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TACOMA PUBLIC UTILITIES

July 31, 2006

ELECTRONIC FILING

Ms. Magalie Roman Salas, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, DC 20426

Re: Tacoma Narrows Tidal Energy Project, FERC No. 12612-000
City of Tacoma (dba Tacoma Power), Washington State
Progress Report # 1

Dear Secretary Salas,

Tacoma Power is pleased to submit the first six-month progress report on the Tacoma Narrows Tidal Energy Project, as required in Article 4 of the preliminary permit granted for project 12612-000 on February 22, 2006.

During the first phase of a three-phase process, Tacoma Power joined with the Electric Power Research Institute, Bonneville Power Administration and the Washington State Department of Community, Trade and Economic Development to perform a concept level evaluation of the feasibility of installing a tidal energy array in the Tacoma Narrows. Phase I is now complete and a description of the associated activities is included in this progress report.

In addition, please be advised that the Tacoma Power contact person for this project has been changed from Ted Beatty to Chris Robinson. Should you have any questions about the contents of this report or our activities on the Tacoma Narrows Tidal Energy Project, please contact Chris Robinson at 253-502-8282.

Sincerely,

Chris Robinson
Project Manager

Enclosure: Tacoma Narrows Tidal Energy Project, 1st Project Report

Cc: Federal Energy Regulatory Commission, Portland Regional Office, Distribution List

**TACOMA NARROWS TIDAL ENERGY PROJECT
FERC NO. 12612**

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**Project No. 12612- Washington
Tacoma Narrows Tidal Energy Project
Tacoma Power**

**Progress Report #1
July 31, 2006**

Tacoma Power submitted an application for a preliminary permit for the development of a tidal energy project in the Tacoma Narrows, located in Puget Sound in northwestern Washington, on September 15, 2005 (Tacoma Power 2005). The Federal Energy Regulatory Commission (FERC) issued the preliminary permit on February 22, 2006. The terms of the preliminary permit require that Tacoma Power file a progress report every six months that describes the activities undertaken to determine the feasibility of the proposed project, and prepare an acceptable application to license the project if found feasible.

Tacoma Power has been working with the Electric Power Research Institute (EPRI), a non-profit industry group based in Palo Alto, California, to complete the first phase of a three-phase evaluation process (Figure 1). Phase I is a concept level evaluation of possible installation sites, equipment, environmental considerations, permitting requirements, and performance and cost estimates for both a pilot installation and a future commercial scale plant. During Phase II, Tacoma Power will decide whether to proceed with installation of a pilot tidal energy unit in the Tacoma Narrows; then move forward with the site engineering, consultation to address environmental concerns, and permitting. The pilot unit would be installed during Phase III and its operational performance and environmental effects monitored for at least one year. Tacoma Power and EPRI are joined in the funding of the Phase 1 evaluation by the Bonneville Power Administration and the Washington State Department of Community, Trade and Economic Development.

Site Survey, Characterization and Selection

Tacoma Power and EPRI utilized the final Environmental Impact Statement produced by the Washington Department of Transportation (2000) for the Tacoma Narrows Bridge replacement project to gain an understanding of the environment of the Tacoma Narrows and to aid in the selection of a potential site for a pilot-project installation. Using existing information and the criteria listed below, Tacoma Power and EPRI selected Point Evans as the most promising location for the installation of a test generating unit as the tidal currents at this location are the strongest reported in the Narrows.

- Tidal flow regime
- Interconnection to transmission infrastructure
- Proximity to major port
- Seabed composition

