Decarbonization and sustainability:
How to drive alumina and aluminium production towards carbon neutrality

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Hatch's Climate Change & Sustainability Practice

Engineering Excellence and Advanced Technical Solutions

- Process optimization & energy efficiency
- Fuel switch, hydrogen, biomass, electrification, CCUS
- Renewable power integration
- Scale-up & integration of new technologies
- Waste minimization
- Circular value chain creation

Project Delivery Support

Environmental and Social Impact Advisory

- Stakeholder engagement
- Baseline studies & evaluations
- Regional context and environmental policy compliance
- Environmental impact assessment

Opportunity Identification & Evaluation

Implementation and Social Benefit Assessment

Investments & Business Planning

- Climate change risk assessment
- Business case design
- Capital prioritization
- Financial modelling and analysis: Marginal Abatement Cost Curve (MACC)
- GHG emission reduction targets
- TCFD implementation

Project Financing Strategies

Sustainable Financing Advisory

- Carbon pricing analysis & trending
- Green financing strategies
- Legislation & regulatory strategy

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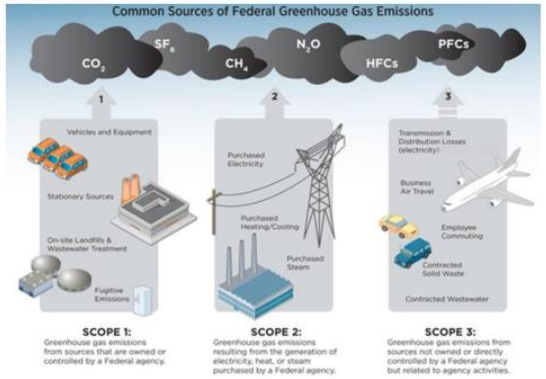
Step 1: Mapping Emissions Sources

- Process experts, working alongside our clients, can help identify and quantify emission sources and energy usage



Source: epa.gov

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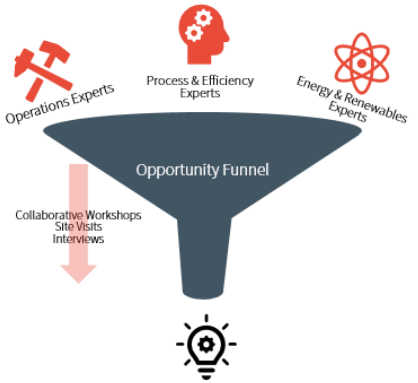
Step 2: Leveraging Expert Team

- Leverage world-leading process and technology engineering experts to populate an opportunity database of reduction initiatives.
- Map and categorize opportunities across the value chain.



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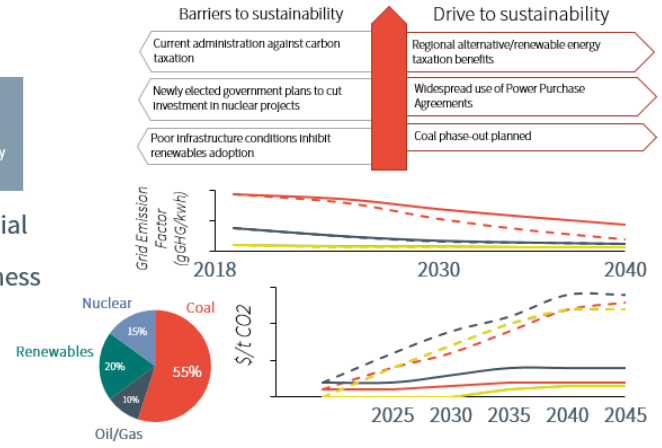
Step 3: Transition Assessment

- Review of environmental, social and governance trends that could materially impact business outcomes
- Trends in energy usage, local market analysis and decarbonization initiatives



