

**U.S. House of Representatives
House Committee on Science and Technology
Subcommittee on Energy and Environment
The Honorable Brian Baird, Chairman**

Hearing: *“Marine and Hydrokinetic Energy Technology: Finding the Path to Commercialization”*

**Testimony of
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Thank you Mr. Chairman, Ranking Member Inglis, and Members of the Committee for the opportunity to appear before you to provide testimony on this important topic. I am Craig Collar, Senior Manager of Energy Resource Development for the Snohomish County Public Utility District. Snohomish PUD is located in Washington State just north of Seattle and serves approximately 318,000 electric customers and nearly 20,000 water customers. Our service territory covers over 2,200 square miles, including both Snohomish County and Camano Island.

Introduction

Snohomish PUD is the twelfth largest publically owned utility in the nation and is located on the shores of the Puget Sound estuary. We believe there is significant potential to generate clean, renewable, environmentally benign, and cost effective energy from tidal flows at selected sites in the Puget Sound, and that successful tidal energy demonstration in the Sound may enable significant commercial development in the Sound and elsewhere resulting in important benefits for both the northwest region and the country. In order to meet the demands of a growing service load, as well as a state renewable portfolio standard, Snohomish is conducting exceptionally aggressive conservation and energy efficiency programs. Additionally, in just the past few years, Snohomish PUD has acquired the highest percentage of wind energy of any utility in the Northwest and is actively pursuing geothermal energy as well as solar, biomass and other clean resources. We believe that tidal energy also has the potential to contribute significantly as part of a richly diversified clean energy portfolio, but that in-water testing is required to address associated uncertainties in performance, cost, and environmental effects.

Snohomish has made significant progress towards the deployment of such an in-water testing program,

but while many barriers to this research and development effort have been overcome, substantial challenges remain to the successful deployment of tidal energy technology in our region.

The marine energy industry today remains in its infancy; even in the United Kingdom which has largely led the world in marine energy development and testing, marine energy projects are limited to a small handful of fairly recent efforts. As a result, little data relative to the technical, economic, and environmental viability of ocean energy generation has yet been established. Our view is that the most effective way to address this data gap is via the responsible deployment, testing and monitoring of utility-scale ocean energy devices at appropriately selected sites – this in fact is the objective of the Snohomish PUD Puget Sound Tidal Energy Demonstration Project. The data from this project will inform Snohomish PUD’s potential development of other sites in and around Puget Sound, as well as provide important information for other marine energy developers in the nation.

Snohomish PUD Puget Sound Tidal Energy Demonstration Project

The purpose of the Snohomish tidal project is to gather data by conducting the deployment, demonstration, and testing of tidal energy conversion technology in the Puget Sound. The project is recognized as one of the leading marine energy efforts in the country, has substantial support in the region, and has built an exceptionally strong project team. Snohomish PUD, in partnership with the U. S. Department of Energy (DOE), the University of Washington (UW), the Northwest National Marine Renewable Energy Center (NNMREC), and the Electric Power Research Institute (EPRI) has conducted a thorough evaluation of potential tidal energy sites in the Puget Sound, and has selected Admiralty Inlet (Figure 1) as the most appropriate location to establish a demonstration project.

