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Sustainability in the Aluminium Industry.

Dr. Michael Kenyon

Senior Materials Engineer

NOVEMBER 2022 - ASPIRE WORKSHOP

What we'll cover today.

1. Innoval Technology.
2. Aluminium sector emissions.
3. Primary aluminium production.
4. Re-setting the scene: how?
5. Is the industry doing enough?
6. Quantifying environmental metrics.

Michael Kenyon
Senior Materials Engineer.

2018 – present: Innoval Technology Ltd. Physical Metallurgist, Sustainability analyst.
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2014 – 2018 AMS CDT: the effect of impurity elements on the precipitation behaviour of dispersoids in Al-Mg-Si alloys.

Other positions: IOM3 SECC and NF&LMG, TFI FLG

Supporting aluminium companies since 2003, with **history** stretching way beyond...

World-class **aluminium expertise** available to everyone...

Who we are.

A diverse team of 24 **experts**.

400+ years of **experience**.

550+ **clients** and **customers**.

Activities in over 55 **countries**.

PART OF THE **DANIELI** GROUP

Support from a **multi-national** company.

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What we do and how we work.

We build long-term relationships to help organisations design, develop and manufacture better products for end-users and the environment.

- Process improvement.
- Materials characterisation & testing.
- Collaborative research & development
- Strategic support.
- Training courses.
- Knowledge management.

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Helping you find sustainable aluminium solutions.

Sustainable aluminium technologies are starting to make an impact. We're involved in many collaborative R&D programmes, many of which focus on technologies to reduce environmental impact, such as electric vehicles.

Other recent examples include sustainable packaging solutions. We believe that innovation is key in positioning aluminium as the material of choice in the circular economy.

Life Cycle Assessment (LCA) and Sustainability Analysis are becoming ever more important because the environmental impact of products and services is increasingly in the public eye as well as the political arena.

Aluminium industry emissions overview.

1,095 Mt

Total GHG emissions from the aluminium industry in 2018.

Sector	Production (Mt)	GHG emissions (Mt CO_2 eq.)	Global GHG emissions
Steel	1,827	3,400	~7%
Aluminium	95	1,095	~2%
Cement	4,282	3,400 – 3,900	~7 - 8%

49 GT

Total global GHG emissions for 2018.

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Aluminium sector emissions.

Units in (Mt) CO_2e.		Mining	Refining	Anode	Electrolysis	Casting	Recycling	Semis	Internal scrap	Total
Electricity	Indirect	0.6	16.9		670.2		3.1	9.5	2.5	703
PFC	Direct				35.4					35
Process	Direct			6.4	92.6					99
Ancillary	Indirect		14.8	19.3	6.4					41
Thermal energy	Direct/indirect	2.6	124.3	6.4		6.4	15.6	19.0	8.4	183
Transport	Indirect				18.7					34
Total	Cradle to gate	3	171	32	823	6	19	29	11	1095

Source: IAI, Aluminium sector B2DS-aligned GHG emissions by unit process, 2021.

