BUILDING AMERICA'S SOFTWARE-NATIVE CRITICAL MINERALS CHAMPION

The Strategic Imperative to Reclaim the Supply Chain for the 21st Century

A Graph4VA Presentation

FROM IPHONES TO F-35s, MODERN POWER IS BUILT ON ROCKS

The 20th Century Analogy (Friedman's Web) | **Consumer Tech** | **National Security**

Milton Friedman used a pencil to illustrate the "invisible web" of global cooperation. Today, that web constructs smartphones, EVs, and fighter jets. At the foundation are **critical minerals—earth transmuted into metal, machines, and power.**

Key Insight:

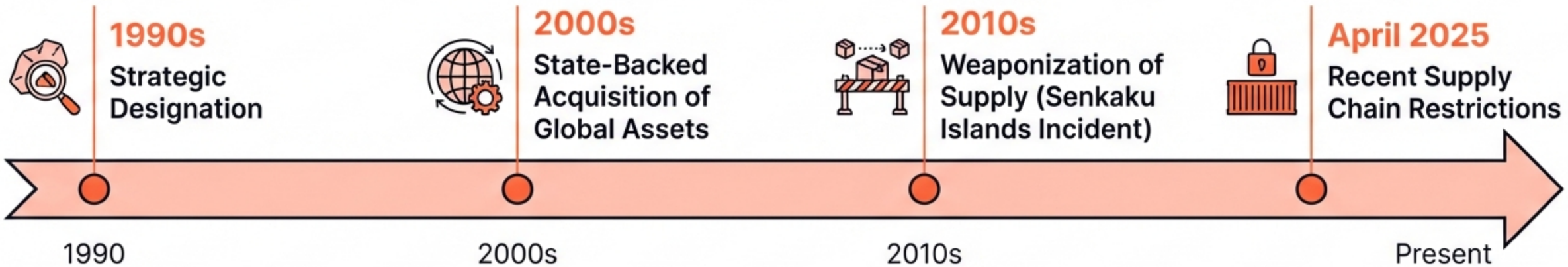
Scarcity is not geological; it is economic. Rare earths are not actually rare—just rarely worth the trouble.

The Quiet Enablers

- **Lithium & Nickel:** Batteries / EVs
- **Copper:** The workhorse of Electrification & AI Data Centers
- **Rare Earths:** Magnets in Precision-Guided Weapons

CONTROL THE METAL, CONTROL THE WORLD

> “The Middle East has oil; China has rare earths.”
>
> — Deng Xiaoping, 1992



70-90%

China’s Control of Global Processing & Refining

30 Years

Duration of Deliberate State Strategy

13,000 Workers

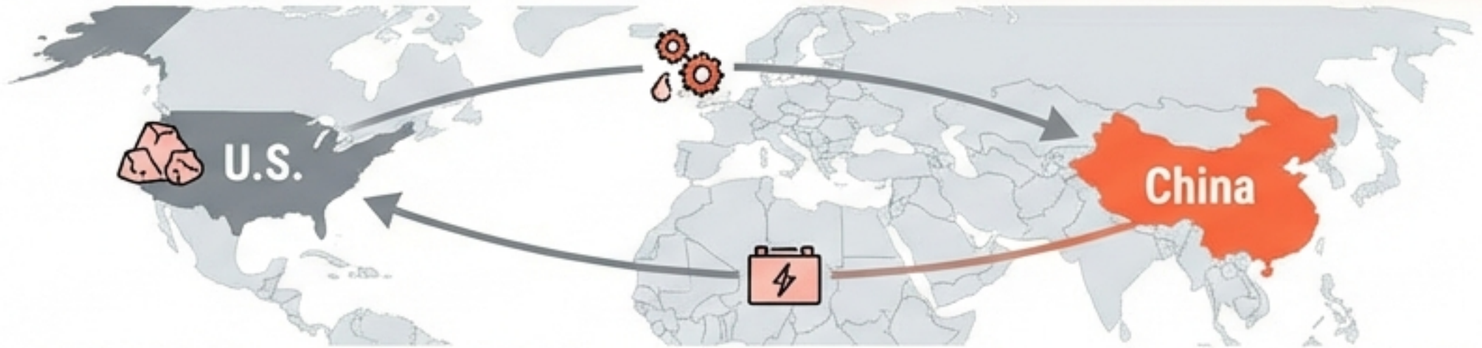
On-site at a single Chinese nickel refinery (Speed & Scale)

