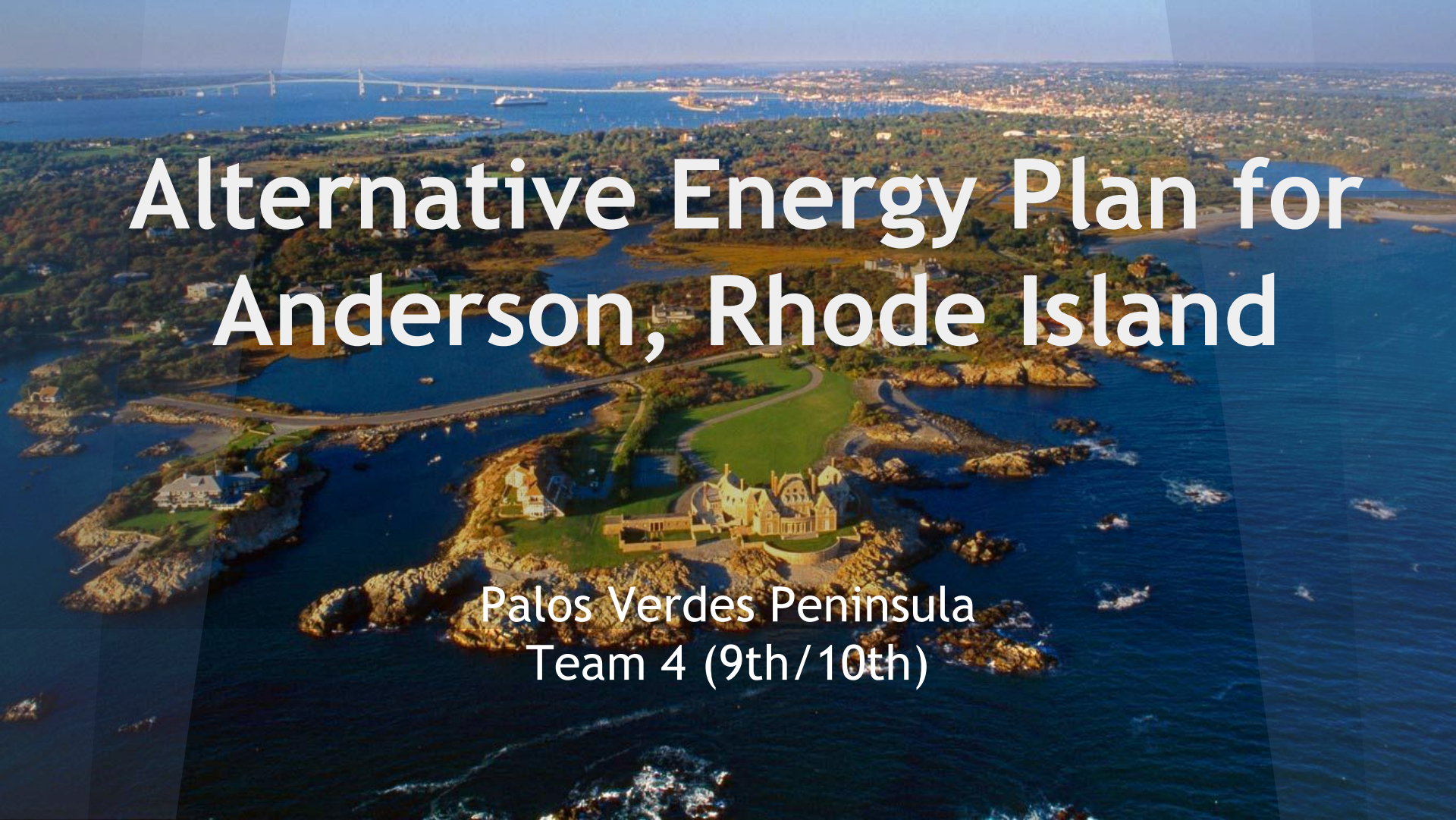


Alternative Energy Plan for Anderson, Rhode Island

Palos Verdes Peninsula
Team 4 (9th/10th)

Introduction and Overview

- Background
- Alternative Energy Options
  - OTEC
  - Offshore Wind/Solar (wind lens)
- Energy Storage Systems
- Risk Assessment and Mitigation
- Economic Considerations and Timeline
- Conclusions

Background on Anderson (Based on Providence)