1. Bauxite mining.

2. Alumina (Al_2O_3) production.

3. Smelting.

4. Casting.

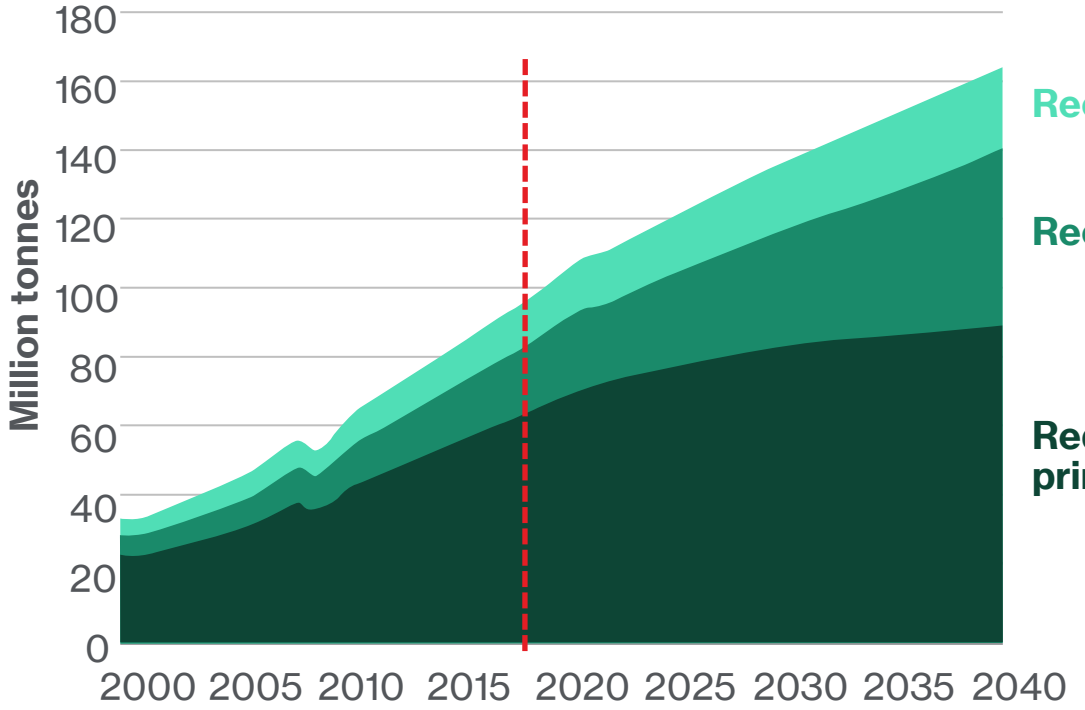
~ 4 t bauxite

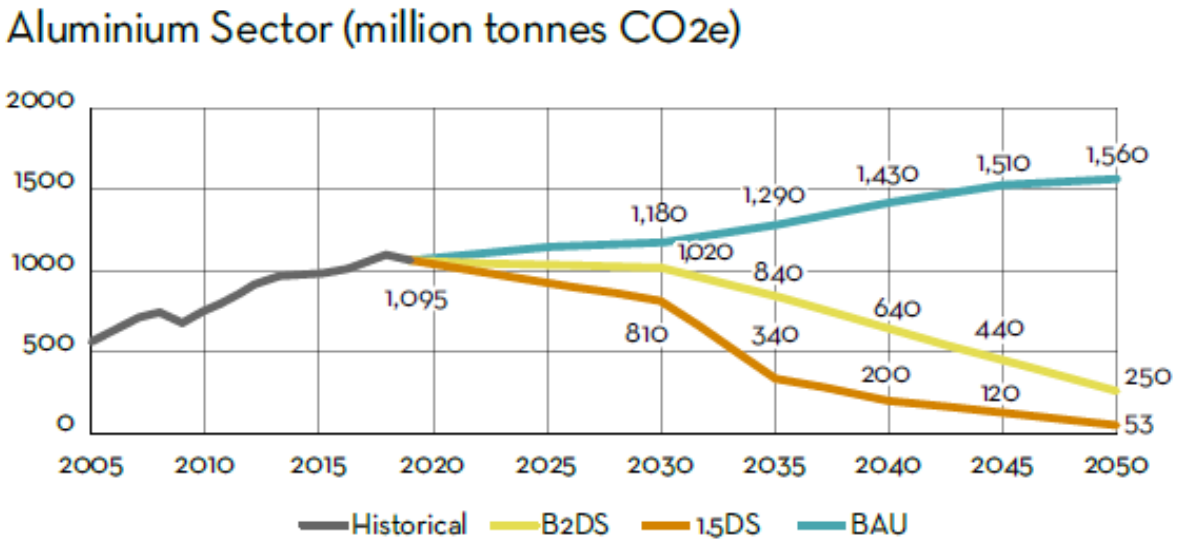
'Red mud'

2 t Al_2O_3

1 t aluminium

Resetting the scene.





By 2050, the aluminium industry has to reduce its emissions by 77% (B2DS) while the industry output is predicted to grow by 81%.

