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Riding the Tide

Have you been misled about the feasibility of tidal power in the Pacific Northwest?

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Researchers have waited years for the implementation of a tidal power pilot project in Puget Sound, but it seems they will have wait a while longer.

Progress has been slowed by the traditional obstacles that prevent pilot projects such as these from coming online. However, maybe this time, that isn't such a bad thing.

For the better part of a decade, UW researchers, Tacoma Utility, and Snohomish County Public Utility District have commissioned studies of the feasibility of tidal based energy in Puget Sound. Early study phases have been completed, yielding data on the currents in various sites in Washington. In fact, in December of 2009, SnoPUD submitted its first license to the Federal Energy Regulatory Committee for approval of a pilot project in Admiralty Inlet. However, bureaucratic back-and-forth has prevented the project from coming online. Without a pilot project to generate energy and serve as a standard for feasibility calculations, tidal energy in Puget Sound will remain merely an educated speculation.

Where exactly did this drive for tidal energy come from?

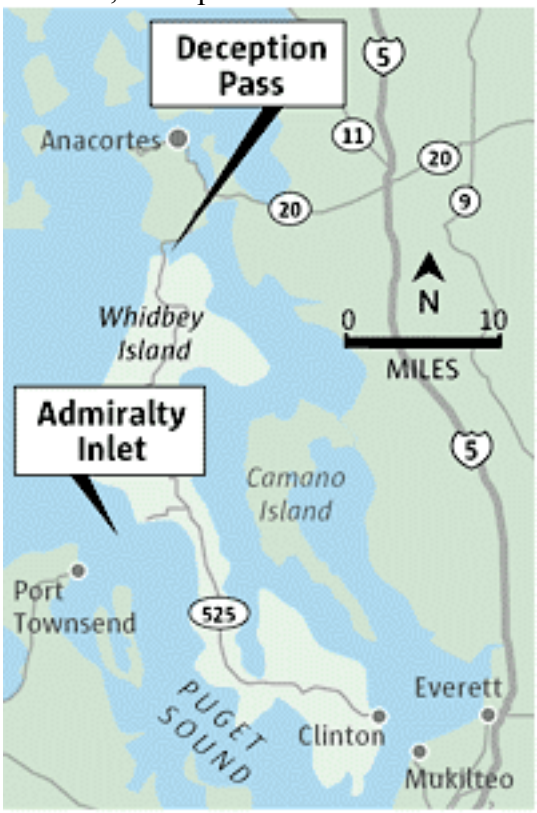
The population of Snohomish County, WA, increased nearly 18 percent since 2000, making it one of the fastest growing counties in the country. The county experiences a load growth of 15-20 additional megawatts a year that must be supplied by the electricity grid.

In November of 2006, Initiative 937 required the state to instate renewable energy standards such that portfolios of large utilities would be 15% renewable by 2020. The new portfolio goal means that companies such as Tacoma Utility and SnoPUD will be required to provide hundreds of thousands of additional megawatt hours a year of renewable energy. Furthermore, hydropower was officially taken off the list of renewable resources in Initiative 937 due to the controversy over the effects of dams on spawning salmon populations. Washington, a state limited in its wind energy production, has looked to the Puget Sound Tidal Channel and the Tacoma Narrows Tidal Channel to close this gap in renewable energy production.

In the spring of 2011, SnoPUD sent a final official license application to FERC to install two tidal turbines in the narrows of Admiralty Inlet. The turbines have blades 65 feet in diameter, and the turbines will be submerged 200 feet deep in the channel. The pilot project will provide 500 kilowatts of total capacity, with an average output of 50 kilowatts. The project will be partially funded by a 10 million dollar Department of Energy grant that is expected to cover half of the project's costs.

The pilot project has a price tag of $40/watt assuming total capacity output. However, pilot projects are usually more expensive than full-scale implementation projects.

Assuming the pilot project is conducted successfully and yields optimistic results, SnoPUD will move to install initial tidal turbine arrays in seven sites, including Admiralty Inlet, Deception Pass, Guemes Channel, and Spieden Channel.



