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# Negative-Emissions H<sub>2</sub>: A Planetary Perspective

**Greg H. Rau, Ph.D.**

*Co-Founder and CTO,  
Planetary Technologies  
(formerly Planetary Hydrogen)  
and*

*Senior Research Scientist  
Institute of Marine Sciences  
University of California, Santa Cruz*

**[greg@planetarytech.com](mailto:greg@planetarytech.com)**



# Planetary Technologies, Inc (formerly Planetary Hydrogen)



Mike Kelland  
Co-founder  
CEO



Greg Rau  
Co-founder  
CTO

- Founded in 2019 based on an electrogeochemical technology developed at LLNL
- Currently, 16 employees and growing
- First 5t carbon dioxide removal demonstrated in 2022.
- A winner of a Carbon XPrize Milestone Award in 2022
- Planning Series A funding round later in 2023



Alex Mezel  
CHIEF METALLURGIST



Brock Battochio  
CO-FOUNDER



Mariam Melashvili  
PROJECT METALLURGIST



Omar Sadoon  
Business Development Lead  
Scaling Partnerships



Jason Vallis  
VP, Business Development  
Scaling Partnerships



Will Burt  
CHIEF OCEANS SCIENTIST



Steve Rackley  
EUROPE PROJECTS LEAD



Hiring-In-Progress  
Yuanyan Xu  
Marine Chemist

# Thanks to our partners and investors:

## Partners & Investors



## PML Applications

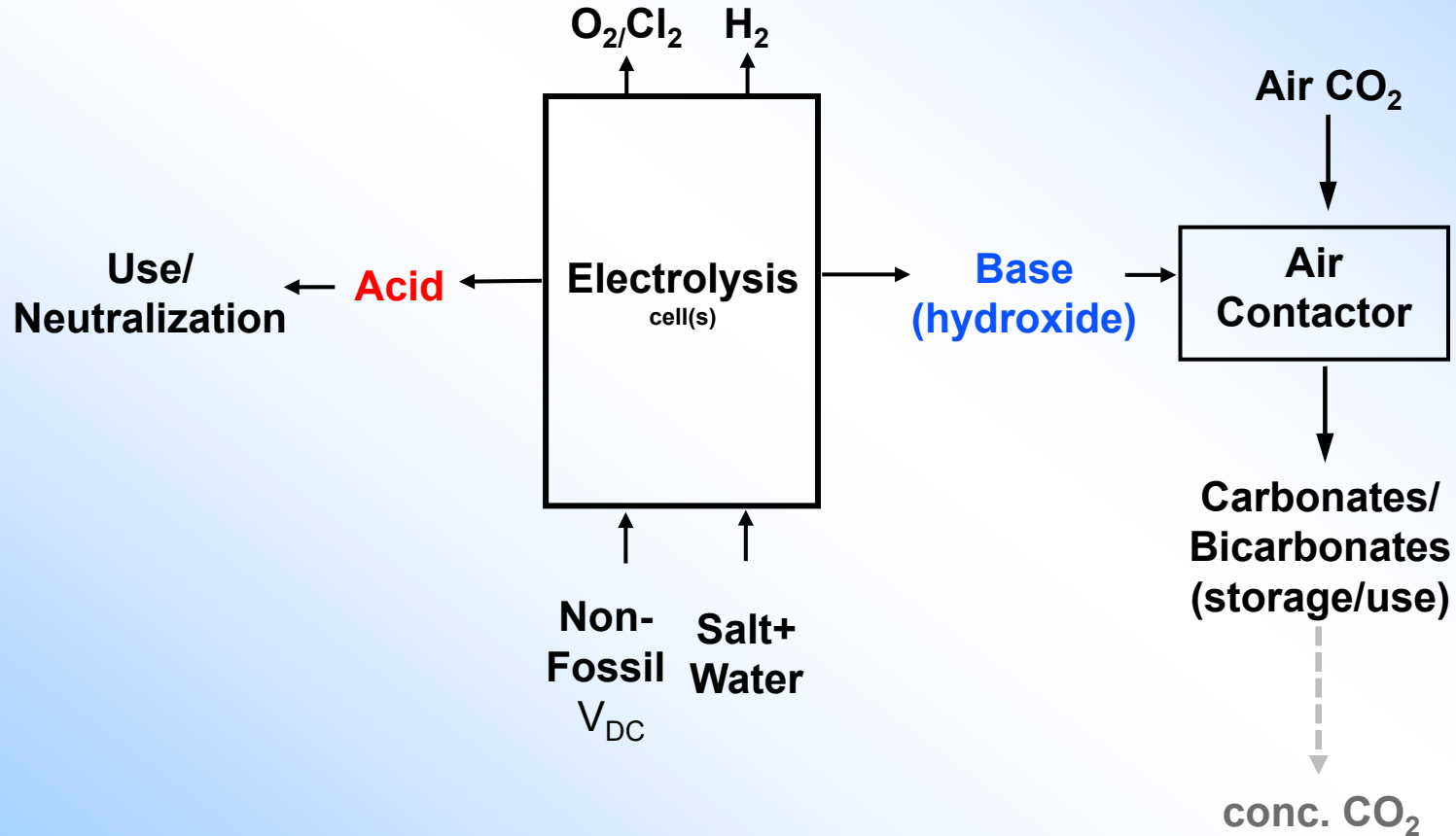


Carbon Removal Alliance



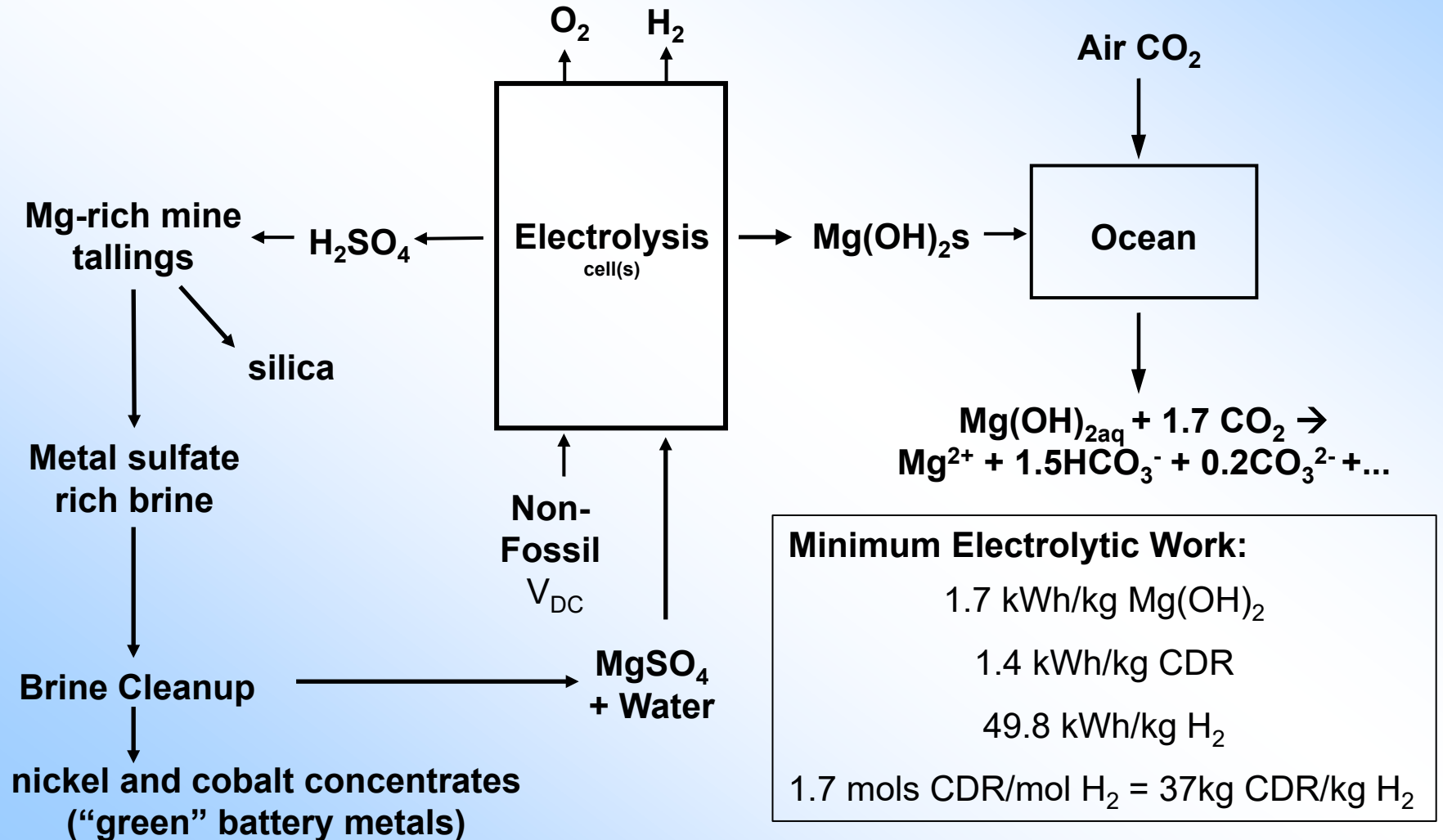
# Electrolytic Negative-Emissions H<sub>2</sub>

