THE VOICE OF THE UK ALUMINIUM INDUSTRY

Driving a sustainable future

Towards Net Zero

Appropriate self-sufficiency, inward investment and energy security have never been more important.

ALFED
ALUMINIUM FEDERATION

TAKING A SYSTEMS APPROACH FOR THE UK ENABLES INDUSTRY AND GOVERNMENT COLLABORATION TO DELIVER RADICAL ACTIONS FOR INNOVATION, GROWTH AND CHANGE.

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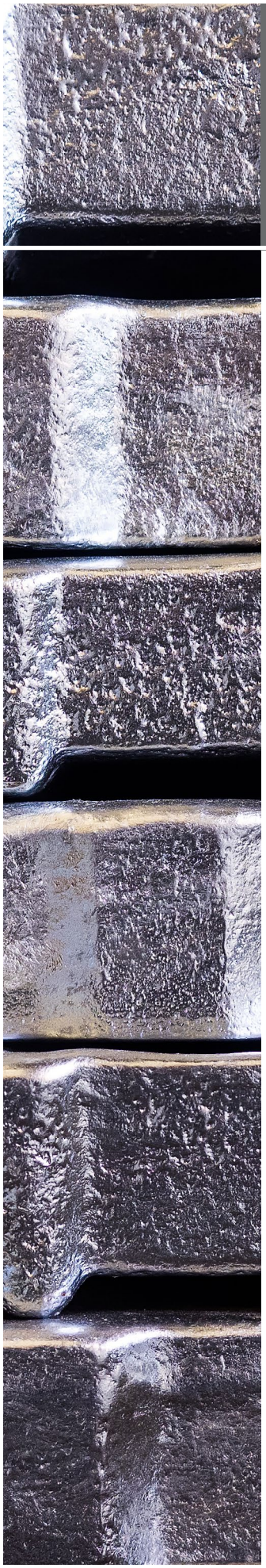


FOREWORD

The UK's aluminium industry stands poised at a crossroad. It could stay on its present path where almost all its cast, rolled, extruded or forged semi-fabricated product forms are imported with little or no control on their embodied carbon level or of their multiple environmental impacts beyond this simple measure. Alternatively, there is the option to follow a different, relatively simple path towards a Net Zero state, whilst also dramatically reducing all the environmental impacts associated with prime aluminium production from bauxite.

Professor Geoff Scamans, Innoval

Over the past few years, almost all the UK's primary aluminium smelters have closed as they became un-economic due to either to high electricity costs or to closure of tied nuclear electricity generation. The only remaining primary aluminium production facility being the small Lochaber smelter with a 50kt/year capacity operated by ALVANCE Aluminium Group and supplied with hydroelectricity from a dedicated generation plant. This smelter is only capable of providing a small fraction of the UK's growing aluminium need.

Generally, importers of aluminium ingots, semi-fabricated products and fabricated components and finished products into the UK are driven by cost concerns rather than environmental issues such as embodied carbon. This means that much of this imported aluminium in all its forms and products has its origin in China, where the aluminium smelted there is best described as "black" rather than "green" due to its exceptional high embodied carbon level of at least 20 tonnes CO_2 per tonne. The Net Zero route to zero carbon primary aluminium is long, extremely expensive and arduous that requires step changes in technology at all stages of the conversion of seven tonnes of bauxite for each tonne of aluminium produced. In 2020 the annual production of alumina from bauxite was over 133 million tonnes resulting in the generation of over 175 million tonnes of red mud. The route to Net Zero primary aluminium must consider all the associated environmental issues and opportunities for industrial symbiosis for the waste streams like red mud.

The UK needs to relinquish its position as the leading exporter of aluminium scrap in Europe and to change to using all this low carbon aluminium in the UK as far as possible and to consider importing this product as an alternative to primary aluminium. This can only happen if the UK market for aluminium scrap is developed to provide the necessary strong demand pull.

The more ambitious and interesting path for the UK is to re-establish its manufacturing base for aluminium fabrication. This will require investment in recycling facilities equipped with automated aluminium scrap sortation technology. This has already started in the UK with investment in X-ray based sortation on density equipment by companies like Scanmetals and Alutrade and laser-based sortation on composition equipment by Ripley. These few sites show the beginnings of the vision for the Zero Carbon aluminium future. The UK can become a world-leading exemplar of this aluminium industry transformation.

The aluminium industry can point the way for other metals to follow what is called the "primary" recycling route where end-of-life aluminium is returned at the same use level and is not down-cycled into less demanding applications by "secondary" recycling as is the case for most steel in high performance applications or even "tertiary" recycling where the recyclate is directly returned to the pot-line of a smelter for aluminium or into the blast furnace for steel.

This tertiary route is also the 180 predominant route proposed for plastic recycling. These changes will stimulate developments again like the uni-alloy beverage can, as the can end is made on a primary aluminium base, the low carbon recycled aluminium widget to replace the plastic widget in beer cans and eventually the low carbon uni-alloy automotive body-in-white. This will drive innovation for the Net Zero aluminium industry and the need for a Sustainable Aluminium centre in the UK to operate like the Sustain centre for steel and Glass Futures centre already funded as partnerships between the government and industry.

ALFED has made a bold move to consult stakeholders to develop a comprehensive understanding of the actions required and barriers facing the aluminium industry for addressing the "towards Net Zero" challenges. This is a timely and existential challenge for the UK and world aluminium industries.

Tom Jones. CEO, Aluminium Federation

INTRODUCTION

The need for decarbonisation, sustainable sourcing and transition to the circular economy were adopted in our early Roadmap[1]. These and the actions we identified are still critical, however, to fully reflect our ambition and align with other partners we will adopt the ESG model.

Our ambition clearly identifies that the work towards Net Zero is not just as a positive opportunity for change, but a direction which enables us to deliver a vision which is in our best interests. The world has changed since we started work on this report!

Your excellent contributions had already allowed us to develop a bolder and braver vision; had encouraged us to plan for greater collaboration and increased action. This vision will support the sectors step changes needed to meet Net Zero and realise the added value of these for our business and the economy.

With the war in Ukraine, this impetus and direction are even more important. There has never been a more important time to be working collaboratively across UK industry, to remain effectively connected with European and global partners and to do this in a way which allows us to also remain independent, to become more appropriately self-sufficient and crucially to use the challenge of meeting Net Zero to our commercial advantage.

We will not be distracted by the attempt to link ambition for Net Zero to the cost-of- living crisis. Reversing climate change is not a bargaining chip to be nit-picked over, it's the solution to the energy crisis / a route out of dependency and vulnerability and an opportunity for the UK to transition to a more successful and truly sustainable economy.

There is a cost-of-living crisis, we are still recovering from the impacts of Covid but, we need to be strategic instead of stepping back; getting behind growth in the UK industrial and manufacturing sectors to build the economy and use this growth to support living costs with increased jobs, profitability, and increased revenue for the treasury.

Every time I write, I say 'aluminium is key to change for the future', it never gets old! It is and we can, with other key sectors, combat the crisis we are facing globally, to work together and make the significant step changes we are capable of, for climate change, economic growth, and resilience in the UK.

Working with other sectors, we can collaborate and lead within the UK and globally drive a sustainable future.

My appreciation and gratitude to all stakeholders who have provided input and support for the development of this document, your time is precious, and your contributions are invaluable. Thank you!

We have a vision because we know long term planning holds the key to strategic delivery and we will work with the government on its emerging strategies to deliver a competitive sector.

This document reflects your vision, your plan for action and adaptation to achieve growth change and commercial advantage because of delivering on Net Zero. This is your Roadmap for the future of Aluminium in the UK.

As ALFED we are committed to working with you in greater collaboration to maximise the contribution of the UK.

[1] alfed.org.uk/policy-areas/sustainability/

ALUMINIUM AND THE UK ECONOMY

The aluminium industry is a vital part of the UK manufacturing sector and an essential component of the modern UK economy, which will play a key role in the UK's transition to a more sustainable future.