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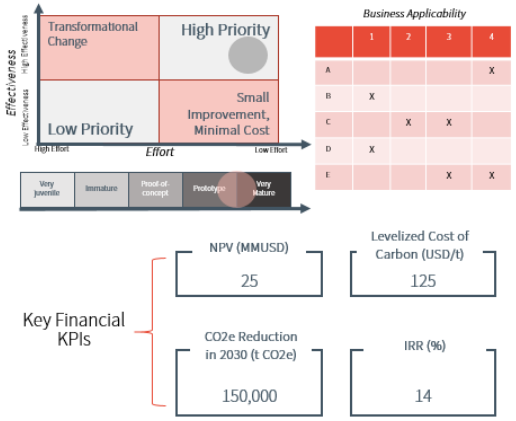
Step 4: Opportunity Assessment

- Working with our clients, we leverage the collective experience of the team to assess opportunities using a proven, structured framework



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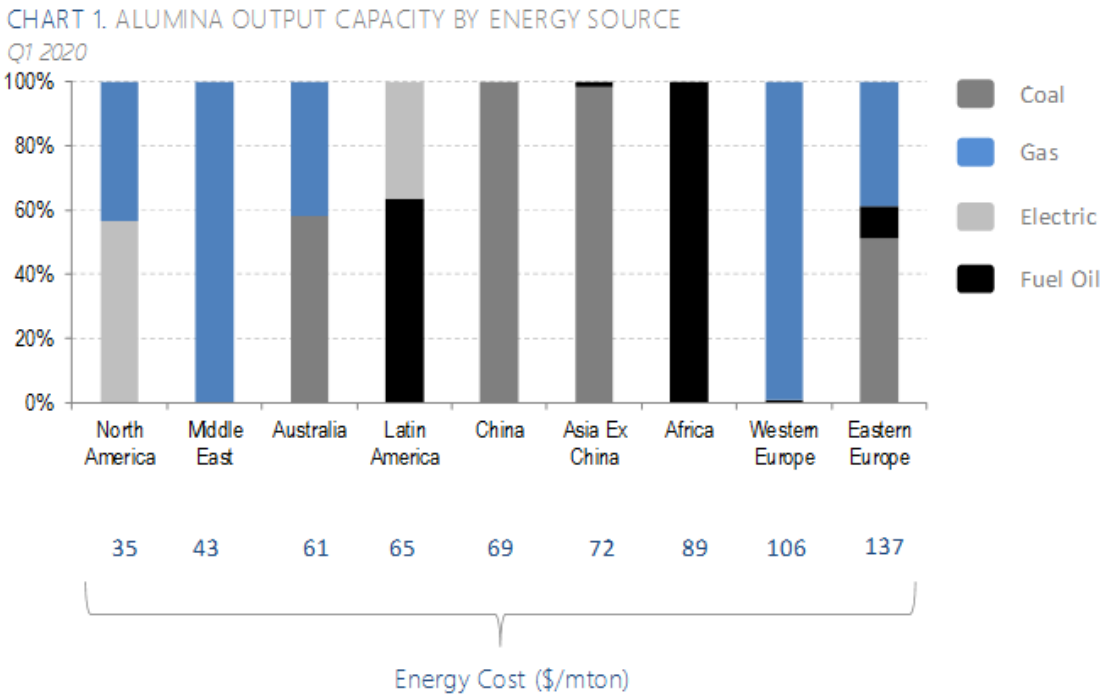
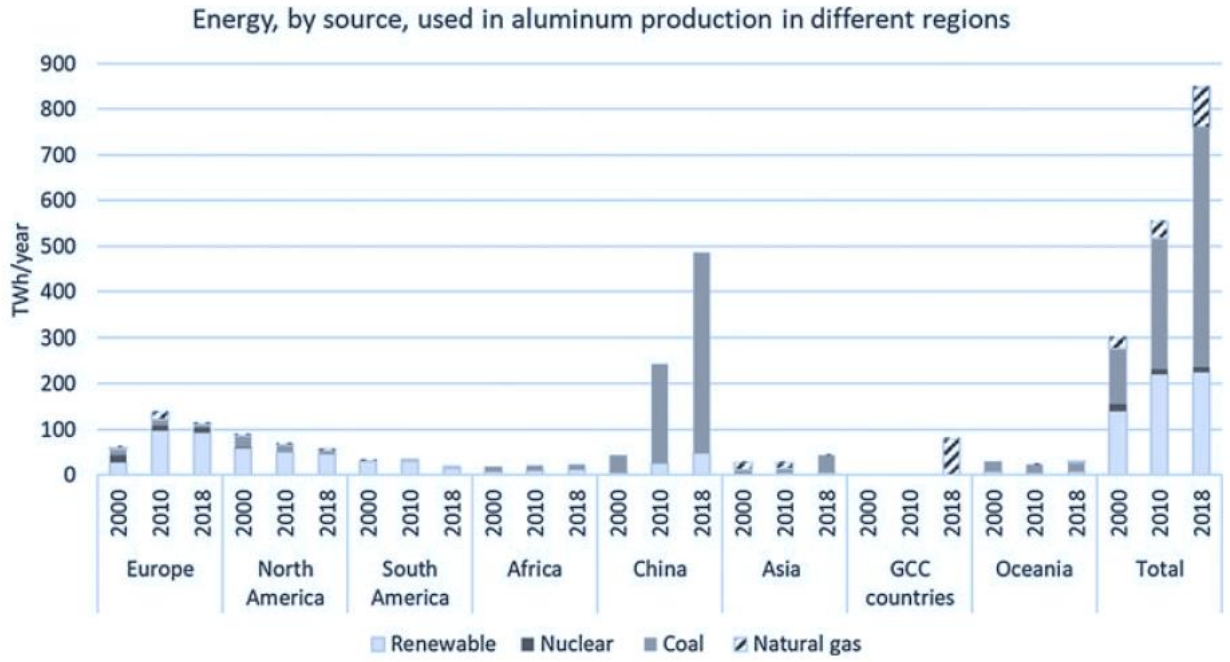
Energy by source used in production

