GREAT DESIGNS IN STEEL

Electric Vehicles, Sustainability & Steel

Michael Davenport
Executive Director
Auto/Steel Partnership Foundation

Electric Vehicles, Sustainability & Steel

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Agenda:

- Auto/Steel Partnership
- What Drives Decisions
- Steel Sustainability
- Make it Personal

Auto/Steel Partnership

A/SP Member Companies

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leading through collaboration

www.a-sp.org

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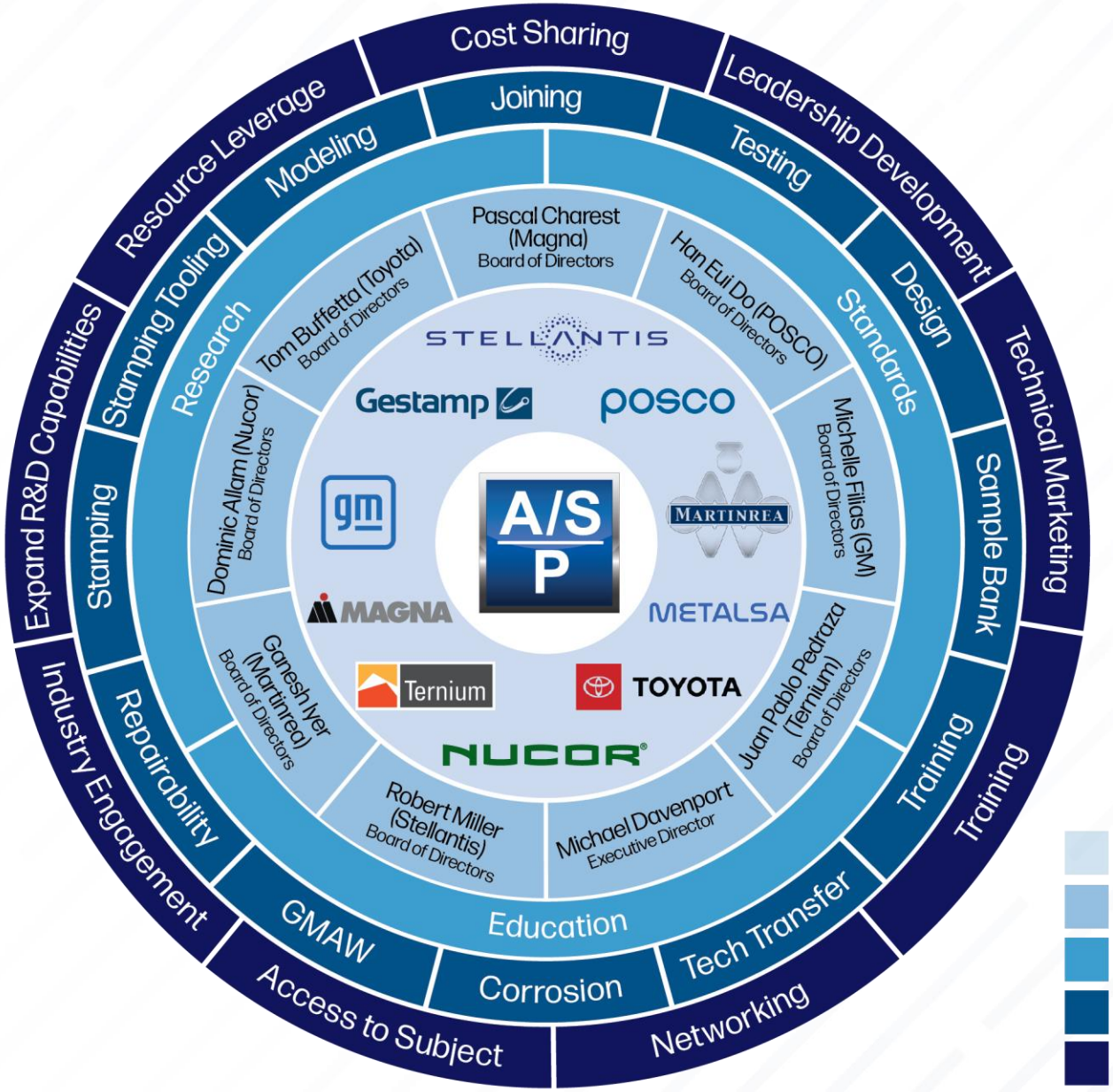
Cost Sharing
Leadership Development
Technical Marketing
Sample Bank
Training
Training
Tech Transfer
Networking
Access to Subject
Corrosion
GMAW
Education
Repairability
Industry Engagement
Expand R&D Capabilities
Stamping
Stamping Tooling
Resource Leverage
Modeling
Joining
Testing
Design
Standards
Research
Pascal Charest (Magna) Board of Directors
Han Eui Do (POSCO) Board of Directors
Michelle Filias (GM) Board of Directors
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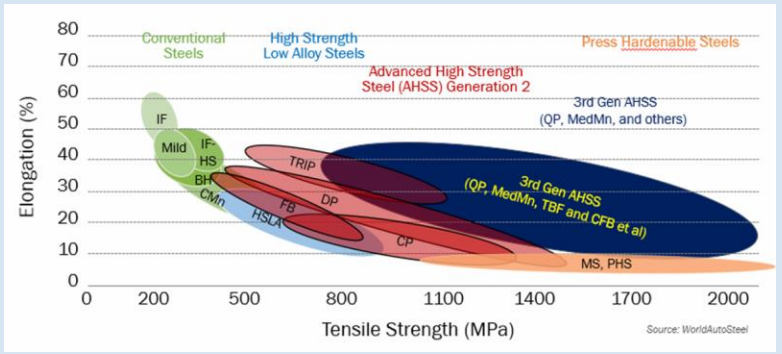
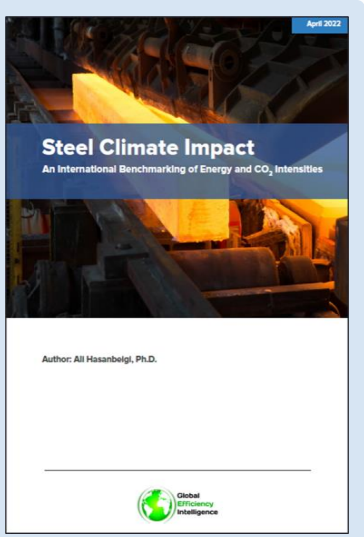
A/SP
Who we are
Leadership
What we do
How we do it
How members use A/SP