Recognising the lack of reliable data in this space, ALFED commissioned the Fraser of Allander (Strathclyde) report, which focused on the wider aluminium industry and crucially its connections with other elements of the UK economy:

alfed.org.uk/the-aluminium-industry-in-the-uk/

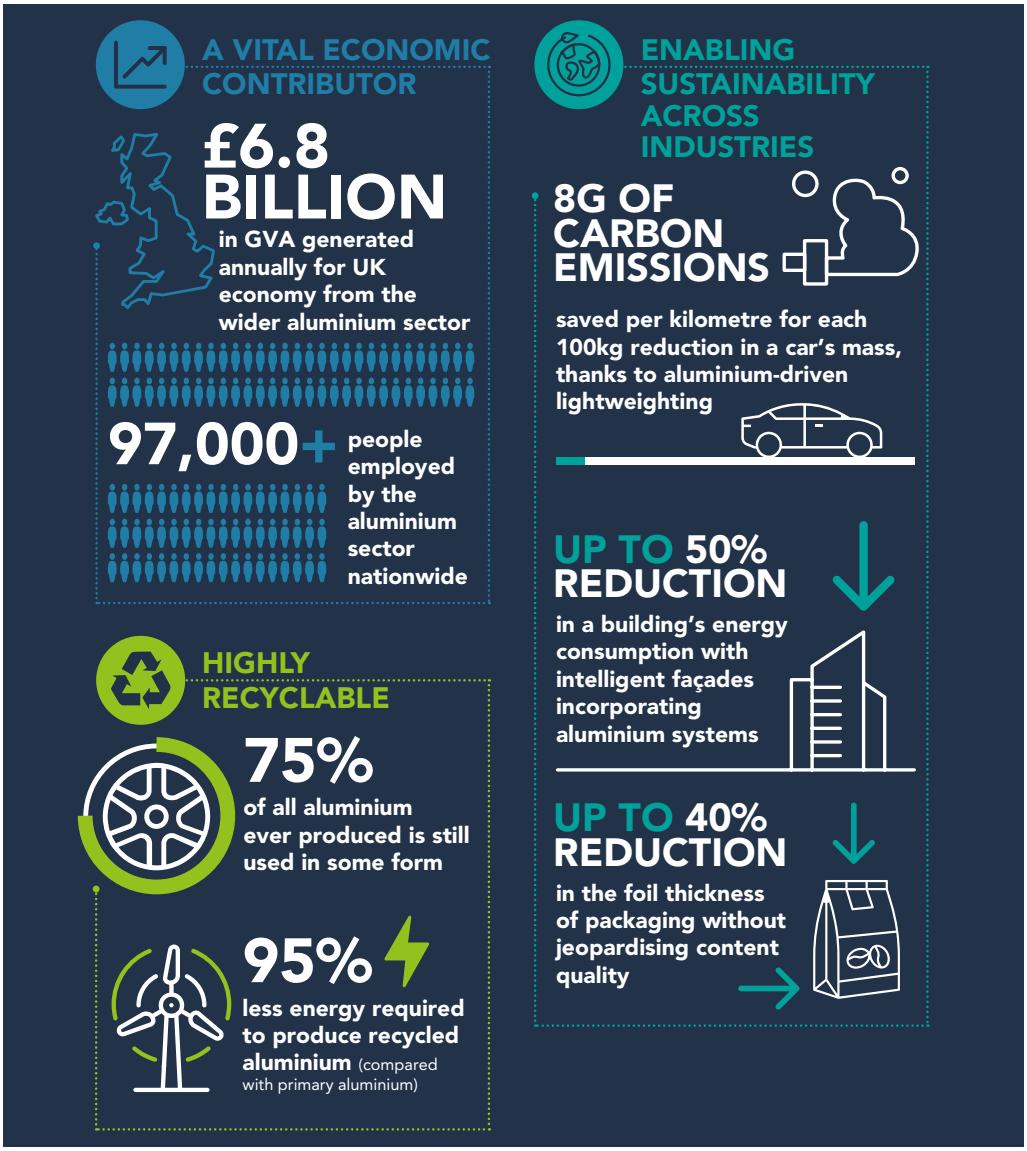
This work has demonstrated not just the value of the sector to the UK, but the added value of connections and relationships between aluminium and other industrial, manufacturing and service sectors.

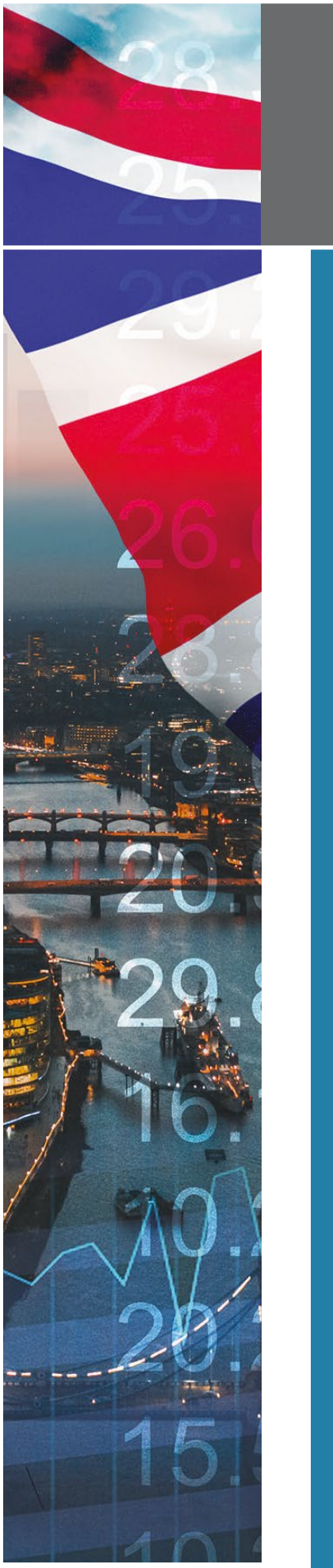
The report highlights the economic importance of our connections to other industries, and we will work harder to build partnerships in these spaces, to understand our common drivers, and to build momentum for change.

Common drivers

- Metrics
- Energy security
- Supply chains
- Inward investment
- Maximising the benefits of industry to society
- Levelling up

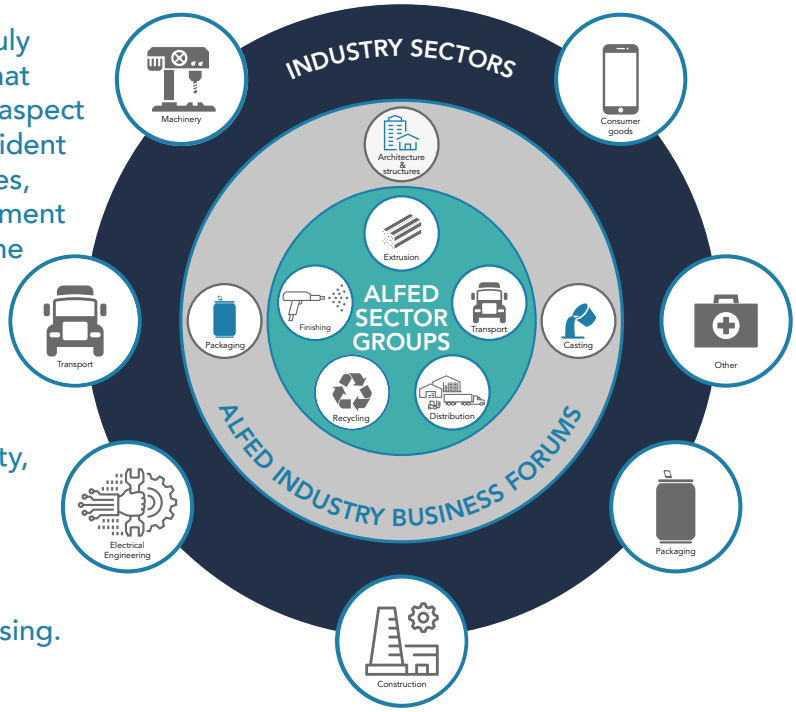
Building on this excellent work, we have commissioned Part Two, which will look in more detail at the wider value chain of aluminium companies, products, manufacturing and consumption.

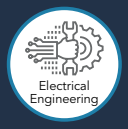




UK ALUMINIUM SECTOR

Aluminium is a truly strategic metal that dominates every aspect of society, it is evident in our living spaces, our close environment and certainly in the home. Domestic and white goods draw on every property of aluminium, not least its formability, ease of working, availability, and durability. It is strong, light and aesthetically pleasing.





