



**DSI**  
DEEP SPACE INDUSTRIES



# Asteroid Mining & Markets

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# Mining Concepts Apply to Asteroids

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**MINERALIZATION:** a mass with valuable minerals that hypothetically could be recovered.

**MINERAL RESOURCE:** is inferred or indicated to have such form, grade, continuity, quality, and quantity that it might be economically extracted.

**ORE:** material that is mined, processed, transported, made into a product, and **sold at a profit!**

**A potential resource must be matched by knowledge about excavation and processing technologies, transportation, and potential markets before it can be declared an “ORE”**



# Implications for Asteroid Assay

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## ASTEROID MINING TARGETS:

- **TYPES:** CI/CM or similar
- **PROSPECTING:** Samples analysis required
- **ORBITS:** Retrievable
- **SPIN:** Period > spin limit
- **SIZES:** 50+ meters best
- **MORPHOLOGY:** Rubble piles & regolith

# Deep Space Industries' Vision:

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*Deep Space Industries will be the gas station,  
the oasis for air and water,  
and the building supply center for the frontier*



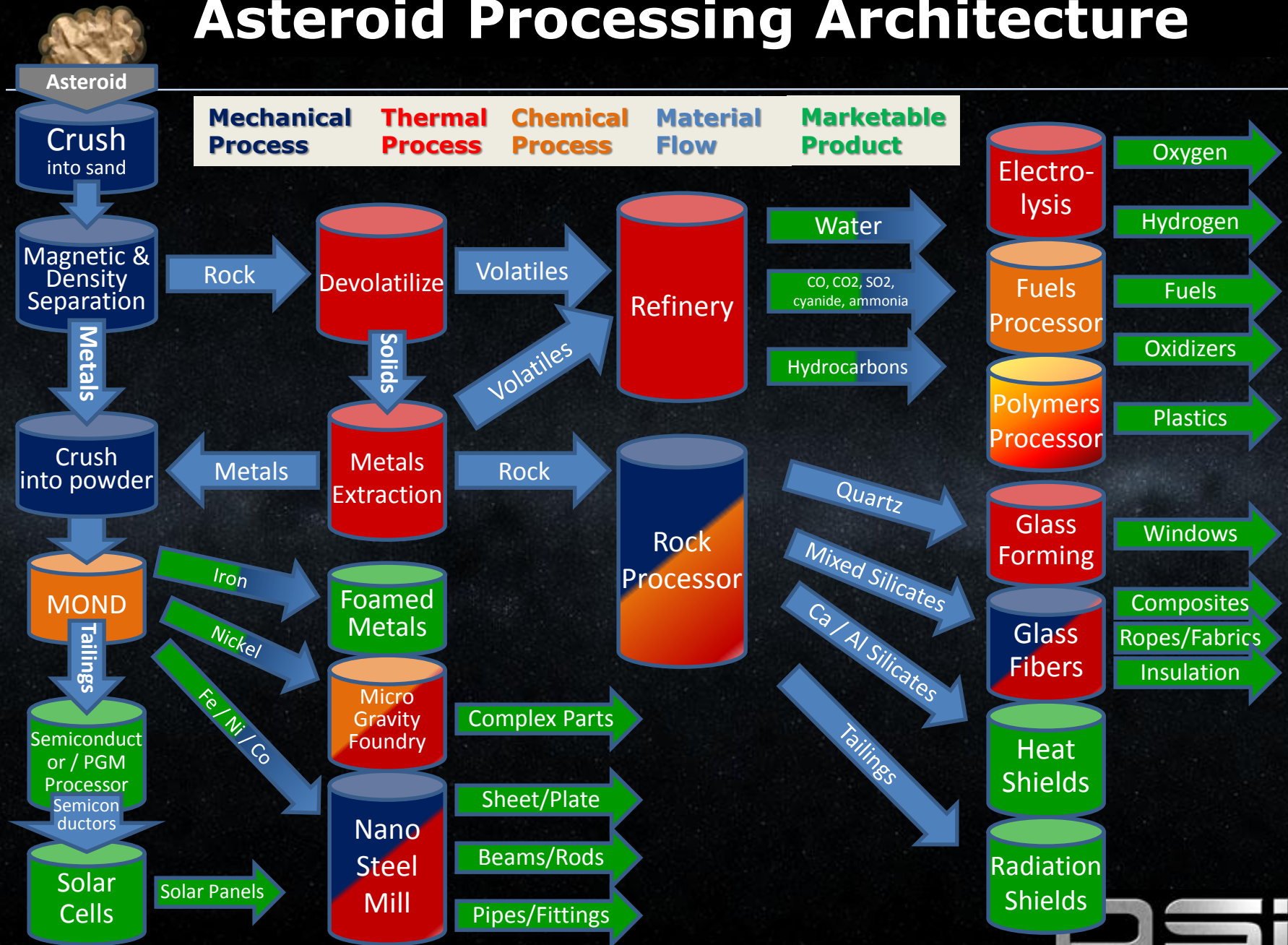


# What Markets are we after?

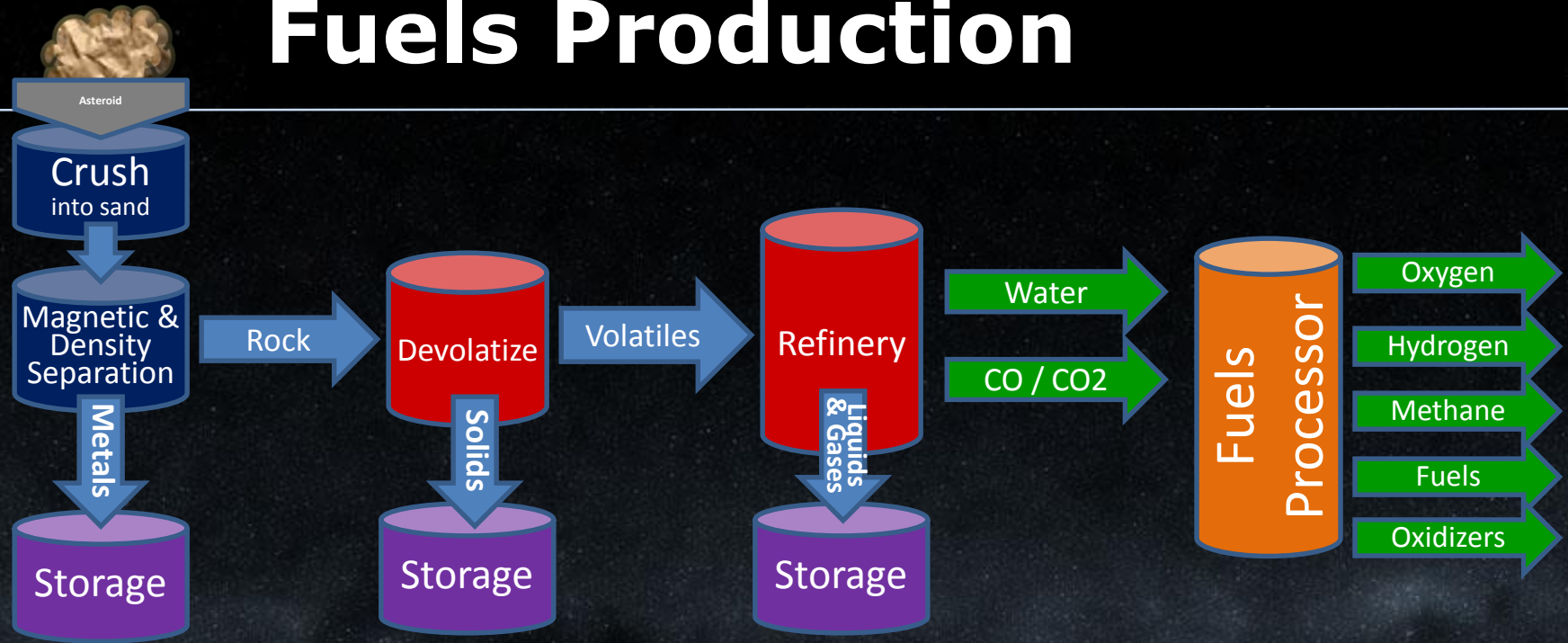
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- **Fuels**
- **Life Support Supplies**
- **Building Supplies**
- **Solar Cells and Solar Panels**

