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2014 HPC ANNUAL REPORT

ENERGY AND CLIMATE (EC):

HPC Provides High Fidelity Evaluation of Tidal Turbine Performance for Industry Partner

High performance computing (HPC) at Sandia National Laboratories is playing a key role in the U.S. Department of Energy's Wind and Water Power Technology Office mission of advancing the commercialization of tidal energy converters; by improving their power performance and reducing their levelized cost of energy below the local "hurdle" price at which they can compete with other regional generation sources without subsidies. This was recently highlighted in a collaborative project between Sandia National Laboratories' (SNL) water power technologies group and the U.S. tidal turbine developer, the Ocean Renewable Power Company (ORPC).

The Sandia-ORPC team applied high fidelity modeling to evaluate the performance of the RivGen® prototype turbine generation unit, a cross-flow turbine, which exhibits more complex flow physics than the more common axial-flow turbine. The 3D unsteady Reynolds-averaged Navier-Stokes (URANS) models used to predict power performance were first validated using a unique set of field measurements collected by ORPC in Cobscook Bay in 2014. Numerical experiments, simulated on Glory, were then conducted to investigate and quantify parasitic drag effects on turbine performance and how these effects could be mitigated to improve performance. The results of this investigation provided a clear path for modifications to be made in the next design iteration of the RivGen® turbine.

This study demonstrated the importance of high fidelity modeling and HPC to resolve the complex 3D flow effects using needed to accurately assess the power performance of cross-flow turbines.

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Include Video Clip: Time History of Flow Field at RivGen® TGU Mid-section, Velocity Magnitude (m/s)

Acknowledgements:

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