# Double Duty Defense - Optimizing Seawalls

## TidalWatts as a Solution to Power in Coastal Regions

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## Challenge

To consider and optimize the additional uses of flood protection structures like seawalls, dykes etc. Economic feasibility and environmental impact needed to be considered.

## Solution- TidalWatts

- Utilize the robust structure of pre-existing seawalls to mount piers from
- Install turbines from these piers to create energy for coastal region
- Use Eco-concrete to build piers and further strengthen the seawalls to allow marine ecosystem to flourish

## Rationale

| | |
|---|---|
| Seawall | They are robust and provides the base needed for piers<br>Saves money, time and energy in looking for new sites<br>Optimizes seawalls by creating an aesthetically pleasing space and commerce |
| Piers | Can be extended to depths required for optimal location of turbines<br>Allows necessary water flow for energy production<br>More jobs created along the piers and seawall |
| Eco-concrete | Mixture 5% stronger than normal concrete<br>80% less carbon footprint<br>Mimics natural structure<br>Brings back marine life<br>• Striving marine life means more fish<br>• Brings more economic opportunity to coastal region through fishing in a sustained way |
| Tidal Energy | Unlike storms is predictable.<br>Truly renewable as long as moon-earth gravitational system exists |
| Water Turbines | Water density is 800 times that of air, slow movement allows a lot of energy<br>Conversion of kinetic energy to electrical with no disturbance to natural flow of water |

## Sources


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## Schematics and Environmental Impact

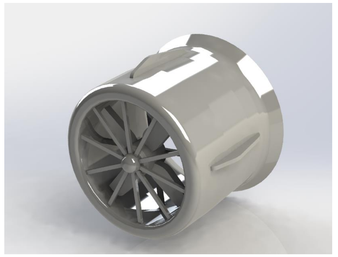


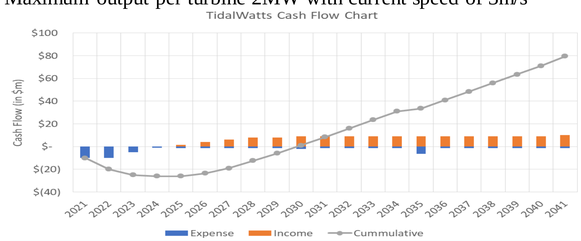
*Fig 1: 4 bladed turbines instead of 3 bladed to reduce marine life damage*

*Fig 2: Extend working pier or extension of seawall so as to reach 20-30 m depth. Vertical alignment of turbines*


*Fig 3: Eco-concrete before and after to show how marine life thrives when used. 80% less carbon footprint*

## Economics

**TidalWatts Objective: To power 1500-3000 homes in coastal regions.** Galveston was taken as the average coastal city. TidalWatts would begin to **make revenue after 10 years** according to the Cash flow chart.
Maximum output per turbine 2MW with current speed of 3m/s




| Expenditure | Amount ($) | Yearly Income | Amount ($) |
|---|---|---|---|
| Capital Expenditure | 25,000,000 | Energy Consumption@11.4c/KWh | 4,000,000 |
| Running Cost/year | 1,000,000 | Commercial use of pier+ seawall | 4,000,000 |
| Energy Production/year@1.5c/KWh | 500,000 | Recreational | 1,000,000 |
| Maintenance 1: Year 2030 | 500,000 | **Total Income** | **9,000,000** |
| Maintenance 2: Year 2035 | 5,000,000 | | |

## Challenges and regulations

- Technology still in infancy hence upfront cost is high compared to other renewable energy sources
- Environmental impact though low can be there on marine life due to the turbines
- Scouring of the base of piers could lead to erosion. Saltwater effect on machinery need to also be assessed
- All EPA, US Energy Department, Water Acts, Americans Jobs creation act etc. must be adhered to and understood
- Ensured licensing by the FERC, and permitting by the U.S. Army Corps of Engineers
- Public (state or federal) and private investment and co-operation needed
- Skill sets required are marine biologist, R&D, engineers, lawyers, lobbyists, geologists, architects, investors