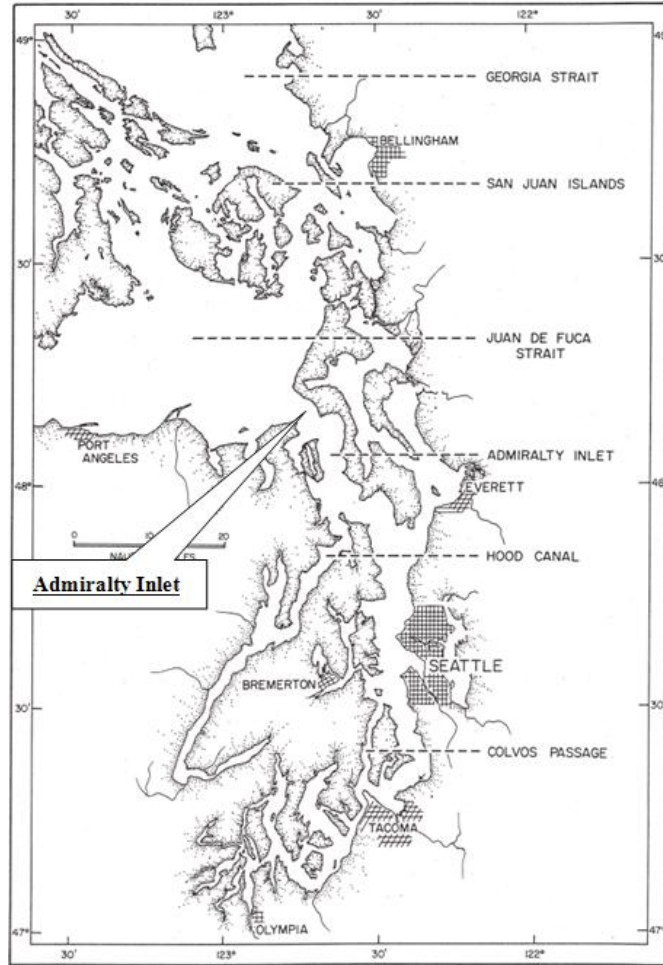


Figure 1: Puget Sound and Admiralty Inlet

Snohomish PUD and its partners have conducted an extensive suite of studies both to establish the suitability of the Admiralty Site for tidal energy generation, as well as to characterize important environmental characteristics of the site. To date these activities have included:

- Acoustic Doppler current profiling and tidal current modeling
- Detailed bathymetry measurements and geotechnical evaluation of the seabed
- Remotely operated vehicle videography of the seabed
- Water quality measurements
- Background acoustics measurements
- Multiple hydro-acoustic surveys to determine the presence, location, and abundance of fish and other marine life
- Passive acoustic monitoring to detect marine mammal echolocation/vocalization

- Passive monitoring for acoustically tagged fish and marine mammals
- Southern Resident Killer Whale (SRKW) observation, tracking, and behavior assessment
- Tidal energy conversion technology assessment and selection
- Preliminary plant design and grid interconnection study
- Navigation, fishing and social considerations

Snohomish PUD engaged with over 30 tidal energy technology developers worldwide as part of its assessment and selection program. This effort included visits with the leading technology developers in the U.S., Europe, and Canada, as well as to the European Marine Energy Center (EMEC) in the Orkney Islands, Scotland. Following a detailed evaluation process Snohomish PUD selected OpenHydro as its technology partner for the demonstration plant. OpenHydro is an Irish energy technology company whose business is the design and manufacture of marine turbines for generating renewable energy from tidal currents. The OpenHydro turbine technology was developed in the United States in the early 1990's and the rights were subsequently licensed by OpenHydro in 2004. During 2006 OpenHydro completed the installation of the first tidal turbine at EMEC. This installation, mounted on a surface piercing testing rig, is shown in Figure 2.



Figure 2: OpenHydro Research and Development Installation

In May 2008 OpenHydro successfully completed the connection of the test structure to the electricity distribution network, making OpenHydro the first company to deliver tidal stream power to the UK national grid. Since that time OpenHydro has successfully deployed two additional turbines on

completely submerged gravity bases; one at EMEC and one in November 2009 in the Bay of Fundy, Nova Scotia. The turbines utilized for the Puget Sound demonstration plant will also be deployed on completely submerged gravity foundations (as shown below in Figure 3) similar to those used for the EMEC and Bay of Fundy efforts.

