

SPACE POWER SYMPOSIUM (C3)

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NICHE APPLICATION DEVELOPMENT FOR SPACE BASED SOLAR POWER

Abstract

The results of this report indicate how niche product developments for Space Based Solar Power (SBSP) can be easily achieved using present day technology, which markets need to be addressed, which niche configurations to pursue, and which organizations have the needed competencies to proceed.

Classical SBSP concepts generally call for large rigid systems to be placed in orbit to collect and transmit several GW of energy down to Earth's commercial electricity grid, and are still faced with many problems including system complexity, development, and costs. Smaller more specific niche applications of these concepts focus on different markets with lower complexity and barriers to entry while developing technologies and infrastructure needed for the classical SBSP.

Technical research was performed in order to identify potential system configurations as well as crucial competencies and technologies needed by the SBSP effort. A pair of unique technical configurations was proposed in an attempt to mitigate standard SBSP challenges such as construction, rigidity, and launch costs. A strategic evaluation tool was created to evaluate all potential system configurations in terms of risk and complexity; ideal configurations were chosen based on anticipated markets and the results from the strategic analysis.

Market research was performed in order to understand and value the utility of different niche configurations; these included the scientific, remote, green, space to space, and military markets. Very high value segments were observed in each of these market areas with a range of \$0.37 to \$1.88 USD per kwh for Terrestrial applications, and a range of \$380.00 to \$1200.00 USD per kwh for space applications. Exploration of the European Carbon Trading Exchange as a source of revenue is explored due to CO2 offsets. A unique satellite product is proposed and valued which receives energy directly from an external on orbit source. The value of restoring functionality to damaged satellites is estimated in the millions of dollars.

Organizational and stakeholder research was performed in order to identify the competencies possessed by many Private and Public organizations. A tiered development roadmap is suggested combining ideal niche configurations, markets, and organizational participation. The roadmap presents a conceptual evolution which overcomes many of the technical, logistical, and economic challenges faced by the classical SBSP.