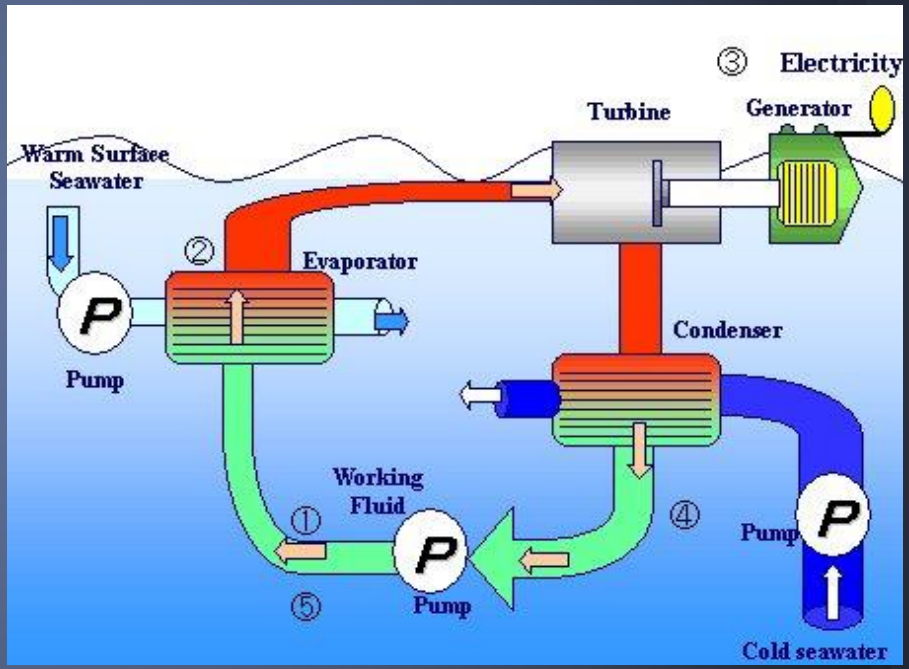
- Avg wind speed: 10.4 mph
- Coastal city
- Average residential electricity consumption is 7200 kWh/year

Ocean Thermal Energy Conversion (OTEC)

- Land-based, closed cycle
- 10 MW plant can supply 12,200 houses

OTEC cont.

- Working fluid continuously evaporates, then condenses to run turbine
- Solar heating of working fluid increases efficiency by 25%



OTEC Effects on Economy, Environment, and Society

- Profit for economy from unlimited resource
- Creates jobs through maintenance needs

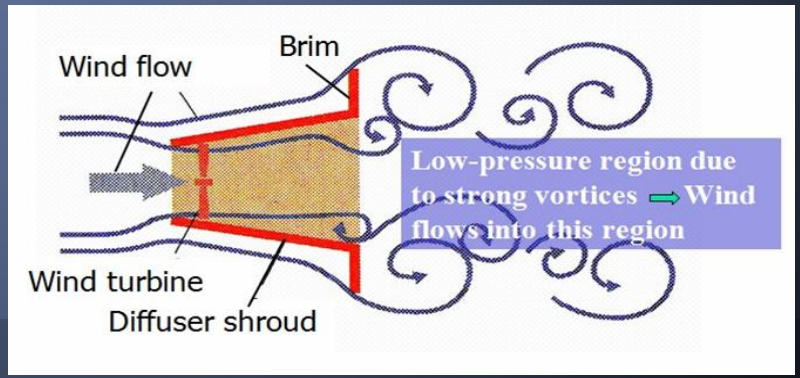
- Impingement on marine life

The OTEC plant on Kume Island

- Occupies coastal area
- Noise Pollution

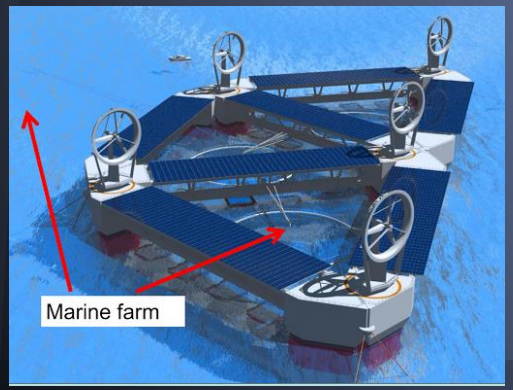
Offshore Wind and Solar

- Wind lens
- 2-3 times more effective
- 85 million kWh/year can power 12,000 households (1 farm)