Source:: IAI, 1.5 degrees scenario: a model to drive emissions reduction, 2021.

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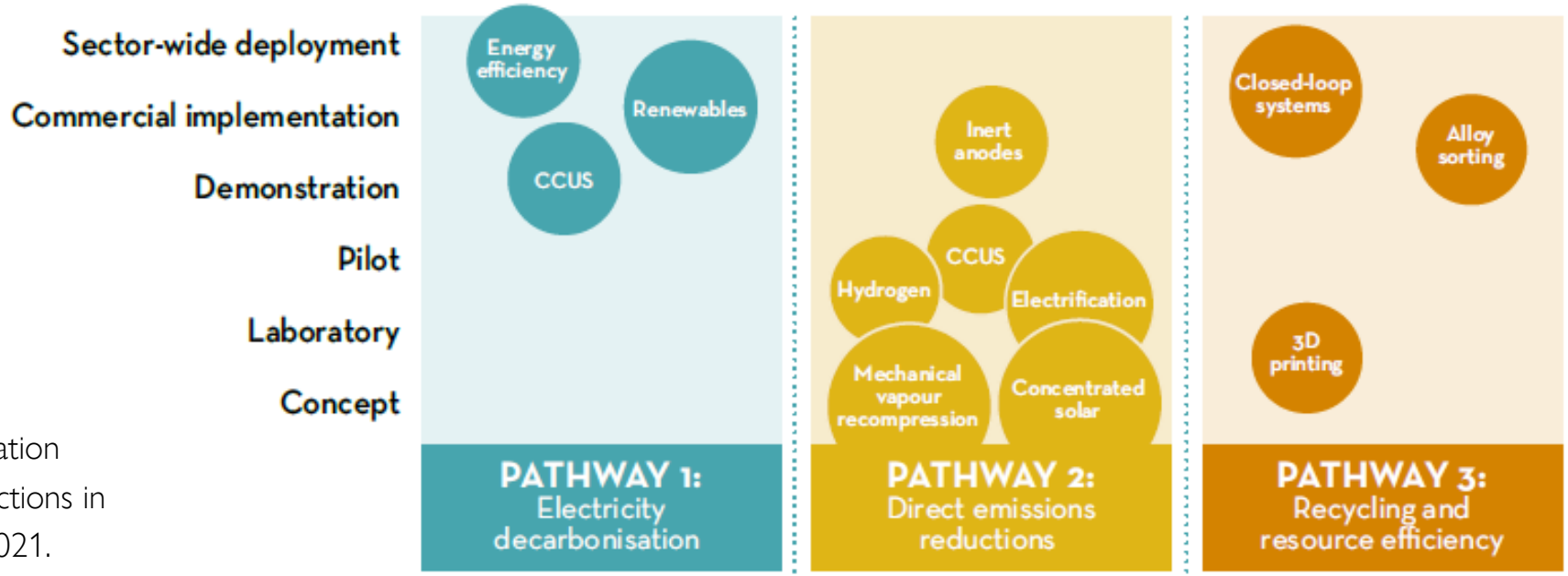
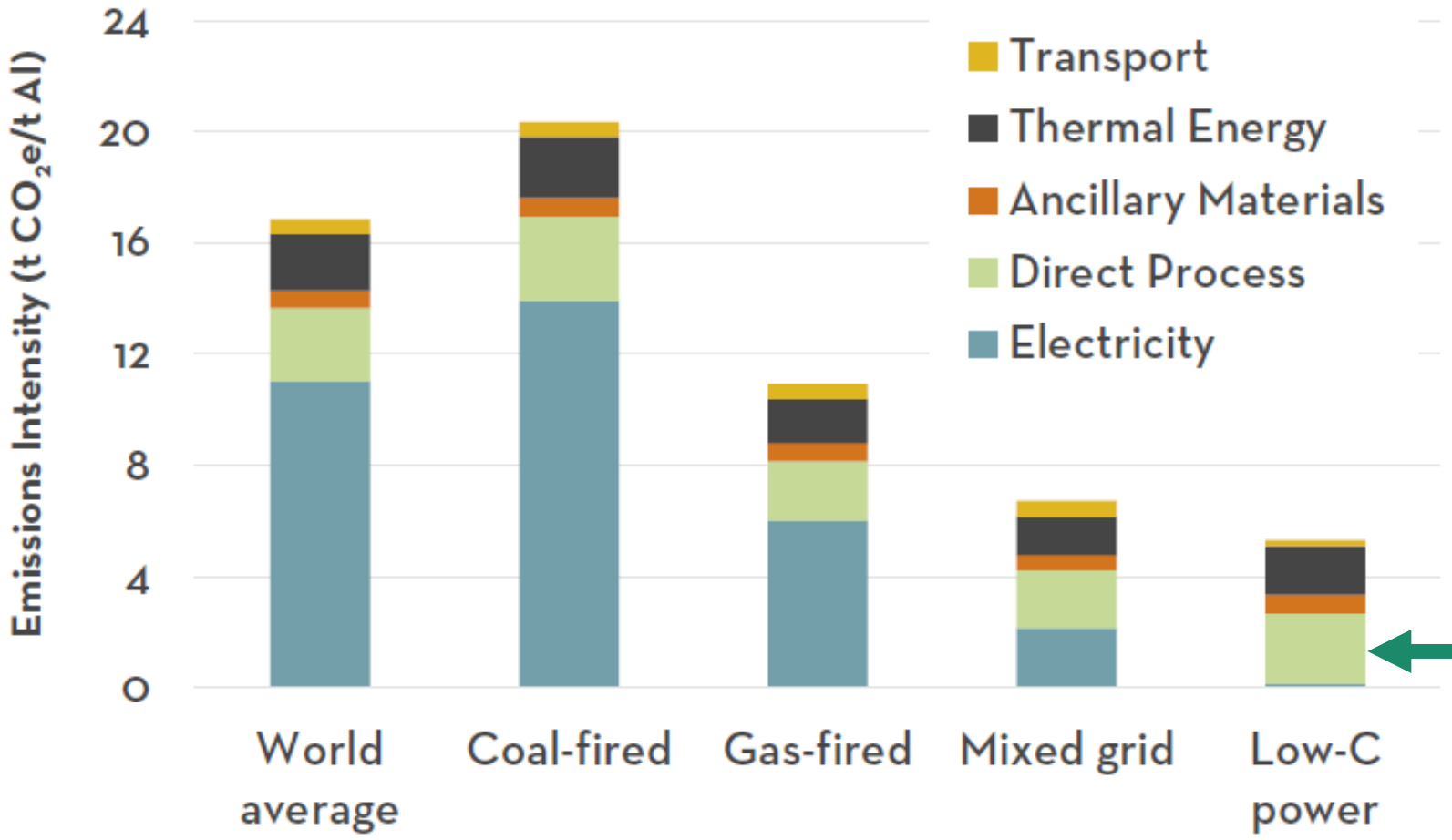
Resetting the scene: how?

