WAVE ENERGY PROJECT STATUS, BARRIERS AND OPPORTUNITIES FOR ASSISTANCE

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INTRODUCTION

In October 2007, Hat Trick Energy and Environment Consulting presented a report to the Energy Trust of Oregon's (the Trust's) Renewable Energy Advisory Committee on emerging, small-scale renewable energy technologies. The report included a market snapshot of the wave energy industry, with a focus on in-state activity and associated considerations for the Trust for engaging in project development assistance in the state.

Following the report, the Trust requested Hat Trick to investigate further potential measures that the Trust could pursue to incentivize the generation of wave energy in the state. This report addresses the request by discussing the current status of project development in the state, key barriers related to project development, potentially useful measures to assist with project development, and issues for the Trust to consider when deciding if and how to assist in-state wave energy projects.

PROJECT STATUS

The October 2007 report discussed six different wave energy projects on the Oregon coast, most in very early stages of development. Of those projects, four are still in existence. Another project has begun since then. We discuss these projects in brief below.

Florence. Australia-based Oceanlinx (formerly Energetech) had filed for a Federal Energy Regulatory Commission (FERC) preliminary permit for a 10-MW project off of Florence. The proposal entailed oscillating water column (OWC) devices covering a 2.3 mile by 5.1 mile footprint on territorial waters. This year the company withdrew its permit application and appears focused on its Rhode Island project, as well as projects in Australia. The company's lead developer for the Oregon project and her successor no longer work for the company.

Lincoln County. Lincoln County submitted a preliminary permit application for a wave energy project off of its coast. The permit covered the entire coast presumably to secure nine potential project sites that would each hold generation between 20 and 180 MW. Based on FERC's concern that they were merely attempting to block out other developers from their county, the county then focused on permitting a test site off of Newport. However, now the County is no longer pursuing the application.

Bandon. Finavera's Bandon project, which proposes a maximum of 100 MW using point absorber buoys and a first phase of 2 MW, is still under development. However, Finavera is facing financial challenges associated with a sharp drop in its stock price. The price drop appears to be due to at least a couple of factors, including the general decline of the stock market, and the lack of near-term, cash-generating projects to sustain the company as it

pursues longer-term wave energy projects. The company had touted its wind energy project development in British Columbia. However, no projects have materialized. At this time, it is not certain if Finavera will be able to maintain a vigorous development effort in Oregon.

Reedsport. Ocean Power Technologies (OPT) is pursuing two projects in Oregon. OPT received a FERC preliminary permit for its Reedsport Wave Park project, which it plans to hold 200 point absorbers on a 0.4-by-3.1-mile area. OPT submitted a FERC license application last year with an intention to install a test buoy on the site this year. The company is still pursuing a 2-MW project with 10 buoys for 2009 deployment.

Coos Bay. OPT is also pursuing a 100-MW project in Coos Bay that it hopes to install between 2011 and 2013. Unlike its Reedsport project, and unlike most other project efforts in the state, OPT intends a full build-out of the Coos Bay project rather than a phased development. The company believes that permitting costs are too high—exceeding $1 million—to support a small-scale project that will be attractive to power purchasers.

Douglas County. Douglas County intends to develop a small-scale project abutting an Army Corps of Engineers jetty at Winchester. FERC issued a preliminary permit to the county in May 2008. The county intends to partner with British "heave" (oscillating water column) device manufacturer Wavegen for the 3-MW project. The county last year intended to install the device within three years.

Since then, the county has been stalled in its bathymetric mapping efforts necessary to size the device based on sea-floor characteristics and their impact on wave patterns and intensity. The lead developer for the county attributed the delay to lack of development funds and a general fiscal shortfall to fund basic county functions. The development effort still relies on annual county appropriations, rather than a standing fund. Nevertheless, the county states that they intend to own the project. Its sense of initial power market demand for output, co-investors (e.g., tax equity), additional subsidy sources, and overall financial structure is still rudimentary.

In addition to the projects discussed in last year's report, another development effort began late last year. The Tillamook Intergovernmental Development Entity (TIDE), a partnership between Tillamook PUD and Tillamook County, submitted a preliminary permit application to FERC in October 2007 for five one-mile-by-three-mile sites at the edge of the territorial waters near Tillamook PUD substations. The sites are located off of Nehalem, Rockaway, Garibaldi, Netarts, Neskowin and Nestucca. Each site would hold 5 to 90 wave buoy generators having a total installed capacity of 20 to 180 MW. (The type of generator is not yet known.) FERC issued the preliminary permit in May 2008.

TIDE also issued an RFP for wave energy project developers, whereby developers will develop the project under TIDE's oversight, with TIDE as the (non-transferable) FERC permit holder. RFP bids are due in June 2008. The entity hopes it can build on Tillamook PUD's experience in

assembling available incentives for energy projects, as well as the PUD's access to municipal bond markets for low-cost debt financing.

Among the projects discussed above, only OPT's two projects (Reedsport and Coos Bay) appear to have momentum, based on the health of the development entity and development progress up to now.

