energy

Voluntary markets can play an important role in the development of ocean energy. A robust and growing voluntary market exists and currently supports thousands of MW of post-1997 renewable energy projects.[158] However, customers in these markets are price sensitive and this market will not support $100-$150 per MWH premiums in large volumes. For substantial expansion of the industry to take place, incentives such as those outlined in Section 1 must be in place.

In the near term, the ocean energy industry is not expected to generate large numbers of MWHs. If structured correctly there are creative ways to use the existing voluntary market to help absorb some of the above market costs that cannot be covered by the incentives outlined in Section 1.

Voluntary vs. Mandatory Markets

It is important to recognize that each OREC generated can be sold into *either* the voluntary market *or* the mandatory market (RPS, FIT) but not both. If utilities purchase ORECs to meet their RPS requirements, those ORECs are retired and cannot be sold into the voluntary market. If a voluntary customer (even a customer of a utility covered by an RPS) purchases an OREC, that OREC cannot be counted toward any RPS requirements. In short, double counting is not allowed.

REC Ownership

It is essential that ocean energy generators understand REC ownership and the importance of receiving the highest possible value for their RECs. Regardless of how much value voluntary markets place on ORECs, ocean energy project owners should review contracts carefully to ensure that the ORECs belong first to them and then to whichever party purchases them. National certification standards for the voluntary market require a clear path of ownership.

Tracking Systems

Nearly every region of the country is covered by a REC tracking system. In Oregon, that system is called WREGIS. It is essential that ocean energy project developers register their projects and their ORECs in these tracking systems.

Certification

We strongly recommend beginning a conversation with the staff at the Green-e national certification [159]program. Selling ORECs into any voluntary market will likely require Green-e certification.

Non-Grid-Tied Systems

By definition, RECs are only created when renewable energy enters the grid. Non-grid-tied systems cannot sell RECs in either voluntary or mandatory markets. Voluntary support for non-grid-tied systems will need to be drawn from either non-REC-based donation programs, or from programs like Salmon Friendly Power. Both approaches are discussed below.

Monetizing Ecosystem Benefits

Ocean energy facilities when sited in areas designated as "marine sanctuaries" may also result in additional ecosystem services, including preservation of breeding grounds for endangered marine species or protection of endangered marine habitats. While secondary to the generation of pollution free renewable power, these benefits could also serve as additional attractors for environmentally conscious consumers. This would provide benefits to utilities or REC marketers offering such a product and could generate significant funds for ocean energy development. Such a product could either include ORECs as available or RECs from another resource such as wind. Customers might look quite favorably on a product that allowed them to green their power with wind, while at the same time, investing in "the next generation of renewable energy, developed with the environment in mind." We recommend discussing these issues with potential voluntary market buyers.

Bundled Sales vs. REC Sales

Given the flexibility that RECs provide, it is very likely that the highest monetary value the ocean energy community will receive for its energy will be from sales of power to one buyer and ORECs to another. Unless a buyer is found who is specifically interested in buying the power bundled with the ORECs, we recommend focusing on power sales to local utilities without the ORECs, while concurrently marketing the ORECs to whichever buyer offers the most attractive terms.

Sales Term and Delivery Flexibility

Generally, we recommend selling both ORECs and power separately under long-term agreements. Voluntary customers in utility green power programs are more likely to be attracted to ocean energy based programs if they see that utilities are making long-term commitments to the technology. In addition, it takes significant time to introduce a new product and make it successful. Finally, because production from ocean energu facilities will be unpredictable, we recommend selling ORECs under "as generated" contracts, where numbers of ORECs are either unspecified, listed in ranges, or delivered over a period of several years, rather than having specific numbers of ORECs be contracted for each year. When the Bonneville Environmental Foundation sold the region's first solar RECs, customers agreed to a specific number of RECs that would be delivered during a 3-year period.

