



Marine Clean Energy: Solar Power Island

Sponsor: American Bureau of Shipping / Jude Tomdio

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OVERVIEW

The Solar Power Island is a solar array piled in the Bay of Galveston that provides green energy to berthed ships in the Port of Galveston, so those ships do not have to rely on running their own engines.

The power design uses a self contained microgrid to provide power from 177 thousand solar panels to the ships in the port, and the foundation design gives the panels some place to rest.

Environmental design oversaw the design to minimize effects such as noise pollution and bottom shading, to keep the local fauna and flora happy during the life of the project. This design will offset 16 MW of fossil fuel power for the Port of Galveston, aiding ABS and the world in the fight for decarbonization.

REQUIREMENTS

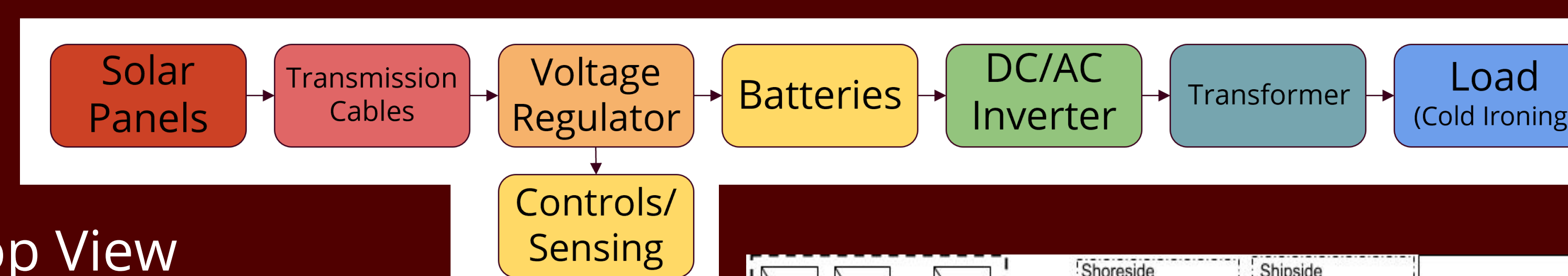
- Design Power Systems including power generation, storage and usage
- Complete a foundation design which can safely and efficiently support the solar panels
- Maintain environmentally conscious approach.

FINAL DESIGN

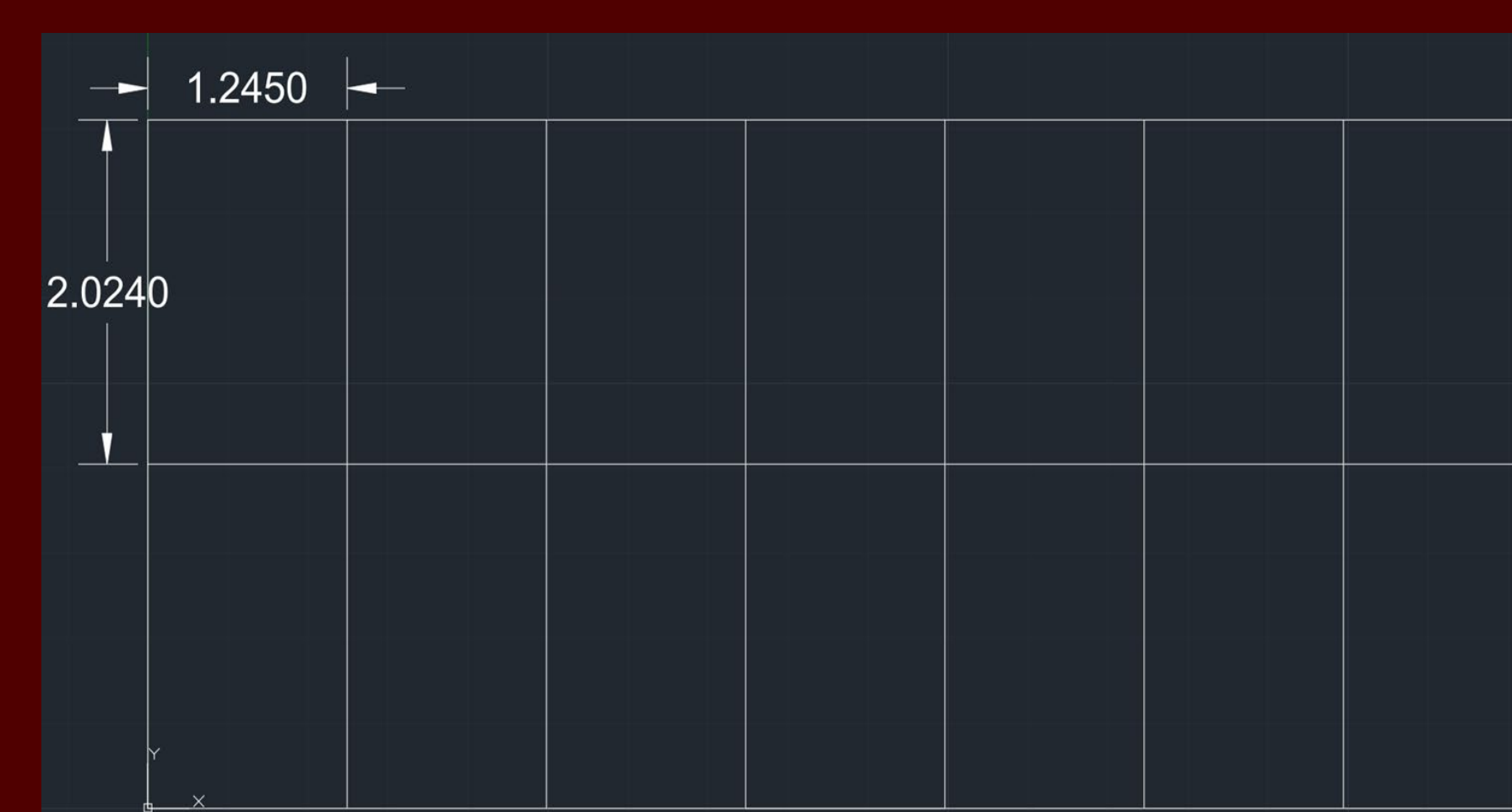
- Switched from Floating (moored) to driven pile foundation.
- Why? Cheaper; too shallow for floating (no precedent for floating at this depth); safer; more reliable tilt.