Industry sector groups:

Machinery: Radical rethinking that has resulted in virtually all air conditioning systems being manufactured out of aluminium. In the United States, aluminium wiring is displacing copper.

Transport: Every kg of aluminium in a moving part - compared to steel will save its own weight in emissions and carbon over its lifetime. In the future lightweight aluminium transport will be designed for disassembly with high value alloy recovery for reuse and high value recycling.

Electromotive: Some of the least appreciated properties of aluminium are revolutionising power storage, transmission, distribution, electromotive drives, and propulsion. Weight for weight aluminium has 200% the thermal and electrical conductivity of copper, with lightweight aluminium, high voltage cross country transmission lines are reducing the loads on pylons, so increasing spacing, and thus reducing environmental impact.

Construction: For longevity in construction aluminium is potentially the lowest energy footprint of any material. Exposed to regular rainfall it is virtually maintenance free and frequently termed an electrical battery, the longer buildings stand, the greater the saved energy. At the end of life, buildings are large structures of known aluminium alloys, largely free from pollutants and optimal for recycling.

Packaging: Aluminium is an absolute seal to gases, liquids, impervious to air, bacteria proof, and a total barrier to light and ultraviolet light with no degradation. It protects and extends the useful life of food stuffs and pharmaceuticals for years, perfect for vacuum packs and strong enough for pressurised cans.

Consumer goods: The ability at moderately high temperatures to be readily extruded sets aluminium apart from all other metals. The ultimate “Net Shaping Process”, most versatile of all metal forming process; “designers can put metal where they need it”.

In health, harnessing the corrosion resistance and thermal properties of aluminium, air conditioning systems provide hospitals with clean, filtered, temperature and humidity controlled pure atmospheres. The cryogenic properties enable the production, liquification, storage and distribution of life, saving oxygen and anaesthetic gases and enable drugs, tissues, and vaccines to be stored at ultra-low temperatures.

THE ALFED SECTOR GROUPS AND INDUSTRY BUSINESS FORUMS

We bring together the entire UK aluminium value chain including primary and secondary producers, extruders, finishers, distributors, recyclers, aluminium casting, packaging, transport and architecture & structures producers – helping everyone involved in UK aluminium make connections for mutually beneficial business and supply development.

ALFED sector groups:

Extrusion

Members are involved in the production of extrusions and sections, and first operations, including cold drawing and distribution, main markets are automotive and architectural.

Transport

The ALFED Transport Sector Group includes automotive, aerospace, rail and shipping sectors. Vision is to create an automotive aluminium supply chain to lead change, to lead the use of aluminium in the UK automotive supply chain to foster sustainability, innovation and customer value. Members include all tiers of automotive manufacturing and the entire supply chain (including extruders and distributors).

Distribution

Members include importers, traders, transport, logistics, distributors, and stockists, and first operations serving all market sectors.

Recycling

The UK aluminium recycling sector's shared vision is to support aluminium circularity's full potential and assist in the transition to a more sustainable and innovative UK industry.

Finishing

Members are involved in anodising and/or powder coating aluminium for all industry sectors. They manufacture and supply pre-treatment chemicals, passivates, powder coating, sealants and the actual anodising and/or powder coating "applicators".

ALFED industry business forums:

Architecture & structures

A complete supply chain including extrusions, sheets, fittings, assembly and manufacturers of all architectural items from window to complete buildings, including coaters.

Casting

Members supply ingot, fluxes to the casting trade, actual casters that produce castings.

Packaging

Members manufacture and supply aluminium sheet and foils, collect scrap and reprocess and manufacture packaging, pouches, cans.

Andrew Perchard,
Edinburgh
Napier University
Business School

STAKEHOLDER ENGAGEMENT

Sustainable growth through cooperation

Aluminium lies at the heart of ambitions for achieving more sustainable cities, transport, and societies and is critical for modern society.

Though aluminium is typically cast as a young industry, it has operated in the UK for over 160 years. From its infancy aluminium has faced challenges arising from a lack of markets, through war and supply surpluses, from competition presented by other materials, threats to supply chains and price volatility.

The industry has risen to those challenges and embraced opportunities arising from technological innovations, certainly, but also through organisational adaptation and resilience. The technological innovations in the 1960s and 1970s onwards have served to reduce emissions in primary and secondary production.

Few other materials have so consistently led the way in end-of-life recovery and recycling overtime. There is always scope and an imperative for the industry to improve on this.

A striking characteristic across the industry's history, underpinning both technological and organisational innovation, has been a recognition of the value of cooperation; across firms and national industries, with government, universities, and society at large.

That cooperation has sustained the industry through turbulent and straightened times. Whilst mention of cartels conjures up negative connotations, and the initial international collaborations between the first stage movers in the aluminium industry certainly did seek to freeze out new entrants and control pricing through the 1920s and 1930s, the collaborative initiatives of the main aluminium industry players, through the Aluminium Association then the Alliance Aluminium Company, around marketing, research and development and transport, sustained and provided a basis for growth in a challenging socio-economic context.

Even when those initiatives were eroded by the rise of totalitarianism and the world was thrown into another war, those international partnerships and cooperation prevailed to some degree. Industry cooperation after the Second World War was evident in the creation of bodies like the Centre international pour le développement de l'aluminium (1950), the European Wrought Aluminium Association (1953), the Organization of European Aluminium Smelters for the Secondary producers (1960), and ultimately the International Aluminium Institute (1972) and European Aluminium (Association) (1981).

The most recent of those cooperative undertakings, the Aluminium Stewardship Initiative, formed in 2009, is expressly concerned with addressing the need for sustainable initiatives within a global industry.

Equally the industry has a long experience of cooperation with government and universities. In the case of the former that has not always been a happy one but in many other cases it has been a constructive and productive one, governed by a pragmatism from both parties.

ALFED, which this year celebrates 60 years, reflects these traditions, and has embraced such cooperation from the outset, taking up from where its parents, the Aluminium Development Association, and the Aluminium Industry Council, left off. ALFED, like its predecessors, has sought to do this through cooperation with a variety of stakeholders seeking innovations, including to tackle emissions from and the impact of the industry. This includes initiatives for end-of-life recovery of the metal.

As the profile of the UK industry has changed profoundly, from one dominated by large vertically integrated producers to one of many interconnected small and medium sized firms in the downstream, so the role of the Federation has become all the more salient as a voice for aluminium.