Winning in Times of Big Change

Environmental stewardship will be the biggest driver of change and innovation in the automotive and steel industries in our lifetime.

Winning in Times of Big Change





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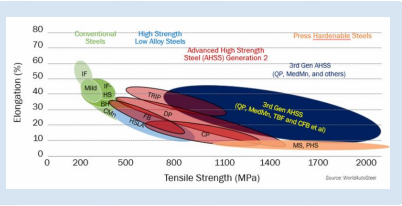
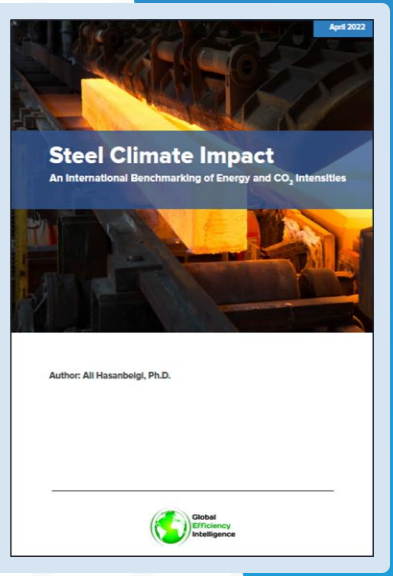
Winning in Times of Big Change



How to position yourself to win?



Big Change Means Big Winners (and losers)

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How to position yourself to win?

- Know what drives decisions during change
- Focus on the fundamentals
- Leverage innovation
- Partnerships
- Make it Personal

What Drives Decisions?

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Cost

Weight

Investment

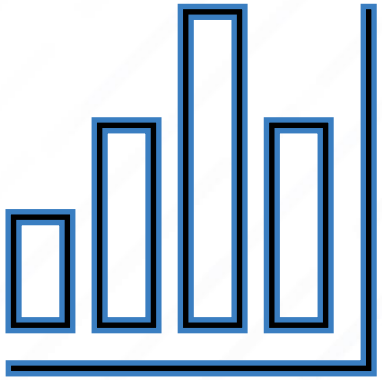
What Drives Decisions?

