

## HYBRID SOLAR AND ELECTRIC LIGHTING TO ALLEVIATE POWER CRUNCH FOR BIOREGENERATIVE ADVANCED LIFE SUPPORT

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Hybrid solar and electric lighting (HYSEL) systems constitute the latest generation of lighting systems for advanced life support, exhibiting continued potential for reducing the significant electrical power demand of current bioregenerative life support systems (BLSS). Two experimental HYSEL systems were developed: one employing xenon-metal halide (XMH) lamps and the other adopting light-emitting diodes (LEDs) as the electric-lighting components, and both using a mirror-based, fiber-optic-based solar collection system. The results showed that both the XMH and LED HYSEL systems effected reduced effective plant growing volume, indicating a potential for a compact plant hardware design. The apparent electrical conversion efficiency of the LED HYSEL system exceeded that of the XMH HYSEL system by five-fold. Both the XMH and LED HYSEL systems provided reasonably acceptable spectral quality and lighting uniformity. So far, LEDs appear to be the most competent artificial light source for a HYSEL system. Also, preliminary studies suggested that HYSEL systems show promise of BLSS application both on the Martian surface and on a Sun synchronous orbit around Mars.