



# Determining Economic Viability Thresholds for Space Resource Missions Using an Analytical Framework

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## AiSTRAEUS Roadmap<sup>1</sup>

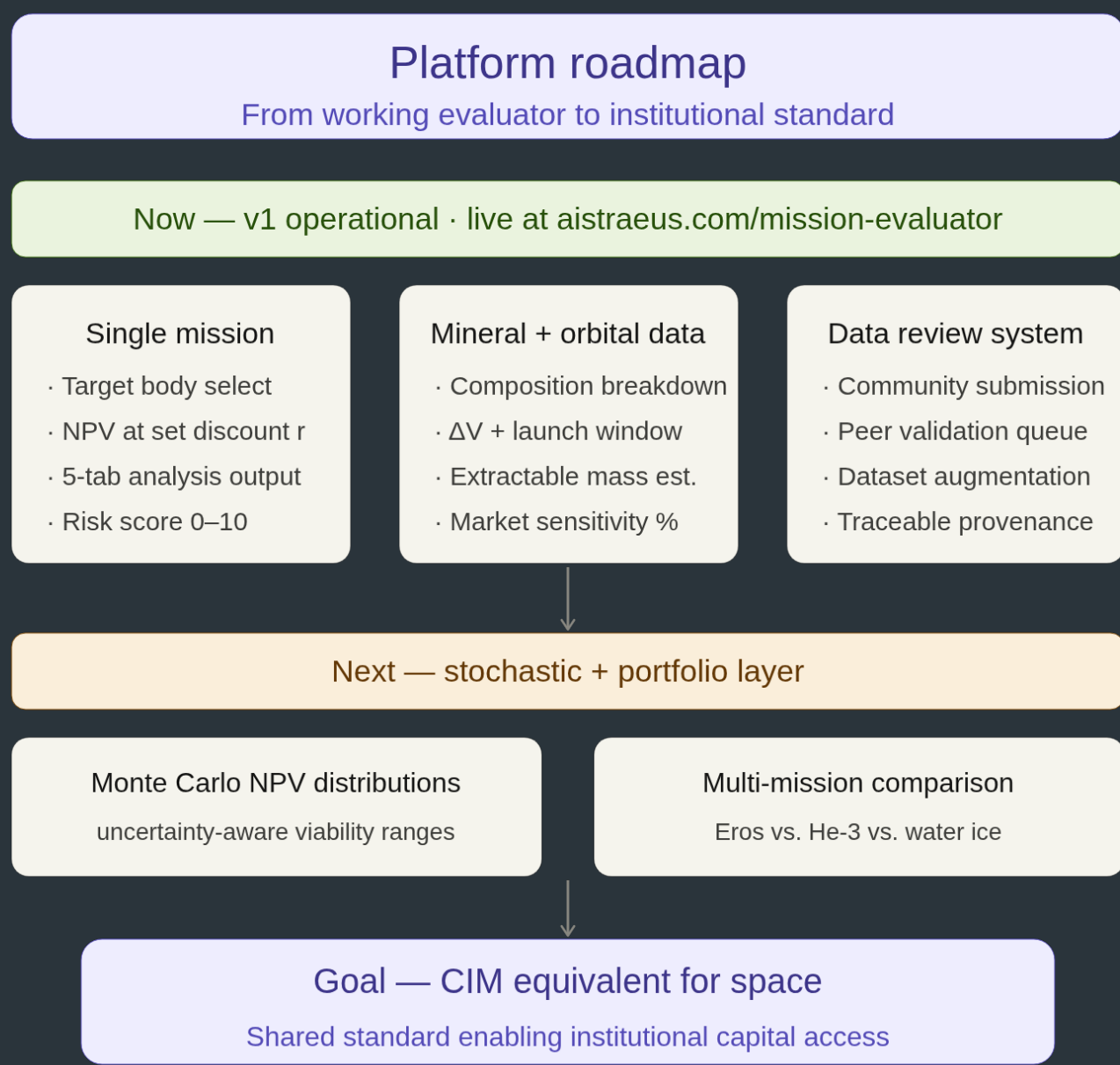


Figure 1. [aistraeus.com](https://aistraeus.com) · [14] · SRR 2026

<sup>1</sup>Platform roadmap shows what exists today (Now - v1), what's next (Monte Carlo + portfolio comparison), and the long-term goal (Confidential Information Memorandum, CIM, equivalent standard).