1. Use of renewable energy sources for primary production (and the whole supply chain).
2. Direct process emissions reduction.
3. Increased use of secondary (end-of-life) scrap and increased process/material efficiency; less process scrap and losses from melt.



Source: IAI, Technological Innovation Roadmap - GHG emission reductions in the global aluminium industry, 2021.

Pathway 1: Renewable energy source.



Need to achieve 0.5 t/t for 1.5 C scenario.

Source: IAI, Aluminium Sector GHG Pathways to 2050, 2021.

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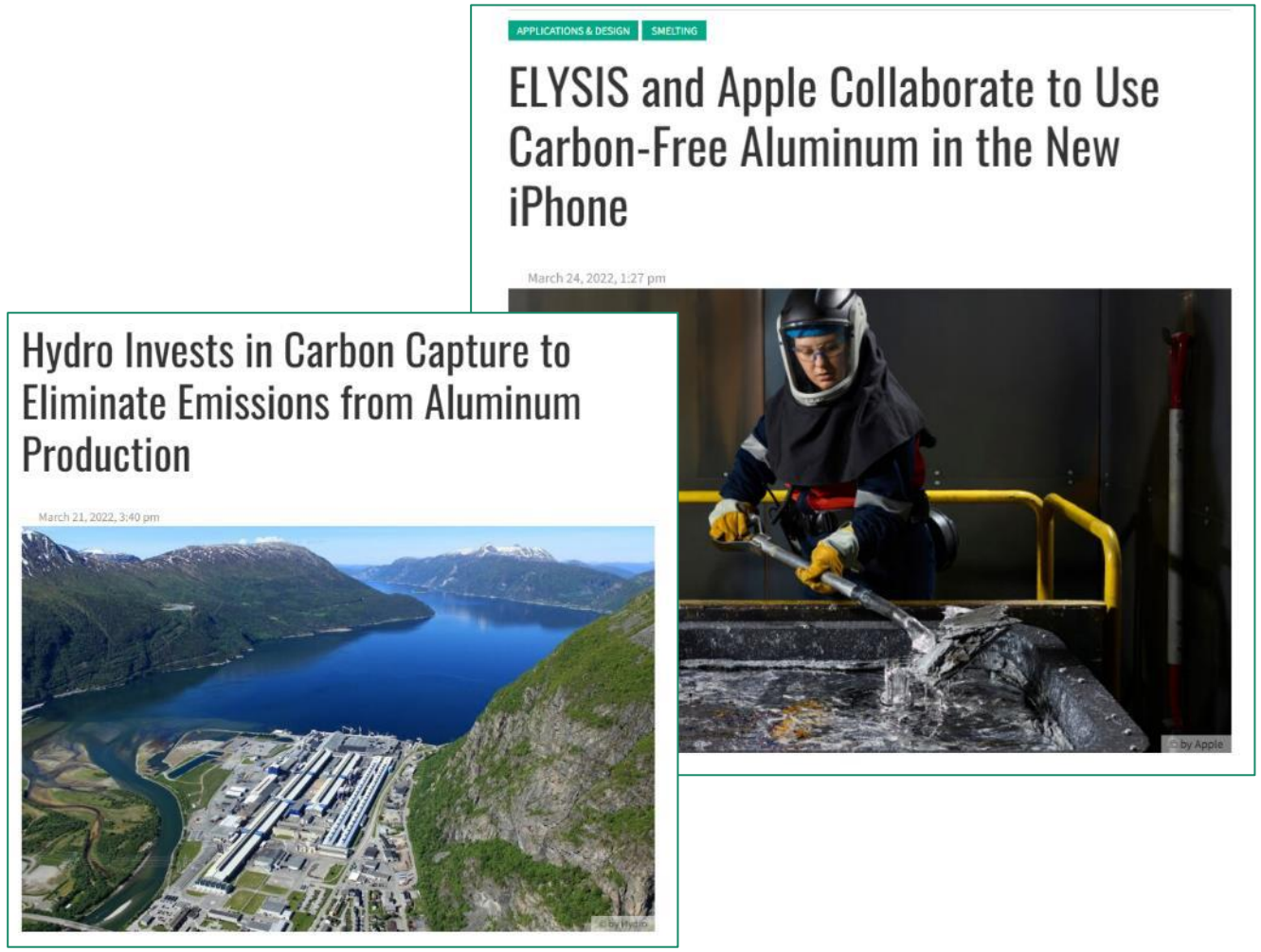
Pathway 2: Direct emissions reduction.

- Elysis: inert anode technology for primary production.
- ASTRAEA™
- CCUS: Carbon Capture Technology.
- Fuel switch (thermal energy – plasma torch, hydrogen).



Pathway 3: Recycling.

Energy.

