

OREGON WAVE ENERGY TRUST UTILITY MARKET INITIATIVE

TASK 2.3: FORECAST OF POTENTIAL WAVE ENERGY IN OREGON



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The Utility Market Initiative was prepared by *Pacific Energy Ventures* on behalf of the Oregon Wave Energy Trust.

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About Oregon Wave Energy Trust

The Oregon Wave Energy Trust – (OWET) - with members from fishing and environmental groups, industry and government - is a nonprofit public-private partnership funded by the Oregon Innovation Council in 2007. Its mission is to serve as a connector for all stakeholders involved in wave energy project development - from research and development to early stage community engagement and final deployment and energy generation - positioning Oregon as the North America leader in this nascent industry and delivering its full economic and environmental potential for the state. OWET's goal is to have ocean wave energy producing 2 megawatts of power - enough to power about 800 homes - by 2010 and 500 megawatts of power by 2025.

Wave Energy Capacity Profile for Oregon: Generation Forecast for 2009-2025

Objective

This document provides an approach for evaluating potential future wave energy development in Oregon. The approach outlines the key drivers affecting the development of wave energy off the coast of Oregon and makes a qualitative assessment of potential development levels under current, low and high scenarios. The document is designed to help OWET understand the factors that will impact wave-energy development and to assist in making decisions about where to focus resources to spur growth in the industry. It is *not* intended as a detailed or comprehensive quantitative analysis of the electricity market or the wave energy industry.

Under current financial and economic conditions, the industry will likely be able to site 250 MW of capacity off the Oregon coast by the end of 2025. This analysis also indicates that if certain key factors are met, the industry could site up to 500 MW of capacity. OWET may be able to spur growth by focusing its efforts in key areas that both encourage development and are subject to external influence. These areas include (1) supporting legislative actions to increase market demand for renewables; (2) supporting (or proposing) federal and state tax incentives and price support mechanisms for wave energy; (3) participating in marine spatial planning efforts to provide for clear siting protocols; (4) supporting (or initiating) efforts to streamline state and federal regulatory processes affecting wave energy; and (5) supporting technology developers to reduce the timeline to commercialization for WEC devices.

Forecast

The graph below includes a best-estimate projection for the development of wave energy under three scenarios: low growth, current and accelerated growth conditions. The factors influencing wave-energy development are described below, and the assumptions that informed the forecast are set out in Table 1.

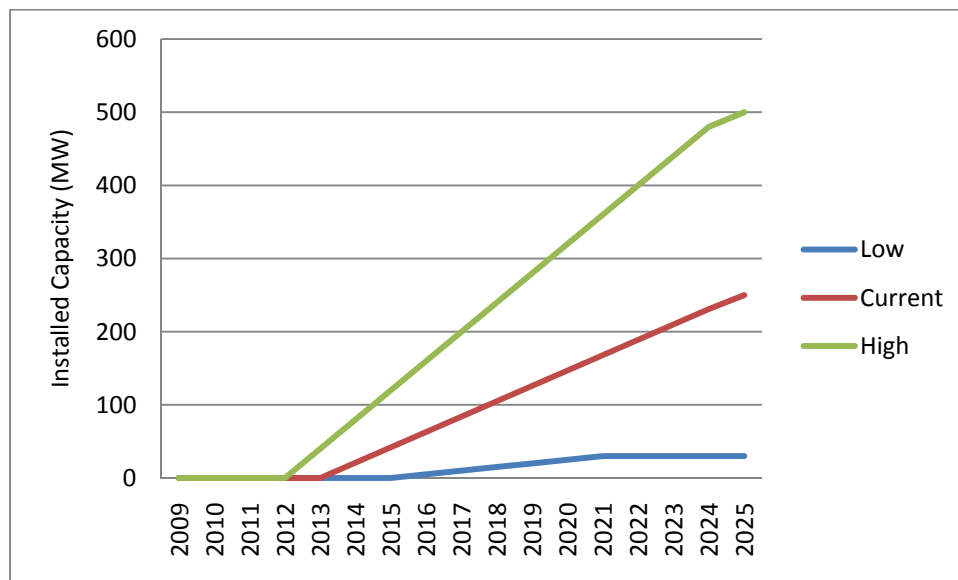


Figure 1: Forecast of Wave Energy Capacity in Megawatts¹

Factors Influencing Wave-Energy Development

Market Considerations

Market Prices: The market prices for electricity on the West Coast depend on many factors including natural gas prices, weather, and economic conditions. High electricity and natural gas prices will make wave energy more attractive.

Economic Conditions: Refers to the overall health of the economy and financial markets. Economic conditions determine the availability of financing and the overall demand for electricity in the market.

Market Demand for Renewables: National cap-and-trade and carbon tax legislation are under discussion. Passage of either legislation would increase the value of non-carbon resources and make wave energy more attractive.

Federal Tax Incentives & Price Supports: Tax incentives and price supports effectively reduce the cost of energy. Increased incentives and price supports would make wave energy more price competitive. Incentives and price supports that are specifically targeted to wave energy can improve wave energy competitiveness relative to other renewable resources.

State Tax Incentives & Price Supports: Tax incentives and price supports effectively reduce the cost of energy. Increased incentives and price supports would make wave energy more price competitive.

Siting Considerations

Marine Spatial Planning: Federal and state efforts are underway to manage different uses in the ocean. To the extent that these planning efforts determine the best sites for wave-energy projects, that can reduce risk and ease the development process for wave energy development.

