# Team 30
# Portable Hydro Power Generator

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## Problem Definition

*Background:*

- Charging essential devices offgrid can be challenging or impossible, especially while being portable and using renewable sources

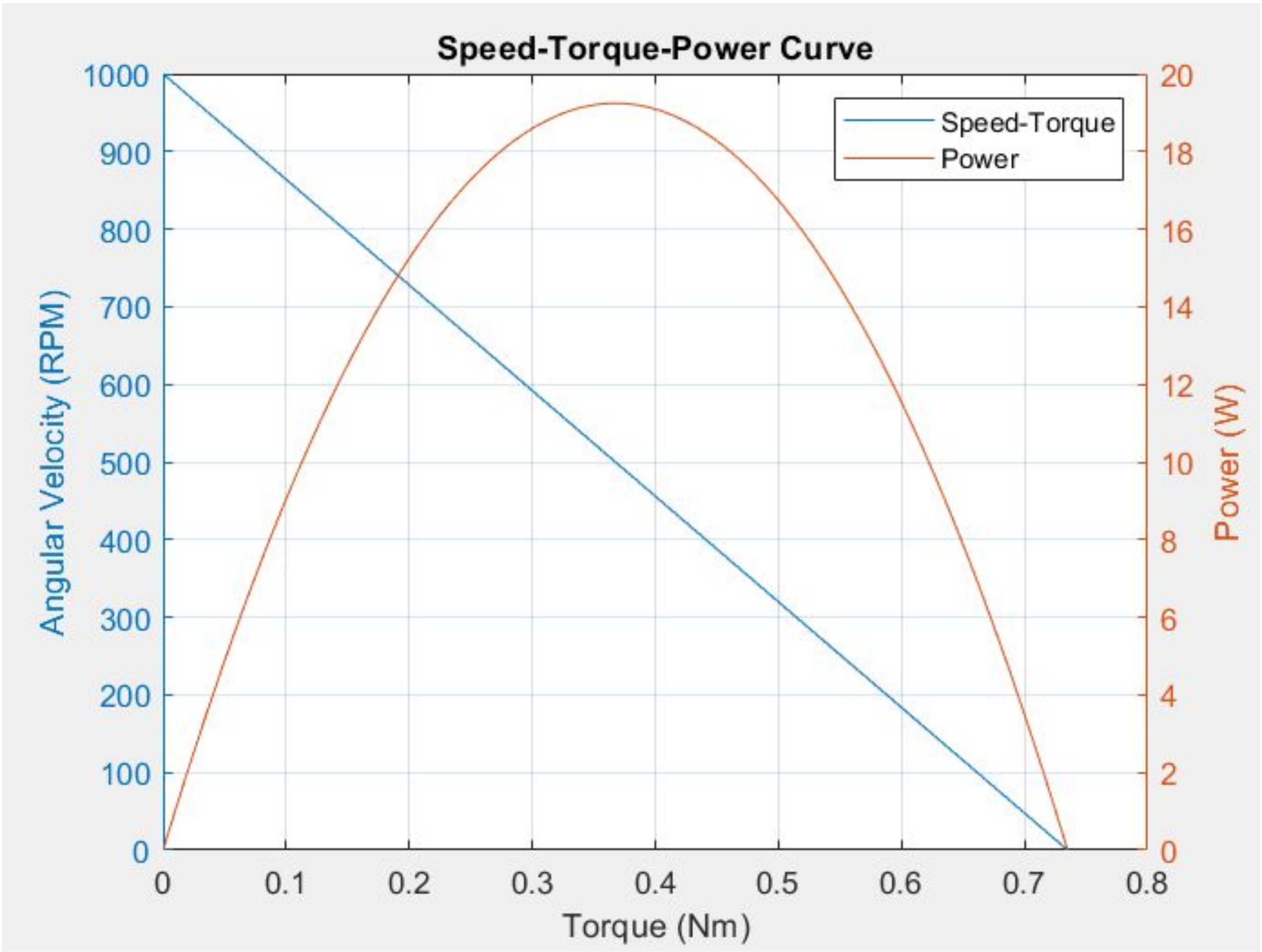
*Problem Statement:*

- The need to have access to electricity while camping, or offgrid in general

*Requirements:*

- Use hydropower to charge a battery in a reasonable amount of time
- Portable
- "Set and forget" solution

