



Resource Exploration / Prospecting Strategies for Lunar Polar Volatiles

Never Stand Still

Faculty of Engineering

School of Mining Engineering

Sophia C. Casanova

Co-authors: C. Espejel, G. Caprarelli, A. Dempster, R.C. Anderson, S. Saydam

Mining / Production Cycle

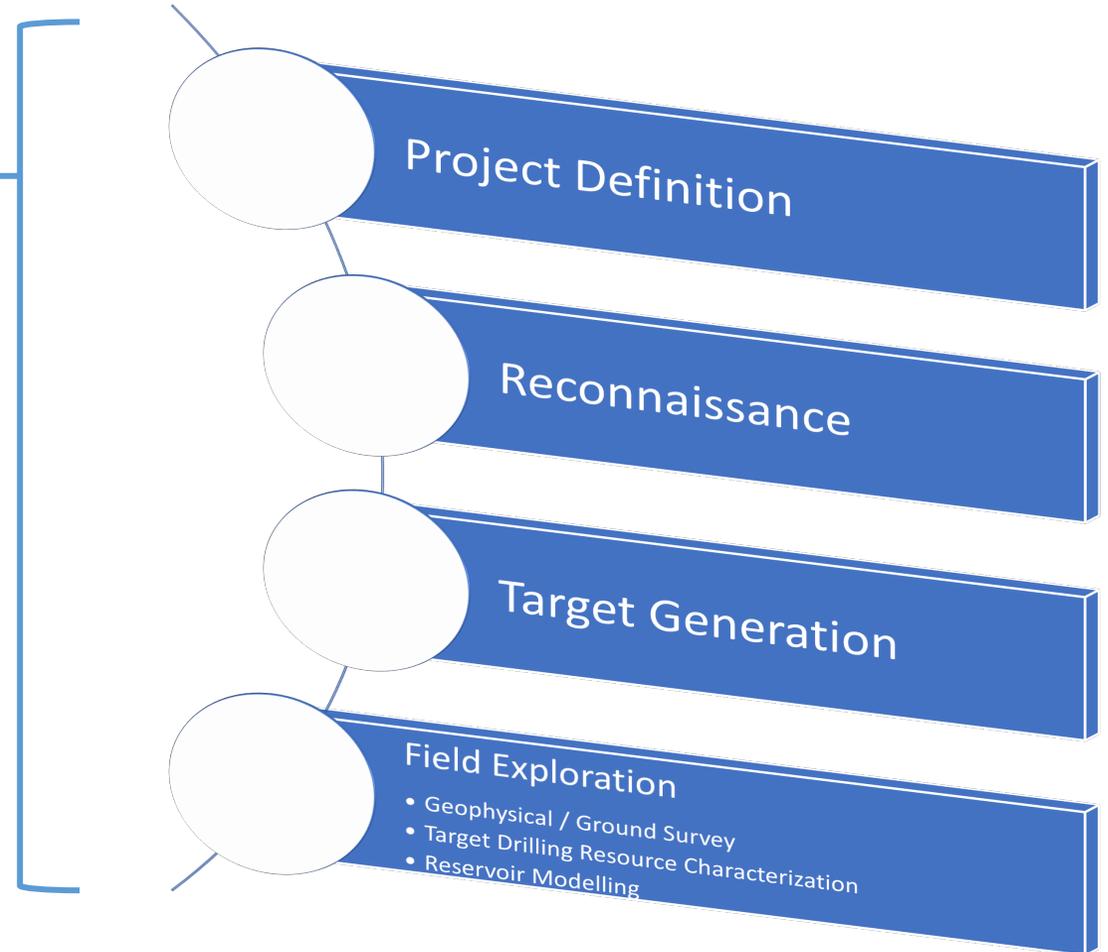
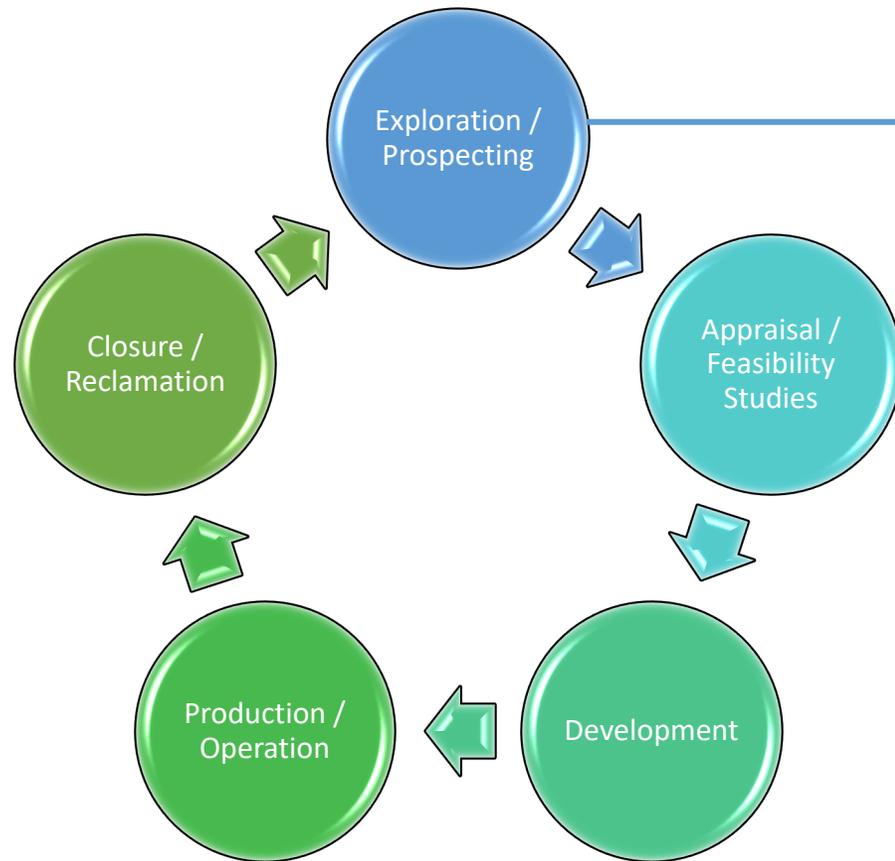