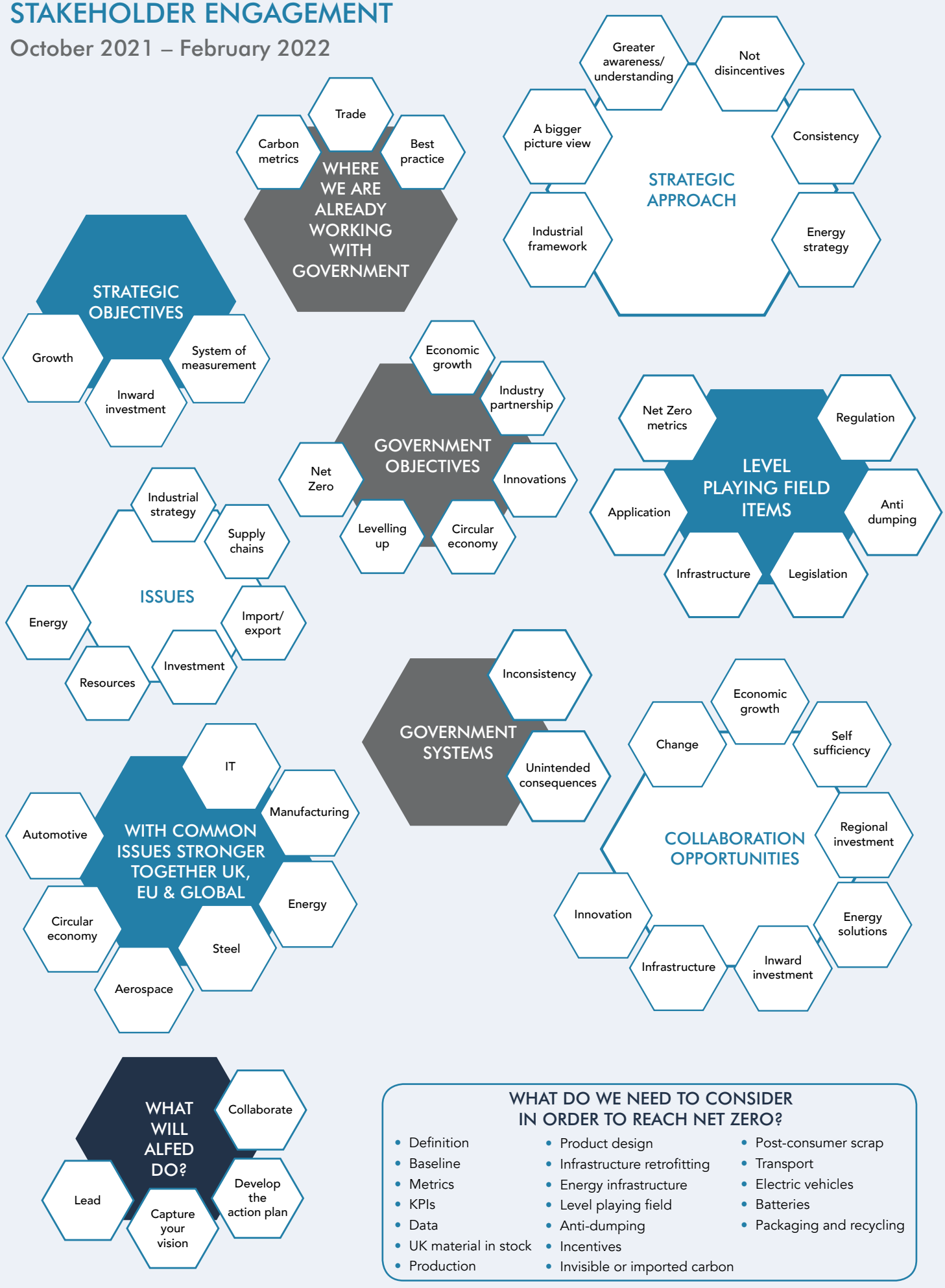
In confronting the challenges, and its responsibility to future generations, to meet the climate change crisis, while contending with social and political upheaval, and the needs of society and the economy, the aluminium industry will benefit from drawing upon those traditions of cooperation across firms, with civic society and across borders.

For it is through such collaborations, as the history of the industry so clearly demonstrates, that aluminium can seek solutions to significant specific questions around climate change, energy efficiency, emissions, and security of supply, whether that be between ALFED and its international counterparts or in encouraging the UK government to find common ground and partnerships with the EU's critical raw materials initiatives.

Cooperation will be pivotal to finding sustainable solutions to the profound challenges of our age and leaving a responsible legacy for future generations and placing aluminium, placing aluminium at the heart of those.

STAKEHOLDER ENGAGEMENT

October 2021 – February 2022



WHAT DO WE NEED TO CONSIDER IN ORDER TO REACH NET ZERO?

- Definition
- Baseline
- Metrics
- KPIs
- Data
- UK material in stock
- Production
- Product design
- Infrastructure retrofitting
- Energy infrastructure
- Level playing field
- Anti-dumping
- Incentives
- Invisible or imported carbon
- Post-consumer scrap
- Transport
- Electric vehicles
- Batteries
- Packaging and recycling

YOUR RESPONSES

Your responses have been both detailed and strategic, there are some significant issues we have been struggling with for some time, but despite these you have ambition and vision for the future.

1. Your direction to ALFED and for the sector collectively, is for us to take leadership and maintain a global view.
2. To focus on collaboration, taking a systems approach to solution development and delivery, maximising economies of scale and sweating proximity. The burning platform that is climate change - enormous and terrifying as it is - needs to be seen as an opportunity for reinvention!

Our sector objectives at their core are change and growth – to be a part of the solution that sees the UK achieve Net Zero and to do so at a profit.

- The current energy crisis demands time and resources that are being diverted from future planning and profitability
- Energy taxes in addition to high prices are impacting our ability to invest in low carbon technology
- There is no alternative system to support investment
- There is a lack of critical UK infrastructure to support the industry
- Level playing field items including anti-dumping need to be addressed
- In the UK we are not a major aluminium producer and are vulnerable as a result
- Supply chains for critical raw materials are also not under our control
- Magnesium specifically is an area of immediate vulnerability

There is currently no end in sight – and whilst there are many solution options and programmes of work for each of these issues, we need to be able to stand back and look at what needs to change? For example, how can we either live without magnesium, or how can we invest in new technology which allows for its recovery? In the UK we are both successful and to a great extent in crisis.

Whilst the energy market is arguably the most significant current problem, without a coherent UK framework, individual businesses are left focusing in the short term on the most pressing issue of the time rather than planning strategically for the future. This reactive short-termism is bad for business and the economy. This is in stark contrast to China with its resource strategy plan that is refreshed every few years. The combined effect of energy prices, exiting the EU, the impacts, and aftermath of Covid 19, alongside the need for economic recovery and growth, have created many questions and problems to solve.

At present, we could be forgiven for wringing our hands or we can say that we have a burning platform, and we will use it to reinvent our industry - we did it before we can do it again. We can be bold about our ambition and our vision – it is about leadership - it is about collaboration; its' compelling and the UK needs that right now! Somebody must be first to say not just I can, but we can, and look at the added benefit and profitability we can achieve along the way!

Cooperation will be pivotal to finding sustainable solutions to the profound challenges of our age and leaving a responsible legacy for future generations, placing aluminium at the heart of a resilient and sustainable economy. Your challenge to ALFED moving forward is for us to take a truly global view, to focus on leadership and collaboration within and across sectors to implement our vision.

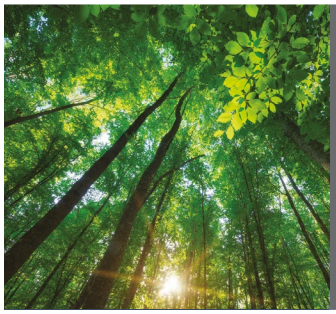
The lack of a UK industrial framework has meant that instead of taking a strategic and competitive approach to delivering our vision for the sector, we are, being driven to firefight, forced to look at specific problems or solutions in isolation. This is suboptimal not just for our sector but for the UK economy.

When looking at the energy market, instead of the sector working within a plan for the future of aluminium; -

Such as how to deliver ground-breaking production, manufacturing, and energy efficiency alongside an optimal suit of infrastructure, delivering renewable energy of the right type in the correct geographic location.

We are instead focusing on one solution, like hydrogen. It's not that hydrogen isn't a brilliant part of the energy surety answer, it's just that focusing on one piece of the puzzle leaves out the enormous potential, efficiencies, and opportunities across other sectors and linked policy aeras.

Energy efficiency first and foremost, maximising renewable energy production and then longer-term energy solutions, but not in isolation and not as an abstract solution to the current energy crisis for aluminium but a longer-term enabler for UK energy security and a resilient economy.



As a minor producer, our contribution to the environmental cost of primary aluminium production is minimal, however, the UK imports significant quantities of raw material along with the imbedded and currently invisible carbon from producers and products made in other countries. Our focus on recycling is crucial, but we can't avoid the issues of production and import if we are to be effective and transparent in achieving our goals.

Global demand for aluminium is high and will continue to grow, maximising recycling and maintaining material value at the highest level are the obvious first steps – and we will take full advantage of our potential here but ultimately, we also must ensure that the carbon footprint for primary aluminium dramatically reduces. We understand that although advances are being made the quest for low carbon, prime aluminium will take a long time and will involve the expenditure of billions of dollars. This quest should be a shared journey for the aluminium industry worldwide, rather than in the hands of individual companies seeking to gain a competitive advantage.

The ELYSIS™ inert anode based on a much earlier Alcoa invented technology that has been described as the greatest breakthrough in the aluminium industry since the late 1800s, has the potential to completely revolutionise global primary aluminium production. Rather than CO_2, the ELYSIS process reduction cells emit pure Oxygen by replacing the carbon anodes traditionally used in aluminium pot lines with inert, proprietary materials. To date, little has been disclosed about these inert materials and the intention is for the ELYSIS company that is a joint venture company led by Alcoa and Rio Tinto to license its technology for new smelters and for retrofit of existing smelters. In June 2021, it was announced that construction had started of the first commercial-scale prototype cells using the ELYSIS' inert anode technology, at Rio Tinto's Alma smelter in Saguenay-Lac-Saint-Jean, Québec.