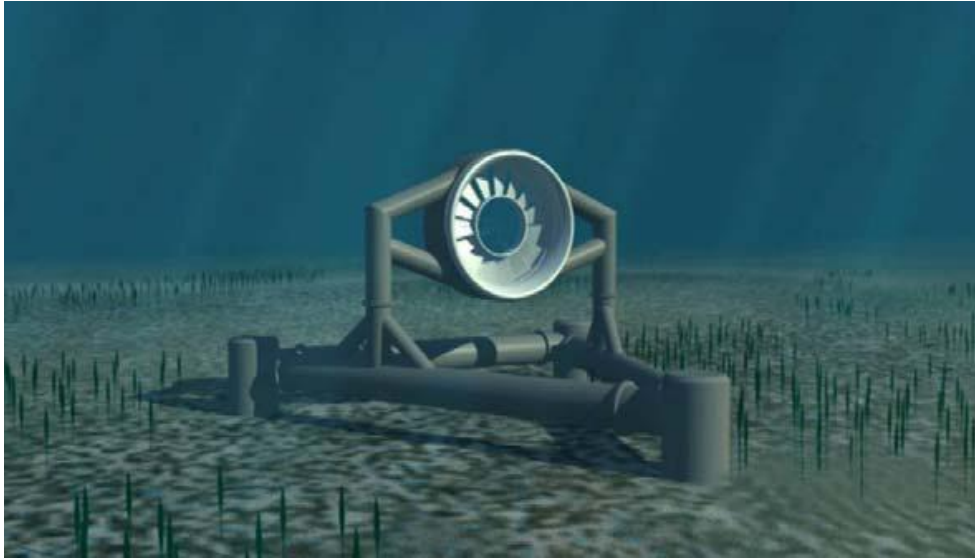


Figure 3: OpenHydro Turbine Gravity Foundation Installation

Snohomish envisions that the demonstration plant will consist of one or two OpenHydro turbines as large as 16 meters in diameter located about 1 kilometer offshore in approximately 60 meters of water depth. Power would be transferred to the electric grid on Whidbey Island via a seabed cable. The cable deployment will utilize horizontal directional drilling so as to avoid disturbing nearshore habitats. No anchor placements, pilings, or surface-piercing structures would be involved with the turbine installations or cable. In fact, both the turbines and their foundations are specifically designed to be completely removable for scheduled maintenance or other needs. The project would be of very limited scale relative to Admiralty Inlet, representing less than 0.05% of the Inlet's cross-section. The small scale and temporary nature of the project significantly diminish the likelihood of adverse environmental effects. Likewise, the water depth at the site and its location outside of the shipping channel mitigates navigational concerns. Figure 4 depicts a tidal turbine to scale in a cross-section of Admiralty Inlet.



Figure 4: Scale Depiction of one Tidal Turbine Deployed in Admiralty Inlet

The OpenHydro turbine consists of a horizontal axis rotor with a single moving part and power take-off through a direct drive, permanent magnet generator. It is principally comprised of the rotor and the stator; there is no requirement for a gearbox. The design incorporates several key features to avoid or minimize environmental risk:

- No requirement for oil/grease lubrication.
- Rotor blade tips are retained within the outer housing.
- Slow rotational speed.
- Ability for the rotor to be stopped quickly and remotely
- Cavitation prevented by design at specified deployment depth.
- Deployment method and gravity base design eliminate need for drilling or piling operations, as well as facilitate potential relocation and complete removal of both the foundation/base and the turbine.

To date, the Snohomish PUD project has been granted approximately \$2.5 million in funding to support technical design and environmental study efforts. Funding has been provided by the Bonneville Power Administration, energy and water federal appropriations, and most substantially by the Department of Energy's (DOE) Advanced Water Power Projects program. Specifically, Snohomish PUD has received two separate grants from the DOE to support project design and environmental studies, and has developed partnerships with numerous entities to carry out this work. In addition to the previously mentioned UW, NNMREC, and EPRI partnerships, Pacific Northwest National Laboratory and the National Renewable Energy Laboratory are also on the Snohomish team.

Snohomish PUD is also collaborating with the U.S. Navy's Puget Sound KHPS Project, which is being conducted with Verdant Power. The KHPS project plans for a test deployment of Verdant Power turbines

for a period of approximately one year. The proposed Navy project is located approximately six miles south of the Snohomish PUD project location as shown in Figure 5 below. The Navy has chosen the southernmost of the two potential sites indicated for their project.

