Statement to Support Public Comment by Robert J. Nicholson, III,
Sea Solar Power International, LLC.,
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SEA SOLAR POWER INTERNATIONAL LLC
OTEC BRIEFING

- It is true that hundreds of millions of dollars have been spent by the US Department of Energy attempting to design an OTEC plant that Sea Solar Power had already designed. This effort was funded by D.O.E., orchestrated by a research group in Hawaii which relied primarily on the aerospace industry for detailed engineering which was flawed from the beginning.

- They designed the cycle as if it were a high temperature power plant using standard off the shelf components. The size and cost was so extravagant that it could not possibly compete with fossil fuels.

- The following outline will identify the reasons why the Sea Solar Power design is 8 times less expensive than the D.O.E. design and why it can produce power and fresh water cheaper than burning fossil fuel.

- Sea Solar Power International is the oldest and most advanced firm world wide in the commercial development of ocean thermal energy conversion or OTEC.

- OTEC is an economically efficient means to convert solar energy from the upper layers of the tropical oceans into low cost electricity and desalinated water when properly designed.

- OTEC takes advantage of the temperature difference between the solar heated surface water and the cold bottom water within a zone 20 degrees north and south of the equator.

- SSPI has two models, a land based 10 MW OTEC plant which also produces 3 million gallons of desalinated water per day as part of the process and a 100 MW floating OTEC plantship which produces 32 million gallons of fresh water per day.

- In addition, millions of dollars worth of fish and vegetables can be raised annually by taking advantage of the cold nutrient rich effluent of a small land based OTEC plant

- Sea Solar Power International is owned by the Abell Foundation of Baltimore. The Abell Foundation is responsible for full funding of the first plants.

- Mature plants will be owned and operated by SSPI but financed with equity from the Abell Foundation and debt through commercial banks

- Power and water utilities in appropriate countries and SSPI will negotiate long-term contracts to purchase both power and water.

- SSPI will build and operate each installation.

- The inventor of this technology, James Hilbert Anderson is the modern day pioneer in the commercial development of OTEC having designed this advanced OTEC cycle in 1962 before D.O.E. was established.

- With a BS and MS in mechanical engineering he began his career at Ingersoll Rand where he soon became director of R & D.

- As a design engineer and inventor he has designed many types of turbo machinery including centrifugal compressors, steam turbines, gas turbines, large pumps, etc.

- During the early days of WWII Hilbert Anderson was one of the leading industry design engineers summoned to the Manhattan Project by the US Army.

- A special compressor was required by the military with a Mach number that had not been achieved. All the experts said that it was impossible to reach a number that high. Hilbert Anderson raised his hand and said that he could design such an advanced machine.

- Anderson's breakthrough design was used by the Army contributing to making it possible to produce the Atom Bomb for the Manhattan Project

- After the War Anderson became chief engineer for the York Corporation, one of the world's largest refrigeration companies

- OTEC is a reverse refrigeration cycle. Anderson's approach to OTEC has been based on low temperature refrigeration principles not the high temperature power cycle attempted by all other OTEC efforts

- James Hilbert Anderson is a brilliant mechanical engineer with over 100 patents pertaining to a variety of turbo machines, special heat exchangers and the inventor of 5 new power cycles

- James Hilbert Anderson invented and built the world's first low temperature commercial binary cycle geothermal power plant-comparable to the OTEC cycle.

- Because of his creative thinking Hilbert Anderson has over 30 patents for Sea Solar Power's OTEC design.

- The size of an OTEC plant and the cost are determined by the amount of water required to operate the cycle

- Although there is an enormous amount of solar energy stored in the upper layers of the tropical ocean it is low grade. Therefore, the challenge is to develop high heat transfer coefficient in order to decrease the volume of water needed. Reducing the HX surface area lowers the capital cost.

- The D.O.E. Hawaii OTEC program used standard heat exchange practices common to the power industry with smooth tubes and an U value of about 600.

- For 75 years the refrigeration industry has been using enhanced surfaces on their HX tubes to increase heat transfer with U values around 1300.

- James Hilbert Anderson designed new high performing enhancements for both the internal and external surfaces of the HX tubes for the evaporators and condensers with an optimized pressure drop exceeding a U value of 2000.