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SnoPUD delivers electricity to 300,000 customers. In order to comply with Initiative 937, they would need to add 140 megawatts of renewable energy to their portfolio. The seven tidal sites in Puget Sound could realistically add 100 megawatts by 2020. While this is a significant dent in Washington's renewable portfolio, it comes at a price.

Tidal power remains a nascent technology, which means both good and bad things for the energy sector. In some regard, tidal turbines are currently being innovated and improved. Turbine designs have low visual impact and virtually no noise pollution, meaning inhabitants of Puget Sound and Tacoma will likely never notice their presence. These turbines also have high power density, meaning a small tidal turbine can provide the same power as a larger wind turbine. And finally, the high predictability of the tides, up to decades in the future, allows researches to optimize turbine and project design.

In Washington, primarily Puget Sound and Tacoma, the portrayal of tidal power has adequately explained the advantages and benefits of this technology. However, tidal power has some serious disadvantages and obstacles that have not yet surfaced in the coverage of these new projects.

Primarily, tidal power is not yet economically feasible. "Tidal power technology is where wind technology was decades ago. Right now, it wouldn't be a sound investment at this site for Tacoma Power and its customers," said Gary Armfield, the superintendent of Tacoma Power.

According to Chris Leyerle, CEO of Hydrovolts, a company that develops turbines for rivers and canals, the price of tidal power currently soars above the price of other electricity generating technologies, including wind. Additionally, the underwater cables necessary to transmit electricity from the tidal turbines to generators on land can cost one million dollars per mile, a devastating cost for a potential tidal power project.

Additionally, tidal turbines have very high operating and maintenance (upkeep) costs. Furthermore, the turbines can be difficult to maintain due to the challenges of underwater construction.

Finally, the power generation is intermittent over the course of the twenty-four hour day due to the natural fluctuations of the tides.

These limitations of tidal power lead to a high overall price of electricity generation. At the current time, tidal power in Puget Sound and Tacoma is not economically competitive with other renewable energy sources, primarily wind power generation. It can be assumed that the price of tidal-based electricity will drop in the next decade due to technological

innovations and further pilot testing, but at the current prices tidal power is a waste of economic resources.

To put into scale the economic infeasibility of tidal power in Washington, take a look at the Tacoma Narrows Tidal Power project design.

Many are calling the Tacoma Narrows an ideal site for tidal energy production. In many regards, it is true that the Tacoma Narrows has relatively good physical characteristics to support a tidal-turbine array. With an average width of 1,490 meters, an average depth of 42m, and a peak velocity of 3.9m/s (8.7 mph), the Narrows have an average power density of 1.7kW/m^2 and an average power extractable of 16 megawatts.

With a proposed sixty-four dual rotor turbines, the Tacoma Narrows project could theoretically deliver 120,000-megawatt hours per year (best case scenario 190,000 MWh/y). The total plant investment would encroach 150 million dollars, with an 8 million dollars O&M cost per year.

These values lead to a levelized cost of energy of 8 cents/kWh in the best-case scenario. To be competitive with wind-generated electricity (which currently resides somewhere around 5 cents/kWh depending on the location and the turbine capacity) tidal power would need to see a 75% reduction in total plant investment costs. At the current time, a 75% reduction in capital costs is not possible, which makes tidal power a waste of money and a waste of turbine resources with the current technologies.

Evaluating the scenario using a fiscal rubric, it is not sensible for SnoPUD or Tacoma Utility to continue to pursue tidal power at the current time. This is not to say that tidal power technology will not improve in the next decade to a point at which tidal-based electricity generation becomes economically feasible for utilities and for consumers.

The answer to Washington's renewable energy gap problem can be found in the Washington wind. Washington currently provides 1,900 MW of nameplate wind generation capacity, with an additional 800 MW under construction. Additionally, Washington has a realistic wind potential of 3,740 MW. By exploiting this abundant resource, much of which is found in the Puget Sound area, Washington could provide over 3 million MWh of renewable energy, more than enough to put Washington on the path to a renewable future.