## Design Calculations & Analysis




Assuming a stream is flowing at 1.5m/s, our turbine should spin at ***225rpm*** and produce ***13.4W*** *of kinetic power*

Our motor must require less than ***0.57N*m*** to spin as that is what our turbine will produce

*Using dimensional analysis to relate our model to a full scaled prototype*

$$D = L$$
$$\omega = T^{-1}$$
$$\rho = m \times L^{-3}$$
$$P = m \times L^{3} \times T^{-3}$$
$$Q = L^{3} \times T^{-1}$$

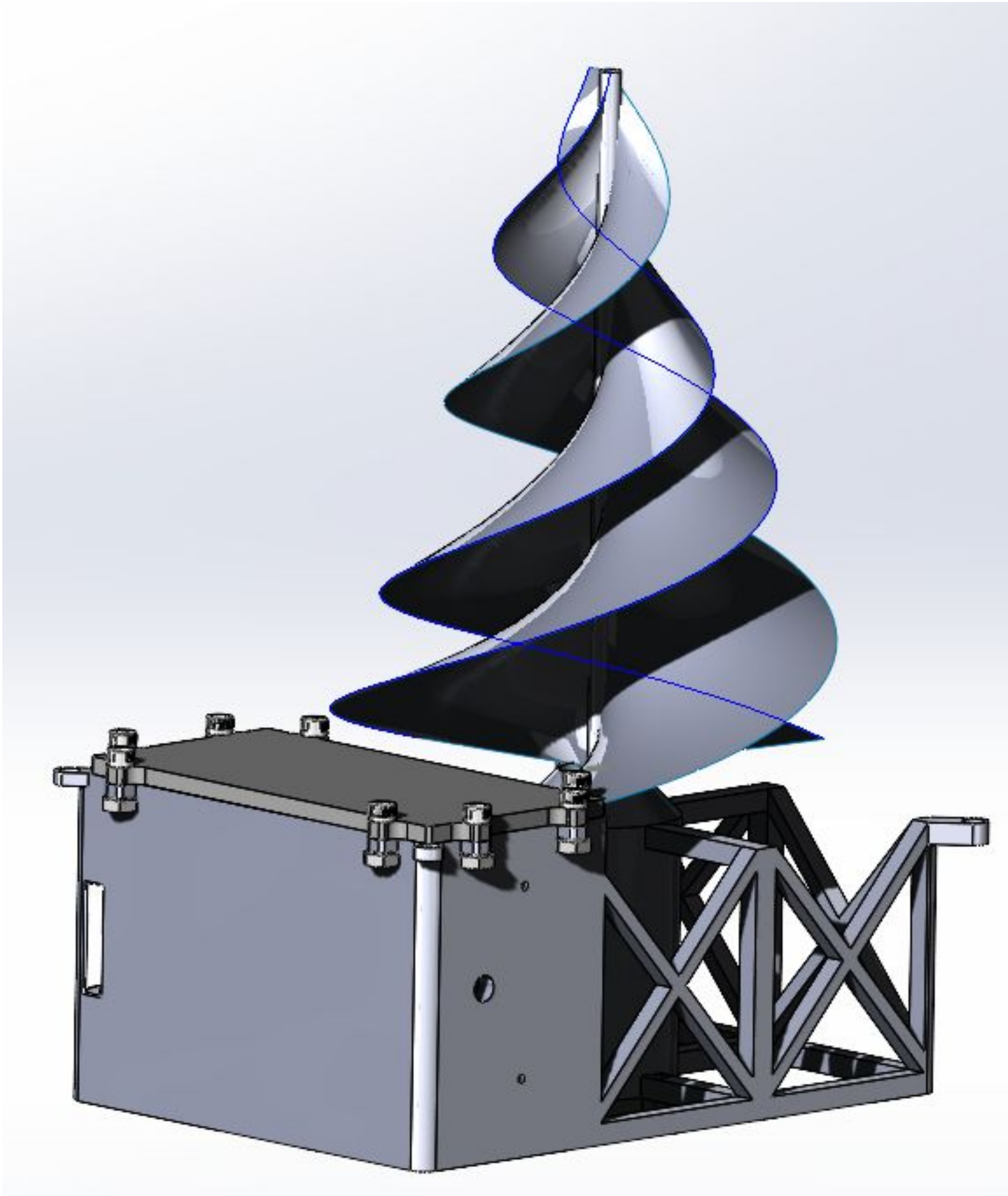
$$\pi_1 = Q \times \rho^{a} \times \omega^{b} \times D^{c}$$
$$\pi_1 = \frac{Q}{\omega \times D^3}$$
$$\pi_{1P} = \pi_{1m}$$
$$\frac{Q_p}{w_p \times D^3_p} = \frac{Q_m}{w_m \times D^3_m}$$
$$\frac{0.032}{\omega_p \times .165^3} = \frac{0.0077}{54 \times .165^3}$$
$$\omega_p = 225\,rpm,\ 23.56\,rad/s$$