GDIS

Cost

Weight

Investment



Sustainability

OEMs will find the best tradeoff of variable cost, weight, investment and sustainability to meet all vehicle objectives

What Drives Decisions?

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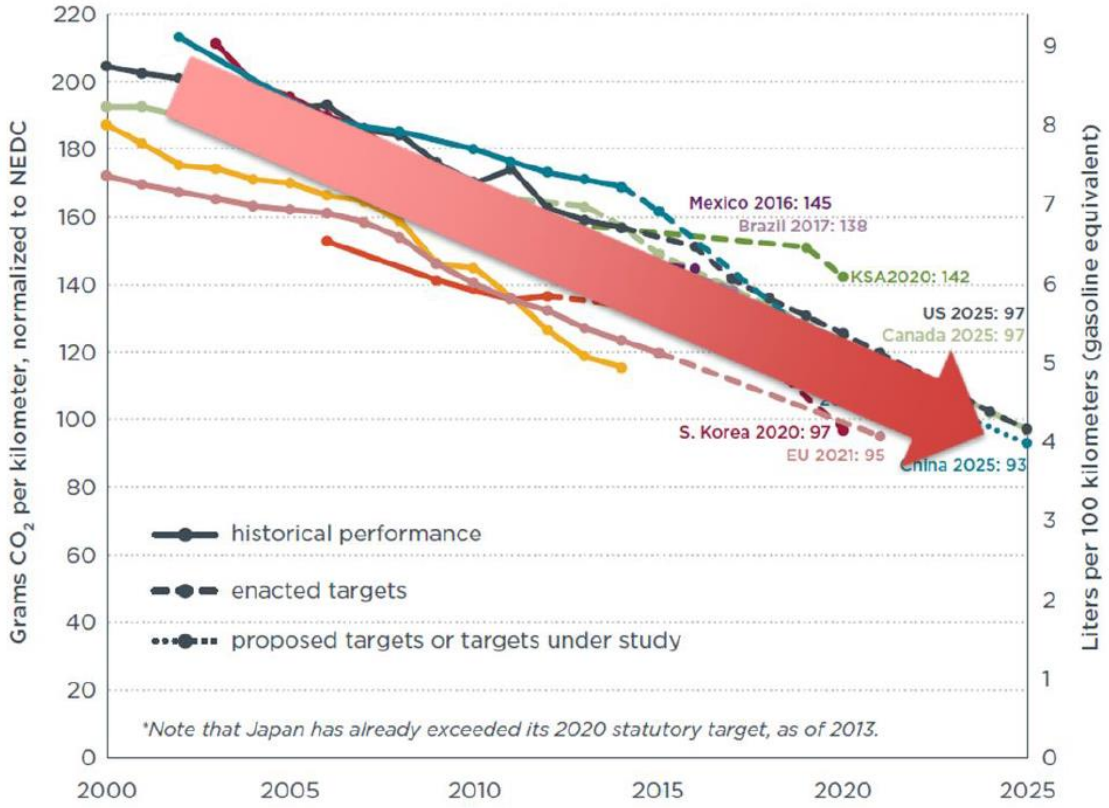
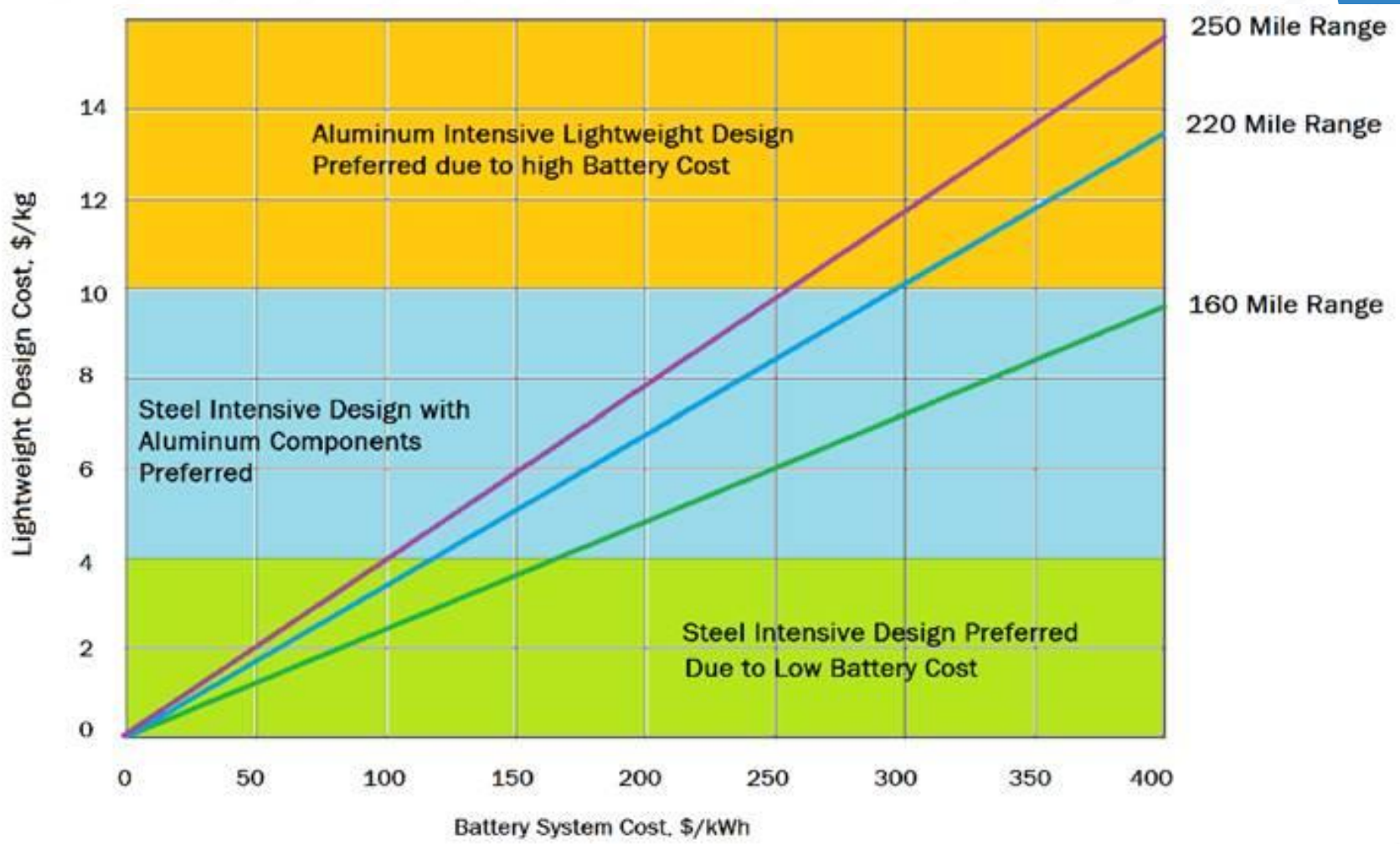
Cost **Weight** **Investment** **Sustainability**