- Finavera's project faces challenges primarily associated with the company's financial state.
- Douglas County's efforts have been sporadic up to now, as the county's difficult fiscal situation points to significant development risk associated with access to funding and the ultimate risk appetite of the county, in light of competing county funding needs.
- TIDE's proposal in Tillamook County is heavily reliant on the expertise (and, most likely, risk appetite) of a private development firm. Since TIDE's RFP includes provisions granting TIDE strong oversight of project development (e.g., hiring of subcontractors), and given the likely high development costs and risks, only time will tell if the project will have any momentum.

Oceanlinx' and Lincoln County's withdrawals point to the impetus of permitting efforts in the U.S. last year—site banking. Initial permit applications for numerous tidal energy sites on the East Coast triggered concern among competitors that developers with uncertain expertise were snapping up promising locations by submitting simple applications to FERC. The concern induced a relatively large volume of preliminary permit applications in 2007 and 2008.

However, by early 2008, many of the developers receiving their preliminary permits had to show FERC that they were making "sufficient progress" in project exploration, leading to a license application. Given site development cost estimates between $500,000 and $4 million for a new technology with uncertain impacts, those permit holders without a strong intent to face development costs and risks have dropped their efforts.

It is worth noting that the number of wave energy projects waiting for FERC preliminary permits dropped from six in 2007 to none in 2008. (This compares to an *increase* in new, preliminary permit applications for tidal energy projects, as opposed to wave energy projects, from 29 in 2007 to 63 in 2008.) The drop points to a drying up of initial interest in wave energy projects (in spite of continued interest in tidal energy projects). Observers are waiting to see how those projects with preliminary permits (five of which are in Oregon) will fare.

Apart from the site banking dynamic, wave energy projects are moving slowly for other reasons discussed below.

BARRIERS

The October 2007 report outlined numerous barriers to wave energy development, many of which are inherent in a new energy technology. It does not appear that any of those barriers have gone away.

- **Lack of federal incentives.** Wave energy still does not qualify for the federal investment tax credit nor the federal production tax credit, creating a strong disadvantage compared to other renewable energy technologies.
- **Lack of technology and project experience.** Little new project experience has occurred since October of last year. In fact, the most prominent U.S. development was the sinking of Finavera's AquaBuoy in Oregon during a brief test. It is worth noting the wave energy projects are under construction off of Spain and Portugal, and that overall industry experience should grow measurably over the next couple of years due to Europe's aggressiveness in supporting the industry.
- **Stakeholder concerns**. Not surprisingly, the lack of *in-situ* project experience has not helped to alleviate uncertainty among environmental and economic interests about wave energy's impacts on natural resources (e.g., wave patterns, mammals, birds) and on other economic activities (e.g., crabbing, fishing, tourism, underwater cable operations).
- **Skittish financial markets**. The lack of certainty in technological performance, permitting, and federal incentives has naturally stifled any potential enthusiasm from financiers, including venture capitalists.

In Oregon, project siting is facing an additional statewide challenge. The state's Department of Land Conservation and Development is revising Oregon's Territorial Sea Plan, which is a part of the state's Coastal Management Plan, which in turn must comply with the federal Coastal Zone Management Act.[1] The Territorial Sea Plan is particularly important for wave energy since it specifies the state process for evaluating project proposals.[2]

The Governor's position on wave energy development is cautious. In a March 26, 2008 letter to FERC, Governor Kulongoski stated that his "support for the use of Oregon waters is presently limited to testing and research and a limited number of small demonstration projects in order to commercialize the technology and develop the scientific analysis for the potential impacts of the technology on ocean resources and existing uses." Regarding OPT's proposed build-out at Coos Bay, Kulongoski elaborates that he is "asking FERC to not process any future application by OPT for large scale commercial development until Oregon has completed an amendment to its Coastal Zone Management Plan." The Governor has stated interest in creating marine reserves,

[1] The federal National Oceanic and Atmospheric Administration (NOAA) must approve the Coastal Management Plan for it to become effective.

[2] Note that the state Territorial Sea Plan, which pertains to state waters (3 nautical miles from shore) must be consistent with the state Ocean Resources Management Plan, which pertains to both state and federal waters, though the state does not have jurisdiction over federal waters. The state Ocean Policy Advisory Council provides recommendations to the state on both plans.

including federal national marine sanctuaries, off of the Oregon coast. While the details of such reserves are not yet clear, it could restrict the location and size of potential wave energy projects.[3]

The October 2007 report discussed FERC's pilot project permitting proposal, in which projects 5 MW and less could receive relatively quick licensing approval (as short as six months) for a limited operating period. However, none of the observers interviewed for this report believed that the proposal has lead to meaningfully quicker licensing processes. Instead, the original concern that FERC's proposal could only be as effective as the state and federal agencies involved in the licensing process has proven true. The participating agencies beyond FERC, still unfamiliar with licensing such a new technology, have not obliged FERC and project developers with a fast-track process for licensing small-scale projects.

