

Appendix 1:

Cape Sharp Tidal Venture Monitoring Program Update

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ABOUT CAPE SHARP TIDAL VENTURE

Cape Sharp Tidal Venture (CSTV) was a joint venture between tidal energy technology developer, OpenHydro, a Naval Energies company, and Halifax-based energy company Emera Inc. The CSTV project used OpenHydro's Open-Centre Turbine (Figure A.1). This turbine technology has four key components:

- a horizontal axis rotor;
- a magnet generator;
- a hydrodynamic duct; and
- a subsea gravity base foundation.

The turbine design has 10 fins, each approximately 2.4 m wide x 4.8 m long, manufactured from glass-reinforced plastic. The thickness of each fin ranges from 21 cm at the root (outer diameter) to 1.5 cm at the tip (inner diameter). The turbine is supported by a triangular-shaped gravity foundation subsea base structure. The entire unit sits on the sea floor without requiring drilling or any preparation to the substrate.



Figure A.1: An image of the OpenHydro Open-Centre Turbine design.

Previously, CSTV deployed a 2-megawatt (MW) in-stream tidal energy turbine at the Fundy Ocean Research Center for Energy (FORCE) site on November 7, 2016. This turbine was retrieved on June 15, 2017. Following retrieval, the turbine and subsea base were towed to port facilities in Saint John, New Brunswick. Details of the marine operations around the retrieval were provided in the 2017 Environmental Effects Monitoring (EEMP) Reports (www.capesharptidal.com/eemp/).

A second turbine was deployed at the FORCE site by OpenHydro on July 22, 2018 and on July 24, 2018 OpenHydro successfully connected the FORCE subsea cable to the turbine and confirmed establishment of communication with the turbine systems. Unfortunately, Naval Energies unexpectedly filed a petition with the High Court of Ireland for the liquidation of OpenHydro Group Limited and OpenHydro Technologies Limited on July 26, 2018. In order to ensure safety, the OpenHydro commissioning team

isolated the turbine from the Nova Scotia Power Inc. grid, which consequently disabled the monitoring devices. On September 4, 2018 the turbine was re-energized and power was restored to the environmental sensors. At that time, it was confirmed that the turbine rotor was not turning and that one hydrophone was not communicating.

At this time, the turbine remains at the FORCE berth where it was deployed in July. The turbine rotor is not turning, likely due to an internal component failure in the generator that caused sufficient damage to the rotor. Some environmental sensors continue to operate and transmit data to the onshore substation. The operating sensors include three hydrophones and three ADCPs. The Gemini sonar ceased communication in late October.

At this time, options to retrieve the turbine are being explored.

Q4 2018 OPERATIONAL UPDATE

The focus of operations during this reporting period (October 1 – December 31, 2018) has included regular reports to regulators to confirm that the turbine rotor remains stationary (i.e., not turning) and to develop plans for the retrieval of the unit. Further details regarding decommissioning will be forthcoming when further details are known.

On September 19, 2018, Fisheries and Oceans Canada (DFO) confirmed a modification of monitoring and reporting requirements under the CSTV *Fisheries Act* Authorization to be comprised of a monthly status updates on the turbine to confirm that the rotor is not turning by monitoring turbine status during the peak tidal flow of each month. This program began October 1, 2018 and will continue until the turbine is retrieved, or unless otherwise approved in writing by DFO. CSTV is using an acoustic Doppler current profiler (ADCP) to gather data for these status updates.

ADCP data indicate that during the months of October and November the turbine rotor remained stationary. Results for December will be provided to DFO in January 2019.

NEAR-FIELD ENVIRONMENTAL EFFECTS MONITORING – 2018 UPDATE

While FORCE completes site-level or ‘mid-field’ monitoring activities at the FORCE site, near-field monitoring (i.e., device-specific monitoring within 100 m of a turbine) is completed by individual berth holders. Like the mid-field monitoring programs, the near-field monitoring plans and reports undergo review by FORCE’s Environmental Monitoring Advisory Committee (EMAC) and regulators.

As noted above, CSTV is currently not completing near-field monitoring at ‘Berth D’ since it has been confirmed that the turbine rotor is not turning. At this time, the turbine remains at the FORCE berth where it was deployed in July. Some environmental sensors continue to operate and transmit acoustic and flow data to the onshore substation. This includes three hydrophones and three ADCPs. The Gemini sonar ceased communication on October 26, 2018. The autonomous multichannel acoustic recorder (AMAR), which was deployed in close proximity to the turbine in Q2 2018 as part of the CSTV environmental effects program, was recovered in November 2018. The AMAR was deployed on June 29, 2018 and collected CSTV turbine sound data before and after deployment. This data, along with data from the hydrophones will be compared and used to increase understanding of turbine sound and how it changes with flow speed, as well as ambient (natural) sound in the Minas Passage. Flow data from the ADCPs, mounted on the turbine, will be used to supplement other data sets.

The data from the AMAR and the devices on the turbine is still important in the context of increasing understanding of the environment and is therefore essential for research purposes and for further development of the tidal industry.

The Gemini sonar (active acoustic device) mounted on the subsea base continued to collect data until October 26, 2018, when communication with the monitoring device was lost. Data collected from early September, after the turbine and monitoring devices were re-energized on September 4, 2018, is currently being assessed by researchers.