Alumina refining



Source Harbor.

Aluminium smelting



Source: Saevarsdottir, Gudrun & Kvande, Halvor & Welch, Barry. (2020). Reducing the Carbon Footprint: Aluminium Smelting with Changing Energy Systems and the Risk of Carbon Leakage. 10.1007/978-3-030-36408-3_98.

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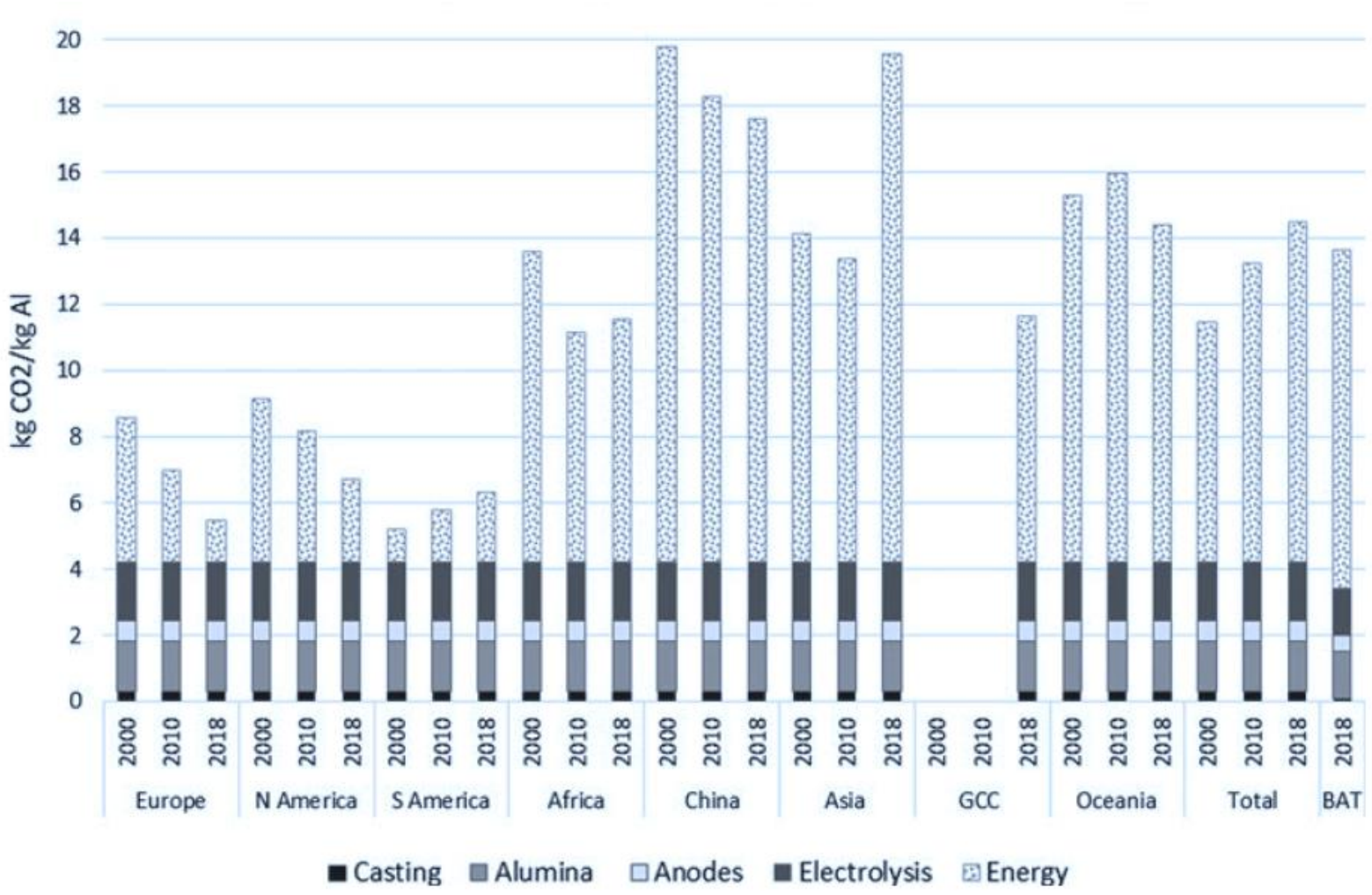
Carbon intensity of aluminium production by region