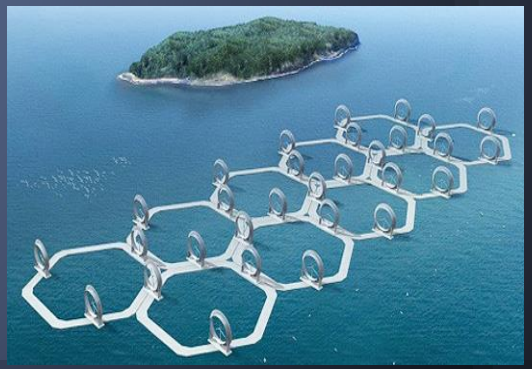
Economy, Environment, and Society

- aquafarming/ aquaculture
- local farmers
- purchasing food



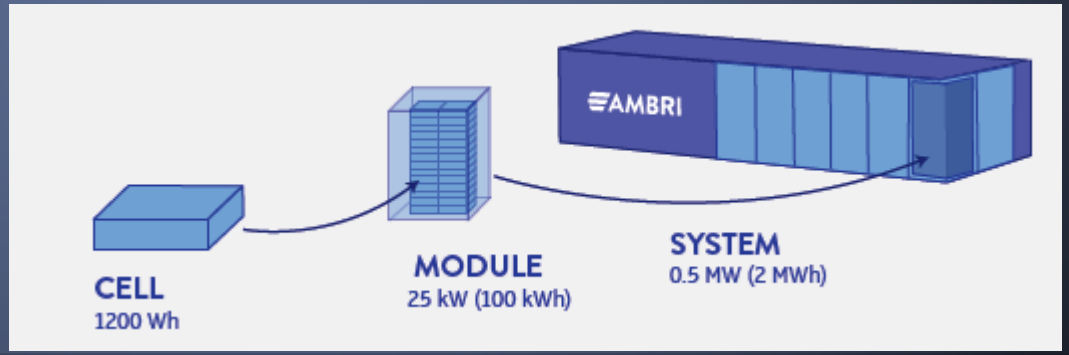
- Net to prevent bird collision

- Extremely quiet and safe
- Effective use of space



Energy Storage With Liquid Metal Batteries (LMB's)

- Molten lithium (Anode), lead, antimony (Cathode)
- ½ of the cost to store energy ($500 for a kWh)
- Cheap maintenance
- 1 Ambri Core = 200 kWh
- Long life span



Risk Assessment and Mitigation

- Wind solar power more reliable
- OTEC maintenance to minimize impact on environment

Risk Assessment cont.

- Amorphous solar panels in case of system failures
- Western Europe
- New technologies unproven

Economic Considerations

- OTEC plant: $40 million over four years
- Energy Cost: 7 cents/kWh
- Offshore wind/solar: $12.2 million per 10 hexagon units
- Amorphous Solar cells: $250 per sq. meter

Timeline

Amorphous solar panels installed for energy use until a centralized system is created

Offshore wind and solar facilities operational

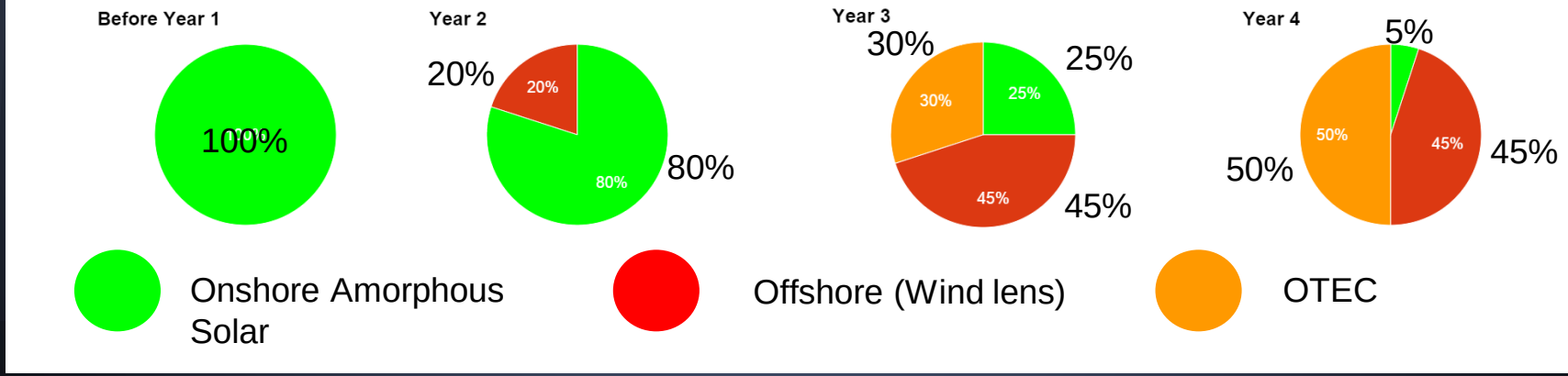
OTEC Plant Operational

System is fully operational and prepared for any other natural disaster

Start

Year 1

Year 2



Conclusions

- OTEC
  - Utilizes the ocean’s huge reservoir of heat energy
  - Low environmental harms
- Offshore wind and solar
  - 2-3 times more efficient
  - Compact energy gathering

Offshore Wind and Solar Implementation Plan

- 18m hexagon floating body, 30 1,670 kW wind lens turbines and 1.5kW solar panels
- 12.2 million dollars, 85 million kWh/year = annual power consumption of approx. 23,600 households
- 2 years to build

Wind Lens Study

- K. Toshimitsu, H. Kikugawa, K. Sato and T. Sato, "Experimental Investigation of Performance of the Wind Turbine with the Flanged-Diffuser Shroud in Sinusoidally Oscillating and Fluctuating Velocity Flows," *Open Journal of Fluid Dynamics*, Vol. 2 No. 4A, 2012, pp. 215-221. doi: 10.4236/ojfd.2012.24A024.