Direct Sales to Industry Partners

We recommend building a consortium of corporate ocean energy infrastructure providers, both those who are currently serving the industry and all those looking to expand it. These industry partners could commit to a large aggregate purchase.

Direct Sales to Government Partners

We recommend approaching local and state government, both of which have already demonstrated a vested interest in the success of ocean energy. Those governments could commit to using a specific amount of ocean energy (or ORECs) in their facilities.

Sales to Retail REC Sellers

We recommend approaching the Bonneville Environmental Foundation (BEF) and other regional REC sellers to gauge interest in an OREC purchase. BEF might be interested in either purchasing the ORECs as produced, or providing ocean energy developers a grant in exchange for any ORECs produced.

Sales to BPA

The Bonneville Power Administration might be interested in ORECs as either part of their supply of Environmentally Preferred Power or as part of an agreement that included funding for research, development and demonstration.

Working with the Public Utilities Commission

We recommend working with the Oregon utilities and the Portfolio Options Committee to see if ORECs can be incorporated into the utilities' voluntary green power programs. This could allow small amounts of high priced ORECs to be blended in with existing RE resources at a price that voluntary customers would pay as the industry seeks to establish itself.

Sales to Investor Owned Utilities

Both PGE and PacifiCorp have very successful voluntary green power programs. We recommend approaching both utilities to explore the creation of an ocean energy based product similar to PGE's Habitat Support program.

Sales to Public Utilities

Many of the region's public utilities have voluntary green power programs. We recommend approaching the leading programs (Eugene Water and Electric Board and Seattle City Light) to explore the creation of a voluntary donation program to fund ocean energy development. Customers could donate a certain amount each month, which would be channeled to ocean energy projects. In exchange, the utility could receive any ORECs the project produced. This approach would be particularly useful for non-grid-tied projects.

Public Awareness Campaigns with Utility Partners

Should the ocean energy industry chose to pursue support from utility voluntary programs, we recommend working with those utilities on an awareness building and marketing campaign to educate utility customers in the Northwest about the potential for them to help create a Northwest ocean energy industry. A possible compelling message might be, "You can power your homes and businesses while powering a new economy for coastal communities in the Northwest."

Conclusions and Recommendations

Based on documents provided by OWET and interviews with ocean energy stakeholders, we understand that the ocean energy industry hopes to build 500 MW of capacity along the Oregon coast. The capacity factory is estimated to be approximately 25% and the energy is expected to cost approximately $250/MWH.

Given that utilities seek the least expensive resources to meet their RPS requirement, we do not believe that mandated markets would provide any significant support to ocean energy until generation costs are greatly reduced. That leaves the voluntary markets to provide the demand "pull" for ocean energy.

Five hundred MW at a 25% capacity factor will result in the generation of approximately 1 million MWH/year. Assuming existing tax incentives and a relatively generous power purchase contract signed under PURPA would together cover approximately $100/MWH, a shortfall of $150/MWH remains. If that amount were covered simply by the sale of ORECs, it would require a commitment of $150 million per year. That is the approximate value of the entire voluntary green power market in the United

States.[160] In our opinion, it is unrealistic for the ocean energy community to expect a significant fraction of this $150 million will be provided by the voluntary market.

At this stage, what is needed is a multi-faceted approach with a strong focus on non-production-based incentives that help reduce the initial cost of ocean energy deployment. It is possible that the voluntary market can support some portion of early stage research, development and deployment of ocean energy through non-REC based donations. The voluntary market can further support the industry thought the purchase of modest numbers of high-priced ORECs, when they are available. However, the voluntary market will not support $100+ ORECs in large quantities.

It may be much more economic to leverage the investment community and government grants at this stage of ocean energy development as those dollars are not tied to what it at this point, uncertain energy production.

