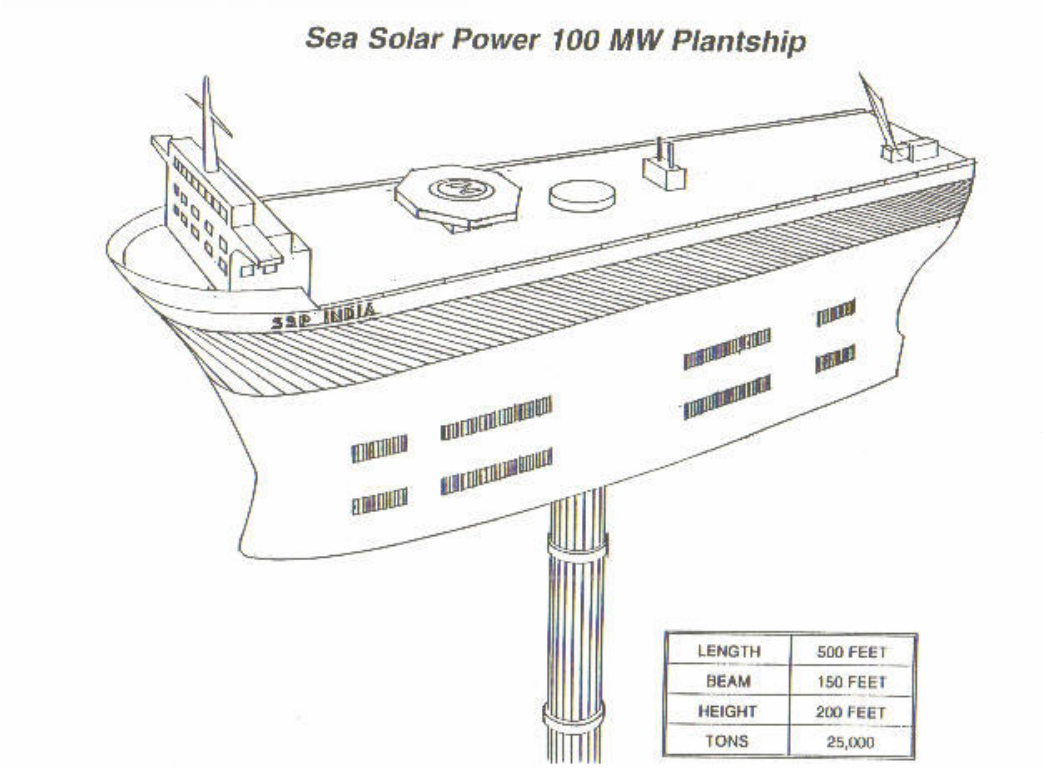
# Sea Solar Power 100 MW hybrid cycle OTEC plantship design

http://www.otecnews.org/articles/ssp100mwotec.html

by **Phil Kopiske** 4 February 2002

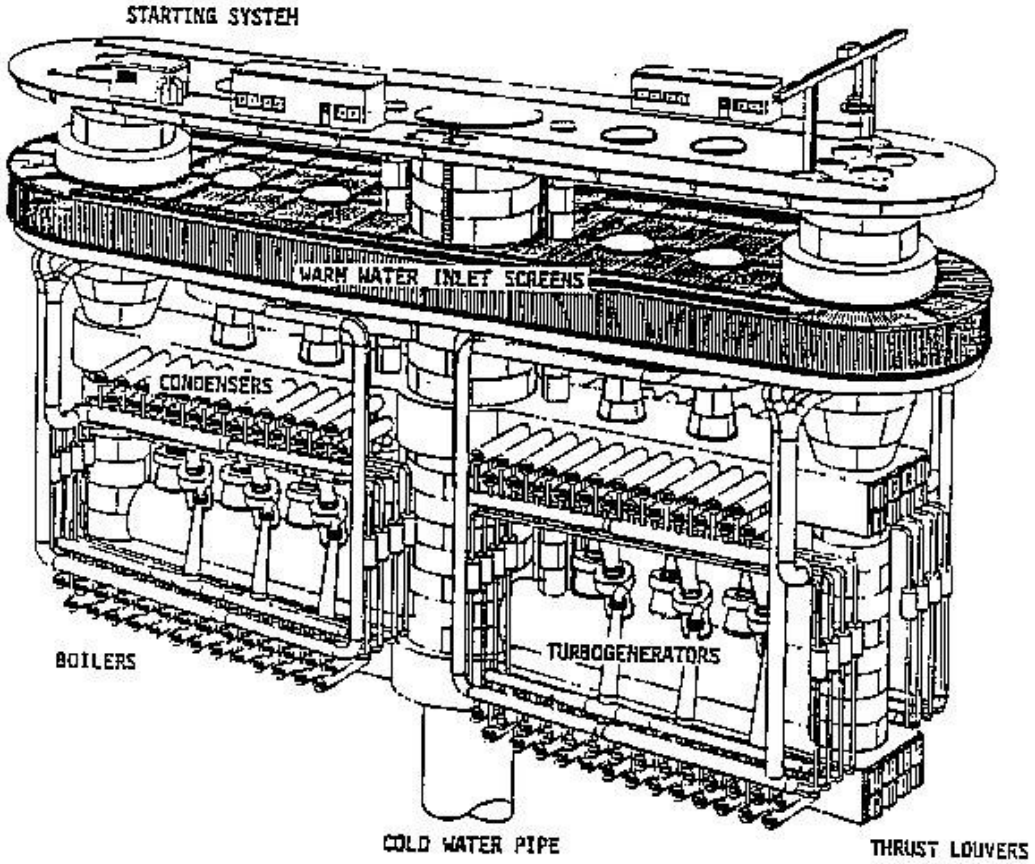
References: SSP's OTEC Review and Proposal for U.S. Navy, 1996, and SSP's website
Product: SSP 100 MW plantship OTEC
Cost: $250,000,000 USD
Cost Year: 2002
Output 1: 100 MW electricity
Output 2: 32,000,000 gallons (120,000 m3) per day fresh water
Output 3: Cold nutrient-rich seawater for open ocean caged aquaculture
Input 1: 8,000 $ft^3$/s surface seawater at 80 ºF (227 $m^3$/s at 27 ºC)
Input 2: 5,000 $ft^3$/s deep seawater at 40 ºF (142 $m^3$/s at 4.4 ºC)
Size: 500 ft x 150 ft x 200 ft (152 m long, 47 m wide, 61 m high, 25,400 tons)
Designer: J. Hilbert Anderson
Technology: Closed cycle propylene