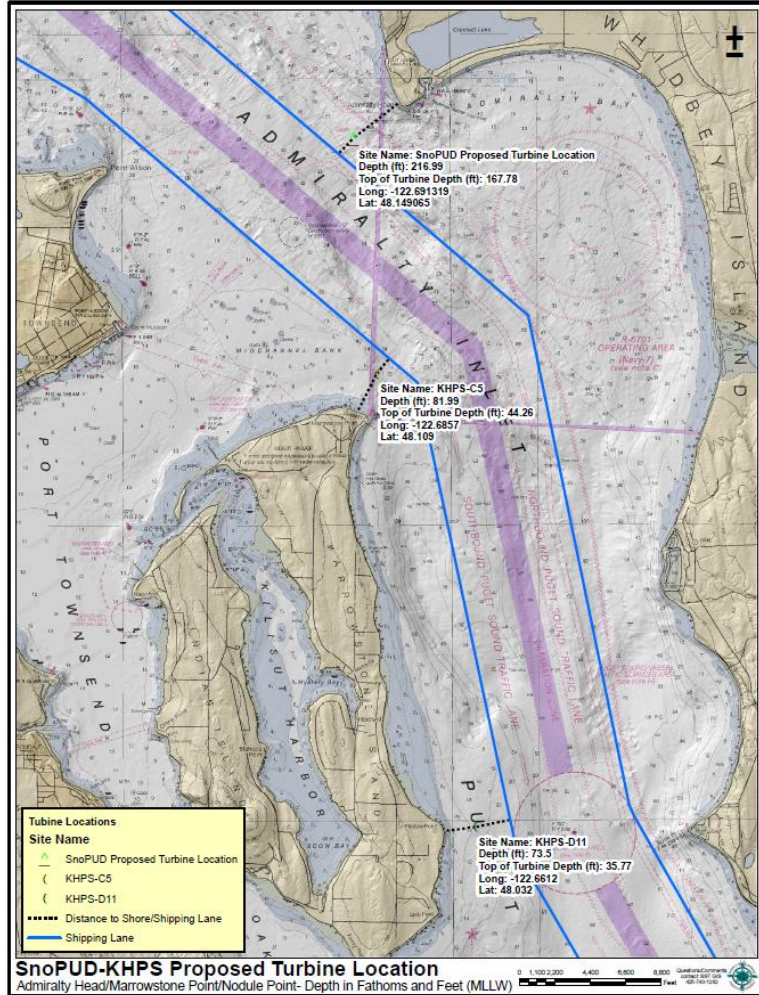


Figure 5: Snohomish PUD and Verdant/Navy Project Locations

The KHPS project will be interconnected to facilities at Naval Magazine Indian Island and will consist of 3-6 Verdant Power turbines as shown in Figure 6. Snohomish PUD and the Navy have conducted some joint studies to share and reduce overall costs, and we are actively working to share information and collaborate in developing project operations and monitoring plans.

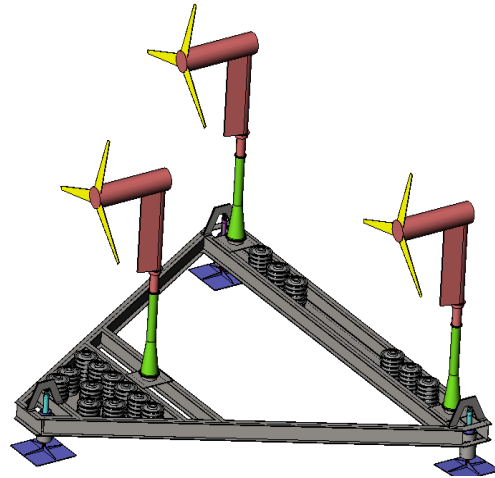


Figure 6: Verdant Power Turbines

In addition to the Snohomish and Navy projects, there is also consideration being given to the potential establishment of a National Tidal Energy Facility (NTEF) in the Puget Sound. This facility would utilize the infrastructure that will remain at the KHPS project after the Verdant turbines have been removed, and would provide a characterized, permitted site for test and demonstration of tidal energy systems. The NTEF would be device-independent and would provide consistent, comparable performance data for a range of tidal energy devices and systems. The NTEF would provide developers with a permitted test site so that their resources can be better focused on technology development and not on permitting actions. Because the Snohomish and KHPS projects will both be in progress prior to the potential development of the NTEF, the data (technical, environmental, social, etc.) generated by these earlier projects should inform the ultimate design, utility and viability of developing the NTEF in the Puget Sound.

Outside the Puget Sound, Oregon State University (OSU), as a NNMREC partner, is working primarily to advance the *wave* energy industry. This includes improved wave energy forecasting for both offshore and near shore locations, device and array optimization methods and models, environmental effects evaluation, and the development of a mobile test berth for full scale wave device testing. Testing and evaluation will identify best practices for maintenance and quality control of wave energy systems and refine wave energy power measurements. The State of Oregon has invested significantly in wave energy including the formation of the Oregon Wave Energy Trust and designation of State capital funds to OSU as direct investment in the development of the NNMREC.

Environmental Considerations and Studies

While they are limited in scope, existing data and assessments regarding currently operating and proposed tidal projects are notable in that they document no substantial or unanticipated environmental risk. Scotland's Orkney Islands (where EMEC and the OpenHydro turbine are located) represent a very ecologically diverse and productive marine ecosystem which is home to a number of fish and marine mammal species. Fish and shellfish species include: mackerel, herring, haddock, cod, monkfish, several flat fish species, lobster, crab, and scallops. Marine mammal species include: otters, seals, minke whale, harbor porpoise, white-sided dolphin, common dolphin, killer whale, and pilot whale. Leatherback turtles also regularly visit Scottish waters between August and November. Operation of the EMEC OpenHydro turbine installation has been continuously videotaped while in operation since 2006 and to date no marine life incidents have been recorded. Review of the videotape data indicates that fish and marine mammals avoid and do not interact with the device while it is rotating, but as might be expected some fish species do aggregate downstream of the turbine at tidal current velocities too low for the turbine to rotate (Figure 7).