Key Take Away Items

Given the substantial economic and environmental benefits the emerging ocean energy industry can provide to Oregon and the nation, we recommend the following:

Reduce the Cost of Ocean Energy

1. Build alliances with the manufacturing community to advocate for specific incentives creating near-term local economic development and local job creation.
2. Build alliances with the investment community to advocate for specific incentives leveraging private sector investment.
3. Focus on grants first, followed by investment incentives. If financing is necessary, focus on loan guarantees and renewable energy bonds. (Expansion of the SELP program is one example.) Production incentives are significantly less useful in the early stage of technology development, when production is uncertain.
4. Ensure that interconnection and operations policies scale equitably with installation size.
5. Continue to work with Oregon on preferential siting issues.
6. Work collaboratively on joint development, spreading the infrastructure burden across multiple stakeholders, possibly including the offshore wind energy industry.

Use Regulatory Markets

(Note: Advocating for especially favorable treatment in these markets is likely to meet significant resistance.)

1. Work to ensure that projects meet the requirements for Qualifying Facilities under PURPA.
2. Ensure that the ORECs belong first to the generator and then to whichever party purchases them.
3. Register projects and their ORECs in regional tracking systems.
4. Ensure that OE is included as a qualifying technology for any production-based incentives, such as RPSs and FITs.

5. Build strong, mutually supportive relationships with potential utility customers. Frame energy sales as important research and development for utilities, which will likely need the power and the RECs in the future.

Use Voluntary Markets

(Note: Customers in these markets are price sensitive and this market will not support $100-$150 per MWH premiums in large volumes. For substantial expansion of the industry to take place, generation costs must be reduced.)

1. Work with the staff at the Green-e national certification program. Selling ORECs into any voluntary market will likely require Green-e certification.
2. ORECs from facilities sited in areas designated as "marine sanctuaries" may be attractive to environmentally conscious consumers.
3. Focus on power sales to local utilities without the ORECs, while concurrently marketing the ORECs to whichever buyer offers the most attractive terms.
4. Sell ORECs under long term, "as generated" contracts, where numbers of ORECs are either unspecified, listed in ranges, or delivered over a period of several years, rather than having specific numbers of ORECs be contracted for each year.
5. Build a consortium of corporate ocean energy infrastructure providers, both those who are currently serving the industry and all those looking to expand it. These industry partners could commit to a large aggregate ocean energy or OREC purchase.
6. Approach local and state government. Those governments could commit to using a specific amount of ocean energy or ORECs in their facilities.
7. Approach the Bonneville Environmental Foundation (BEF), other regional REC sellers and the Bonneville Power Administration to gauge interest in an OREC purchase.
8. Ensure that ORECs are incorporated into the utilities' voluntary green power programs. This could allow small amounts of high priced ORECs to be blended in with existing renewable energy resources at a price that voluntary customers would pay as the industry seeks to establish itself.
9. Approach Oregon's investor-owned utilities to explore the creation of ocean energy based product similar to PGE's Habitat Support Program.
10. Approach Eugene Water and Electric Board and Seattle City Light to explore the creation of a voluntary donation program to fund ocean energy development. Customers could donate a certain amount each month, which would be channeled to ocean energy projects. This approach would be particularly useful for non-grid-tied projects, which do not generate RECs.
11. Work with targeted utilities on an awareness building and marketing campaign to educate utility customers in the NW about the potential for them to help create a NW Ocean Energy Industry.

Approaches Not Addressed in the Report

- <u>Resource Assessment</u>

  The UMI report addresses the importance of gaining a better understanding of resource potential and its characteristics. This is an essential part of the broader effort to lower costs. Without an adequate understanding of the resource, investors will place a significant premium on the costs of financing such projects. The cost of financing will have a major impact on the cost of ocean energy.

- <u>Technology Assessment</u>

  Technological advancement will be critical to lowering the cost of wave energy technology.

- <u>Model Agreements</u>

  The development of model agreements will significantly lower the on-going costs of ocean energy development. Those agreements include both interconnection and power purchase agreements. (The National Renewable Energy Laboratory has done significant work on model agreements for the renewable energy industry and we recommend communicating with them on this topic.)