$$\pi_2 = P \times \rho^{a} \times \omega^{b} \times D^{c}$$
$$\pi_2 = \frac{P}{\rho \times \omega^3 \times D^5}$$
$$\pi_{2P} = \pi_{2m}$$
$$\frac{P_p}{\rho_p \times \omega^3_p \times D^5_p} = \frac{P_m}{\rho_m \times \omega^3_m \times D^5_m}$$
$$\frac{P_p}{225^3 \times .165^5} = \frac{.1854}{54^3 \times .165^5}$$
$$P_p = 13.41W$$
$$T_p = 0.57Nm$$

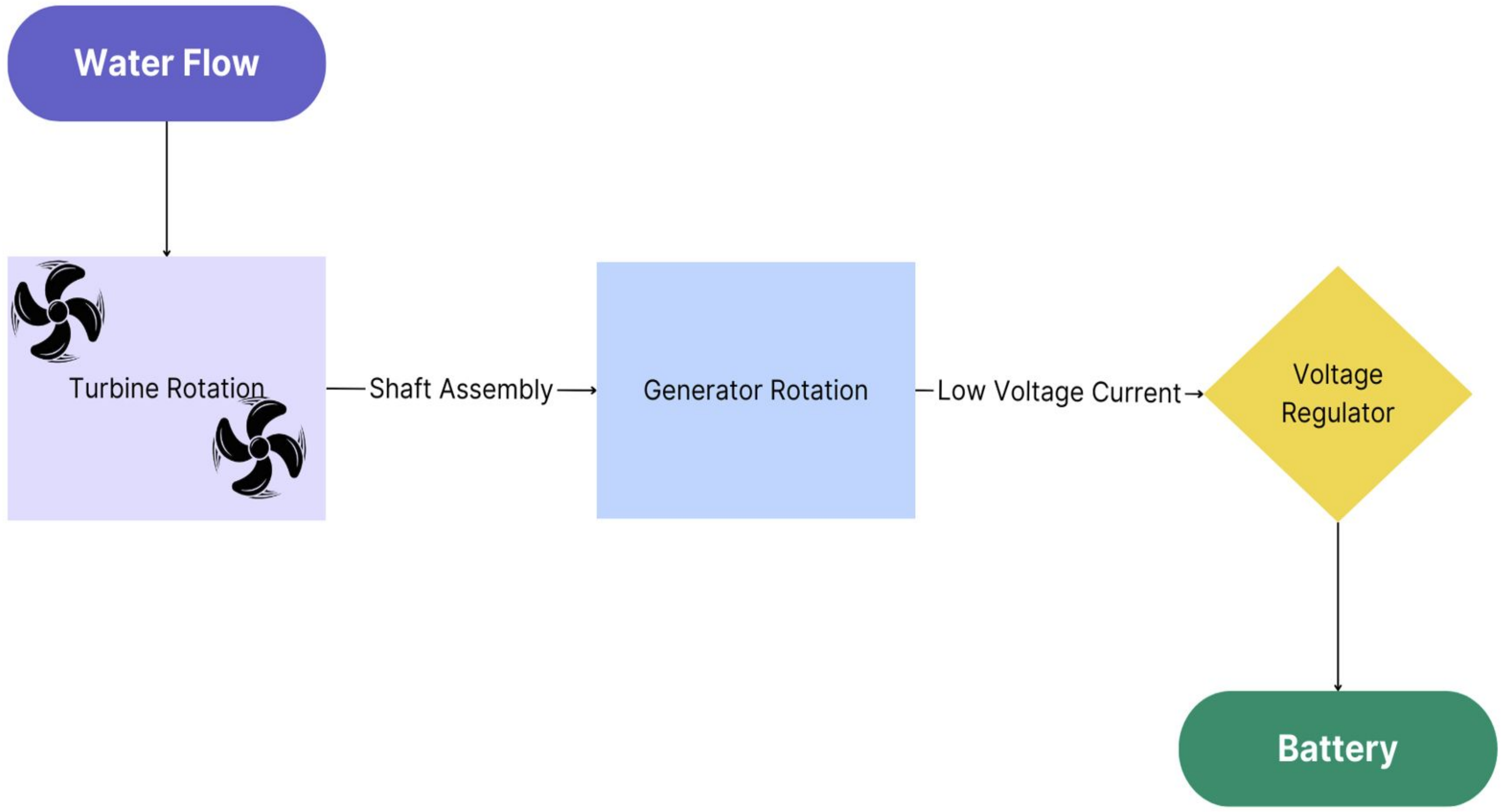
## Final Design

Users will be able to anchor the generator to a tree, branch, or rock via four nylon strings, and return in a few hours to a battery that can charge their devices

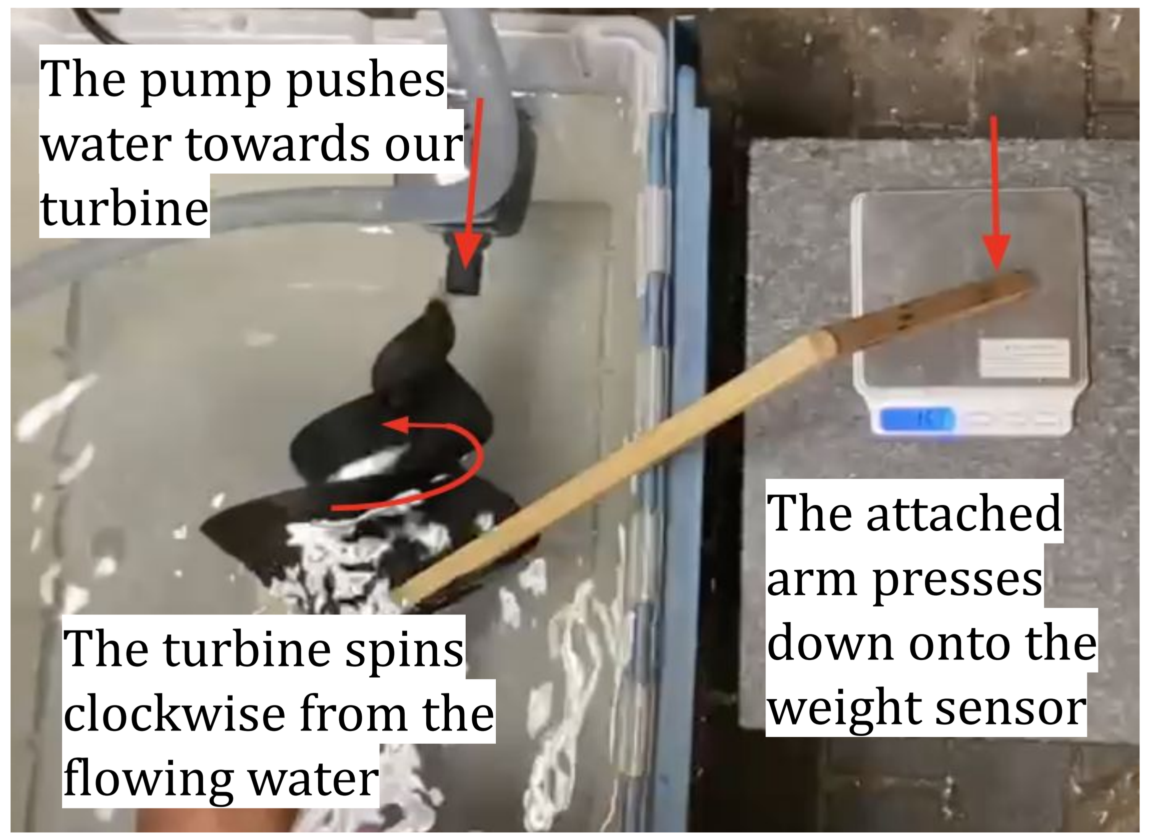
SW Assembly:



Block Diagram:




## Prototype & Test Results




*Test Results (For .36m/s flow): Torque = **0.0328N*m***