Figure 7: Fish Aggregation – OpenHydro Turbine (not rotating)

During periods of tidal current velocity energetic enough to turn the turbine's rotor the fish have been observed to leave the area rather than expend energy to maintain position against the flow of the tidal currents. It is also important to note that the flow dynamics of the turbine are such that the device will

not “entrain” fish in any conventional hydropower turbine sense, but rather fish or other objects in the tidal flow would be drawn through the center opening or around the outside of the device.

The previously noted OpenHydro installation in the Bay of Fundy was recently evaluated in a comprehensive Environmental Assessment report to Canadian federal and provincial governments; the likely effects of the project were found to be limited in scope and duration. While these and similar assessments do not by themselves document a lack of environmental effects for the Admiralty Inlet Pilot Project, Snohomish PUD believes they provide important context that must be considered in developing study plans and environmental analyses. Admiralty Inlet supports or includes designated critical habitat for eight ESA-listed species managed by the National Marine Fisheries Service (and two managed by the US Fish and Wildlife Service) and supports a wealth of unlisted marine resources as well. As is the case for the entirety of Puget Sound, Admiralty Inlet is designated as Essential Fish Habitat for a number of species and includes several Habitat Areas of Particular Concern. It is important to note that Admiralty Inlet also includes a major shipping lane utilized by essentially all commercial and military traffic in and out of Puget Sound, substantial shoreline development, and a busy ferry route operating directly to the south of the project site.

Snohomish PUD is conducting environmental analyses by assessing potential mechanisms of effect for the species known or believed to occur in the project area based on existing information and a suite of pre-installation studies. Snohomish is also developing a significant monitoring effort to determine if unacceptable impacts occur or are likely to occur. An approach focused on monitoring enables direct evaluation of the primary unanswered question of how marine life will interact with the turbines.

The NNMREC has been a key partner in the design and execution of project pre-installation studies conducted so far. An instrumentation platform designed by the University of Washington Applied Physics Laboratory to facilitate the study of tidal sites is shown in Figure 8. This platform is currently deployed on the seabed at the project site and has already delivered important information during the several months that it has been in service.

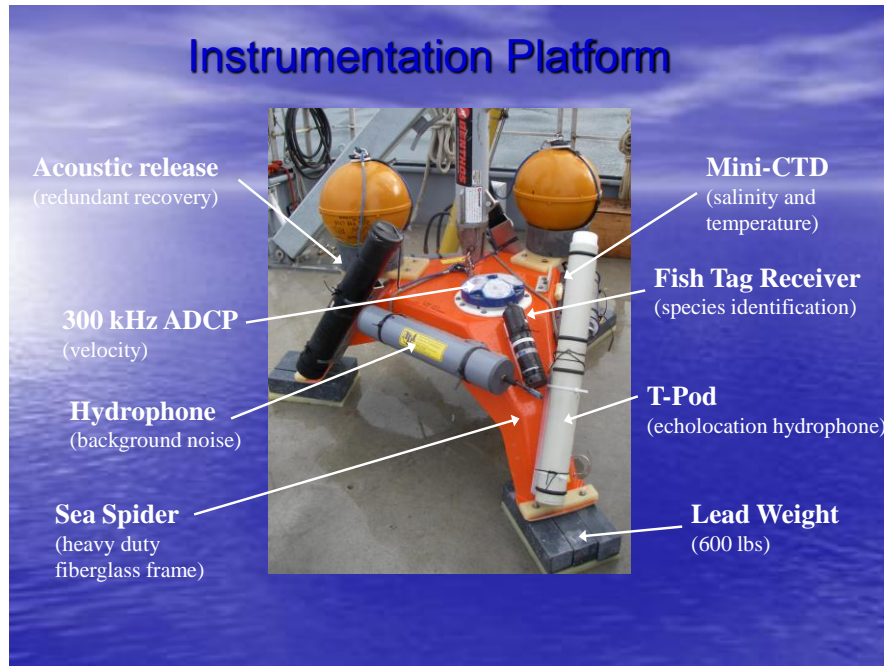


Figure 7: Tidal Project Studies Instrumentation Platform

Because there is not yet any subsea cable run to the deployment site, the platform must be retrieved and redeployed approximately every three months to download collected data and replace batteries. While pre-installation studies have essentially been completely developed and are underway, development of studies intended to monitor the project once it is operating continues. Potential project effects identified by Snohomish include modifying local habitat by adding new structure, blade strike or collision and similar “near field” effects, altered behavior patterns of some marine mammals or fish, modification of the acoustic or hydrodynamic environment, and the accumulation of derelict fishing gear. The goal of Snohomish’s proposed monitoring efforts is to detect and describe in detail the potential for interactions between the project and marine species.