The UK aluminium industry might have no active role to play in the global quest for Zero Carbon primary aluminium that has been running intermittently for at least four decades or more, but should certainly be sourcing its primary aluminium in all its imported forms from sources of the lowest carbon intensity provided this is available at an acceptable market price. Whilst the pull for these changes will be led by global brands and their sustainability commitments and by a more informed customer base demanding Net Zero products, we have an opportunity in the UK to lead rather than follow in realising this crucial change. The quest for Net Zero must not be at the expense of other sustainability targets resulting from other by products or waste streams or other environmental pollutants or excessive water consumption or habitat destruction for example.

Maintaining the value of material at its highest level requires a deliberate approach for resource management as opposed to the current systems of management which meet required regulations but loose value as a result. It will require great capture and crucially sorting to ensure material is retained at its highest value. China implemented a long-term natural resources strategy for control over exploration, production, pricing, and exports with a long term strategic Five-Year Plan in 1953. China has been thinking and planning for maximum control of natural resources for nearly 70 years. These long-term planning decisions have created a situation in which much of the world now relies on China for critical natural resources. The UK aluminium industry has the opportunity to break away from this reliance.

Technological advances will allow for recovery and capture at increasing levels of purity however moving towards an in-stock view rather than discarded as waste one, is crucial to the sorts of revolutionary changes we will need to achieve as aluminium and across other sectors.

These are complex issues and unfortunately the combined legislative, regulatory and policy framework in the UK in this space currently runs counter to government objectives.

Professor Geoff Scamans, Innoval

OUR VISION

ALFED with our members, partners and networks will work together in greater and greater collaboration to maximise the contribution of the UK aluminium sector in achieving the transformation to global Net Zero and by 2030 - 50 will ensure that: -

1. All aluminium production recovery and recycling will be net zero by 2050
2. 100% of all aluminium in the UK will remain in use at its highest value
3. Design for aluminium component reuse and disassembly is the norm
4. UK aluminium supply chain will be globally competitive, sustainable, and robust enough to meet growth and capacity
5. All current and all legacy; bi products, wastes and process residues will be utilised, converted, or recycled to maximise value retention and environmental benefit
6. By 2025 Sustain Aluminium will have an internationally respected UK centre affiliated to many UK and Global Academic institutions

- This facility will benefit from UK European and international funding to support R&D new technologies and cross sector initiatives
- The Sustain virtual site will contain or be linked to state-of-the-art R&D facilities including the AI Carbon neutral demonstrator
- As a series of sites, they will be CO_2 negative and a net energy exporter

Driving innovation and change

The biggest problem currently facing the UK sector in the long term is not energy prices, it is being held hostage globally for material.

The more ambitious and interesting path for the UK is to be clear about where we want to get to as a sector - how we want to be developing aluminium use in the future. We can use this plan to look at what changes that will mean and then how to get there.

For example, re-establish the UK manufacturing base for aluminium fabrication by expanding capacity for rolling block and billet casting, sheet and foil rolling, extrusion, forging and shape casting. The key to Net Zero then being the supply of these facilities as far as possible from end-of-life aluminium scrap sources rather than prime aluminium. Naturally these facilities should also be fed with as much prompt scrap from the UK's manufacturing plants that make cans and automotive closures for example.

The UK needs to relinquish its position as the leading exporter of aluminium scrap in Europe and to change to using all this low carbon aluminium in the UK as far as possible and to consider importing this product as an alternative to primary aluminium. This can only happen if the UK market for post-consumer aluminium scrap is developed to provide the required strong demand.

This will also require investment in recycling facilities equipped with automated aluminium scrap sortation technology. This has already started with investment in X-ray based sortation on density equipment by companies like Scanmetals and Alutrade and laser-based sortation on composition equipment by Ripley. These few sites show the beginnings of the vision for the Zero Carbon aluminium future. The UK can become a world-leading exemplar of this aluminium industry transformation.

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These changes will stimulate developments again like the uni-alloy beverage can as the can end is made on a primary aluminium base, the low carbon recycled aluminium widget to replace the plastic widget in beer cans and eventually the low carbon uni-alloy automotive body-in-white.

This will drive innovation for the Net Zero aluminium industry and the need for a Sustainable Aluminium centre in the UK to operate like the Sustainable Steel and Glass Futures centres already funded as partnerships between the government and industry.

> "The Federation and the industry's initiative to achieve Net Zero represent the latest in a history of actions to maintain the industry's resilience and sustainability.
>
> ALFED'S drive for renewal and re-invention has been a feature of its 60 year history."
>
> Andrew Perchard, Edinburgh Napier University Business School

> "This plan reflects the need to be an Industry with a vision and programme for the future, leading rather than waiting to be led."
>
> Chris McDonald, Materials Processing Institute

TRANSITION

This sort of change can't happen overnight and if we look in the period it has taken to complete the stakeholder interviews and draft this document a number of businesses have found the trading environment extremely challenging.

Staying the same cannot be the solution

We see an opportunity to lead changes with our members for the sector to work collectively to evolve into something better.

This vision and plan is our first step into continuing to think and act independently whilst also acting collaboratively towards our strategic goals.

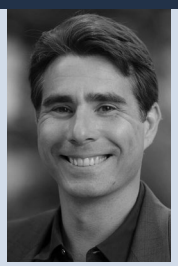
Do we:

- hold all the material we have in the UK and add value?
- answer the equation for carbon neutral aluminium?
- maximise material value in life?
- innovate?
- attract low transport scrap and process for enhanced value?

Should we:

- develop and deliver a scheme which allow UK business to access resources to support the transition to a net zero model. How can these be embedded within individual organisations to become the tailored experts, with training, development and ongoing support provided through various partner institutions?
- maximise the take up of energy initiatives available to ALFED members. Capture, share and celebrate the energy efficiency achievements and renewable energy investment within and alongside the sector?
- support career switch and apprenticeship programmes to enhance the sectors access to crucial skills and resources?
- work with regional partnerships to deliver local energy infrastructure and UK aluminium specific assets?
- support a demonstrator project for a company making the transition to green hydrogen - e.g., contracted energy purchase with a partner making the infrastructure investment. A learning and open book study demonstrating solutions to known or suspected problems as a pilot to share and celebrate?

ASI – Supporting transition



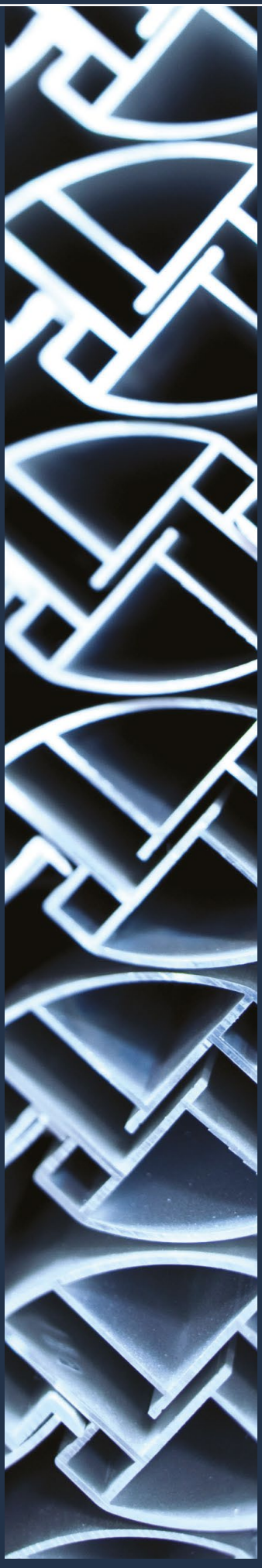
Chris Baylis, Aluminium Stewardship Initiative

Under a 1.5-degree scenario, the aluminium sector must reduce its GHG emissions from over a billion tonnes of CO2e to around fifty million tonnes by 2050. This is less than one-twentieth of current emissions. (ASI)

A theme of the communications from Glasgow, by both Parties and other participants, is that climate action at the scale and speed required to achieve net zero by mid-century is only possible through co-operative action and partnerships. This is clear for the aluminium sector, which has been identified as "hard to abate" and on which work is now focused by the Mission Possible Partnership.

