

**SENSITIVITY OF LUNAR RESOURCE ECONOMIC MODEL TO LUNAR ICE CONCENTRATION** Brad Blair<sup>1</sup> and Javier Diaz<sup>1</sup>, <sup>1</sup>Colorado School of Mines, 1500 Illinois St., Golden, CO 80401, bblair@mines.edu

Lunar Prospector mission data [1] indicates sufficient concentration of hydrogen (presumed to be in the form of water ice) to form the basis for lunar *in-situ* mining activities to provide a source of propellant for near-Earth and solar system transport missions. A model being developed by JPL, Colorado School of Mines, and CSP, Inc. generates the necessary conditions under which a *commercial enterprise* could earn a sufficient rate of return to develop and operate a LEO propellant service for government and commercial customers. A combination of Lunar-derived propellants, L-1 staging, and orbital fuel depots could make commercial LEO/GEO development, inter-planetary missions and the human exploration and development of space more energy, cost, and mass efficient.

This paper presents preliminary model results for a commercial lunar-based propellant service, examining sensitivity of the model to ice concentration. The lunar Prospector results suggest an average ice concentration of 1.5%, but allow an interpretation that concentrations of as much as 10% exist [1]. While a profitable scenario may be possible at 1% ice concentrations, these variations can have a very large effect

on the profitability of a lunar propellant production system. As concentrations rise, the amount of extraction and processing equipment required on the Moon diminish and the time between initiation of the project and full production can be reduced. These physical changes in the architecture lead also to changes in the financial model. The results provide a strong incentive for lunar polar exploration to provide information both on typical occurrences of lunar ice as well as areas in which elevated concentrations may occur.

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#### References:

- [1] Feldman W. C., Maurice S., Lawrence D. J., Little R. C., Lawson S. Gasnault L. O., Wiens R. C., Barraclough B. L., Elphic R. C., Prettyman T. H., Steinberg J. T., and Binder A. B. (2001) Evidence for Water Ice Near the Lunar Poles, *J. Geophys. Res., Planets*, 106, #E10, 23232 – 23252.