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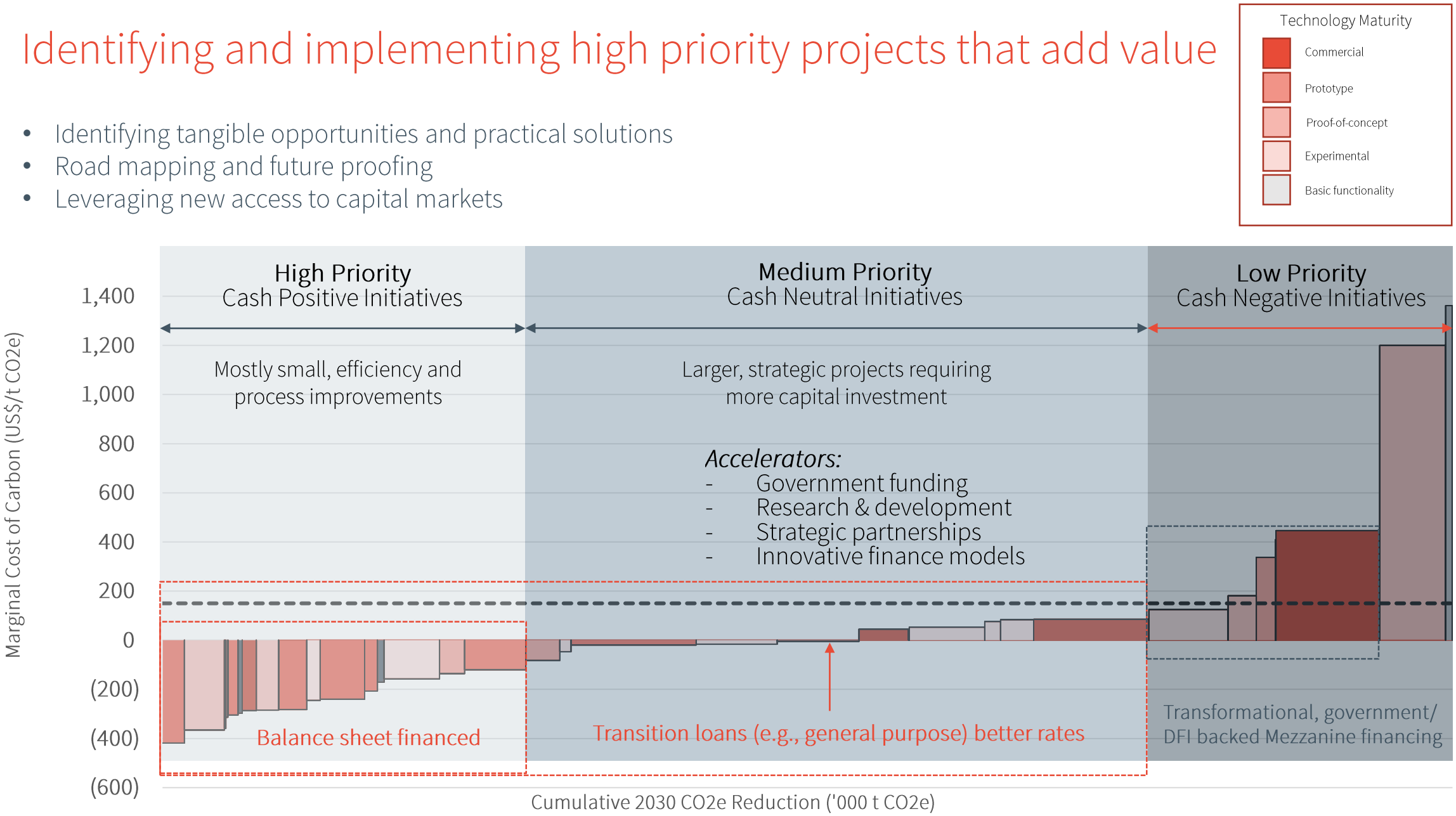
Identifying and implementing high priority projects that add value