What Drives Decisions?



Courtesy of Nucor, BEVA presentation Sept 2018

What Drives Decisions?

- The automotive industry is a leading player in the drive to lower environmental footprint by reducing CO_2 emissions
- This will have an impact on major parts and materials suppliers to the industry

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AUTOMOBILES

Honda sets net-zero CO2 target by 2050 for whole supply chain

Automaker asks main suppliers to cut carbon emissions 4% annually

Nissan brings its innovation and excitement to the 'Race to Zero'

March 31, 2021 10:19 AM

Ford adds short-term emissions targets en route to 2050 carbon neutrality goal

The automaker detailed the goals in its annual sustainability report

MICHAEL MARTINEZ

CLIMATE CHANGE

Toyota speeds up carbon-zero target for factories to 2035

Goal pushed forward 15 years as industry prioritizes decarbonization

EDITORS' PICK | Jan 28, 2021, 11:00am EST | 5,677 views

GM To Make Only Electric Vehicles By 2035, Be Carbon Neutral By 2040

Sam Abuelsamid Senior Contributor

Transportation

A lifetime in the car business, first engineering, now communicating

Follow

What Drives Decisions?

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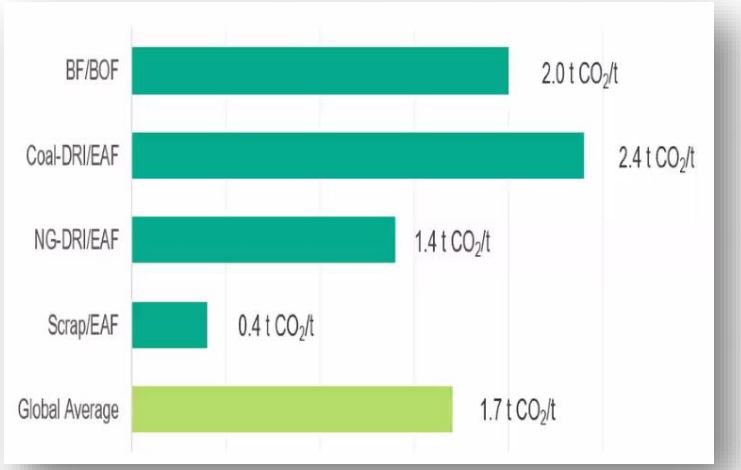

