Increased Tidal Barrage Energy Output through Pumping

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The purpose of this project is to determine if pumping is a useful method of increasing tidal barrage energy output and how to implement pumping most effectively. Pumping is the process of using a pump to increase or decrease the height of the water in the pool so that more energy is generated when the water is allowed to flow through the turbines. The effects of pumping were modeled using a numerical model developed in a previous project to calculate the energy output of the tidal barrage. As part of this project, the numerical model was modified to allow for pumping. The change in energy output caused by pumping was then analyzed by using the numerical model to simulate various scenarios with different parameters. The amount of energy gained by pumping varied depending on the tidal range and pool flow rates, but the net energy was increased by between 6% and 13% for moderate pool flow rates. The data also showed that the optimum pumping time depends on both the pump efficiency and the turbine efficiency, and that a faster pumping rate yields a greater gain in energy.

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