In the above discussion of barriers, most noticeably absent is a discussion of typical barriers for more mainstream renewable energy projects, including transmission access, integration costs, equipment availability, and input costs. The absence is not meant to imply that these issues do not exist for wave energy. Instead, the implication is that these concerns are not the first barriers that the industry must overcome. Rather, they represent barriers for those projects that actually receive FERC licensing and plausible power market opportunities. No project is far enough in its development to merit a deep discussion of these conventional project barriers.

Perhaps the safest investment in the industry right now is in technology development. Firms such as WaveBob and Pelamis (formerly Ocean Power Delivery) that are devoted to design and fabrication are either receiving substantial investor interest or even partnering with large, established energy firms (Chevron in the case of WaveBob) that are looking at a five-year horizon for initial commercial deployment.

MEASURES TO OVERCOME BARRIERS

Discussions with wave energy industry participants and observers points to numerous measures that the industry needs now to make progress.

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[3] The federal definition of a "marine protected area" is "any area of the marine environment that has been reserved by federal, state, tribal, territorial, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein." A marine reserve is typically a marine protected area closed off to all extractive activities. The Governor is not pursuing federal marine sanctuaries, which are administered by NOAA, within state territorial waters. The state Ocean Policy Advisory Council is considering a definition of state marine reserves as "an area within Oregon's state territorial sea that is protected from all extractive activities, including the removal or disturbance of living and non-living marine resources, except as necessary for monitoring or research to evaluate reserve condition, effectiveness, or impact of stressors such as climate change."

- Permitting. Streamlining permitting regulations, including more clarity on what areas in the territorial sea are potentially available for development, and what the process with each relevant state and federal agency is.
- Community outreach. Outreach to local and state-level stakeholders must address environmental and economic concerns, and that can articulate the local and state economic benefits of wave energy.
- Environmental impact studies. Related to the above measure, assessments are needed to clarify impacts on salmon migration, sea birds, marine mammals, among other organisms. Issues such as electromagnetic forces and sediment transport are also uncertain. Studies would require baseline study and ongoing monitoring, as well as assessment of potential cumulative impacts of multiple projects.
- Data on technology performance. Oregon State University's planned test bed might be a good venue for gaining better understanding among developers, regulators, and financiers about wave energy generator performance.[4] (One observer raised the concern that Oregon State's investment in their own generation technology would raise intellectual property concerns among other technology developers who could also use the site.)

The recently created Oregon Wave Energy Trust (OWET) received $4 million from the state legislature to invest in regulatory coordination (state territorial sea plan, federal permitting), environmental assessment (to help with potential coastal zoning process and licensing requirements), R&D for technology development, and community outreach. The OWET Board is envisioning a $20 million work plan, though future funding is dependent on the state legislature and other federal and private resources.

Some developers and observers noted an interest in funding for near-term development needs for specific projects (e.g., bathymetric mapping, other project feasibility studies, initial environmental studies). This interest is notable in that it implies a potential lack of internal funding for such measures, which reinforces the worry about the stability of many project development efforts so early in the lengthy development process. Wave energy projects have the added risk of unproven technology, nascent permitting processes, inexperienced development entities, and limited subsidy availability compared to other renewables. Early-stage project assistance for any technology inherently entails risk that latter development steps fail to result in a completed project. Wave energy's added risks raises the overall risk to the Trust that early-stage assistance will not result in desired generation, at least in the near-term (i.e., one to two years).

IMPLICATIONS FOR THE TRUST

[4] OSU is investing $3 million and seeking additional federal funds to develop a test bed.

The problems facing wave energy project development in Oregon reflects the infancy of the wave energy industry. The problems represent standard issues for a technology and an industry that remains in the research and development phase.

The current industry needs are not related to production (or even investment-based) subsidies, access to transmission, or stable supply of key equipment. Rather, the industry needs help on the basics: reliable technology and a defined permitting process, which in turn points to technology R&D, environmental impact studies, and community outreach.

The Trust faces two general options if it is to invest in wave energy development in Oregon:

1. Support industry infrastructure that is not specific to individual projects.
2. Support specific proposed projects, either through development assistance, or through the offer of incentives for the generation of power from such projects when they being to generate power and deliver power to the grid.

The first option points to more immediate, industry-wide needs. However, it also does not promise a straight-forward attribution of new renewable energy generation to the Trust's funding. The funding needs in this area are significant.

The second option does offer specific megawatt-hours for the Trust's funds, but it also entails uncertainty over when and whether the Trust will disburse the funds.. Due to the lead-time of most projects, it could be several years before the Trust disburses the committed funds.

Given the lack of federal incentives, the lower cost and risk of competing renewable options, and the potentially high cost of initial wave energy projects, the cost per MWh of generation will likely be higher than for other renewable energy projects available for Trust funding, assuming no other substantial source of subsidies.

In short, the Trust needs to consider the trade-off between the risk of unspent funds versus the difficulty in associating renewable energy generation to Trust funding. Further, it is unclear which technology is in the lead. The Trust also should consider the tradeoff between supporting early-stage wave energy development with more commercial-stage renewable energy funding opportunities in the state.

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