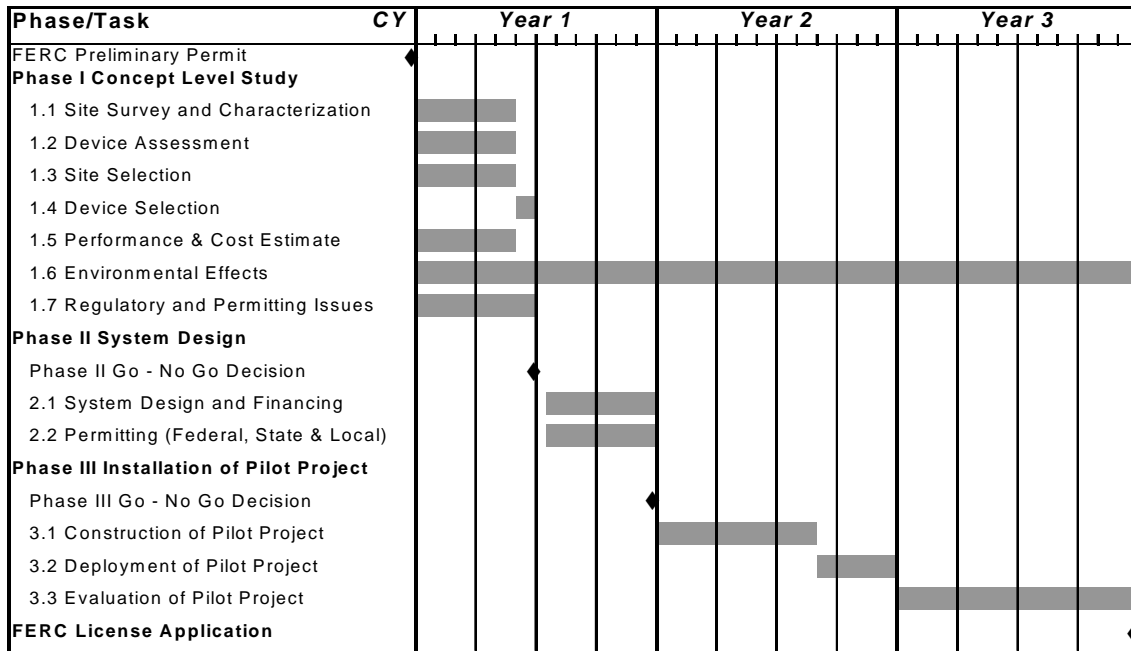


Figure 1. Three-phase tidal energy study process.

The Point Evans test installation site is outside of the Narrows shipping lanes in 30 meters of water (Figure 2). The depth-averaged current velocity is four feet per second at this location, which converts to an approximate annual average of 16 megawatts (MW) of extractable power. This extracted power can be transmitted to Tacoma Power’s existing transmission infrastructure in the area.



Figure 2. Area map of proposed pilot plant (small blue circle) and commercial plant (blue square) in the Tacoma Narrows. (Source: Bedard 2006)

Device Assessment and Selection

Tacoma Power's preliminary permit allows for the installation of a pilot project, with the appropriate approvals and regulatory permits, in order to determine the potential for a commercial array, verify reliability, availability, low environmental impact and cost estimates, and generally build towards regulatory acceptance of an array of similar devices (Polagye and Previsic 2006). The generating device anticipated for selection in the pilot test, should such an installation proceed, is the Marine Current Turbine's SeaGen dual-rotor turbine (Figure 3). This model has two rotors, each 18 meters long, mounted on a platform attached to a monopile installed in the seabed and extending above the surface. This design allows the rotors to be raised for maintenance. It is assumed at this time that any licensed commercial array would be fully submerged and that the support structure for the commercial plant would vary from the pilot unit.



Figure 3. Marine Current Turbine's SeaGen dual-rotor turbine

Performance and Cost Estimate

EPRI conducted a performance and cost assessment for both a pilot project and a commercial scale tidal power plant. A pilot project using the SeaGen dual-rotor turbine would be rated at 0.7 MW. Capital costs for the purchase and installation of the single turbine would exceed \$4,000,000. EPRI estimated that a commercial plant would have the capacity to produce, on average, 16 MW of kinetic power (120,000 MWh per year), enough electricity to power about 10,500 homes. Performance estimates for a commercial power array are listed in Table 1. The estimated capital costs associated with the installation and operation of a full scale commercial plant would be upward of \$103,000,000. These price estimates do not include costs associated with engineering and design, environmental studies and monitoring, permitting, or financing (Polagye and Previsic 2006). Because a commercial power array design is only conceptual at this

point, there is significant uncertainty surrounding the technical and economic assumptions used in the EPRI evaluation until more information can be gained through further investigation, consultation, and deployment of a pilot project.

Table 1. Performance assumptions for a conceptual commercial power array.

Array Performance	
Number of Turbines	64
Number of Transects	5
Availability	95%
Transmission to Shore	98%
Capacity Factor	30%
Average Extracted Power	16 MW (Extraction Limit)
Average Electric Power	13.7 MW
Maximum Electric Power	45.8 MW
Annual Electricity Generation	120,000 MWh

Source: Polagye and Previsic 2006

Environmental Effects and Permitting Issues

The 5.3-mile long Tacoma Narrows channel is dominated by high current velocities that occur during tidal exchanges. The maximum tidal range is 16 feet, and the estimated average current velocity at the Point Evans site is 4 feet per second (Devine Tarbell and Associates, Inc. 2006).