- Identifying tangible opportunities and practical solutions
- Road mapping and future proofing
- Leveraging new access to capital markets



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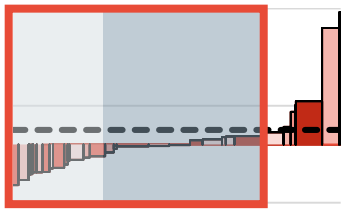

Balance sheet financing and transition loans

High priority, cash positive

Medium priority, cash neutral

Commercially available

Lower risk profile

Near to medium-term implementation

Conventional project life-cycle

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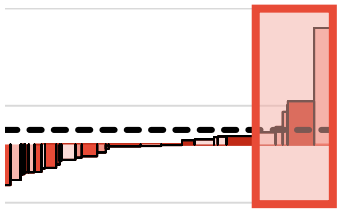
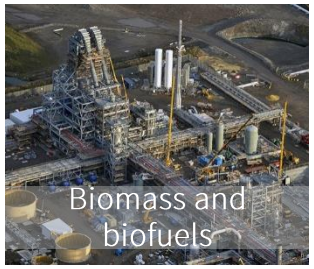
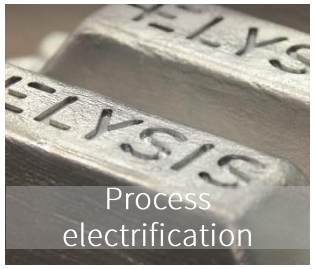


Transformational, government / DFI backed mezzanine financing

Longer term, cash negative, existing technologies

Longer term, cash negative, emerging technologies





Transformational abatement potential

Hard-to-decarbonize emissions sources

Capital intensive, longer development timelines

Getting from “TRL” to “FEL”

Evolving cleantech ecosystems

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Identifying a unique portfolio of initiatives across the Aluminium value chain

	Commercially available	Emerging, transformative
Bauxite	• Renewable, hybrid energy • Electrification of equipment	• Hydrogen
Alumina refining	• Natural gas • Fluidized bed calcination • Tube digesters • CHP and waste-heat co-gen	• Thermal Storage • Green steam • Hydrogen • Red mud treatment
Aluminium smelting	• Natural gas • Magnetic compensation • Lining elements with increased conductivity • Improved anode designs • Pre-heating of anodes and alumina • Heat recovery from off-gases • Recuperative and regenerative burners	• CCUS • Inert anode and wetted cathode electrolysis (Elysis) • Plasma torches (electrification) • Smelter as a virtual battery • Green carbon
Downstream	• Electrification of equipment • Transfer hot metal to alloying furnace • Magnetic billet heating	• Mini-mills

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