



Abstract:

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Optimizing Power Extraction for Tidal Turbine Arrays with Python

Optimizing the design of tidal turbines arrays can be a very challenging problem. Each new array design requires a recalculation of the potential power generation of the array, and the potential impacts of the array on the tidal flow. As well, numerical simulation of tidal flow can produce terabytes of data that needs to be analysed to make these calculations.

In this study, we use a turbine array assessment tool programmed in python to design turbine arrays for potential tidal energy sites in the Bay of Fundy. The tool uses long-time, high resolution output from a numerical oceanographic model. It calculates the best rated power for each turbine, the power the turbine generates based on a power curve, an estimate of the wake generated by each turbine, and the impact of the turbine farm on the tidal flow. As well, the tool allows for simple restrictions on turbine location, such as water depth or distance from shore. By using python, the tool can take advantage of advanced and efficient vectorized numerical schemes, which can be easily parallelized to run on large, high-performance computers. As a result, many different turbine arrays can be examined in reasonable and computationally efficient time.