Marine habitats located within the Tacoma Narrows include unconsolidated and consolidated marine and estuarine shorelines, estuary, and vegetated estuarine habitats (WDOT 2000). The primary plant communities in Puget Sound are eel grass and kelp. Brown and red macroalgae are the dominant algae. Puget Sound finfish include salmonids, forage fish, groundfish, and rockfish. Spawning habitat for Pacific giant octopus (*Octopus delfeini*) occurs in the Tacoma Narrows. California sea lions (*Zalophus californianus*) and harbor seals (*Phoca vitulina richarsi*) are common in Puget Sound, and Steller sea lions (*Eumetopias Jubatus*), humpback whales (*megaptera novaeangliae*), gray whales (*Eschrichtius robustus*), killer whales (*Orcinus orca*), Dall's porpoise (*Phocoenoides dalli*), and Pacific harbor porpoise (*Phocoena phocoena*) have been known to occur. A variety of waterfowl and seabirds occur in the area of the Tacoma Narrows. Those species of particular concern include the federal- and state-listed threatened and endangered species that may occur in the proposed project area (Table 2).

The waters and seabed of Puget Sound are governed by the State of Washington Department of Natural Resources (WDNR). The proposed project occurs in two state Water Resource Inventory Areas (WRIAs), the Chambers-Clover Creek Basin (WRIA 12) and the Kitsap Basin (WRIA 15). Because Puget Sound is classified as an estuary, it has been designated as a "Habitat Area of Particular Concern", a subcategory of Essential Fish Habitat (EFH). All of Puget Sound is designated as EFH for coho, Chinook and pink salmon and numerous species of ground fish.

Table 2. Threatened and endangered species that may occur in Tacoma Narrows.

Common Name	Scientific Name	Federal Status	State Status
Humpback whale	<i>Megaptera novaeangliae</i>	Endangered	Endangered
Killer whale – southern resident	<i>Orcinus orca</i>	Endangered	Endangered
Leatherback sea turtle	<i>Dermochelys coriaces</i>	Endangered	Endangered
Steller sea lion	<i>Eumetopias jubatus</i>	Endangered	Endangered
Bald eagle	<i>Haliaeetus leucocephalus</i>	Threatened	Threatened
Marbled murrelet	<i>Brachyramphus marmoratus</i>	Threatened	Threatened
Chinook salmon – Puget Sound	<i>Oncorhynchus tshawytscha</i>	Threatened	State candidate
Chum salmon – Hood Canal	<i>O. keta</i>	Threatened	State candidate
Coho salmon – Puget Sound/Strait of Georgia	<i>O. kisutch</i>	Species of concern	Not listed
Steelhead – Puget Sound	<i>O. mykiss</i>	Proposed threatened	Not listed
Bull trout	<i>Salvelinus confluentus</i>	Threatened	State candidate

(Source: Devine Tarbell and Associates, Inc. 2006)

Steep slopes occur along both sides of the Tacoma Narrows; landslides frequently result because of the erosion caused by high tide and seepage from the hillsides. The bluffs, for the most part are forested with mixed coniferous/deciduous forest and a dense understory including Himalayan blackberry (*Rubus discolor*), salmonberry (*R. spectabilis*), and salal (*Gaultheria shallon*). Forested areas include douglas fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), western red cedar (*Thuja plicata*), big-leaf maple (*Acer macrophyllum*), red alder (*Alnus rubra*), and black cottonwood (*Populus trichocarpa*) (WDOT 2000). It is anticipated that the amount of terrestrial habitat that would be disturbed by construction of a shore station and connection to the existing grid would be small (Devine Tarbell and Associates, Inc. 2006).

The Tacoma Narrows lies within the Medicine Creek Treaty Area where Usual and Accustomed fishing rights are held by several tribes. These tribes share co-management jurisdiction with the state, as well as equitable resource allocation and resource protection responsibilities, which also extends to shellfish and non-salmonids traditionally fished by treaty tribes. A wide variety of salmon fisheries occur in Puget Sound throughout the year; including commercial, recreational, subsistence and ceremonial. Due to swift currents through the Tacoma Narrows, Indian and non-Indian commercial net fishing is limited in the proposed project area although recreational fishing does occur, as well as dive fishing for marine fish and shellfish (WDOT 2000). Other recreational activities that occur in the Tacoma Narrows include boating and scuba diving.