## Introduction

A theoretical framework for space resource economic evaluation is taking shape. DCF-based critical path sequencing, from geological characterization through market formation to technology maturation, is establishing the logical structure needed to assess mission viability [14].

The gap is execution, not theory. No operational system exists to run that critical path, integrate heterogeneous datasets, and produce traceable outputs for decision makers.

**Claim:** A shared economic methodology standard across governments, commercial actors, and academia is prerequisite to integrating the space economy with terrestrial capital markets.

AiSTRAEUS is that system. An adaptive platform that merges economic logic with space science to produce actionable mission valuations.

## Methodology

**1. Data Integration:** Heterogeneous inputs normalized to mission parameters: orbital mechanics, resource composition (grade G, recovery factor F), transportation  $\Delta V$  costs, market prices.

**2. Economic Modeling:** Adapted terrestrial DCF/NPV [10; 11] where mission viability is assess against risk-adjusted thresholds. A discount rate is decomposed as  $r = r_{base} + r_{tech} + r_{market} + r_{policy}$  so each risk premium is named and traceable [14].

**3. Mission Archetypes Evaluation:**

*ISRU missions:* savings from replacing Earth-supplied alternatives

*Earth Return missions:* revenue from space-derived goods in terrestrial markets

## Concept of Operations

**Current capability (v1):**

- ▶ User selects target body, inputs spacecraft mass, mining efficiency, commodity price.
- ▶ Platform returns: Object Profile (type, orbit, spectral class, diameter, mass estimate), Mineral composition breakdown, Estimated extractable mass, Potential gross value, NPV at user-defined discount rate, AiSTRAEUS Score, Mission Risk Assessment.
- ▶ Outputs span five analysis tabs: Orbital, Mineral, Overview, Economic, and Mission. Generated from a single parameter input set.

**Three user classes served:**

- ▶ Mission Evaluators: parameter inputs; NPV outputs + risk scores
- ▶ Researchers/Data Providers: dataset validation and augmentation
- ▶ Infrastructure Partners: data feeds for integrated planning pipelines

## Challenges

**Geological uncertainty:** Spectral data based resource concentrations are inferred: not measured; AiSTRAEUS explicitly flags unconstrained variables.

**No shared methodology:** Proprietary siloing means no assessments use comparable frameworks. AiSTRAEUS operationalizes the standard [14].

**Market immaturity:** Demand curves for space commodities are speculative; AiSTRAEUS models sensitivity to price and quantity assumptions so users understand what demand signal is viable.

### Submit Data Review

Help improve the AiSTRAEUS asteroid database. Submit corrections, updated values, or new evidence for any asteroid parameter. All submissions are reviewed by the AiSTRAEUS team before publication.

**Open-Source Peer Review**

The AiSTRAEUS database is open for community review. If you have peer-reviewed data, mission telemetry, or published papers that contradict or improve any value in our database, submit it here. Approved corrections are versioned and attributed.

TARGET ASTEROID

Select asteroid...

FIELD TO REVIEW

Select field...

PROPOSED VALUE

Your corrected value

YOUR INFORMATION (optional but encouraged for attribution)

YOUR NAME: Dr. Jane Smith

ORGANIZATION / INSTITUTION: MIT, JPL, ESA, ...

EVIDENCE / SOURCE URL

<https://doi.org/> ... or NASA link

NOTES / JUSTIFICATION

Explain why this value should be changed. Include relevant methodology, publication details, or mission data.

SUBMIT FOR REVIEW

REVIEWABLE FIELDS

Orbit	Estimated Mass	Mineral Fraction	Albedo	Diameter km
Spectral Type	Orbit Class	Launch Cost	Transfer Cost	Data Confidence

All data in AiSTRAEUS is released under **CC-BY-ND**. Full dataset export available at [//export](https://export.aistraeus.com). Edit history and version logs are publicly accessible at [//asteroids/14/history](https://asteroids/14/history)