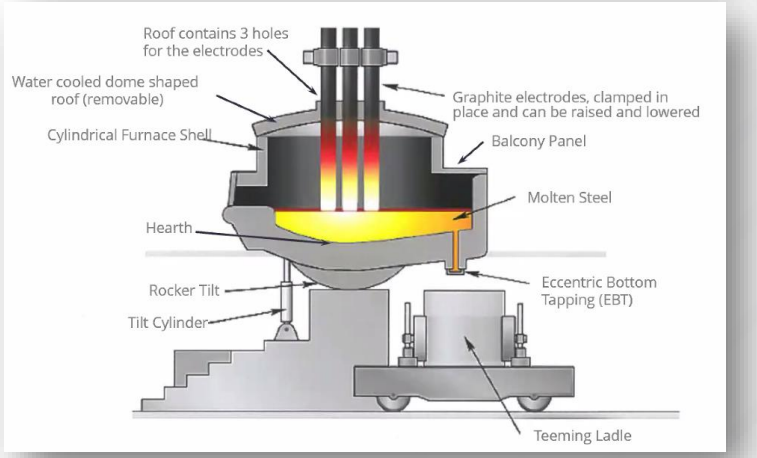

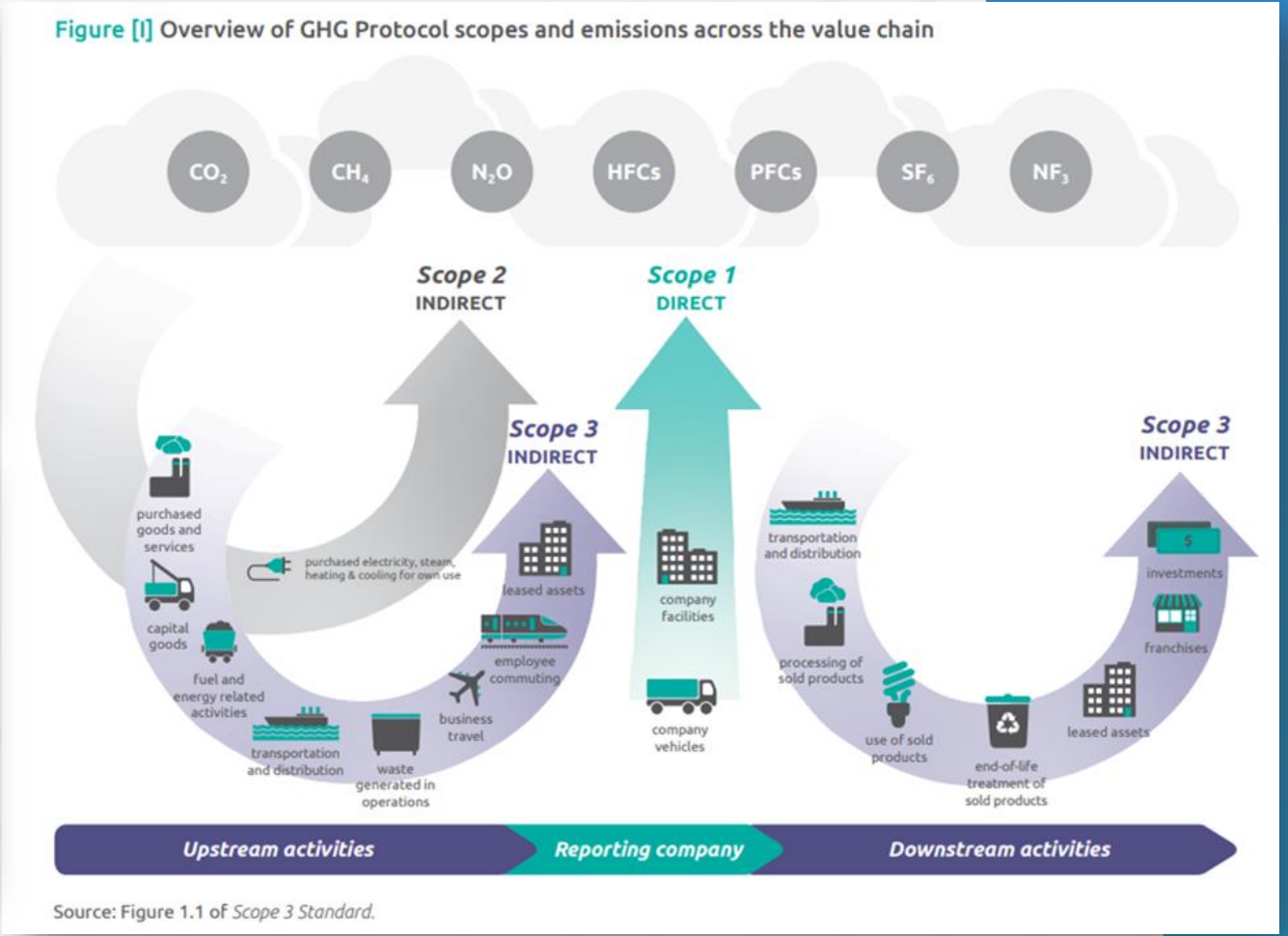

Steel Evolution – Decarbonization & Sustainability

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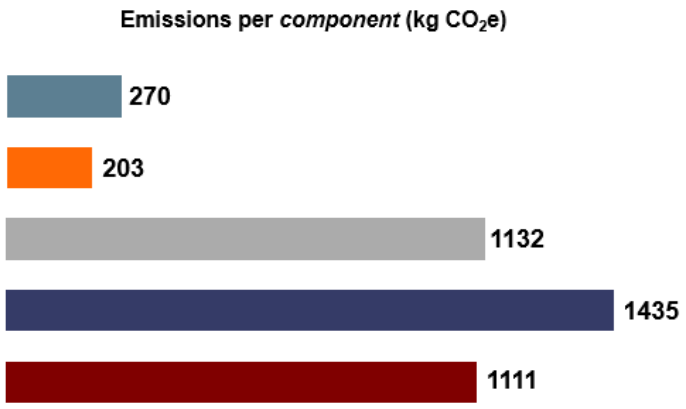
Latest World Steel Association Statistics

- The steel industry accounts for 7% to 9% of the total man-made greenhouse gases, producing 2.6 billion tons/annum of CO_2.
- 1.85t of CO_2 per ton of steel (USA).
- The major contribution comes from the integrated steel route as the blast furnace is heavily dependent on coke for iron ore reduction.

Functional Unit GHG Comparison

Material Production GHG comparison for a functionally equivalent component - ***typical example***

	CO_2e Emissions (kg/kg)	Estimated Component Weight (kg)
Mild Steel	2.7	100
AHSS	2.7	75
Aluminium	16.9	67
Magnesium	28.7	50
Carbon FRP	20.2	55



Source: WorldAutoSteel

Steel Evolution – Decarbonization & Sustainability

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Average steel product lasts 75 years.
Scrap available today = steel production from 1950.