The specific objectives of Snohomish’s proposed monitoring efforts are:

- Assess near-turbine presence and distribution of marine species;
- Assess near-turbine fish behavior;
- Identify near-turbine species composition;
- Evaluate the Project’s acoustic signature;
- Evaluate the Project’s effects on hydrodynamics; and
- Monitor and remove derelict gear.
- Evaluate potential effects of construction, decommissioning, or maintenance on aquatic species and water quality.

To address these objectives, Snohomish proposes to pursue the following monitoring efforts:

- Near-turbine monitoring and identification of aquatic species;
- Acoustic monitoring;
- Hydrodynamic effects monitoring;
- Derelict gear monitoring and removal; and
- Construction monitoring.

Snohomish believes the methods described below represent the best current practices for evaluating presence, distribution, and behavior of mobile marine species. At the same time, both hydrokinetic and hydroacoustic technologies are evolving at a rapid pace that makes it likely there will be significant technological advances and new information regarding hydrokinetic turbines during the course of pre-installation licensing efforts for the project. As a result, there is an expectation that changes will occur over time and will be addressed through an adaptive management program.

Numerous technical hurdles will need to be considered and addressed as part of the successful implementation of the monitoring plan. Chief among these are a complex of questions related to selection, placement, deployment, and retrieval of monitoring gear. For example, many of the sonar transducers and cameras envisioned in the monitoring plan will require periodic maintenance, whether scheduled (e.g., lens cleaning) or unscheduled (e.g., flooded casings). Servicing this equipment likely will require bringing it to the surface, which presents substantial challenges related to physical and electrical connections with data and power cables, subsequent redeployment of the gear, correct orientation and calibration of redeployed equipment, and similar issues. Snohomish will pursue a continuing dialogue with technology providers as to potential methods of addressing and testing each of these issues; however it is important to note that no method to address these challenges is currently identified, which may substantially affect Snohomish's monitoring abilities and technology decisions.

Snohomish believes that many of the technical issues described above, as well as data interpretation associated with the monitoring effort, will warrant review and discussion by a technical working group. This group would oversee and evaluate results of pre-installation and monitoring studies. These results would be used in combination with an understanding of the ecosystem and information from other relevant sources to make adjustments to study methods as appropriate, and to manage aspects of the project operation in a manner that avoids or minimizes unexpected or undesirable impacts on resources. The adaptive management process allows for immediate action where necessary to address

a critical adverse effect of the project should any occur. Snohomish envisions this as a consensus-based group that would include representatives from federal and state resource agencies, tribal governments, and other appropriate stakeholders. It would administer key topics related to the project, including:

- Consideration of results from pre-installation studies and monitoring efforts and subsequent adjustments to study methods as appropriate.
- Development of monitoring thresholds for inclusion in Project license conditioning.
- Evaluation or initiation of potential mitigation or impact avoidance measures.

Snohomish believes that the environmental monitoring plan represents a critical and particularly challenging element of the overall project. Close collaboration with tribes, agencies, and other stakeholders; technical support from NNMREC and the Pacific Northwest National Lab; and the ongoing and strong support from the DOE's Advanced Water Power Projects program will all be important to the success of the effort.

Permitting Process, Consultation and Outreach

Snohomish PUD is utilizing the Federal Energy Regulatory Commission (FERC) Hydrokinetic Pilot Plant Licensing Process (Pilot Process) for the Admiralty Inlet project. The Pilot Process was proposed by FERC in late 2007 specifically to facilitate the licensing of small (rated capacity of less than 5 megawatts), short-term, removable, and carefully-monitored projects intended to test marine energy technologies, sites, or both. FERC recognized that there are a number of barriers to realizing the potential of these new technologies but that the primary barrier may be that they are as yet unproven, and that more data was necessary prior to any large scale commercial deployments. The purpose of the Pilot Process is to provide a means of testing new technology, including interconnection with the electric grid. The process aims to minimize both the up-front baseline study burden and the risk of adverse environmental effects by requiring a rigorous project operations monitoring effort, as well as project shutdown and removal if significant adverse environmental effects occur and cannot be mitigated.