Remelting, casting and the other required operations to recycle aluminium requires **5% of the energy.**

CO_2

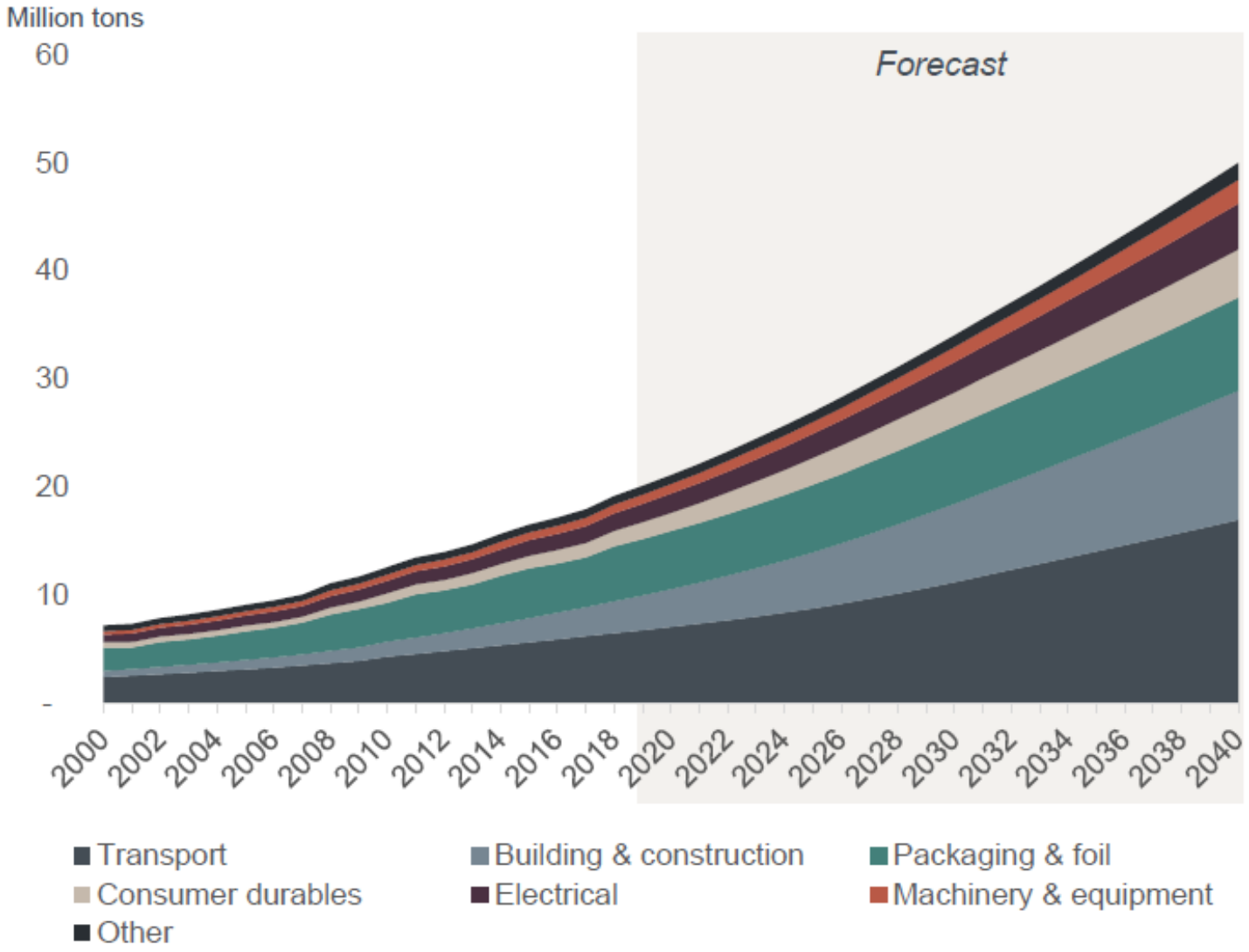
Emissions.

Recycling emits **95% fewer emissions** vs primary production.

$

Cost.

Scrap aluminium is **cheaper** than primary depending on quality.