ASI has been involved with the Partnership's Aluminium for Climate Initiative since its inception, with an objective to ensure harmonisation between the Initiative and all the other activities referenced above, to encourage the use of common methods and standards and to use ASI's Standards to drive change along a 1.5°C Pathway.

https://aluminium-stewardship.org/asis-position-and-direction-on-a-1-5c-pathway-aligned-aluminium-sector
https://aluminium-stewardship.org/climate-cop-26-outcomes-and-asi-alignment
https://aluminium-stewardship.org/low-carbon-aluminium



COLLABORATION, CONNECTIVITY AND CONTINUITY

Working towards Net Zero is necessary and done right it makes good business sense, is good for industry, good for the economy and it's good for the UK.

To achieve this vision, we will work collaboratively to maximise the contribution of the UK aluminium sector in achieving the transformation, such that all aluminium production recovery and recycling will be Net Zero by 2050.

Working towards Net Zero requires a plan...

Delivering on the Vision

- Mapping: ALFED will work with sector, non-sector, and knowledge partners to develop UK industry mapping tools to facilitate greater industry collaboration. Supporting the development of subsector, cross sector and regional opportunities for intervention and infrastructure.
- Infrastructure: ALFED will work with our sector and knowledge partners to understand the key additional infrastructure needed in the UK to support the appropriate self-reliance of the UK sector.
- Sector and cross sector initiatives and projects: ALFED will review and integrate our involvement across all current initiatives, to maximise communication and benefit for all contributors.

ALFED will make the business case to government for investment in aluminium in the same way as Glass Futures / Sustain Steel - The Fraser of Allander Institute reports parts I & II are key components of this, as is the production of this stakeholder document and associated case studies.

ALFED will work with existing and new UK, EU and International partners and government to develop the collaborative relationships and tools necessary.

- New infrastructure / self sufficiency
- A bespoke programme to maximise sustainable solutions and uses for bi-products and wastes
- We will have key UK facilities to support demand for aluminium
- Renewable energy transition
- Planned uptake for new sustainable aluminium products
- State-of-the-art capture and recovery systems for post-consumer and in stock recovery
- The sector will have strategic relationships across related and complementary industries
- A clear understanding of the UK stock of aluminium with timeframes for recovery

Professor Matthew Winning, UCL

"The complexity of decision-making requires not only a mapping of technologies and levers within the UK aluminium industry's direct control to achieve its vision for the future, but also an understanding and mapping of wider government objectives, and how these intertwine.

Government objectives may be directly or indirectly linked with ALFED's goals, and it is necessary to consider both current and potential future objectives. For example, low-carbon and competitive industrial electricity prices are absolutely key to the sector and how such prices are practically achieved within the context of the UK Industrial Decarbonisation Strategy are fundamental to all."

Alvaro Calzadilla, UCL

"While we cannot predict the future for UK aluminium, we can use new tools and models to consider the ways in which the future might play out.

The use of scenarios can help us analyse what types of goals and policies may or may not be beneficial for the industry, downstream sectors, exports, and the wider economy including consumers. In particular, scenarios which achieve various levels of scrap utilisation in the UK can be considered."

New Tools

During the development of this work, particularly in phase two interviews we have been asked if scenario modelling will form a part of this work, the answer has been, yes – as a next step!

In order to move this forward ALFED are committed to working with our colleagues in academic institutes through the various projects and programmes to maximise our relationships with Strathclyde, Cranfield, UCL, UKRI and others as well as the benefits of projects such as Transfire and Circular metals;

1. To explore the potential for scenario modelling and systems mapping for industry and government
2. To align this work with the action plan for greatest contribution and use
3. Create a joined-up programme of work for:
   - Supply chains
   - Systems
   - and related UK Industry mapping

Collaborating with academics within and across industry to present common intel - measured proposals and direct support for action and activity which supports governments objectives.

Working with Government - to achieve a commercial environment where business can thrive rather than survive. There are calls across the SH group for work on the industrial strategy, but from a more wholistic perspective - this is not separate to the strategy for economic growth, the circular economy or levelling up, but takes the systems approach and includes longer term objectives for infrastructure transport etc.

Government don't do this, and we are not asking for it, but by working with the collaborative academic group using scenario modelling we would like to include work with government to test alternatives in the longer term against the status quo. In this way we can map options, unintended consequences and demonstrate options or opportunities.

With our academic partners, world class institutions with robust global macro-economic models, we will work to deliver new scenario modelling tools - to map how these systems currently work, and to develop and test what if and change options for optimal action and intervention.

HOW

Accelerating change is essential if we are to address the burning platform that is climate change whilst thriving as an industry.

Minor step changes or evolution are no longer enough, and we will need to be radical to succeed. Why Aluminium (https://alfed.org.uk/why-aluminium/) explores the potential of aluminium as an enabling material to support decarbonisation of sectors and services critical to a circular and net zero economy – mobility, buildings & infrastructure, food, and energy security to name a few.

All aluminium however does not have the same environmental impact, and we are on the cusp of a seismic shift which could ensure that primary aluminium be produced without any direct greenhouse gas emissions from the smelting process. This revolutionary step means that with the right support, global carbon dioxide emissions from smelting could be reduced by 20% over the next 30 years.

This would require global adoption of new technology and significant investment in new renewable energy infrastructure, but this is how seismic changes are made! We are proud as an industry that 75% of all aluminium ever produced is still in use, but there is a global challenge we need to meet to ensure the embedded carbon of all aluminium is retained. More than retained however, we need to deliver on a further shift to ensure the value is retained at its highest level.

Current practices which whilst ground-breaking in their time, recover high value alloys for down-cycling rather than value retention. Reinvention is the name of the game and whilst the temptation is to push back from this level of change as all too difficult, we need to see that these changes are in our commercial best interests, as well as that of the planet.

Shredding of cars ensures 97% recovery of material for recycling, but it's a blunt tool which sees the higher value materials downgraded.

Designing cars for disassembly may once have seemed like a future state solution, but in real terms if we are aiming to maximise resource efficiency and keep unit costs down, its as realistic as infinite packaging - refillable at your local supermarket - not just achievable but eminently and commercially sensible.

Realising energy and process efficiencies should be a minimum effort target, yet in our drive to commercial 'efficiency' just in time and lean manufacturing, we have reduced our ability to flex and invest the relatively small resources required to understand, change, and deliver in this space.

A more radical approach is also required when looking at inward investment and key infrastructure delivery. For too long we have looked to government for leadership here and we need to recognise that instead, it is industry who need to drive change. That we will need to form partnerships with other sectors to understand opportunities for shared investment, new systems, and collective action. This extended collaboration will inevitably support our work on energy security and robust supply chain development and as ever, will lead to those extra advantages and areas of interest only ever achieved because of shared endeavour.

