THE ALUMINIUM STORY

ENERGY BANK FOR THE FUTURE

www.thealuminiumstory.com
“The best design acknowledges that you can't disconnect the form from the material. The material informs the form.”

“Sir Jonathan Ive
Chief Design Officer, Apple

“The only way to make the MacBook Pro unibody was to machine it from a single piece of aluminium.”
"The Commerzbank Building is clad in durable, anodized aluminium rain screen panels, lasting for decades"

NORMAN FOSTER
Foster + Partners
The use of aluminium…brings benefits in terms of:

- weight savings,
- improved fuel efficiency,
- lower emissions,
- increased crash safety, and...
- better vehicle dynamics

“...the material of choice”
“Aluminium allows Bombardier to manufacture low weight vehicles and thus reduce environmental impact, with a high quality exterior finish”

Guillaume Rétaux
Director Strategic Sourcing
The industry must demonstrate that...

1. it produces responsibly, by mitigating environmental impacts and positively impacting the communities in which it operates;

2. its products bring a net benefit to society in terms of reduced environmental impact; improved quality of life, health, safety & wellness and economic growth;

3. at the end of product life, the value of the metal, the energy that went into its production and the resource inputs are retained and realised as another product, through collection and recycling or energy recovery.
Greenhouse Gas Emissions

• All sectors:
  • Approx. 50 Gt CO$_2$e in 2010 *
    • [ likely ~60 Gt CO$_2$e in 2018 ]

• Aluminium industry (cradle to gate):
  • 1 Gt CO$_2$e in 2018 †

Source: * IPCC 2014, † IAI
...of which aluminium <1%

...of which aluminium ~1%
Vehicle light-weighting

- 1 kg of aluminium, replacing heavier materials in a car or light truck, can save **20 kg of CO₂** over the vehicle life;
- Similar number for electric vehicles in coal-intensive grids such as India and China;
- Up to **80 kg CO₂** per kg aluminium used in trains;
- The 20 million tonnes of aluminium shipped to the transportation sector every year could save **half a billion tonnes of CO₂** and over **100 billion litres** of crude oil.
Building applications: durability matters

Source: KieranTimberlake Research Group/IAI
Protective packaging

Source: European Aluminium Foil Association
ALUMINIUM DEMAND
Semis shipments per annum

Source: IAI
Three quarters of all aluminium ever produced is still in productive use

- 1.3 billion tonnes produced since 1888
- One billion tonnes still in use

- A positive recycling story but...
...more significantly a story of

- Demand growth
  - For light, strong, conductive, protective products
  - 800 million tonnes produced since 2000

- Durability
  - Long lifetime products not yet reached the end of “First Life”
  - Long lifetime products tend to have high recycling rates (>90%)
Primary continues to dominate supply

<table>
<thead>
<tr>
<th>Million tonnes</th>
<th>2000</th>
<th>2018</th>
<th>2040</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semis demand</td>
<td>35</td>
<td>95</td>
<td>160</td>
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<tr>
<td>Final product demand</td>
<td>30</td>
<td>80</td>
<td>140</td>
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<tr>
<td>Recycled aluminium</td>
<td>12</td>
<td>31</td>
<td>70</td>
</tr>
<tr>
<td>...of which “old”</td>
<td>7</td>
<td>18</td>
<td>50</td>
</tr>
<tr>
<td>...of which “new”</td>
<td>5</td>
<td>13</td>
<td>20</td>
</tr>
<tr>
<td>Primary required</td>
<td>25</td>
<td>64</td>
<td>90</td>
</tr>
</tbody>
</table>

Source: IAI
RAW MATERIALS
Global bauxite demand

- + 50% by 2040;
- Additional 150 Mtpa;
- China ratio 60:40 domestic to imported to reverse (40:60);
- Fast growing regions of supply bring risks
  - supply,
  - political,
  - environmental,
  - reputational.

Source: IAI
Sustainable Bauxite Mining Guidelines

Panduan Penambangan Bauksit Berkelanjutan

First Edition
May 2018

Edisi Pertama
Maret 2018
What is included?

- Sustainable mining practices
- Governance
- Community assessment & contribution
- Health & safety
- Environmental assessment & performance
Guideline use

Theory and how it applies to bauxite mining

- Do’s and don’t’s
- Key risks
- Mitigations

Bauxite specific guidelines

Guideline use

One or more case study per section; practical examples
SPL and bauxite residue

**Annual generation**
- Spent Pot Lining (SPL)
- Bauxite residue

**Cumulative bauxite residue**

Source: IAI
• Optimal strategy for a site at a given time;
• Not “one-size fits all”;
• Approaches evolve to accommodate innovations;
• Best available technology, appropriate to local, national and regional circumstances.
ENERGY AND GREENHOUSE GASES
Growth of primary production

Source: IAI
Electrolytic energy intensity reduced by over 15% since 1980

Source: IAI
Globally smelter power is now 60% coal-fired
Carbon footprint
primary aluminium cradle-to-gate

Source: IAI, GaBi
Primary production
2040 scenario

Source: IAI
Primary production
2040 scenario

Source: IAI
Total GHG emissions

Historic

2040 Scenarios (90 Mt Al)

Source: IAI, GaBi
CONCLUSIONS
2040 baseline scenario

- 50% increase in semis demand from today;
- Increased recycling rates only offer limited potential, due to long life of products;
- Scrap quality also an issue;
- Primary aluminium will continue to meet the bulk of metal demand, at least until mid-century;
- 90 Mt primary required (65 Mt today).
Increasing risks

• Raw materials supply and waste management;
• Significant range of greenhouse gas emissions, primarily a function of power mix;
• Location of new smelting capacity uncertain, but likely fossil fuelled power;
• Some companies are already marketing “low impact” aluminium in response to customer demands.
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3. at the end of product life, the value of the metal, the energy that went into its production and the resource inputs are retained and realised as another product, through collection and recycling or energy recovery.
Semis demand (Mt Al)

- Required Primary
- Recycled (Old)
- Recycled (New)

Source: IAI
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