Figure 1: a) The mining / energy production cycle b) Stages of Exploration

Managing Risk

Milestone	Confirm Water Presence	Achieve Water Recovery / Flow	Achieve a Potentially Commercial Flow / Extraction Rate	Commercial Development Plan	Execute
Risk	Geological	Geo-technical	Technological	Commercial and Regulatory	Operational
Activities	Coring & sample analysis, OWIIP assessment	Recovery trials	Pilot production	Optimized production	Continuous operation
Indicators Results	Water content, Rock mechanics, Porosity / Permeability	Movable water, Measurable rate of production	Economic rate, Sustained production, Reserve booking, Establish market, facilities and infrastructure		Production

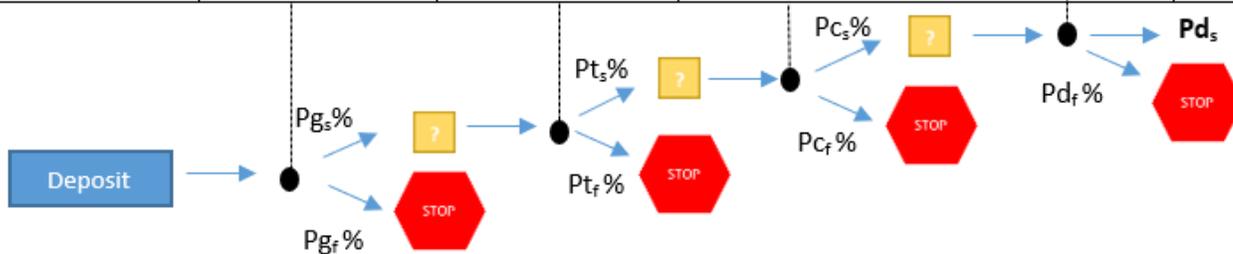


Figure 2: Lunar water mining/production activities and risks

Expected Monetary Value (EMV)

$$= \text{Probability of success} * (\text{Value}) + \text{probability of failure} * (\text{Cost})$$