Basic Idea – Electro salt and water splitting:



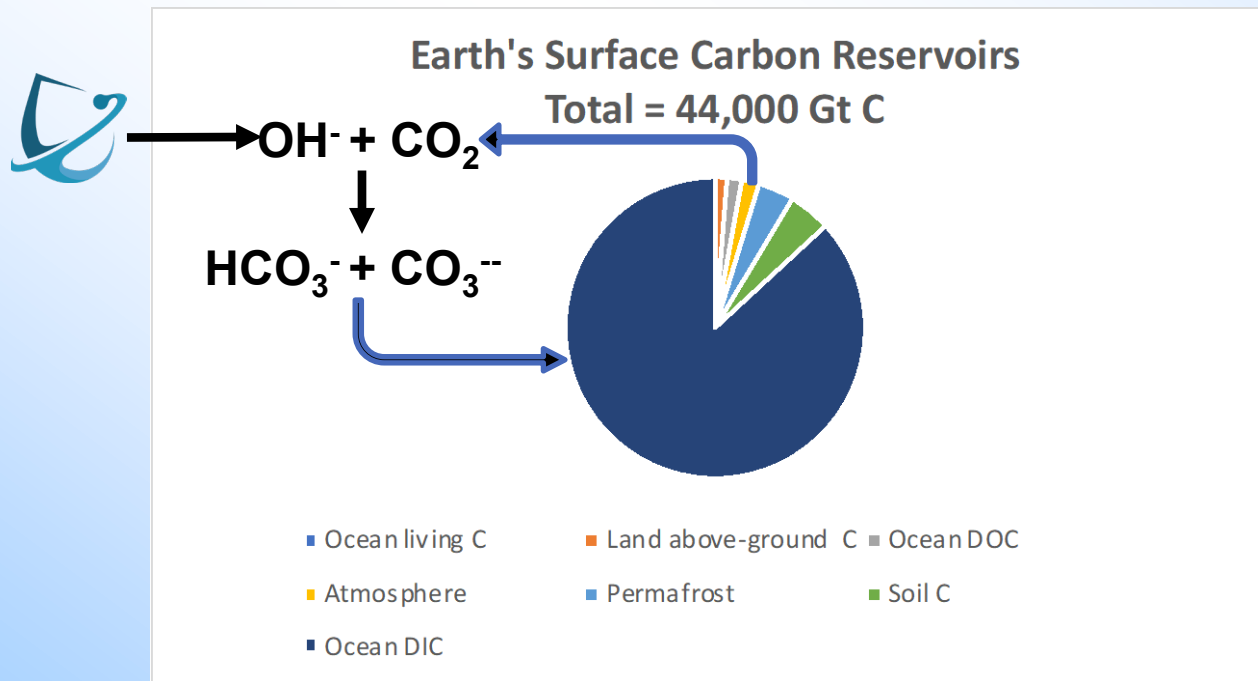
# Planetary's Scheme

## Magnesium Sulfate and Water Splitting:

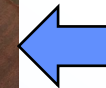
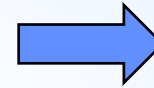
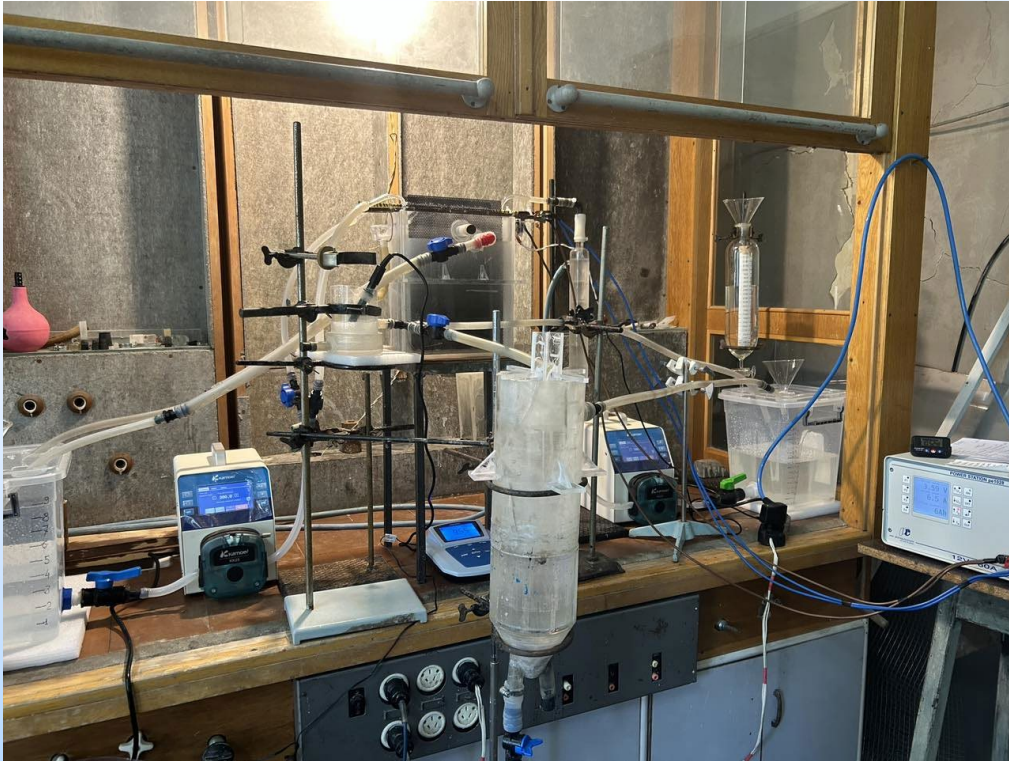


# Hydroxide-Based Ocean Alkalinity Enhance (OAE)

Planetary (and others) seek to simply repartition more atmospheric CO<sub>2</sub> to seawater carbon via the addition of alkalinity like hydroxide to the ocean:



# Electrochem Lab Trials



Results (so far):