THE CHOKEPOINT ISN'T EXTRACTION, IT'S PROCESSING

Extraction (Mining)
US has resources (50 designated minerals).

Processing (Refining)
THE CHOKEPOINT.
Capital intensive, chemically complex, dominated by China.

Manufacturing
Batteries, Magnets, Alloys.



The U.S. has officially designated 50 critical minerals. However, having the rocks is useless if we cannot refine them. Raw concentrates currently move globally to be refined in China before returning as finished goods.

Risk Factor

Economic Hostage Risk:

Vulnerability to trade dependencies and "Black Swan" geopolitical events.

THE WESTERN MINING INDUSTRY IS A COLLECTION OF INDUSTRIAL RELICS

Juniors (Exploration)

- High Risk
- Struggle for Capital
- Exit post-discovery

Majors (Extraction)

- Bureaucratic
- Slow-moving
- Paper-based workflows

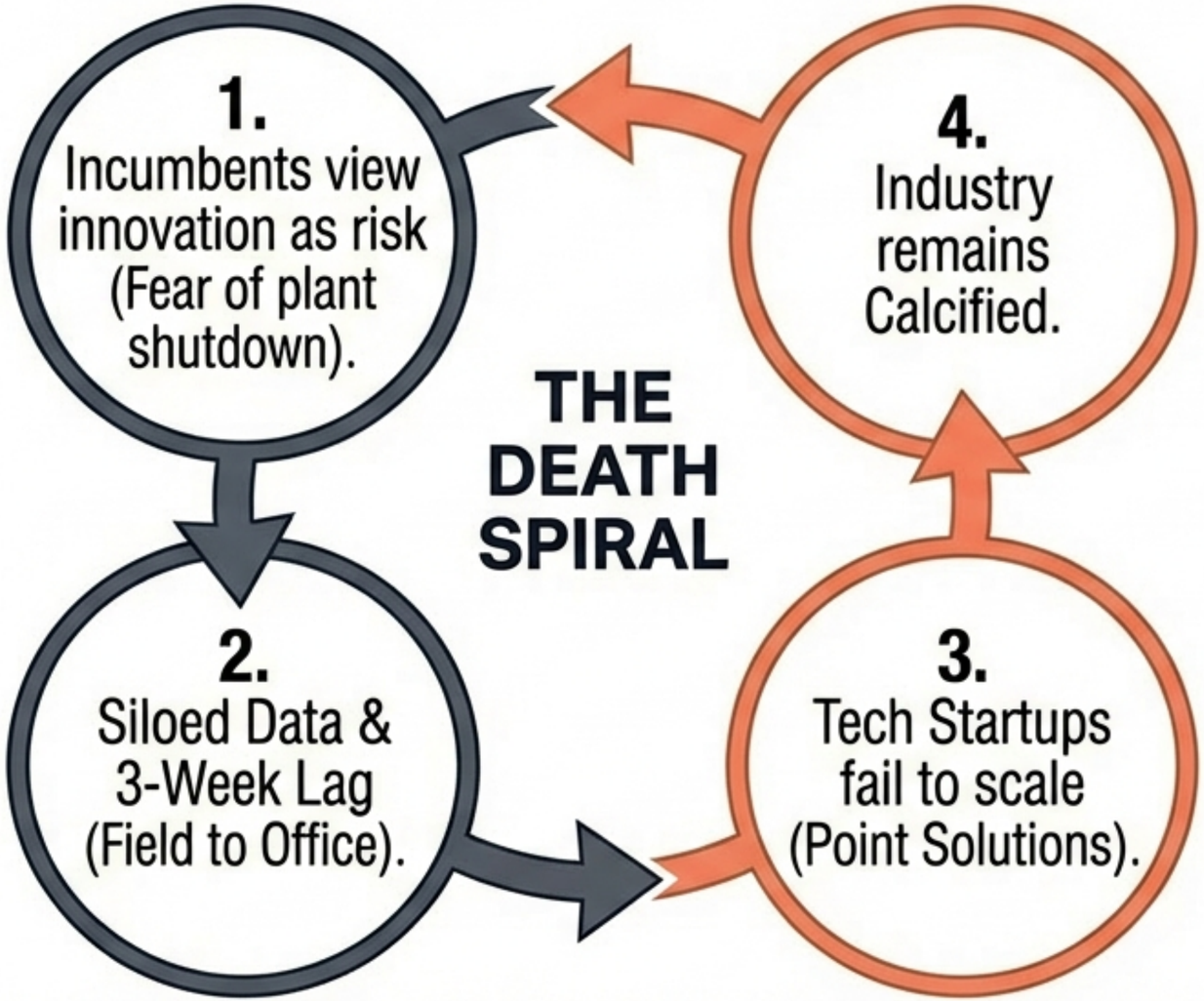
Processors (Refining)

