

## Abstract

- Commercial fishing harms many endangered and threatened species including turtles, sharks, and sea birds
- Illuminated fishing nets have been shown to reduce turtle bycatch without impacting target fish catch value
- A small-scale, renewable energy source is needed to power the LED lights used on smart fishing nets

## Motivation

- Turtle bycatch decreases significantly when green LED lights are attached to fishing nets
- Current net LEDs are battery powered
- A single fishing vessel can go through 100 batteries a week



## Problem Statement

- More needs to be understood about marine animal behavior in response to visual cues
- We are developing a smart fishing net, capable of emitting light at different wavelengths and duty cycles, as well as taking photos of marine life that interacts with the net

## References

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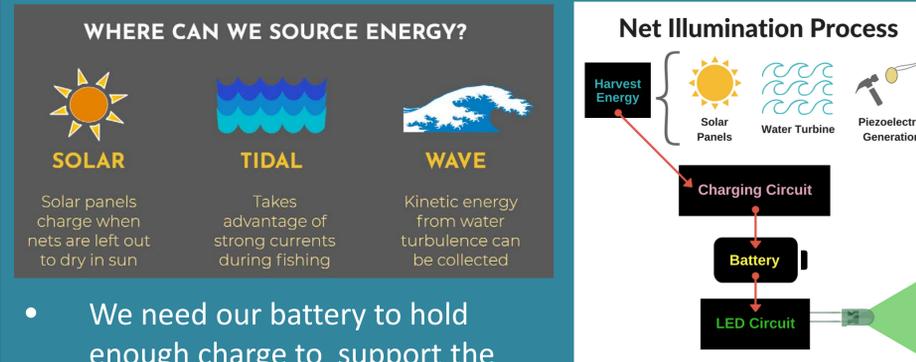
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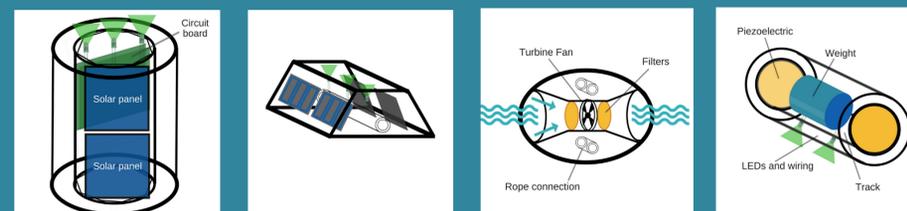
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## System Parameters



- We need our battery to hold enough charge to support the LED circuit for at least 24 hours
- Charging and LED circuits need to be as low power as possible
- Buoys need to be small and difficult to tangle
- Turtles respond well to green (~540 nm) light, which also penetrates water

## Buoy Design

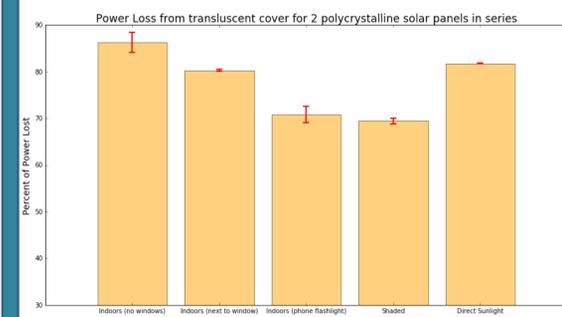
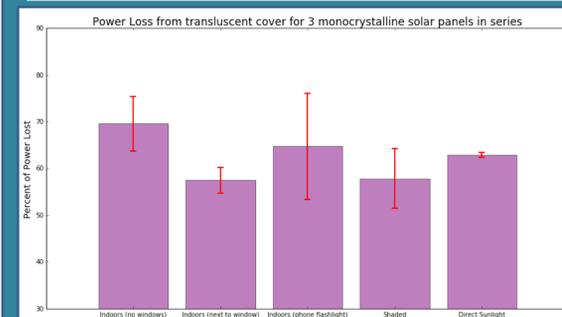


- Solar panel designs need to land panel-up more often than not, aerodynamic flow is considered for the tidal design

## Solar Panel Characterization

- We investigated two types of solar panels for use in our prototype

Solar Cell Parameters	Monocrystalline	Polycrystalline
Dimensions	4.3 x 1.4 cm (6.02E-4 m <sup>2</sup> )	5 x 5 cm (2.5E-3 m <sup>2</sup> )
Maximum Power - Pmax	89 mW	210 mW
Vmp (Voltage at Pmax)	2 V	3 V
Imp (Current at Pmax)	44.6 mA	70 mA
Voc (Open circuit voltage)	2.52 V	3.5 V
Isc (Short circuit current)	50 mA	79 mA
50% operation Power / Area	73.92 Wm <sup>-2</sup>	42 Wm <sup>-2</sup>
50% operation Energy / Hour	160.2 J/hr	378 J/hr



- Monocrystalline panels perform better than polycrystalline across the board
- Monocrystalline panels cost twice as much as polycrystalline
- In tests, panels were soldered together into modules that collectively produce 6V
- Power loss from translucent buoy casing was 64% for monocrystalline panels, 78% for polycrystalline

## Timer Circuit Parameters

- A breadboard prototype of the timer circuit was created to determine optimal parameters like resistor values R1 and R2

$$\text{Duty cycle: } d = \frac{R_2}{R_1 + 2R_2}$$

$$\text{Period: } T = 6.93 \cdot 10^{-5} (R_1 + 2R_2)$$

$$\text{Pulse time: } t_{LED} = 6.93 \cdot 10^{-5} (R_2)$$