- Anderson has built a heat exchange test facility where his high heat transfer design has been tested and confirmed by heat transfer experts from the University of Maryland.

- As a result of the test it proves that the flow of water for the SSPI OTEC design will require a fraction of what any other design has been able to achieve.

- For example, the SSPI OTEC design uses only 8,000 CFS (cubic feet per second) as compared to 15,000 CFS for the D.O.E. OTEC design. The cold water flow for SSPI's OTEC is only 5,000 CFS compared to D.O.E.'s design which is 15,000 CFS.

- Therefore, the cold water pipe for the D.O.E. OTEC design is 50 feet in diameter, is made of concrete and weighs over 18,000 tons.

- The SSPI cold water pipe is only 28 feet in diameter, is made of pultruded fiberglass and weighs only 500 tons.

- The D.O.E. design uses standard off the shelf turbines and compressors with low efficiencies.

- James Hilbert Anderson has designed compressors and turbines specifically for the SSPI OTEC plant that are more efficient than any other design

- The Abell Foundation has spent $1.5 million building to full scale the special compressor for the 10 MW OTEC plant. It has been operated and tested meeting the special requirements for OTEC

- The special turbine is now being built for the standard 10 MW OTEC plant.

- A ten-point increase in turbine efficiency equates to a 15% increase in cycle efficiency.

- The Anderson designed vapor turbine is designed to achieve 94% efficiency, whereas existing turbines operate between 79% and 84% efficiency.

- The size and the cost of the SSPI 100 MW OTEC plant is thus 1/8 the size and cost of the D.O.E. design because of all the highly efficient special cycle components and optimized cycle designed by Anderson.

- D.O.E. selected ammonia as the working fluid.

- Seawater leaking into the closed loop with millions of joints is assured –water mixing with ammonia retards heat transfer-it is extremely costly to separate.

- A propylene vapor turbine is more efficient than ammonia vapor turbine- it is easy to separate water from propylene. This is why propylene has been selected by SSPI as the working fluid – not ammonia

- Comparison of the SSPI OTEC design vs. the design of OTEC by the US Department of Energy:

SSPI 100 MW OTEC plant	D.O.E. 100 MW OTEC plant
25,000 tons	200, 000 tons
8,000 cf/s	15,000 cf/s
5,000 cf/s	15,000 cf/s
$250 million	$ 2 billion

- A mature hydro plant cost $3500 per KW to build- SSPI's first 100 MW plant is calculated to cost $2500 per KW or 40% less. OTEC will operate 95% of the time compared to hydro average of 55% - OTEC will be the lowest cost producer of power and water.

- 4 independent engineering evaluations confirmed that the SSPI OTEC design is sound and economically feasible.

- Therefore, the Abell Foundation is providing full funding so that SSPI can offer clients along the equator (most of the world's population) no risk OTEC installations

- Currently, SSPI has proposals to 20 countries. The Grand Cayman Islands are the most advanced with final negotiations underway followed by the Philippines, St. Croix, Saipan, Guam and the Maldives – Brazil, India, Pakistan, Indonesia are all eager for OTEC.

- The Sea Solar Power floating plantship can be dedicated to produce only desalinated water at the rate of 130 million gallons per day. As an example, SSPI can supply the Gulf States with billions of gallons per day cheaper than any other means.

- Even with the first demonstration OTEC plant SSPI can generate electricity and produce fresh water for less that the host client can when burning oil producing an attractive ROI for the investors.

- Mature plants will cost much less providing the world with the cleanest, safest, lowest cost baseload power and an endless supply of low cost high quality fresh water.

- World leaders are concerned about global warming, the water crisis and how modern society sustains development – Sea Solar Power's OTEC can address all of these challenges more efficiently than any other technological means

- Whiting-Turner of Baltimore has been selected as the construction company for the first plant

- AON Risk Insurance of Baltimore will guarantee the performance of the first plant

- R. W. Beck is SSPI's design engineering firm

- Abell Foundation will finance the first plant

- The US government should be supporting this technology in the international markets.

- Please refer to our web site @ www.seasolarpower.com for more information