- <u>Technical System Integration Needs</u>

  Creating model agreements for system integration will not be possible without an adequate understanding of the requirements of both the utility and the technology. The development of these model integration agreements should be part of ongoing research and development efforts.

- <u>Regulatory Roadmaps</u>

  The regulatory road maps that OWET is already tasked with developing will, when complete, significantly improve the efficiency of navigating the regulatory process. This will reduce costs for generators.

- <u>Test Beds</u>

  The test bed under development in Newport under Oregon State University leadership will help lower costs through Research, Development and Demonstration of the technology.

- <u>Sharing of Infrastructure Risks</u>

  As noted in the UMI report, it will be expensive and complex to develop the infrastructure needed to significantly expand ocean energy in Oregon. It will be much more cost effective to share those risks among multiple stakeholders, rather than assigning all of those costs and risks to one party.

  One approach is to collaborate with the offshore wind energy community on joint permitting, transmission and other areas of mutual interest.

Definition of Terms

Alternative Compliance Payments

An alternative compliance payment (ACP) is a penalty a utility must pay if it does not meet an annual renewable energy generation target, which is typically defined in a renewable portfolio standard. In cases where renewable energy generation is too expensive, a utility may opt to pay an ACP.

Balancing Authority

A balancing authority is responsible for managing and integrating an electric grid's resources in a given area. The balancing authority must maintain the load-interchange-generation balance and support the real-time interconnection frequency.[162]

Balancing Authority Area

A balancing authority area is an array of grid infrastructure capacity—such as generation, transmission and load—within metered boundaries.[163]

Bond

A bond is a debt security, similar to a loan, issued by a borrower and held by a lender. A bond allows the borrower to receive a lump-sum cash payment to finance an investment or expenditure. The borrower must repay the principle plus interest to the lender by a defined date and on a defined schedule. In the case of government bonds, the lender may receive tax benefits in addition to or instead of interest payments.

Carve Out

A carve out is a stipulation in a renewable portfolio standard (RPS) that requires a certain portion of the overall RPS goal to be met by generation from a specific technology. States that want to promote a particular renewable energy resource or a renewable energy technology establish carve-out targets for these renewable energy sources and technologies. Carve outs are also referred to as set-asides.

Corporate Tax Incentive

A corporate tax incentive is a tax credit, deduction, or exemption that reduces a corporation's business tax liability. A corporate tax incentive is issued by a federal, state, or local government.

Credit Subsidy Cost

A credit subsidy cost is the total estimated cost to the government for a loan or loan guarantee.

Debt Financing

Debt financing is the use of debt, generally loans or bonds, to provide the capital necessary to construct a renewable energy project.

Electricity Generation

Electricity generation is the production of electricity from other forms of energy. For example, the movement of wind, water, or steam.

Equity Financing

Equity financing is the funding secured by a company via the sale of stock (a share of the company).

Feed-In Tariff

A feed-in tariff is a government policy tool that promotes the development of renewable energy generation by requiring a utility to purchase renewable energy at a specific rate over a period of time, typically for 10–25 years.

Government Subsidy

A government subsidy is a form of financial assistance provided by a governmental entity to a person or group in support of a defined goal. For example, a renewable energy subsidy provides financial assistance for the production of renewable energy.

Grant

A grant is a form of financial assistance that is paid in cash or in kind to an eligible person or group for a specific purpose or task. A competitive grant requires a recipient to be selected among other applicants based on merit.

Hydrokinetic

Hydrokinetic is the movement or flow of water or other fluids. Hydrokinetic energy is the energy inherent in the movement or flow of water.

Integration

Integration is the connection of a generator—for the production of electricity—to a transmission or distribution system that is not owned by a balancing authority.[164]

Interconnection

Interconnection is the connection of a generator—for the production of electricity—to a transmission or distribution system.[165]

Intermittent Power

Intermittent power refers to sources of energy that do not provide a constant and controllable power supply. Renewable energy sources, especially wind and solar, are intermittent. Ocean energy resources, including tidal and wave power, are also intermittent.