- Disconnected from mine
- Feedstock insecurity

The Incentive Trap

Mining Logic vs. Manufacturing Logic:
In mining, “More demand = Higher Price.”
In manufacturing, “More demand = Lower Cost.”
This prevents efficiency scaling.

THE INNOVATION DEATH SPIRAL AND PILOT PURGATORY

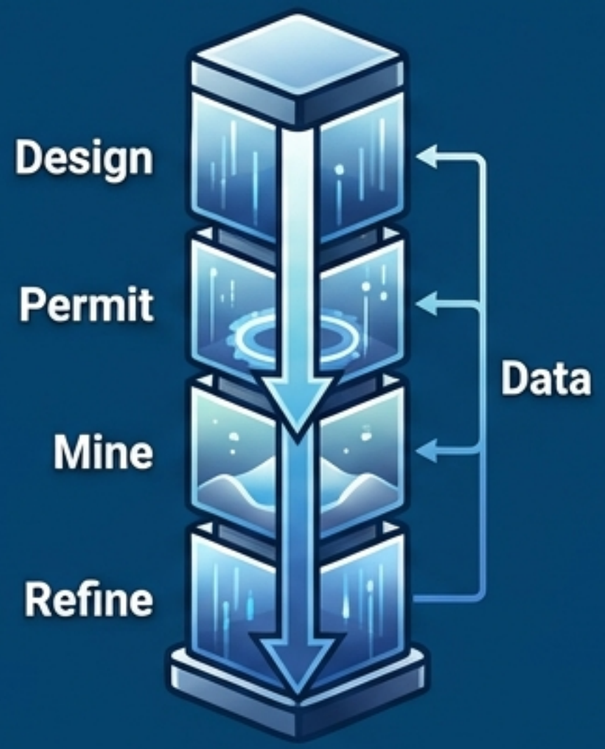


Tech Stack

Legacy	Consequence
Windows XP	Decisions made on stale data.
Excel Spreadsheets	
Manual "Fat-fingering"	Inability to compete at "War Speed"
Clipboards	

THE PIVOT: VERTICAL INTEGRATION IS NO LONGER OPTIONAL

The winning model is not a vendor, but an operator. “The Factory is the Product.”



The Integrated Operator
(Design -> Permit -> Mine -> Refine).

Historical Precedents

SpaceX: “Built payloads AND engines.”