Company: Sea Solar Power International
Address: 111 S. Calvert Street, Suite 2300, Baltimore, MD 21230
Phone: (410) 547-1300
Web Site: **http://www.seasolarpower.com**




Sea Solar Power of Baltimore, Maryland, has designed a floating 100 MW net plantship, a 130,000,000 gallon per day desalination version of that same plantship, and for technology demonstration purposes, a 10 MW shore based OTEC. This second abstract is a brief description of the 100 MW plantship design, depicted below in an earlier design configuration without it's fresh water containment hull, added to reduce drag and minimize corrosion of submerged components. The principle design objective was to minimize plan cost by minimizing plant mass, and taking maximum advantage of minimal warm and cold water flows. Descriptions of the OTEC plant designs of other companies and individuals will follow.

Warm seawater at 8,000 cfs (226 $m^3$/s) flows through a perimeter inlet screen at the surface, and enters forward and aft pumping wells each containing four propylene vapor driven pumps. An overhead crane can remove warm and cold water pumps for maintenance while the plant remains in operation. The warm water passes through boilers positioned at equilibrium depth to their internal propylene vapor pressure, allowing the wall thickness and mass of the boilers to be minimized.



100 Mwe OTEC Plant

Cold water is drawn up a 3300 foot long 28 foot diameter (1000m x 8.5m) stockade pipe constructed once the plantship is on station. Smaller pipes are welded side by side to form cylindrical sections, which are welded end to end and lowered down the central cold water well. A spring collar decouples the near neutrally buoyant cold water pipe from plantship motion. The 5,000 cfs (142 $m^3/s$) cold water flow is directed through multiple pass condensers to maximize cold water utilization, and then discharged through louvered vents.

The four cold water pumps in the central cold water well are also driven by propylene vapor turbines. The use of vapor turbine driven pumps represents an efficiency improvement over the use of electrical motors to provide pumping power. Two gas turbine driven compressors produce high pressure propylene vapor to augment station keeping during storms, and to provide plantship propulsion prior to plant startup. Propulsion is achieved by using the compressed propylene vapor to run the warm water pumps, and subsequently discharging the warm water through louvered vents.

Propylene vapor from the boilers travels upwards through 12 turbo generator turbines, and is then condensed into liquid in the cold water condensers. Due to the elevation of the condensers above the boilers, there is sufficient pressure head in the condensate lines to force the liquid propylene back into the boilers without the need for feed pumps.

Power is converted to high voltage DC, and is cabled to shore for conversion to AC and integration into the local power distribution network. Fresh water is pumped to shore as well. Both power and fresh water lines first run vertically to an anchored connection on the ocean floor, giving the plantship a station keeping radius that it must stay within, and then run up to 30 km horizontally to reach the shore.

A Saudi Arabian company has expressed interest in a 130 million gallon per day desalination version of this plantship design. The plant produces 30 MW of gross power, and no net power. Water is sent to shore via a pipeline. As with the 10 MW shore-based prototype design, this plant can also be tailored to the customer's needed mix of fresh water and power.