

AI Along Critical Materials Supply Chain: From Exploration to Recycling

Plenary Session 2
Moderator build slide

One bottleneck, one intervention, one number — added up as we go

COMPANY	BOTTLENECK REMOVED	THE NUMBER
EIT Raw Materials Bernd · Europe	Fragmented capability	200,000 trained
Australia Bronwyn · Exploration	Cannot see the orebody	293 mines needed by 2030
ProLogium Dima · Batteries	Constrained material inputs	12 months → 3–6
Syensqo Vincent · Chemicals	Effort spread too thin	600+ use cases screened
Momentum Technologies Preston · Refining	Rigid, centralised processing	15% cobalt → 3%, handled live
Finnish Minerals Group Matti · Mining	Permission, not technology	27M+ pages searched

VOLUME ▲

throughput unlocked

—

COST ▼

optimisation and working capital

—

Key Messages — What We Heard

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The Bottlenecks

Fragmented European capability, so good tools never reach scale — EIT Raw Materials

You cannot see the orebody, and the easy deposits are gone. 293 new mines needed by 2030 — Foley / ATSE

Dependence on constrained, concentrated and costly material inputs — ProLogium

Too many candidate uses and effort spread thin. 600+ evaluated to find the few that pay — Syensqo

Processing is rigid, centralised and slow. Find more material and the bottleneck moves downstream — Momentum

Permission, not technology. Courts refuse applications because water and air impacts are not modelled well enough — Finnish Minerals Group

Where AI Already Pays

\$450M a year from optimising drill-and-blast at one mine — Deloitte, cited by Foley

12 months → **3–6** to production yield on a new battery generation — ProLogium

20–25% down on inventory and working capital; volatility exposure high to low — ProLogium

3× faster development, success rate from 10% to 40% — Syensqo

15% → **3% cobalt** absorbed while running, membranes reconfigured live — Momentum

27M+ pages across 29,000+ projects made searchable — Chile environmental agency

The Hard Constraints

Models are chemistry-specific. They transfer across neither chemistries nor generations — ProLogium

Boundary-conditioned. Outside what they learned, they give confident wrong answers — ProLogium

Data-hungry. No architecture removes the need for your own production data — ProLogium

A well-run line makes almost no defects, which starves the model that must find them — ProLogium

Plants stay expensive and often single-use, so flexibility to a new chemistry is limited — Momentum

Solving one constraint moves the bottleneck rather than removing it — Momentum

Key Messages — What To Do

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The Must Do

AI strategy with senior business leadership, never with IT — EIT Raw Materials

Build the workforce: 200,000 people trained — EIT Raw Materials

Data scientists on the floor with chemists and process engineers — ProLogium

Train data scientists into your chemistry, not the reverse — ProLogium

Screen widely before committing: 600+ use cases evaluated — Syensqo

Model environmental impact to the precautionary standard — Finnish Minerals Group

Targets on outcomes — tons, yield, recovery, time. Never adoption — EIT Raw Materials

Treat the production line as a continuous data factory — ProLogium

Own the models where the IP sits; buy the cloud and the MLOps — ProLogium

Uncertainty estimates built in from the start where safety is involved — ProLogium

Design modular, for actual conditions rather than expected ones — Momentum

The Must Not Do

Never present adoption as achievement — EIT Raw Materials

Never carry a model to a new chemistry or generation and assume it holds — ProLogium

Never trust a model outside its envelope without uncertainty estimates — ProLogium

Never assume that finding more material means you can process it — Momentum

Never treat permitting as someone else's problem — Finnish Minerals Group

Underestimated for Next Year

Crushing rock — 3–4% of world electricity — Foley / ATSE

The balance sheet — working capital and price risk, not unit cost — ProLogium

Recycling — variability is intrinsic and fixed processes cannot cope — Momentum, Syensqo

Permitting — a non-technical gate no process improvement unblocks — Finnish Minerals Group

From more data to better decisions.