LUNAR SOLAR POWER SYSTEM AND LUNAR EXPLORATION. D. R. Criswell[1], [1]Institute for Space Systems Operations, SR1, Suite 617, Mail Code 5506PHYS, University of Houston, TX, 77204-5506, dcriswell@uh.edu or dcriswell@houston.rr.com 281-486-5019 (phone and fax)

Global Power and the Moon: Five of the six billion people on Earth produce less than 2,500 $/year-person of Gross World Product. GWP growth is severely limited by the high cost, low availability and reliability, environmental damages, and political uncertainies of conventional fossil, nuclear, and terrestrial renewable power systems. In 2000 the World Energy Council challenged all decision makers to enable the equivalent of 6.7 kWt/person of thermal power within two generations[1]. This implies 67 TWt, or ~20 to 30 TWe, of sustainable electric power by 2050. Twenty-five power systems were reviewed to select which could:

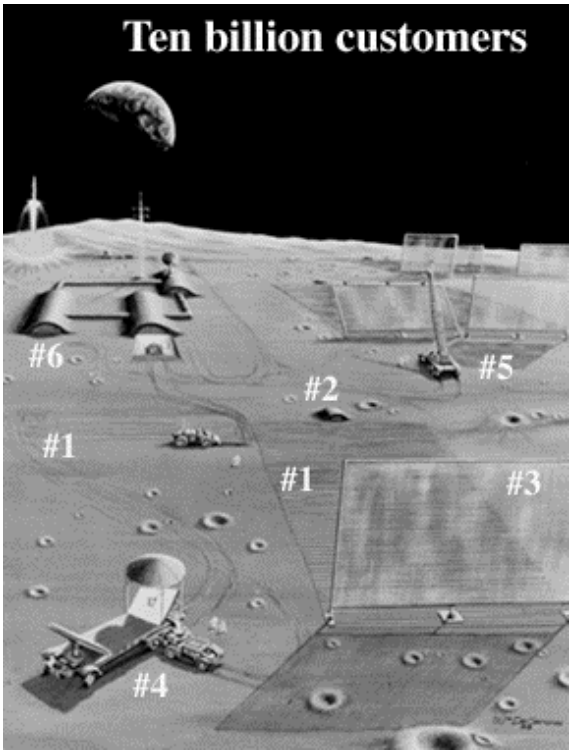
- sustainably provide 20 TWe to consumers;
- profitably sell electricity for < 0.01 $/kWe-h;
- be environmentally neutral, even nurturing; and
- use understood technologies.

The analyses indicated that only the Lunar Solar Power (LSP) System could meet these requirements within the 21st Century.[2, 3]

LSP System: The Moon dependably receives 13,000 terawatts of solar power.[3, 4] Power stations on the east and west limbs of the Moon can convert a few percent of this dependable solar power into beams of microwaves. Those beams can dependably deliver more than 20 terawatts of the needed clean, safe, low-cost commercial electric power to receivers on Earth. Relay satellites in orbit about the Earth can supply load following power to receivers when the receivers cannot view the Moon. Each power station consists of tens of thousands of power plots.

The figure depicts several prototype power plots. A power plot consists of solar cells (#1), underground wiring (not shown), microwave generators (#2), and microwave reflective screens (#3). The microwave reflective screens (#3) of the power base overlap, as seen from Earth, to form a microwave lens that is 30 to 100 km in diameter. The cells, wiring, generators, and screens are made primarily from lunar materials and assembled by mobile (#4, #5) and fixed factories (#6) that are deployed from Earth. Making most of the plot components from lunar materials significantly reduces the need for transport from the Earth to the Moon. More versatile factories (#6) can make significant fractions of the production machinery (#4, #5, #6) from lunar materials. This further reduces the mass of components and machines that must be transported to the Moon.

Exploration: LSP establishes the Earth and the Moon a two-planet economy. Lunar exploration can be



conducted as a large-scale and long-term component of permanent human habitation of the Moon. Power, people, and resources will be available to support active seismology, deep drilling, systematic exploration of the surface, and long-term studies of the interaction of the Moon with the Earth and the solar system. Lunar geophysical laboratories can be free of terrestrial contamination. LSP industries can construct telescopes (radio, optical, UV, etc.) and powerful radars for probing the Earth, other bodies of the solar system, and performing experiments on space plasmas. Cis-lunar facilities and transport, combined with lunar power and materials, will enable large scale and safe exploration of the inner solar system.

References: [1] World Energy Council (2000) *Energy for Tomorrow's World – Acting Now!*, 175pp., see p. 2, Atalink Projects Ltd, London, [2] Criswell, D. R. (2002) Energy Prosperity within the 21st Century and Beyond: Options and the Unique Roles of the Sun and the Moon. Chapter 9: *Innovative Solutions To CO_2 Stabilization*, R. Watts (editor), Cambridge Un. Press, [3] Criswell, D. R. (2001) Lunar Solar Power System: Industrial Research, Development, and Demonstration, Session 1.2.2: 18th World Energy Congress http://www.wec.co.uk/wec-geis/ , [4] Criswell, D. R. (2002, April/May) Solar Power via the Moon, The Industrial Physicist, 12–15, http://www.tipmagazine.com