Pg = chance of geologic success (discovery)

Pc = chance of commerciality

Pd = chance of development

Lunar Volatile Exploration Play Analysis

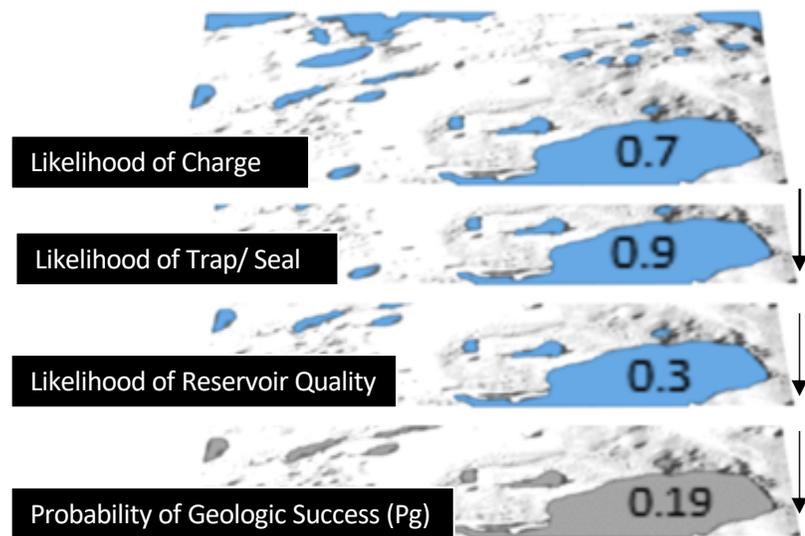


Figure 3: Hypothetical Play Analysis of a Lunar PSR crater

Probability of Geologic Success (P_g)
 $P_g = P \text{ charge} \times P \text{ trap/seal} \times P \text{ reservoir Quality}$

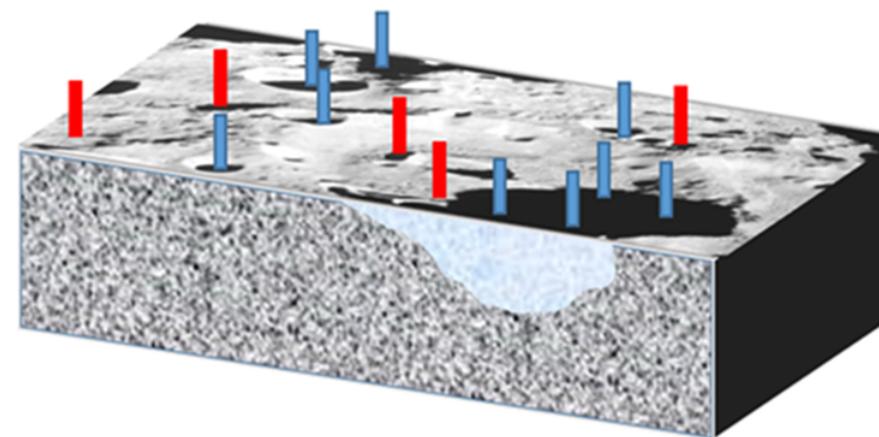


Figure 4: Hypothetical Lunar Resource Exploration Program. Blue markers denote discoveries. Red denote dry holes

Acknowledgments

Gratefully acknowledge the generous support provided by the SRR/PTRMS to attend the conference

This study was funded by:

University of New South Wales – University Postgraduate Award (UPA) & the Australian Institute of Minerals and Metallurgy (AusIMM) Educational Endowment Fund