Investment Tax Credit

An investment tax credit is a tax incentive that allows a taxable entity to reduce its tax liability by a specified portion of its investment in a qualifying renewable energy project, technology, or industry.

Load

The load is the amount of power an end-user device or customer receives from the electrical system. The total load is the total amount of power the electrical system provides to end users at a given time.

Loan Guarantee

A loan guarantee is a loan provided by the government and guaranteed by the government. If a debtor defaults on the guaranteed loan, the government promises to assume the debt. Governments typically guarantee loans for industries and companies that experience significant barriers to financing, regardless of creditworthiness.

Multiplier Incentives

A multiplier incentive is a stipulation in a renewable portfolio standard (RPS) that allocates “bonus” accounting credit to the buyer of renewable energy credits (RECs) from applicable technologies. These bonus accounting credits are then applied toward the requirements of the RPS. These bonus credits are typically awarded due to a preference for specific technology, in-state manufacturing, or in-state sourcing of supplies and/or labor. The credits are an accounting mechanism. Each megawatt hour of energy continues to receive only one REC, but some RECs receive additional accounting “credit” toward the RPS.

Null Power

The electricity that remains after its associated Renewable Energy Credits have been separated from the power.

Ocean Energy

Ocean energy is the kinetic energy in tides and waves, as well as the thermal conversion energy in the ocean that can be used to generate electricity.

Permit

A permit is the legal or authoritative permission for a project or facility to be developed, requiring a formal application and approval process.

Personal Tax Incentive

A personal tax incentive is a tax credit, deduction, or exemption that reduces an individual taxpayer's personal income tax. A personal tax incentive may be issued by the federal government, or by a state or local government.

Power Quality

Power quality comprises the various physical characteristics of an electrical system (voltage, frequency, etc). Electric equipment is designed to operate within a certain set of optimal operating ranges for these physical characteristics, and the degree to which the electrical system matches these optimums defines the quality of power delivered from the grid.

Property Tax Incentive

A property tax incentive is a tax exemption, exclusion, or credit that reduces a property owner's property tax. A property tax incentive is typically issued by a state or local government.

Power Purchase Agreement

A power purchase agreement (PPA) is an agreement between a buyer and an electricity producer for the supply of a specified amount of energy over a certain period of performance. In addition to private sector agreements, PPAs can take the form of partnerships between a government entity and a private-sector project developer.

Preferential Siting

Preferential siting is a method or planning process that determines preferred or ideal locations to develop renewable energy projects and generation. This typically replaces consideration on an open-ended site-by-site basis. Micro siting inside the preferential area may still be necessary.

Public Purpose Charge

A public purpose charge (PPC) is a mandatory charge on a customer's utility bill that provides funding for renewable energy, energy efficiency, and/or low-income programs in a state, county, or utility territory.

Production Tax Credit

A production tax credit is a tax incentive that allows a taxable entity to reduce its tax liability for the production of—in the cases covered in this report—renewable energy.

Reliability

Electricity reliability refers to the number of electricity interruptions that feature a complete loss of voltage. Measures of reliability include the number of customers affected, the connected load, the period of time the interruption occurs, the amount of power interrupted, and the frequency of interruptions.[166]

Renewable Energy

Renewable energy is energy that is produced from a resource that is theoretically inexhaustible and naturally replenished. Examples of renewable energy resources are wind, sunlight, geothermal heat, rain, tides, waves, and ocean thermal energy.

Renewable Energy Credit

A renewable energy credit (REC) represents the environmental and social benefits achieved for each megawatt hour (MWH) of renewable energy produced. When, for example, a utility generates electricity from renewable energy resources, there are two products produced: the electricity produced and the environmental benefits and other attributes of using the renewable resource. The utility sells the electricity to customers and sells the environmental and social benefits as a REC. The REC is sold on a

REC market, and companies or other organizations can purchase the REC as a means to claim the benefits equivalent to 1 MWH of displaced traditional energy. (RECs are also called Green Tags and Renewable Energy Certificates.)