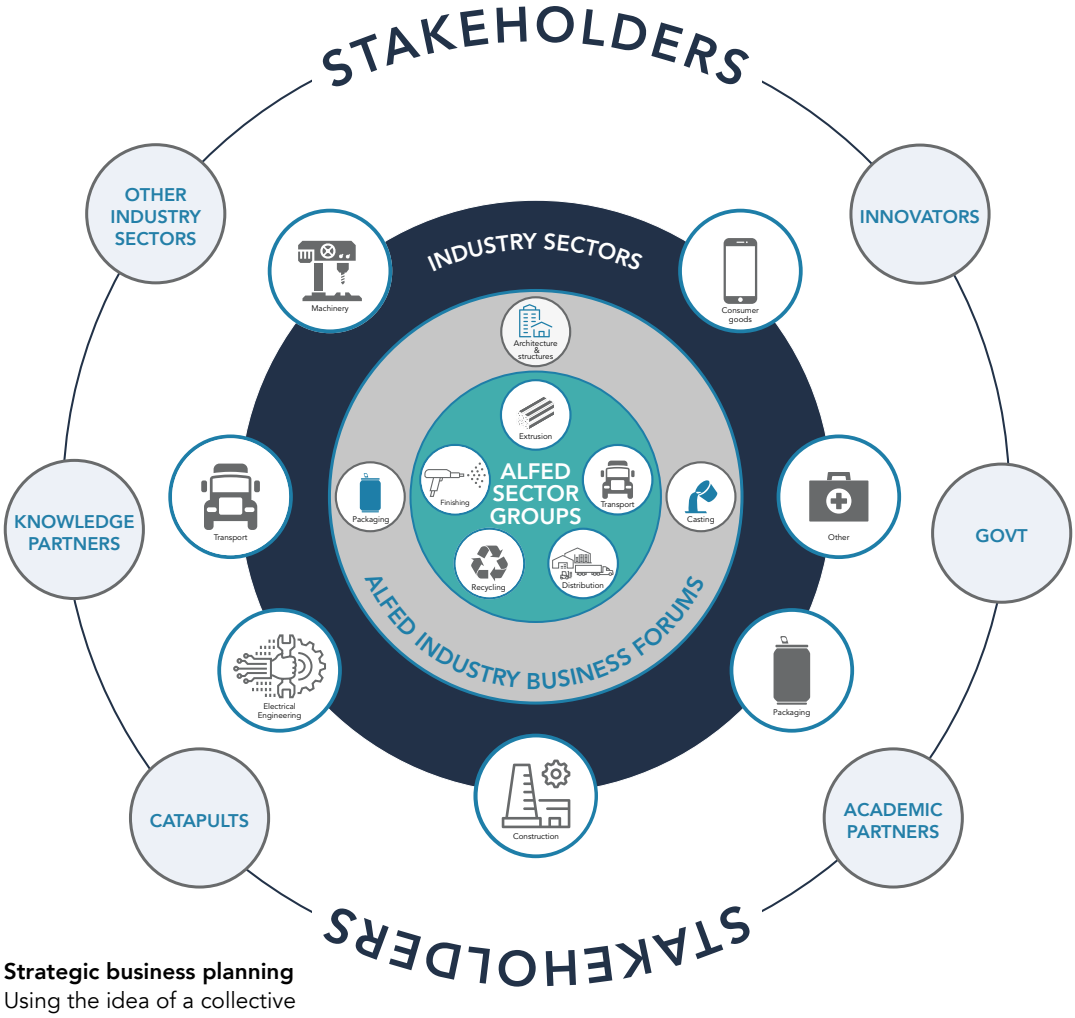
As Andrew set out: "In times of crisis we have proved that we can band together to generate new ideas, new systems and new solutions, we need to do that again now and we are fortunate to have many of the elements in place to support this."

How

Achieving Net Zero is not possible in isolation and we don't have the luxury of time to try, we need to maximise the benefits of shared objectives and available funding to harness our full potential.

The sector isn't a multinational company with an inexhaustible suit of resources, but we are a collaborative - we have rules of engagement and a series of talented leaders, innovators, and delivery professionals. Action here benefits us all and our proposal is to formalises these structures for collective endeavour as a virtual team.

We will work with members, the sector groups, our partners, and government



Strategic business planning
Using the idea of a collective sector within the UK with a plan for active collaboration.

to develop and deliver a multi streamed programme of work. Working collaboratively in a coordinated way across the UK, adopting a common vision and moving forward with delivery of the action plan. The sector groups will lead key streams of work with project calls for greater involvement in specific new initiatives.

The action plan set out in the final pages provides our first pass at the key areas and opportunities. It reflects your ambition and your drive for action and adaptation to meet Net Zero and to become more resilient individually and collectively and crucially to profit whilst doing so.

Who?

The image above sets out our idea for a virtual team, comprised of existing board members and key stakeholders, organised through the structures we already have in place. Our expectation is that this will evolve and change as we move forward but for now it provides a framework which is inclusive of the wider sector and of our members.

ALFED will continue to work with you in developing this model to allow for changes as well as new projects and programmes of work overtime. Reporting and communication are key, and we will ensure robust and iterative systems are put in place.

A key milestone for delivery will be the successful business case for the Sustain Aluminium hub. Delivery of this crucial step change will provide us with a focal point, resources, and funding to support and accelerate our programme of work.

Ian Scattergood, National Account Manager, Zenergi

KEY AREAS FOR ACTION AND PROGRAMME DEVELOPMENT

These four examples are some of the areas you have identified as priorities for project and programme development.

Energy efficiency is sexy!

We need to invest the time and our expert resources into saving energy wherever possible, the economics stack up and we will work with you to develop the systems and tools to support these crucial changes.

Understanding where our business can become more self-sufficient, self-generation, be it PV, geothermal or low-grade heat recovery and streamlining the process for delivery.

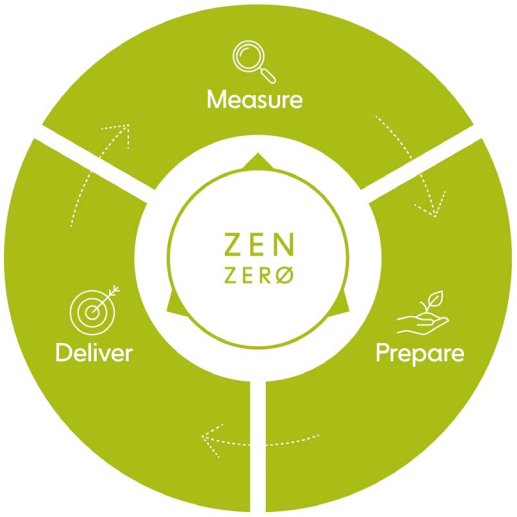
Linking these actions to process and resource efficiency as well as to finance where available.

ALFED will work with members and our partners to develop and deliver this key programme of work.

Zenergi is built on the belief that there is a brighter, better way forward for the energy industry. As an ALFED knowledge partner, Zenergi's highly experienced and qualified energy engineers can support your transition to Net Zero.

ALFED members can also benefit from our free on-site scoping survey, using your existing data to identify energy saving opportunities and options for renewable generation.

If it hasn't already, your journey to Net Zero can start today and Zenergi can support your organisation, every step of the way. Our service levels can be tailored to suit your organisation's individual requirements.



	Zen Zero Assist	Zen Zero Manage	Zen Zero Attain
Typical customer profile	In house specialist resource	Limited in-house resource	No in-house resource
Commercial model	Proposal: Per service	Retainer: Fixed days per year	Performance: Share of savings
Contract	Service agreement	Service agreement	Partnership agreement
Scope	Case by case basis	Flexible access to services	Full suite of services

Energy infrastructure

It has been nationally acknowledged that we will have to get smarter about energy investment to support industry. Resolving the barriers for finance in making the switch to renewables is crucial for UK resilience.

There is no silver bullet, hydrogen will not be the answer for everyone, and a composite solution will be required, tailored geographically and in accordance with industry need.

Delivery of key infrastructure needs to ensure self-sufficiency for energy now and in the future.

Collaboration and funding

The sector isn't a multinational company with an inexhaustible suit of resources, but we are a collaborative - we have rules of engagement and a series of talented leaders, innovators, and delivery professionals. Action in this space benefits us all and our proposal is to formalise these structures for collective endeavour as a virtual team.

Enhanced and deliberate collaboration across UK Industry

Aluminium, as with other UK Energy Intensive industries, has been working together under the Industrial Decarbonisation agenda for some time - now working with UKRI and others our focus needs to be engagement across nationally significant issues and opportunities to sweat the benefits of our commonalities, as well as to consider where regional or joint initiatives and infrastructure can be developed and delivered.

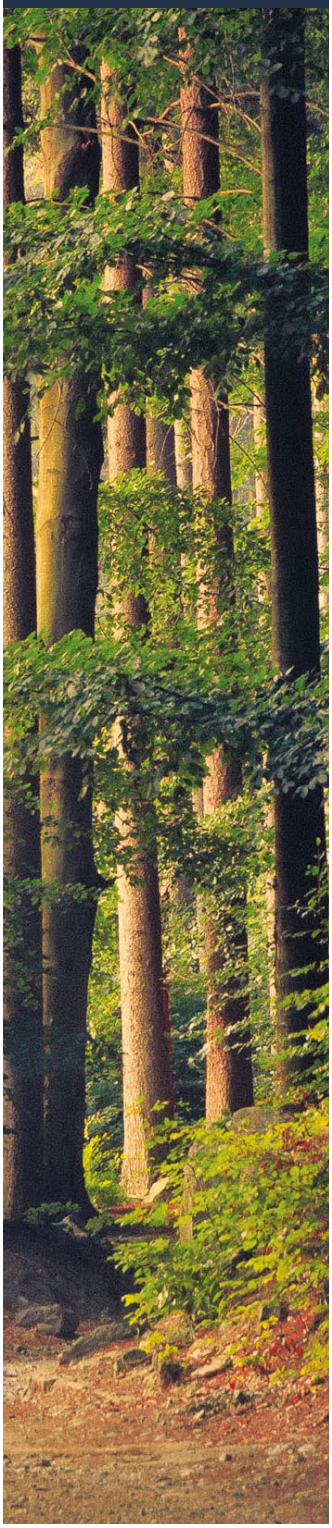
Building a deliberately rich picture of where and how our sector relate to other industry regional centres, academic partners, and government programmes. Developing partnerships and engagement across common issues, using mapping and scenario modelling to determine areas for optimal intervention and inward investment - such as proximity based shared energy infrastructure for region or an aluminium sector in a shared energy infrastructure for a geographic area, or an aluminium sector specific investment for appropriate self-sufficiency e.g., salt slag processing.