Port Infrastructure: Wave-energy projects require access to sufficient port infrastructure to support the launch, operations, and maintenance of WEC devices.

Regulatory Process: The regulatory process is an important element associated with the development and implementation of a wave energy project. However, the time and permit requirements associated with the regulatory process impact the overall cost of energy. Efficient state and federal permitting processes can reduce cost and risk to project developers.

Transmission Capacity: Sufficient transmission capacity will exist for approximately 650 MW build-out of wave-energy projects by 2025.

Technology Considerations

Cost of WEC Technology & Pace of Development: The cost of WEC technology is considered on a per-kW installed capacity basis. Consensus on device design standards will speed-up development and decrease overall costs.

Generation Planning/Capacity Value: The capacity value of a resource depends on the consistency of resource performance throughout the year and the ability to accurately forecast resource output. To the extent that wave energy can be accurately forecasted for extended time periods and perform consistently, the value of the resource relative to other renewable resources will improve.

CCS Technology Development: Carbon capture and sequestration technology has not yet been proven. If it is proven, is commercially viable and has Federal support, fossil-fuel-based generation may regain favor, reducing the demand for renewable energy technologies.

Solar Technology Development: Solar technology is a competitor to wave energy in the renewable energy market. Rapid growth or significant cost reductions in solar could negatively affect wave-energy development.

Viability of Nuclear Development: Nuclear technology could be a non-carbon alternative to renewable energy. Although no new nuclear plant has been brought online in the United States since 1996, the political atmosphere may favor further development in the next decade reducing the demand for renewable energy technologies.

Biomass Technology Development: Biomass technology is a competitor to wave energy in the renewable energy market. Because biomass provides renewable baseload power, any increase in biomass production reduces the potential demand for wave-energy project output.

Table 1: Forecast Assumptions

		LOW LEVEL OF WAVE ENERGY	CURRENT	HIGH LEVEL OF WAVE ENERGY	ABILITY TO INFLUENCE
MARKET CONSIDERATIONS	Market Prices for Electricity & Natural Gas	Depressed electricity and gas prices; high hydro output.	Basic annual price growth; average rainfall; few extreme weather events.	High electricity and gas prices; low hydro output.	Highly variable; cannot be influenced.
	Economic Conditions	Poor economy; financing difficult to acquire and low demand for energy.	Slow market recovery; some financing available.	Rapid economic recovery; strong financial markets and high demand for energy.	Highly variable; cannot be influenced.
	Market Demand for Renewables	No national carbon tax, RPS, or cap-and-trade legislation passed.	State-by-state RPS.	Cap-and-trade passed; high carbon price; low % free allocations. US RPS.	Variable; may be influenced.
	Federal Tax Incentives & Price Supports	PTC & ITC expire. Grants in lieu of ITC are not renewed. No new allocations to CREBs.	All existing incentives renewed.	Renewed and expanded PTC & ITC; grants in lieu of ITC renewed; new CREBs allocations.	Variable; may be influenced.
	State Tax Incentives & Price Supports	BETC disappears. No FIT or RPS multiplier set for hydrokinetics.	All existing incentives renewed.	BETC unchanged; FIT and multiplier set for hydrokinetics.	Variable; may be influenced.
SITING CONSIDERATIONS	Marine Spatial Planning	Federal leadership lags. Major data collection required before development can begin.	MSP process continues slowly with some Federal leadership.	Strong Federal leadership in data collection.	Variable; may be influenced.
	Regulatory Process/ Hurdles	Congress changes FERC/MMS roles re: hydrokinetics.	Status quo	Increased intrastate agency cooperation; streamlined federal/ state communications.	Variable; can be influenced.
	Transmission Capacity	POIs located far from strong Port infrastructure and wave resource and/or existing POIs require upgrades.	Approximately 600 MW of transmission capacity available.	POIs with high capacity coincide with strong Port infrastructure and wave resource.	Fairly constant; can be influenced.
TECHNOLOGY CONSIDERATIONS	Cost of WEC Technology & Pace of Development	Five years into a 25-year commercialization timeframe.	Five years into a 15-year commercialization timeframe.	Five years into a 10-year commercialization timeframe. Int'l standards established.	Highly variable; can be influenced?
	Generation Planning/ Capacity Value	Forecast accuracy is poor and only accurate 4-8 hours in advance. Resource performance is inconsistent and unpredictable.	Forecast accuracy and performance similar to other renewable energy technologies.	Forecast accuracy is high for extended periods (e.g. 180 hours). Resource performs consistently in all weather.	Variable; can be influenced.
	CCS Technology Development	CCS technology proven and has federal support.	CCS development continues; no major breakthroughs.	CCS development stymied and politically unpopular.	Variable; cannot be influenced.
	Solar Development	Active solar development. Permanent FIT is established for solar.	Small growth in commercial solar; no permanent FIT.	Solar development stymied; no permanent FIT for solar.	Variable; cannot be influenced.
	Nuclear Development	New nuclear plants are permitted. High-level waste site determined.	Status quo	No new nuclear development. No waste site determined.	Variable; cannot be influenced.
	Biomass Development	Active biomass development	Status quo	No strong development of biomass	Variable; cannot be influenced.

ⁱ Low development assumes three 10-MW projects are built beginning in 2016.
Current development assumes five 50-MW projects are built beginning in 2014
High development assumes five 100-MW projects are built beginning in 2013