Renewable Portfolio Standard

A renewable portfolio standard (RPS) is a state policy tool that mandates utilities to produce, purchase, and/or sell a defined percentage of renewable energy within a certain period of time. Typically, the mandate requires large, investor-owned utilities in the state to source renewable energy for 10%–25% of its total retail sales within 10–20 years.

Set Asides

A set aside is a stipulation in a renewable portfolio standard (RPS) that requires a certain portion of the overall RPS goal to be met by generation from a specific technology. Set asides are also referred to as carve outs.

Sales Tax Incentive

A sales tax incentive is typically an exemption from state sales tax, or sales and use tax, for the purchase of an eligible item, such as a solar hot water system.

Tax Incentive

A tax incentive is a reduction in the amount of tax owed. This reduction is given to encourage certain behavior. Tax incentives can only be issued by governmental entities that collect taxes and can only benefit persons or groups that are required to pay those taxes. Tax incentives take the form of credits, deductions, or exemptions.

Tax Credit

A tax credit reduces the total amount of tax owed on a dollar-for-dollar basis. For example, a tax credit of $1,000 will reduce tax owed by $1,000.

Tax Deduction

A tax deduction reduces the total tax amount owed by reducing taxable income. For example, if a tax rate is 25%, a tax deduction of $1,000 would reduce the amount of tax owed by $250.

Tax Exemption

A tax exemption allows certain persons and organizations, as well as specific properties or other taxable items, to be exempt from some types of tax or from all taxes.

List of Acronyms

ACP: alternative compliance payment
AE: Austin Energy
ARRA: American Recovery and Reinvestment Act
BEF: Bonneville Environmental Foundation
BPA: Bonneville Power Administration
CESA: Clean Energy States Alliance
CHP: Combined Heat and Power
CMSP: coastal and marine spatial planning
CREB: Clean Renewable Energy Bond
CREP: Custom Renewable Energy Projects, Oregon Energy Trust
DOD: U.S. Department of Defense
DOE: U.S. Department of Energy
EPP: Environmentally Preferred Power
ETO: Energy Trust of Oregon
ESTCP: Environmental Security Technology Certification Program, DOD
FERC: U.S. Federal Energy Regulatory Commission
FIT: feed-in tariff
FOA: funding opportunity announcement
GWH: gigawatt hour
IOU: investor-owned utility
ITC: investment tax credit
KW: kilowatt
KWH: kilowatt hour
MOU: Memorandum of Understanding
MW: megawatt
MWH: megawatt hour
NREL: National Renewable Energy Laboratory
NYSERDA: New York State Energy Research and Development Authority
OBETC: Oregon Business Energy Tax Credit
OPUC: Oregon Public Utility Commission
OWET: Oregon Wave Energy Trust
OREC: Ocean Renewable Energy Credit
PBF: public benefit fund
PBI: performance-based incentive
PGE: Portland General Electric
PPA: purchase power agreement
PPC: public purpose charge
PTC: production tax credit
PUC: Public Utility Commission
PURPA: Public Utility Regulatory Policy Act
PV: photovoltaic
QECB: Qualified Energy Conservation Bond
RE: renewable energy
REAP: Rural Energy for America Program, USDA
REB: renewable energy bond
REC: renewable energy credit
RNP: Renewable Northwest Project
RPS: renewable portfolio standard
SBIR: Small Business Innovation Research
SELP: Oregon Small-Scale Energy Loan Program
SERDP: Strategic Environmental Research and Development Program, DOD
SMUD: Sacramento Municipal Utility District
SREC: solar renewable energy credit
STTR: Small Business Technology Transfer Program
UMI: Utility Market Initiative, Oregon Wave Energy Trust
USDA: U.S. Department of Agriculture

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