Hadrian: “Manufactured parts instead of just selling software.”

Ganfeng Lithium: "Started downstream, moved upstream to secure feedstock.”

Goal: Create an **industrial flywheel** where operations feed data back into design.

MARIANA MINERALS: THE SYSTEMS ENGINEERING APPROACH

The Mission

- A full-stack operator backed by a16z.
- The Heresy Goal: 10 Projects in 10 Years (Industry Standard: 12 years for one).

Team Pedigree: Silicon Valley meets Heavy Industry

- Turner Caldwell (CEO): Tesla Metals & Minerals Team
- Talent DNA: Ex-Affirm (Software), BASF (Chemicals), Exxon (Energy), Tesla (Speed).

Treating mining not as a geology project, but as a Systems Engineering challenge.

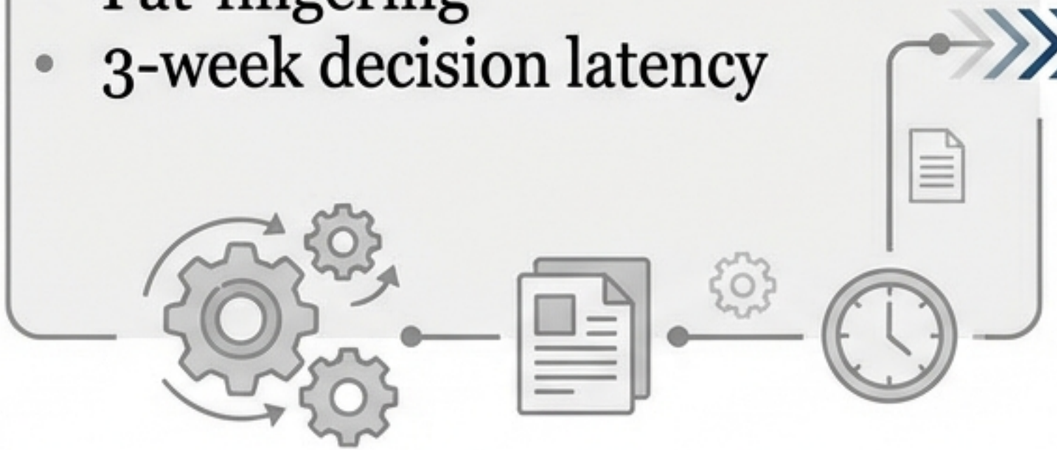
TECHNOLOGY STACK: CAPITAL PROJECT OS

Automating the Physical Build

PROBLEM

The Construction Lag.