Figure 2. AiSTRAEUS Data Review Submission Page

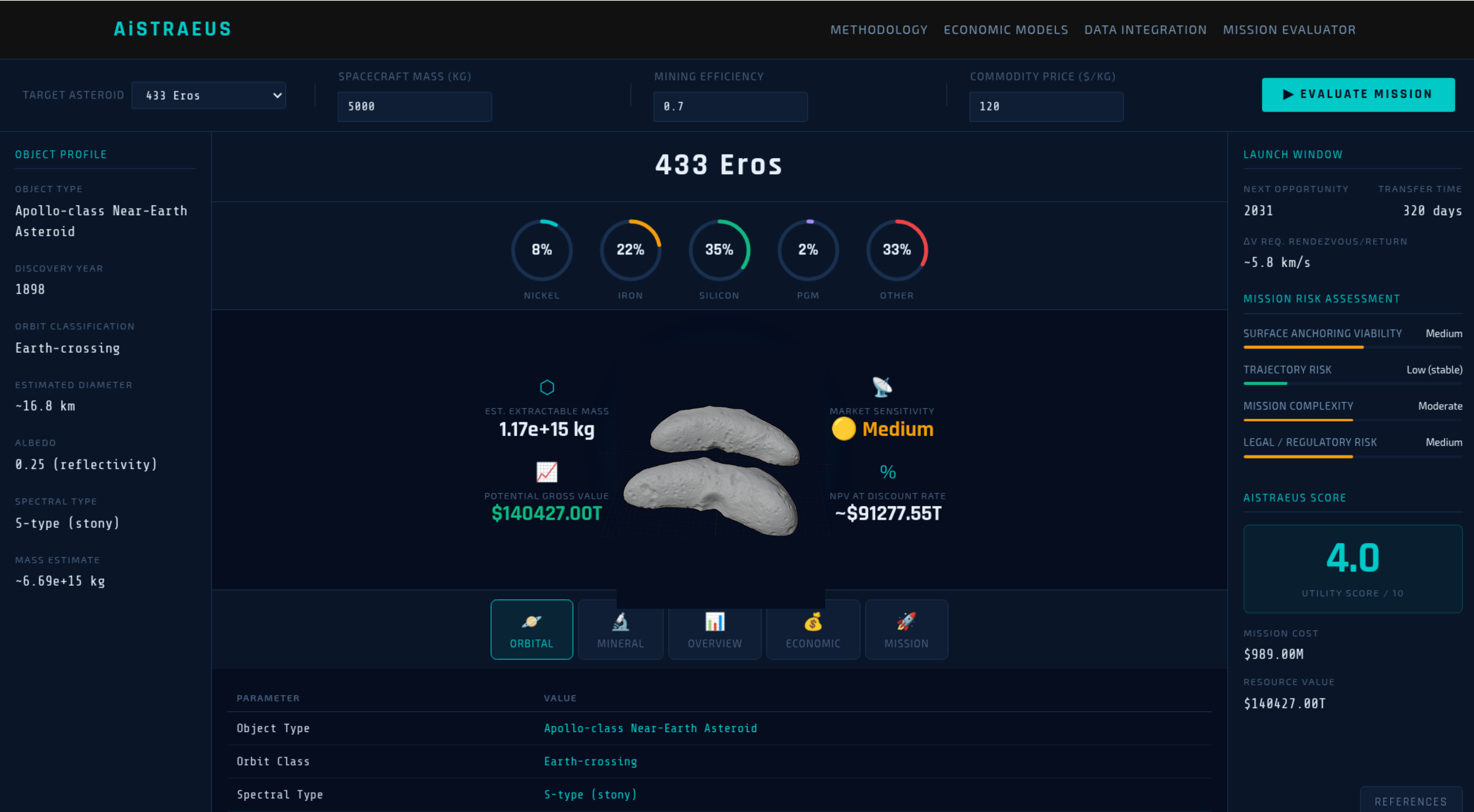


Figure 3. AiSTRAEUS Mission Evaluator

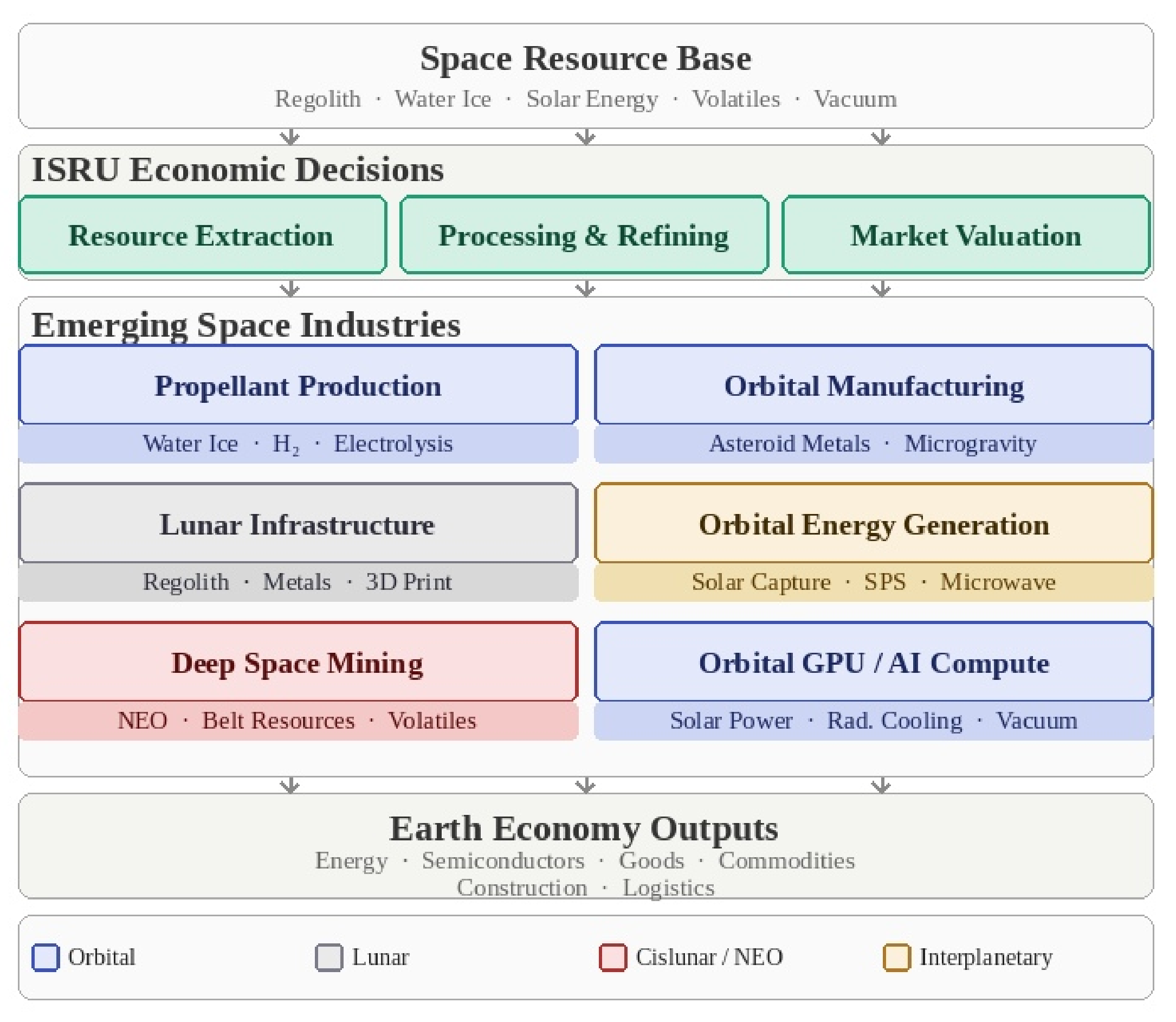


Figure 4. Tiered Flow of Emerging Space Markets Related to Resource Inputs & Economic Outputs

## Conclusion

AiSTRAEUS is operational. The Mission Evaluator produces real NPV outputs against real asteroid and mission parameters today.

The tool is based on the emerging standard framework.

The next step is extending this capability to lunar resources, portfolio comparison, and stochastic risk modeling.

The objective is to build toward a shared standard economic methodology that is required to integrate with terrestrial markets and attract institutional capital.

Try it at:

[www.AiSTRAEUS.com](https://www.aistraeus.com)

## CONTACT

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[1] Metzger, P. T. et al. (2013) J. Aerospace Eng., 26, 18–29. [2] Spufford, P. (2002) Thames & Hudson, Power and Profit. [3] NASA (2015) NASA Space Technology Roadmaps. [4] Morgan Stanley (2020) Space Economy Report. [5] OECD (2019) The Space Economy in Figures. [6] National Research Council (2011) Vision and Voyages. [7] Elvis, M. (2014) Planet. Space Sci., 91, 20–26. [8] Space Capital (2021) Space Investment Quarterly. [9] World Economic Forum (2021) Space Data Sharing Report. [10] Brealey, R. A. et al. (2020) McGraw-Hill, Principles of Corporate Finance. [11] Damodaran, A. (2012) Wiley, Applied Corporate Finance. [12] Trigeorgis, L. (1996) MIT Press, Real Options. [13] NASA JPL (2020) Small-Body Database. [14] Smith-Vaniz, G. et al (2026) Space Planet. Resour., 2, 3.