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
  – 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
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’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
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