Power Design

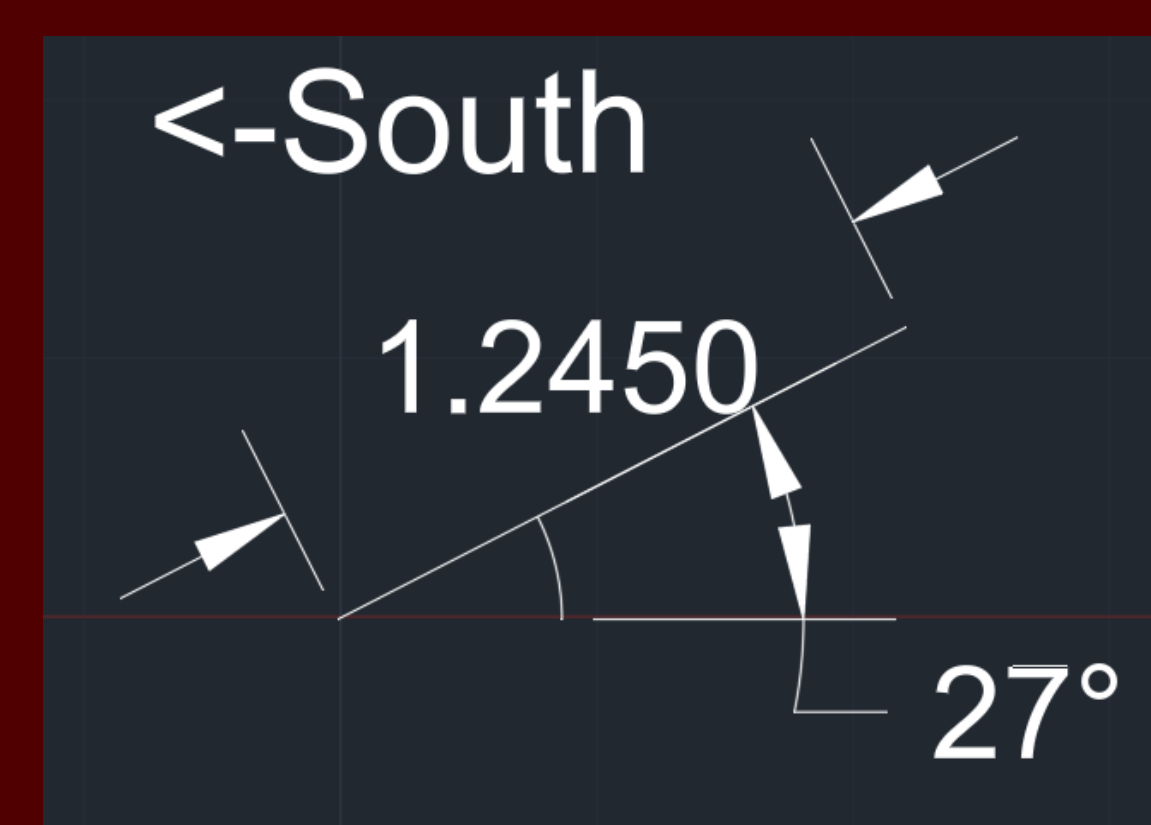


Top View



12,691 Mini-Islands

Side View



27° angle of Solar Incidence

Foundation

- Circular with 18" outer diameter, 0.25" wall thickness
- 20' long, 12' above mudline 8' below - decided by calculations
- 11 million USD for all piles at given estimate of 1800 USD per ton of pile

Layer	su (ksf)	soil weight density (kcf)	Starting Depth (ft)	End Depth (ft)
1	0.24	0.095	0	4
2	0.24	0.095	4	8
3	0.24	0.095	8	10
4	0.24	0.095	10	12
5	1	0.095	12	14
6	2	0.095	14	16



COST EFFECTIVENESS

- Panels cost \$35 million per berth
- Cables cost \$66 million per berth
- Transformer costs \$1.39 million per berth
- Inverter costs \$1 million per berth
- Batteries costs \$0.1 million per berth
- Piles Costs: \$10.95 million + \$3 million install+ \$22 million of silt curtains
- Miscellaneous Costs (Cleaning, Installation): \$18 million

Total cost: \$161 million dollars
Payoff Period: 16 Years

ENVIRONMENTAL IMPACT

- Identify/describe affected environment
 - Galveston Bay and Pelican Island
- Identify risks
 - Water quality
 - Marine life
 - Sediment/foundation disruption
 - Currents/erosion
- Alternatives to proposed actions
 - Response to identified risks
- Analysis of each possible alternative
 - Describe impact of solutions