Source: Hans Bjerkaas Hydro, International Recycled Aluminium 2019, November 12-14° 2019, Hamburg, Germany

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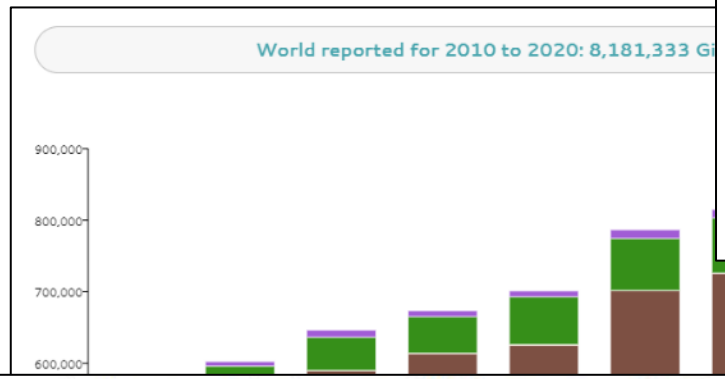
Is the industry doing enough right now?

PATHWAY 1
Electricity decarbonisation



Harnessing the power of the desert sun: BMW Group sources aluminium produced using solar energy

02.02.2021 PRESS RELEASE TOP ARCHIVE

Aluminium produced using solar energy will meet almost half the annual requirements of the light metal foundry at Plant Landshut +++ Triple-digit million-euro contract with Emirates Global Aluminium to supply 43,000 tonnes of aluminium in 2021 +++ BMW Group also plans to source aluminium produced with green power long-term, with CO2 savings of around 2.5 million tonnes by 2030 +++ Wendt: "Will reduce CO2 emissions in the supplier network by 20% by 2030" ++

#Aluminium · #CO2 emissions · #green power · #supplier network · #light metal foundry · #Landshut · #Aluminium Stewardship Initiative (ASI) · #natural resources · #Environment · #Finance, Facts, Figures · #Technology · #Corporate · #Sustainability · #Production, Recycling

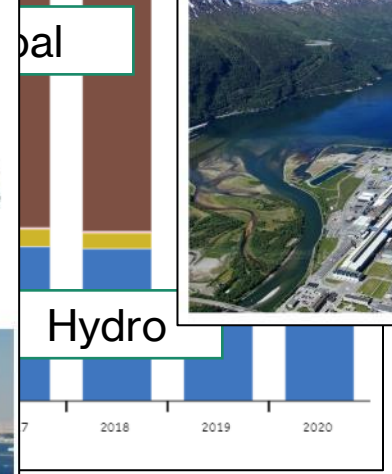
PATHWAY 2
Direct emissions reduction

SMELTING

Elysis Moves Toward Commercialization of Inert Anodes

March 1, 2022, 8:00 am

Hydro Invests in Carbon Capture to Eliminate Emissions from Aluminum Production



PATHWAY 3
Recycling and resource efficiency

Novelis Launches High-Recycled, Low-Carbon Aluminium Product for Architectural Applications

Published 22nd March, 2022 by Zahra Awan

Novelis Inc. has announced the launch of Novelis HRC57S®, an innovative, anodising quality aluminium product containing more than 90% recycled content.

What?

- **Quantifying environmental footprint.**
- **...avoid green washing!**

Why?

- Benchmarking and improvement (process, product or site)
- Hotspots
- Marketing
- Comparison
- Design support
- Moral obligation
- Regulations

How?

- **Life Cycle Assessment**
- Carbon and water footprints
- Environmental Product Declarations (EPD)
- GHG protocol
- Certification;
  - ASI accreditation

Closing remarks.

Green(ish) 2022+

- Responsibly sourced primary, renewable power sources.

Greener 2030

- Low(er) carbon primary + increased volume of recycled material.

Greenest 2050

- Low carbon primary (<0.5 t/t) + maximum use of recycled content alloys + optimised secondary metal value chains + inert anode technologies.

