A Perspective on Lunar ISRU Needs

Lunar Surface Innovation Consortium
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Virtual

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A Perspective on Lunar ISRU Needs

- **The bucket of in situ lunar resources includes:**
  - Sunlight – an energy source
  - Shadow – an existing heat sink
  - Regolith – oxygen source, radiation shielding, construction
  - Lava tubes – radiation shielding, thermal stability
  - **Volatiles – water, methane, ammonia, hydrogen, carbon dioxide and carbon monoxide (https://www.nasa.gov/centers/ames/news/releases/2010/10-89AR.html)**
  - Abandoned stages and other assets – tanks, electronics, mechanisms, structure

- **Cislunar Space Development Company is interested in propellant**
  - **Water to produce LOx and LH or a LOx and LH provider**
  - **LOx and LH for hopping around the Moon**
  - **LOx and LH for returning to EML1**
  - **Water to export to EML1 propellant depot**

CSDC

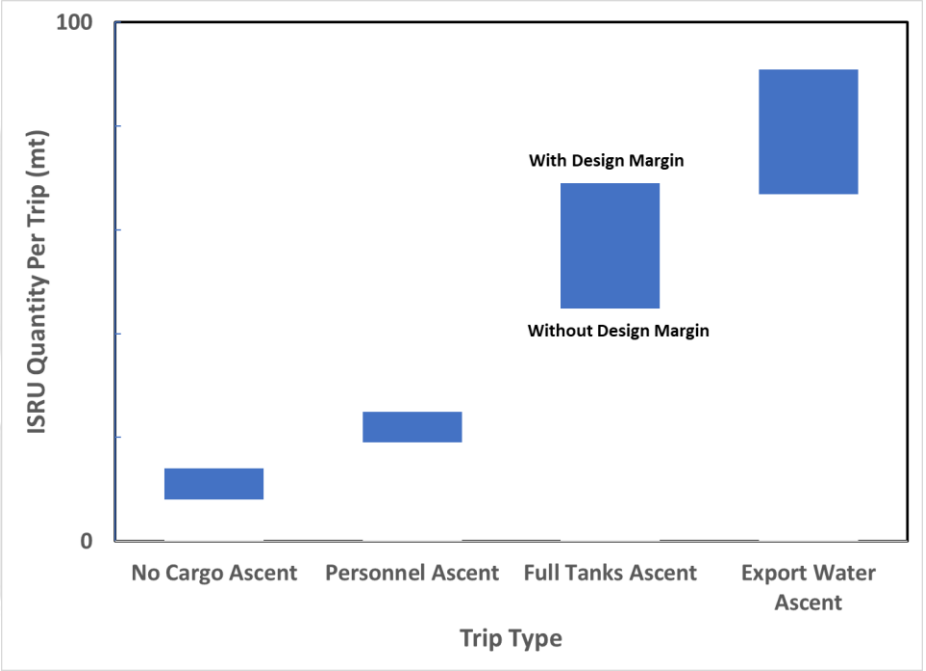
ISRU Propellant Needs are Architecture Specific

- CSDC is a transportation services provider between LEO and the Moon
- Our propellant needs are architecture and mission type specific
- We operate a Moon shuttle between our EML1 depot and the lunar surface
- The Moon shuttle delivers 25 t to the surface and returns without refueling
- Moon shuttle can carry personnel roundtrip between EML1 and surface
- Moon shuttle can export 25 t to EML1 from the lunar surface

CSDC

CSDC's Lunar Propellant Needs per Trip

- 8 – 15 t to return to EML1 without cargo
- 19 – 25 t for personnel return to EML1
- 45 – 69 t to fill tanks before departure
- Up to 69 t for roundtrip surface hops
- 67 – 91 t to export 22 t water
- **Quantity and Value will determine economic viability**



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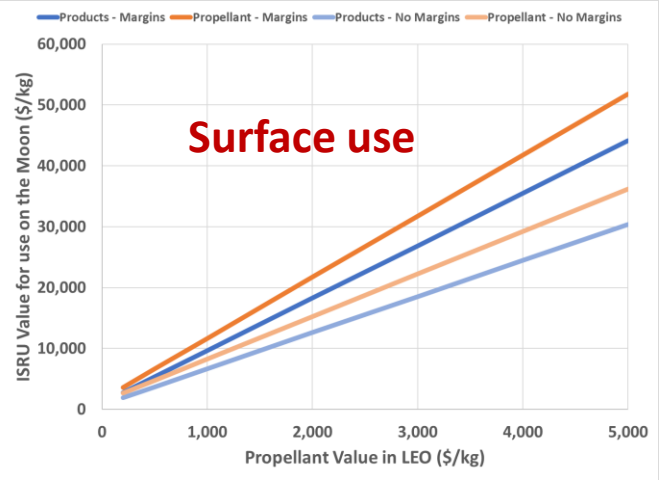
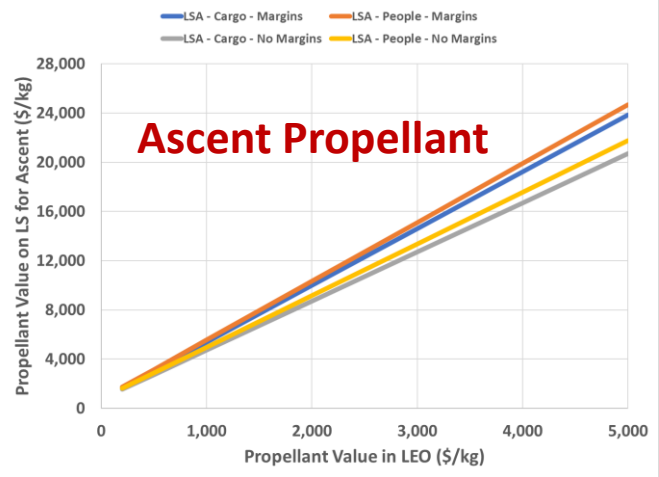
Lunar ISRU Value Depends on LEO Propellant Value

- **Propellant for use on the surface is more valuable than ascent propellant**
- **Propellant more valuable than product**
  - **Propellant tanks increase inert mass**
  - **100% of cargo is useful**
- **Surface use ISRU value factors**
  - **Products: 6 – 14 x LEO value**
  - **Propellant: 7 – 18 x LEO value**
- **Ascent propellant ISRU value factors**
  - **4 – 9 x LEO value**
- **Factors increase as LEO value decreases**
- **Factors increase as margin increases**





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