The full extent of the effects of a tidal energy project in the Tacoma Narrows on the environmental resources will not be known until completion of the studies and monitoring that will occur during Phase III of the feasibility evaluation; however, many

of the plants and animals described above occupy habitats that will not be affected by the project (Devine Tarbell and Associates, Inc. 2006). Although there is minimal information on mechanical and flow-related injuries to marine mammals or other marine fauna caused by the effects of tidal turbine operation, the risk of collision with turbine blades is thought to be extremely low. Maximum SeaGen rotor tip velocities are 27 miles-per-hour with a maximum rotation of 13 revolutions per minute.

In Phase II of the feasibility evaluation Tacoma Power will work with the federal, state, county and municipal governments that manage and protect the environmental resources and the lands and waters likely to be affected by the installation of a pilot tidal generating unit to identify all necessary permits. It is anticipated that these agencies will include:

- U.S. Fish and Wildlife Service and National Marine Fisheries Service for federally-regulated fish and wildlife species compliances;
- U.S. Army Corps of Engineers for federal navigation and dredge and fill compliances;
- Washington Department of Natural Resources for state regulated aquatic lands compliance;
- Washington Department of Fish and Wildlife for state fish and wildlife and hydraulic code compliances;
- Pierce County for shoreline, potential rights-of-way, and other county code compliance; and
- City of Tacoma for shorelines, critical areas, rights-of-way, and other city code compliances.

Consultation

On April 26, 2006, Tacoma Power participated in a presentation sponsored by EPRI focused on providing northwest law makers, regulatory agencies and utilities with information on current tidal energy development efforts in the western United States, as well as a thorough discussion of Tacoma Power's investigation of the Tacoma Narrows site. This meeting was attended by a representative of the Washington State Governor's Office and many of the regulatory agencies that Tacoma Power will be consulting with over the upcoming months (Appendix A). The presentation provided the attendees with a fairly in-depth explanation of the fundamentals of tidal power generation, the general types of generating equipment and the performance and cost history of each, and the environmental effects as they are known to-date.

Future Work

During Phase II, Tacoma Power will continue its evaluation of the suitability of the Point Evans site for installation of a pilot tidal generating unit and will begin the conceptual system design effort required for such an installation. Hydrodynamic and bathymetric surveys will be undertaken in the Point Evans area. These surveys will be extended in range should initial results indicate that Point Evans is not a suitable location

for the installation of the pilot unit. Results of these two surveys will be depicted in 3-dimensional maps showing vectors, velocity contours and seabed elevations and 2-dimensional maps showing velocity and elevation contours.

Meetings will be scheduled with the federal, state and local regulatory agencies that will be involved in the permitting of a pilot tidal energy project to discuss permitting requirements and timing, and the types of environmental monitoring that will be required during the testing of the pilot unit.

The results of these efforts will be reported in the next six-month progress report, due to the FERC on January 31, 2007.

References

- Bedard, R. 2006. North American In Stream Tidal Power Feasibility Study: Final Briefing. West Coast States. April 26, 2006.
- Devine Tarbell and Associates, Inc. 2006. Tacoma Narrows Tidal Energy Project (FERC No. 12612): Summary of Environmental and Permitting Issues.
- Polagye, B. and M. Previsic. 2006. System Level Design, Performance, Cost and Economic Assessment – Tacoma Narrows Washington Tidal In-Stream Power Plant. EPRI North American Tidal In Stream Power Feasibility Demonstration Project. EPRI – TP – 006 WA. April 16, 2006.
- Tacoma Power. 2005. Application for Preliminary Permit. Tacoma Power’s Narrows Tidal Energy Project. September 14, 2005.
- Washington Department of Transportation. 2000. SR 16/Union Avenue Vicinity to SR 302 Vicinity, Final Environmental Impact Statement. Volume 1.

Appendix A

*EPRI Attendance List
April 26, 2006*

EPRI Tidal Energy Feasibility Study West Coast Final Briefing - April 26, 2006					In
Last Name	First Name	Organization	Telephone	Email	Attendance
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Reuter	Robert	WA Dept of Ecology	(425) 649-7086	RREU461@ECY.WA.GOV	✓
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Stearns	Tim	WA CTED	360-956-6121	TimS@CTED.WA.GOV	✓
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Submission Contents

Tacoma Narrows Tidal Energy Project
Progress Report #1

TacomaNarrowsProgressRpt.pdf..... 1-12