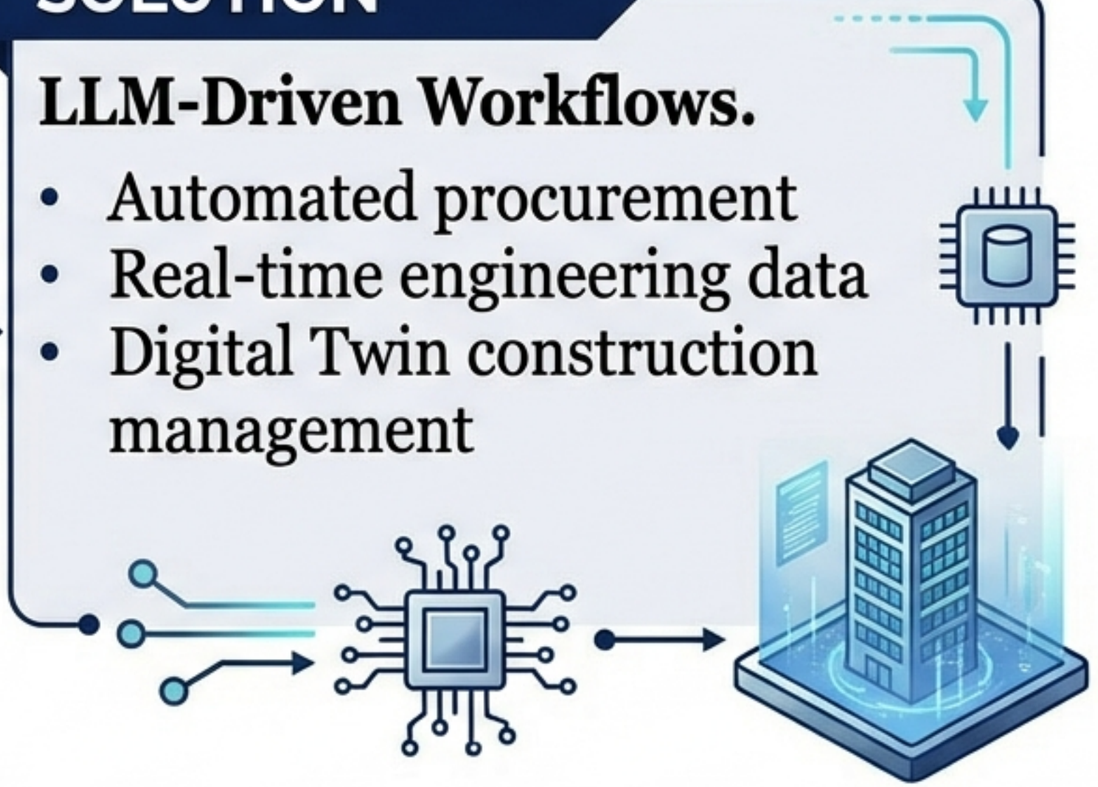
- Manual data entry
- Fat-fingering
- 3-week decision latency



SOLUTION

LLM-Driven Workflows.

- Automated procurement
- Real-time engineering data
- Digital Twin construction management



Metric: Enabling 200 people to do what 10,000 people are needed to do today.

TECHNOLOGY STACK: PLANT OS & REINFORCEMENT LEARNING

Removing Humans from the Control Loop

HYPERDYNAMIC REFINING CIRCUIT

Traditional plants blend ore to **minimize variability** (wasteful). **Plant OS** uses **Reinforcement Learning** to adapt to changing ore grades in **real-time**, similar to Google Data Center cooling optimization.

BENEFITS

- Higher Recovery Rates
- Lower Reagent & Energy Costs

Metric: Autonomously managing 95%+ of plant control decisions.