@3.5 to 7.0 V and 160 – 1300 A m<sup>-2</sup>

Current efficiencies: 60 to >90%

Energy consumption: 4-10 kWh/kg Mg(OH)<sub>2</sub>

= 116 - 293 kWh/kg H<sub>2</sub>

Energy efficiency: 17-43%

# First Field Demonstration of CDR

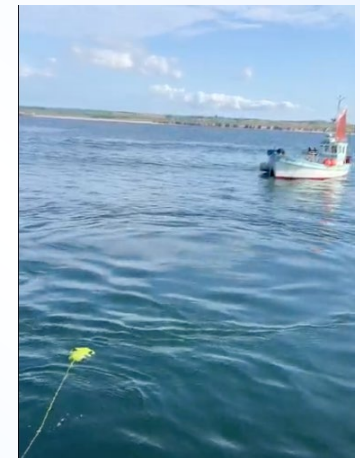
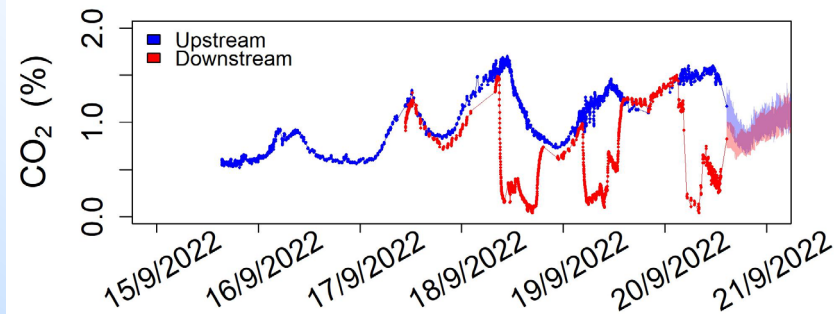
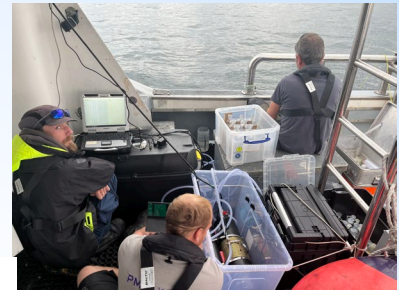


**UK Trial** - 4 tonnes commercial  $Mg(OH)_2$  added over 3 days, Sept. '23

$$CDR_{net} = CDR_{WW} + CDR_{OAE} \times (OAE_{eff} - OAE_{holdback}) - LCA_{emiss}$$