# Asteroid Processing Architecture

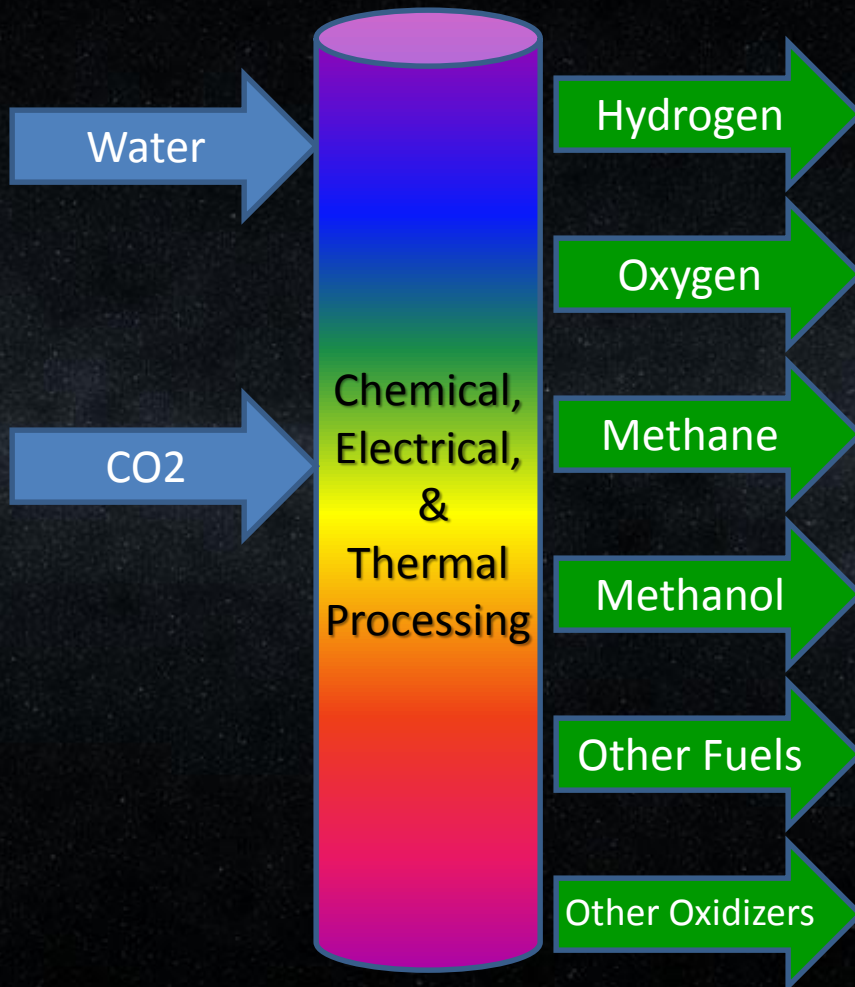


# Fuels Production





# Fuels Processor



## Inputs:

- ▶ Water
- ▶ CO2

## Processing:

- ▶ Electrolysis
- ▶ Complex Chemistry

## Outputs:

- ▶ Rocket Propellants
  - Hydrogen, Methane
  - Oxygen (LOX)
  - Storables (H2O2, CH3OH, DME)



# Asteroid Resources

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Fuels are the low-hanging fruit

- Need albedo  $\leq 0.10$ , preferably  $\leq 0.06$

Bulk ore worth  $\sim \$2\text{M}/\text{tonne}$  in GEO

Required delivery pipeline:

- thousands of tonnes
- (not just tens of tonnes)

# Claims: Based on Contact Exploration

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## A mining claim

- Enables funding by investors and banks
- Supports the sharing of scientific data
- Must be based on in-situ operations, not just remote surveys
- Must require on-going operations (but not necessarily immediate)
- May be limited in radius



# Earth-Safe Asteroid Return

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No repeat of Chelyabinsk!

Return materials to Earth orbit safely

- No nickel-iron monoliths
- Perhaps maximum 1,000 tonne rocky monoliths
- But tens of thousands of tonnes when packaged into fragile bags of gravel, sand, or powder, designed to rip open if they enter the atmosphere

# The Bottom Line:

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We need juicy (low-albedo) asteroids!

We need many thousands of tonnes,  
harvested in an Earth-safe manner.

Asteroid prospecting yields scientific data, but...

We need a Mining Claims Mechanism

Near Earth Asteroids are the major resource  
opportunity of the 21<sup>st</sup> century





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**This is a long game,  
perhaps the longest ever,  
and the job is bigger than  
all of us combined.  
So we are looking for  
good partners...**