Snohomish was issued a preliminary permit from FERC for the Admiralty Inlet site on March 9, 2007, though as early as July of 2006 Snohomish had informed key stakeholders (tribes, state agencies, federal agencies, NGO's, communities, etc.) of its intention to pursue tidal energy exploration in the Puget Sound. An initial project meeting was held with numerous stakeholders (tribes, state agencies, federal agencies, NGOs) on February 23, 2007 to formally introduce the project, answer questions, and discuss the consultation approach going forward. During the approximately two and one-half years since this initial meeting Snohomish has conducted nearly 90 formal project communication meetings with various

stakeholders. These have included formal consultation meetings, community town hall meetings, conference presentations, NGO meetings, and more. Groups who have been engaged through these efforts have included:

- Washington Department of Ecology
- Washington Department of Fish and Wildlife
- Washington Department of Natural Resources
- Washington Governor's Office of Regulatory Assistance
- Washington Department of Community, Trade, and Economic Development
- Washington State Attorney General's Office
- Washington Energy Facility Site Evaluation Council
- U. S. Department of Energy
- U. S. Navy Region Northwest
- Naval Station Everett
- Naval Magazine Indian Island
- Federal Energy Regulatory Commission
- National Marine Fisheries Service
- U. S. Army Corps of Engineers
- U. S. Department of Fish and Wildlife
- U. S. Environmental Protection Agency
- U. S. National Park Service
- U.S. Coast Guard
- Puget Sound Pilots
- American Waterways Operators
- Puget Sound Harbor Safety Committee
- Washington State Ferries
- Federal Ocean Research and Resources Advisory Panel
- Puget Sound Partnership
- Tulalip Tribes of Washington
- Suquamish Tribe
- Skagit River System Cooperative
- Pacific Northwest National Laboratories
- The National Renewable Energy Lab
- The University of Washington
- Washington State University Energy Extension
- Seattle Pacific University
- People for Puget Sound
- The Orca Network
- The Whale Museum
- The Sea Mammal Research Unit
- Beam Reach Marine Science and Sustainability School
- Northwest Straits Conservation Alliance
- Fort Casey State Park
- Ebey's Landing National Historic Preserve
- Puget Sound Anglers

- Regional county Marine Resources Committees
- Regional city councils
- Numerous local community and service groups

As indicated by this level of engagement, Snohomish considers stakeholder outreach and consultation to be a critical element of project success, and believes that these efforts have been invaluable in keeping stakeholders informed and in maintaining open lines of communication for feedback and dialogue. Additionally and where practical, Snohomish has collaborated with regional stakeholders and marine experts to design and carry out certain studies. As one example, Beam Reach Marine Science and Sustainability School, the Whale Museum, and the Orca Network, all strong regional stewards for killer whales in Puget Sound, worked with Snohomish to design the project's Marine Mammal Study Plan and are currently conducting the study in partnership with the Sea Mammal Research Unit. The Sea Mammal Research Unit is associated with the University of St. Andrews in Scotland, and is currently engaged with efforts to study sea mammal interactions with tidal turbines at projects in the UK.

As required by FERC, Snohomish submitted a pre-application document (PAD) for the project in January 2008. The information provided in the PAD is intended to enable stakeholders interested in participating in the licensing process to become familiar with the project before any formal licensing procedure is initiated and assists these participants in identifying potential resource issues. The Snohomish PAD consisted of over 600 pages of information related to the project and project site and drew upon more than 700 different information sources to compile. As part of the PAD development effort, Snohomish reached out to 20 Indian tribes and organizations, 11 federal agencies, 9 state agencies, 13 Washington ports, 9 counties, 5 municipalities, and 49 non-governmental organizations representing environmental, recreation, and business interests.

With respect to formal permitting requirements, the following is a list of the potential regulatory authorizations, licenses, permits, or regulatory approvals that may ultimately be required prior to constructing and operating a hydrokinetic project within Washington State waters:

- License from the Federal Energy Regulatory Commission.
- Clean Water Act Section 401 Water Quality Certification from the Washington Department of Ecology.
- Marine Mammal Protection Act incidental take permit from the National Marine Fisheries Service.
- Endangered Species Act (ESA) compliance through ESA Section 7 consultation with the National Marine Fisheries Service and U.S. Fish and Wildlife Service.