UK Research and Innovation

The Aluminum Association

INTERNATIONAL ALUMINIUM

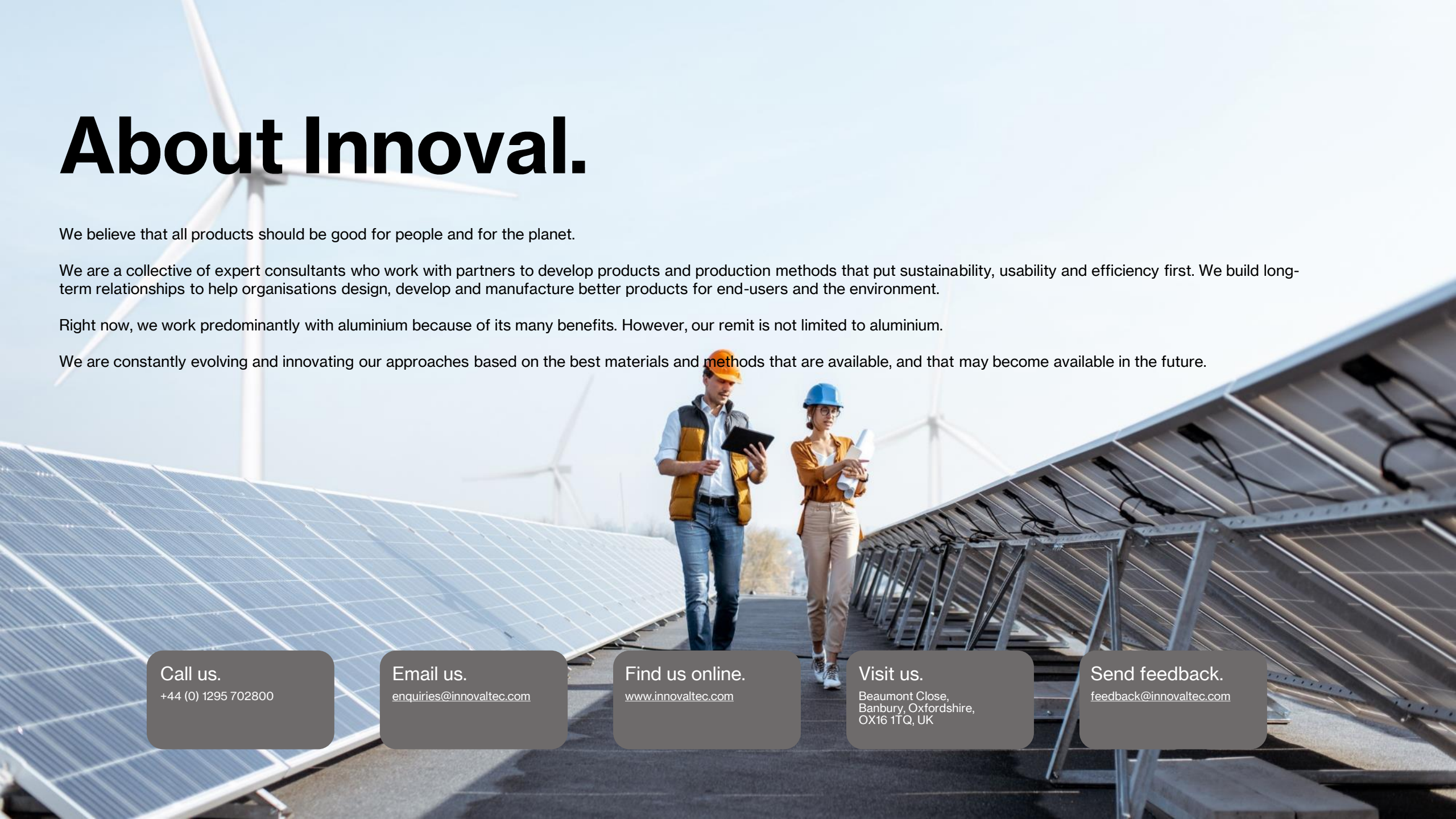
About Innoval.

We believe that all products should be good for people and for the planet.

We are a collective of expert consultants who work with partners to develop products and production methods that put sustainability, usability and efficiency first. We build long-term relationships to help organisations design, develop and manufacture better products for end-users and the environment.

Right now, we work predominantly with aluminium because of its many benefits. However, our remit is not limited to aluminium.

We are constantly evolving and innovating our approaches based on the best materials and methods that are available, and that may become available in the future.



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