TEAM 8: ELECTRO-WAVE

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OUTLINE

Project Scope
Proposed Question
Design Process
Design
Obstacles
Design Norms
First Semester
To provide Consumers Energy with a case study conducted in the Great Lakes that will show whether or not wave energy is economically viable. Team 8 will also be constructing a small scale Wave Energy Converter (WEC).

Second Semester
Propose a one sentence question in regards to wave energy and create a roadmap capturing important facts and details.
Create a 3D model of overtopping device and perform optimization calculations
PROPOSED QUESTION

What would it take for wave energy to become a feasible renewable energy option, bringing it from the conceptual stage into the market/mature stage?
4 STAGES OF TECHNOLOGICAL ADVANCEMENT

Invention ➔ Machine ➔ Market ➔ Mature
DESIGN PROCESS - ROADMAP

Phase 1
- Current Status of Wave Energy
- 4 Stages
- Power Potential

Phase 2
- Comparison to other forms of Renewable Energy
- Cost of Elec.
- Look at history of Renewable Energy Sources

Phase 3
- Trendlines
- Predictions to where Wave Energy is going

Phase 4
- Renewable Energy Credits
- How can wave energy be incentivized?

Phase 5
- List of barriers

Phase 6
- Answer to question
POWER POTENTIAL

Maximum Power
7.44 kW/m

Best Locations
Oswego, NY
Westfield, NY
Prince Edward, Ontario
Port Rowan, Ontario
**POWER POTENTIAL**

<table>
<thead>
<tr>
<th>State</th>
<th>Wave Power Density</th>
<th>Estimated Annual Energy Production</th>
<th>Assumed Capacity Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maine</td>
<td>12.4 kW/m</td>
<td>7038 MWh</td>
<td>34%</td>
</tr>
<tr>
<td>Oregon</td>
<td>21.2 kW/m</td>
<td>10938 MWh</td>
<td>34%</td>
</tr>
<tr>
<td>Washington</td>
<td>26.5 kW/m</td>
<td>12302 MWh</td>
<td>34%</td>
</tr>
<tr>
<td>Hawaii</td>
<td>15.2 kW/m</td>
<td>7240 MWh</td>
<td>34%</td>
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</tbody>
</table>

Average Annual Wave Power (kW/m)
<table>
<thead>
<tr>
<th>Device Characteristics</th>
<th>Weight (%)</th>
<th>Ocean Power Delivery</th>
<th>Energetech</th>
<th>Wave Dragon</th>
<th>SEADOG</th>
<th>WaveBob</th>
<th>Aqua Energy</th>
<th>OreCON</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device Width (m)</td>
<td>0.1</td>
<td>10</td>
<td>7</td>
<td>4</td>
<td>10</td>
<td>9</td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td>Device Annual Production (MWh)</td>
<td>0.2</td>
<td>5</td>
<td>6</td>
<td>10</td>
<td>1</td>
<td>6</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Number of Devices needed</td>
<td>0.15</td>
<td>2</td>
<td>4</td>
<td>10</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Water Depth needed (m)</td>
<td>0.1</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Rated Power (kW)</td>
<td>0.15</td>
<td>5</td>
<td>6</td>
<td>10</td>
<td>5</td>
<td>6</td>
<td>3</td>
<td>6</td>
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<tr>
<td>Cost (Million $)</td>
<td>0.3</td>
<td>7</td>
<td>7</td>
<td>3</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td>5.55</td>
<td>6</td>
<td>6.9</td>
<td>4.5</td>
<td>5.5</td>
<td>4</td>
<td>6.4</td>
</tr>
</tbody>
</table>
Overtopping – “Wave Dragon”

1. Two wave reflectors act to focus the incoming waves.
2. Waves overtop the double curved ramp to reach the reservoir.
3. Electricity is generated by running the water through turbines in the bottom of the structure.
MAJOR OBSTACLES

Ice Buildup

Legal Barriers

Marine Life
DESIGN NORMS

Stewardship

Integrity

Trust
RESOURCES

http://archivesocial.com/
www.dvidshub.net
www.extremetech.com
rosspmiller.weebly.com
www.bls.gov
www.power-technology.com
http://www.hongkiat.com/
http://citeseerx.ist.psu.edu
http://www.energy.ca.gov/oceanenergy/E21_EPRI_REPORT_WAVE_ENERGY.PDF
Any Questions?