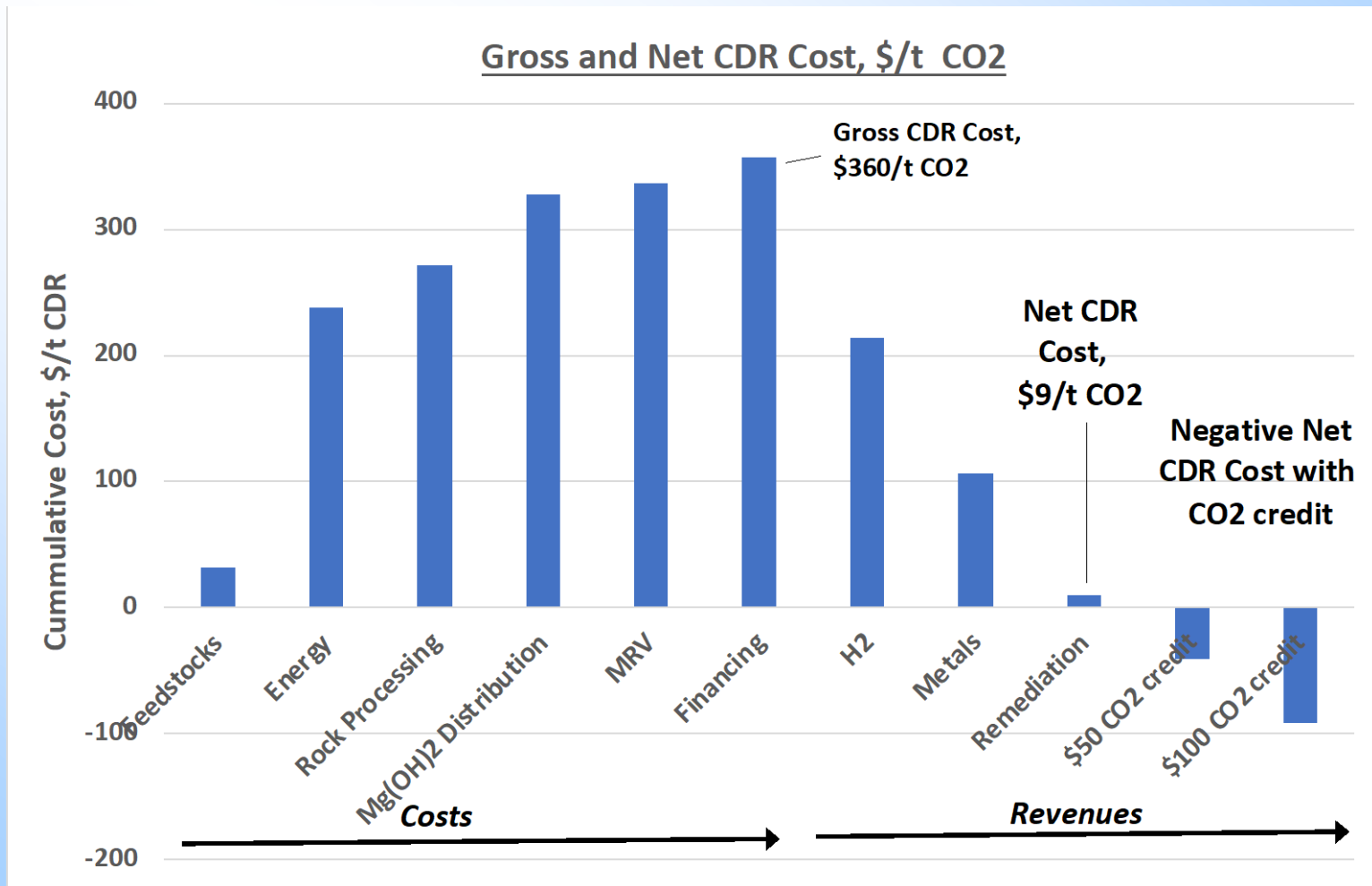
$$CDR_{net} = 0.48 \text{ tonnes} + 4.72 \text{ tonnes} \times (0.90 - 0.15) - 4.49 \text{ tonnes}$$

$$= \underline{\underline{-0.47 \text{ tonnes}}}$$





# Revenue From Multiple Co-products/Services Reduces Net Cost of any One Product or Service:



# Summary

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**Planetary is developing a unique cleantech platform for simultaneously:**

- 1) generating green or negative-emissions H<sub>2</sub>,
  - 2) performing CDR,
  - 3) making green/NE battery metals - Ni and Co, and silica
  - 4) consuming mine tailings and reclaiming mine sites,
  - 5) reducing ocean acidification,
- all with high global capacity potential.

**Further research needed to determine ultimate cost-effectiveness and scale.**

**Get in touch: [greg@planetarytech.com](mailto:greg@planetarytech.com)**