- Essential Fish Habitat Program review from the National Marine Fisheries Service pursuant to the Magnuson-Stevens Fishery Conservation and Management Act.
- National Historic Preservation Act Section 106 compliance through consultation with the Washington State Historic Preservation Officer, as well as the Tribal Historic Preservation Officer of any affected federally recognized Indian tribe.
- Migratory Bird Treaty Act permit from U.S. Fish and Wildlife Service.
- Clean Water Act Section 404 permit from the U.S. Army Corps of Engineers.
- Rivers and Harbors Act Section 10 permit from U.S. Army Corps of Engineers.
- U.S. Coast Guard review for navigation impacts under the Ports and Waterways Safety Act and Coast Guard and Maritime Transportation Act of 2006.
- Water right for a non-consumptive appropriation of waters of the State.
- Hydraulic Project Approval from Washington Department of Fish and Wildlife.
- Aquatic land lease from Washington Department of Natural Resources.
- National Marine Sanctuary permit (for projects located in National Marine Sanctuaries – will not apply to Admiralty Inlet).
- Minerals Management Services (MMS) lease or right-of-way for projects located on the federal Outer Continental Shelf (OCS). If a portion of the project is located outside of waters of Washington State (or Oregon State) on the federal OCS, then authorization from the MMS may be required. (Will not apply to Puget Sound)
- Coastal Zone Management Act (CZMA) Consistency Certification from Washington Department of Ecology. Under Washington’s CZMA program, activities that require federal approval and affect any land use, water use or natural resource of the State’s coastal zone must comply with the enforceable policies within the six laws identified in the CZMA program document. The six laws are:
 - the Shoreline Management Act (including local government shoreline master programs);
 - the State Environmental Policy Act;
 - the Clean Water Act;
 - the Clean Air Act;
 - the Energy Facility Site Evaluation Council; and
 - the Ocean Resource Management Act.

A key challenge faced by Snohomish and project stakeholders, particularly resource agencies, is balancing the small size and scope of the Admiralty Inlet Pilot Project with the level of baseline information necessary to evaluate the project and satisfy permitting requirements. As noted earlier, the FERC Pilot Process minimizes the baseline study burden so as to facilitate the deployment and rigorous testing of these new technologies, thereby generating the data necessary to fill existing information gaps. FERC and others recognized that if baseline information requirements are too burdensome, pilot projects will never advance into the water and progress in the U.S. will be at a standstill. We agree with the position of FERC that any incremental additional risk represented by the Pilot Process approach is more than adequately contained by the stringent safeguards within the Pilot Process license, i.e. the license only applies to small, temporary, closely monitored facilities which are required to be shut down and/or removed if significant adverse environmental effects occur and cannot be mitigated.

Some resource agencies, however, perceive that their existing regulatory accountability precludes their full support of the FERC Pilot Process. For example, we understand that National Marine Fisheries Service (NMFS) generally supports the appropriate development of hydrokinetic projects in United States waters. Nonetheless, given the presence of endangered salmon and killer whales in Puget Sound, NMFS feels that they have little latitude to accept anything less than extremely detailed and rigorous studies in order to support their environmental analysis. While Snohomish has conducted or committed to approximately \$1 million in pre-installation and baseline studies (the data from which will add to the already very substantial body of environmental information available for the Admiralty Inlet site) for the pilot project, NMFS is reluctant to state with any certainty that this baseline information is sufficient. Given that these studies necessarily incur significant cost prior to any certainty of actually receiving a plant license, it is not difficult to see how the study burden could easily prevent even small research and development projects like the proposed Admiralty Inlet effort from going forward. It seems clear that so long as key resource agencies are not enabled to effectively balance the proactive facilitation of renewable energy efforts with their existing responsibilities, the progress of renewable energy in the U.S will advance at a pace unlikely to meaningfully address our country's energy and environmental challenges.

Thank you again for the opportunity to appear before you today to discuss this important topic. I would be happy to answer any questions.

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Mr. Collar has 25 years of operations and program/project leadership experience spanning a variety of technical and general management assignments. Mr. Collar has been accountable for all business results (safety, quality, energy/environmental, production, cost, asset management, capital projects, human resource development) for several major manufacturing departments (up to \$60 million annual operating budget) including the leadership of groups of up to 170 team members in the production of a variety of consumer products. Mr. Collar also has multi-year experience leading the overall operation and maintenance of a 50 MW cogeneration facility as well as that for a naval submarine nuclear propulsion plant.

Experience

- **Senior Manager-Energy Resource Development**, Snohomish County Public Utility District No. 1, Everett, WA. (2006-Present).
- **Engineering and Operations Management**, Kimberly-Clark Corporation, Fullerton, CA & Everett, WA. (1990-2006).
- **Nuclear Submarine Officer**, U.S. Navy, San Diego, CA (1985-1990).

Education and Certification

- **Master of Business Administration**, Colorado State University, Fort Collins, CO.
- **Bachelor of Science in Mechanical Engineering**, Montana State University, Bozeman, MT.
- **LEAN/Six Sigma and Strategic Organizational Leadership Certificates**, Villanova University, Villanova, PA.
- **Global Management Certificate**, Thunderbird - The Garvin School of International Management, Glendale, AZ.
- **Utility Executive Leadership Certificate**, Willamette University, Salem, OR.
- **U.S. Naval Officer Nuclear Power Training**, Orlando, FL and Idaho Falls, ID (a one-year graduate level program).
- **Registered Professional Mechanical Engineer.**