Power in the Waves: Calculation Worksheet

It is very important to understand the amount of power that can be produced by a turbine in the ocean at a given current speed. Once a drifter or ADCP has recorded data over the 4 seasons, this information is used to understand the potential power production, and thus, the payback of the turbine. Let's go through an example: Power = 1/2 * Average Wave Period * Significant Wave Height2

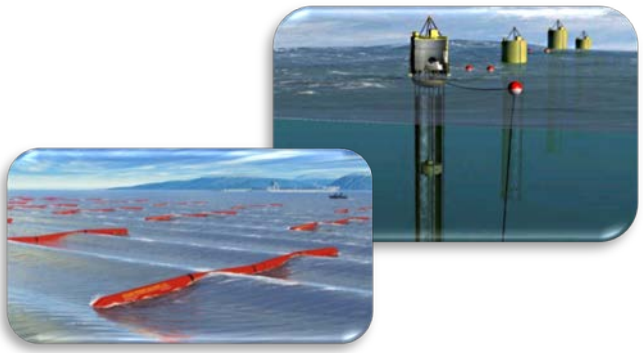
$$P = \frac{1}{2} T H^2$$

Where P is power in Watts (kgm^2/s^3), T is wave period in meters, and H is the significant wave height in meters.

Max Wave Period = 8.3 m – get actual data
Average Wave Period = 6.9 m
Mean Wave Period = 7.8 m

Max Wave Height = 8.3 m – get actual data
Average Wave Height = 6.9 m
Mean Wave Height = 7.8 m

Hours in a year = _____



1) What is the average annual power output (in kWh) from a wave energy generator in this location? Max? Min?

2) According to the US Department of Energy, the average home uses 10,656 kWh of energy every year. How many homes could be powered by this one underwater turbine at average current speed?

3) How long will it take to pay off this $2 million technology through savings on electricity if the cost of electricity in the area is $0.08/kWh (assume average period and height)?

4) How would a wave energy generator effect the marine environment? Give specific examples. Would these effects stop you from putting a turbine in the ocean?