Significant funding opportunities for the sector and for collaborative initiatives related to the Circular Economy, Net Zero, Energy, R&D, supply chains, critical raw materials and many others will be better targeted with this joined up approach.

For our sector - Maintaining competition whilst cooperating and coordinating through Sustain Aluminium - taking the vision and testing it through individual and grouped businesses. Circular Economy and proximity with a view to UK self-sufficiency where appropriate, with a collective Research & Development approach for overall sector benefits.

> The £36 million invested by Innovate UK and industry in (*these) Collaborative R&D projects could lead to major investment in UK based aluminium manufacturing based on end of life aluminium scrap recycling of the order of £500 million to £1 billion over the next few years - Not a bad return on this investment…
>
> Professor Geoff Scamans, Innoval

Nadine Bloxsome,
Membership &
Sustainability Manager,
Aluminium Federation



LET'S KEEP TALKING

This stakeholder document vision and outline action plan represents the best thinking of the stakeholders and knowledge partners involved to date. It is not the whole story, and we may not have all the right first steps.

What we know for sure is that we can't wait to have everything picture perfect before we start. We need to keep talking and listening, evolving the plan whilst we get on with delivery.

As I take on this new role to help outline ALFED's sustainability strategy, I am keen to work closely with members in order to deliver programmes that directly impact the future of a circular economy.

Please do let me know your views, share where you think we are on the right track and where you need us to think differently, but most importantly, let me know where and how you want to be involved.

The possibilities are endless, from more regular updates on a particular subject, through bid development, to involvement or leadership of an initiative or project. Collaboration is going to be key within our sector and across others. We have more in common with our industry and manufacturing neighbours than we have differences, and we will need to work together to build bigger conversations and bigger opportunities for change and resilience in the UK.

Nadine Bloxsome
Membership & Sustainability Manager, Aluminium Federation

WITH THANKS

Thank you to everyone who has helped us to shape and deliver this report.

Special thanks are extended to all stakeholders who participated, as well as the contributors, the exceptional team at ALFED and Clare Saunders, for her thorough and engaging approach to help develop a vision, which is truly reflective of our sector and provides a tangible plan for action.

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ALFED
ALUMINIUM FEDERATION

THE VOICE OF THE UK ALUMINIUM INDUSTRY

WORKING TOGETHER WITH OUR MEMBERS AND KNOWLEDGE PARTNERS, WE'RE ACTIVELY DRIVING UK ALUMINIUM FORWARD

3M United Kingdom PLC
3o Ltd
Aalco
Advanced Forming Research Centre (AFRC)
Aero Metals Alliance
AES Metals Ltd
Air Products plc Hersham
Akzo Nobel Powder Coatings Ltd
Akzo Nobel Powder Coatings Ltd
ALCAS Metal UK
Alideck Ltd
All Metal Services Ltd
Alloy Heat Treatment
Almetron Ltd
Alubend Ltd
AluK (GB) Ltd
Aluminium Shapes Ltd
Alupro
Alutrade Ltd
Alvance British Aluminium Ltd
AMAG UK Ltd
Amari Metals Ltd
Architectural & Metal Systems
Architectural Powder Coatings Ltd
Arconic Global Rolled Products
Arconic Manufacturing (GB) Ltd
Argentum Metal Management Ltd
Argus Media Ltd
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ASC Metals Lincoln Ltd
Aspect Powder Coating Ltd
Avon Metals Ltd
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Bartlett School of Architecture
BCAST, Brunel University London
BKC Consulting Ltd
Bridgnorth Aluminium Ltd
British Safety Industry Federation
Brockhouse Group Ltd
Brompton Bicycle Ltd
Burchill GC
C & O Powder Coatings Ltd
CAPALEX - Capital Aluminium Extrusions Ltd
Capital Refractories Ltd
Carlisle Fluid Technologies UK Ltd
Cashmores Metals Ltd
Chemetall Ltd
CMK (Treatments) Ltd
Coleshill Aluminium Ltd
Concordia International Forwarding Ltd
Council for Aluminium in Building
Coventry University
CRU International Ltd
Deane Roofing & Cladding Ltd
Dore Metal Services Ltd
Durbin Metal Industries Ltd
Ecodek
Elumatec United Kingdom Ltd
Empire Resources (UK) Ltd
EMR - European Metal Recycling Ltd
EnviroBuild Materials Ltd
Epwin Group
Exlabesa Extrusions Doncaster Ltd
Fabal UK Ltd
Foundrax Engineering Products Ltd
Fronius UK Ltd
GARNALEX - Garner Aluminium Extrusions Ltd
Gestamp Tallent Ltd
Glasshouse Ltd
Gould Alloys Ltd
GSM Aluminium Ltd
HanaTech Ltd
Harsco ALTEK Europe Ltd
Heat Treatment 2000 Ltd
Henkel Ltd
Heraeus Noblelight Ltd
Hitachi High-Tech Analytical Science
Hoganas (GB) Ltd
Hulamin Operations
Huttenes-Albertus (UK) Ltd
Hydro Aluminium Deeside Ltd
Hydro Aluminium UK
Hydro Building Systems UK Ltd
Hydro Extrusion UK Ltd
IMA Schelling UK Ltd
INAL (2020) Ltd
Industrial Physics
Innoval Technology Ltd
Integ Metals Ltd
Institute of Materials Finishing
ISC - International Safety Components Ltd
Jenks and Cattell Engineering Ltd
K Home International Ltd
Keen Ltd
Kingspan (Sherburn) Ltd
Kluthe UK Ltd
Knowledge Master UK
Laser Profiles Ltd
Levolux Ltd
London Metal Exchange
Make UK - the manufacturers' organisation
M G Metals Ltd
Martin Davenport Consultant
Materion UK Ltd
MCA UK Ltd
Mechatherm International Ltd
MEPS International Ltd
Metal Coating Services Ltd
Metalex ACP Ltd (formerly Alimex)
Metalex Products Ltd
Metalfin Ltd
Metallic Protectives Ltd
Metalogic Ltd
Metalweb Ltd
Met-Fab Solutions Ltd
Metsource Ltd
Milver Metal Co Ltd
Multi Metals Ltd
Multipanel UK
NCH Chem Aqua
Nextday Metals Ltd
Novelis Automotive Europe
Novelis UK
Omega Pistons Ltd
Phoenix Materials Testing Ltd
Plastometrex Ltd
Powdertech (Corby) Ltd
Powdertech Surface Science
Press Metal UK Ltd
PreTreat Ltd
Pre-Treatment Solutions Ltd
Primetals Technologies Ltd
Real Alloy UK Ltd
REAZN UK Ltd
Richard Austin Alloys (Glasgow) Ltd
Righton Blackburns Ltd
Rimstock Ltd
Rotech Laboratories Ltd
Rusal Marketing GmbH
Scanstrut Ltd
SDE Technology
Senior Architectural Systems Ltd
Sherwin Williams UK Ltd
Short Cut Services
Silberline Ltd
Simmal Ltd
SKF (UK) Ltd
Smiths Advanced Metals
Snelsons Ltd
Spa Aluminium Ltd
Spartal Ltd
Speira UK Ltd
Steel & Alloy Processing Ltd
Superior Paint & Powder Coating Ltd
Surface Finishing Engineering Ltd
Swansea University
TWI - The Welding Institute
Tandom Metallurgical Group
Tecomet (Symmetry Medical)
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The Metal Centre
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The University Of Sheffield
Thermserve Ltd
Tomburn
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UK Profile Components Ltd
UKRI/STFC Rutherford Appleton Laboratory
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Universal Collaboration Research Ltd
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Zenergi Group (Energy Management)

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