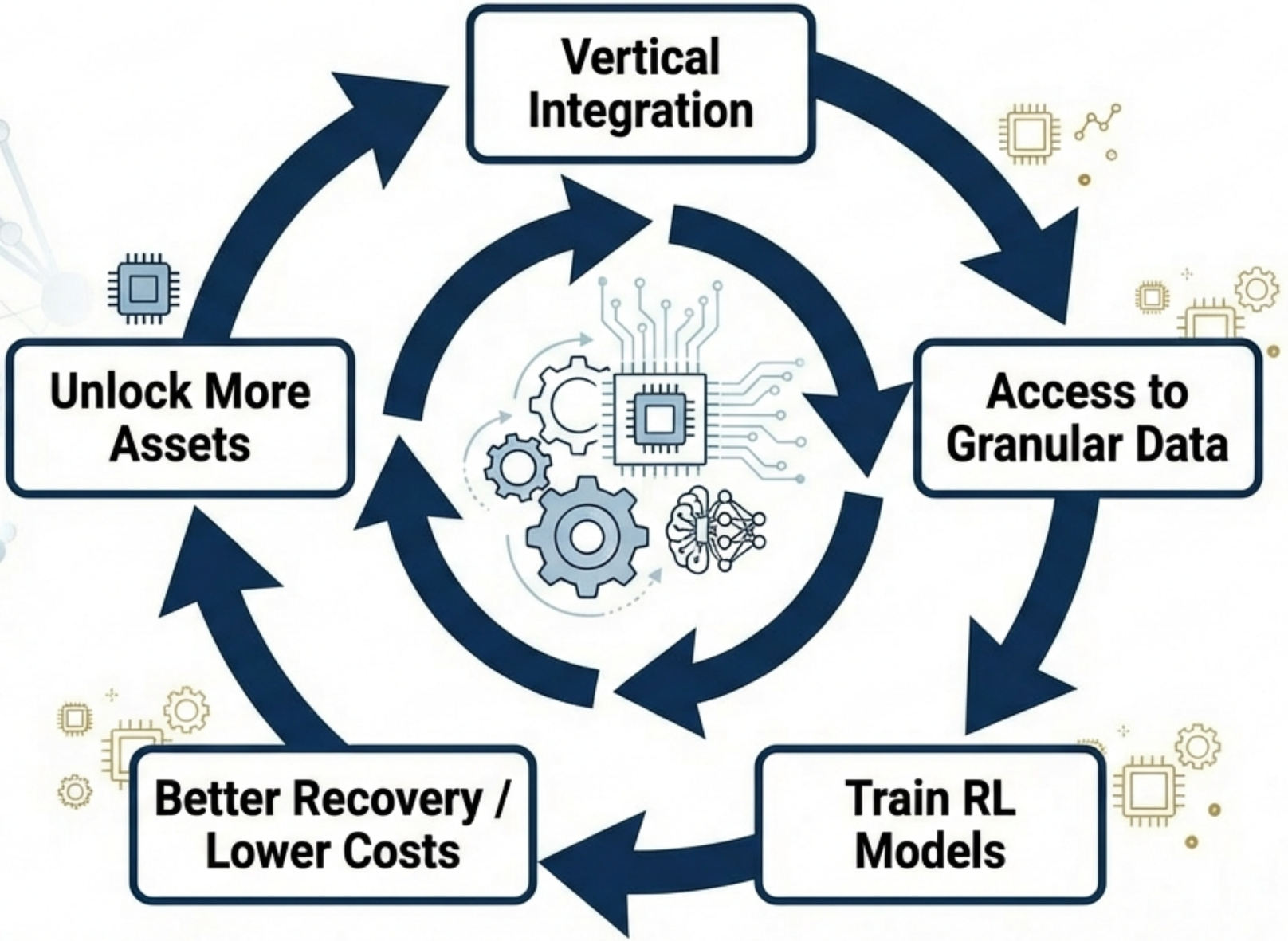
STRATEGY: CAPITALIZING ON THE ‘ORPHAN ASSET’ OPPORTUNITY

Capturing value in the mining sector through tech-enabled optimization.

THE PLAYBOOK

- **Acquire subscale assets** that are inefficiently run.
- **Deploy software-native efficiency** to make them profitable.
- **Build** at the bottom of the commodity cycle (“Blood in the water”).

THE INDUSTRIAL FLYWHEEL EFFECT



The Talent Moat

Solving the Brain Drain:

Top engineers want to solve hard problems with **equity upside**, not work in calcified bureaucracies.

THE ROLE OF GOVERNMENT: DE-RISKING THE INDUSTRIAL BASE

Permitting Reform.

Streamline NEPA/CEQA. Current multi-year timelines are existential threats to investment.

Demand Support.

Offtake agreements and floor pricing to de-risk capital against volatility (e.g., MP Materials model).

Coordination.

Align federal agencies and allied nations. Mineral deposits don't obey borders.

The private sector provides the code; the public sector must provide the pathway.

VISION 2035: RE-INDUSTRIALIZATION AND RESILIENCE

The End State:
A secure, domestic supply chain for AI, Defense, and Energy.

"The Middle East has oil; China has rare earths."
vs.
"The U.S. has the Code."

IT’S TIME TO MINE.

We are building the infrastructure for the next century of American industry.

Graph4VA | Website URL | [Contact Email]