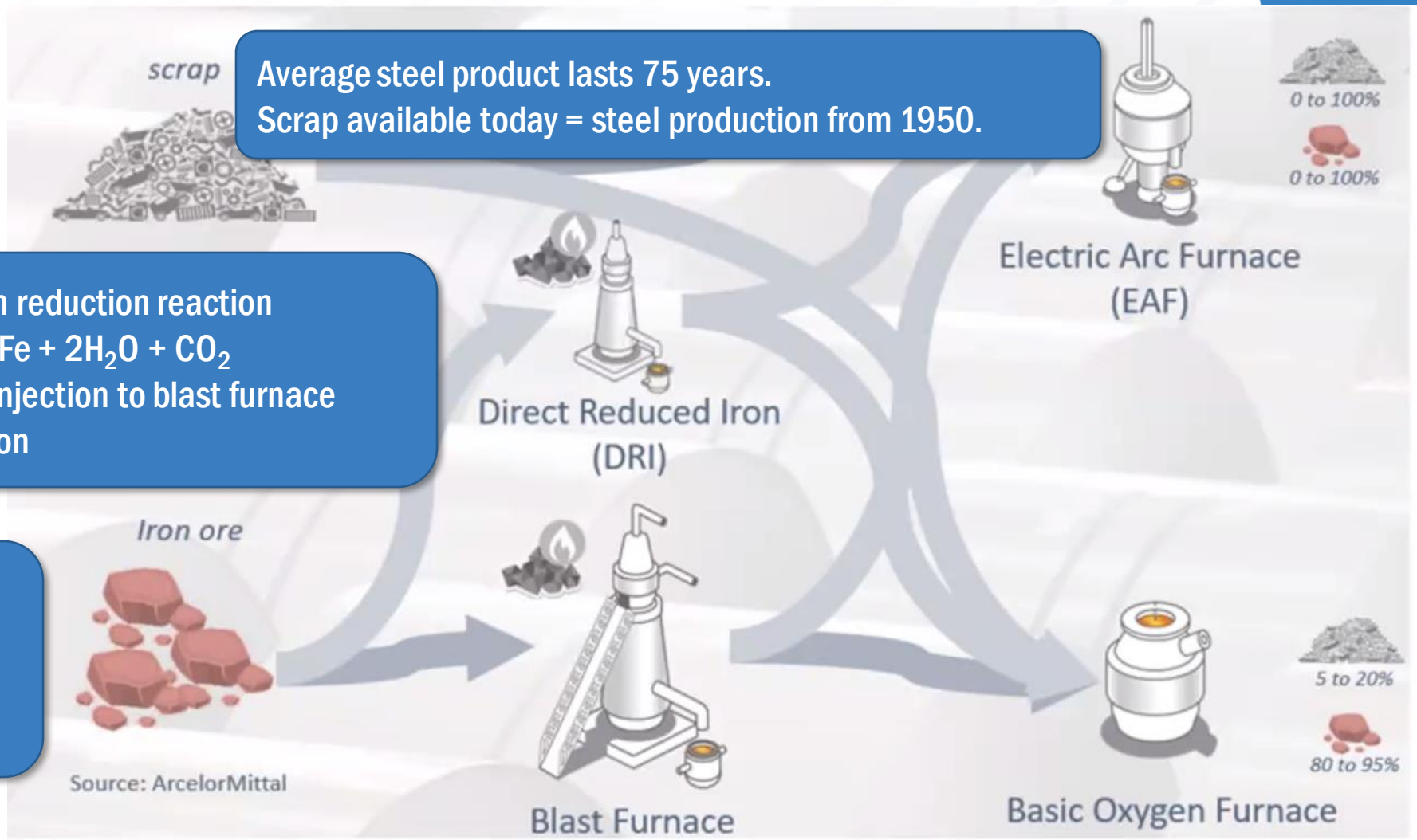
Change the main reduction reaction

$4FeO + CH_4 \rightarrow 4Fe + 2H_2O + CO_2$

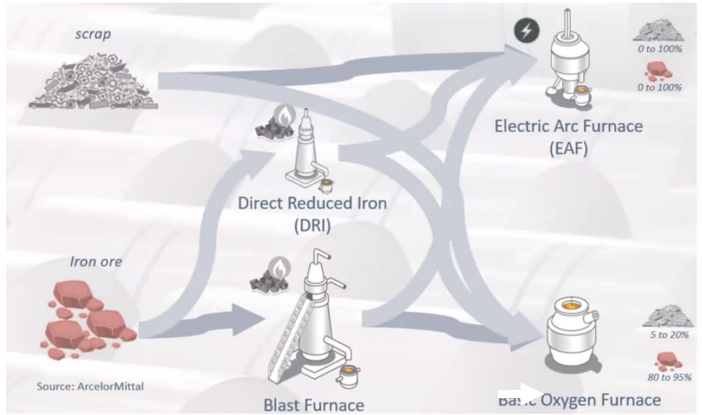
- Natural gas injection to blast furnace
- DRI production

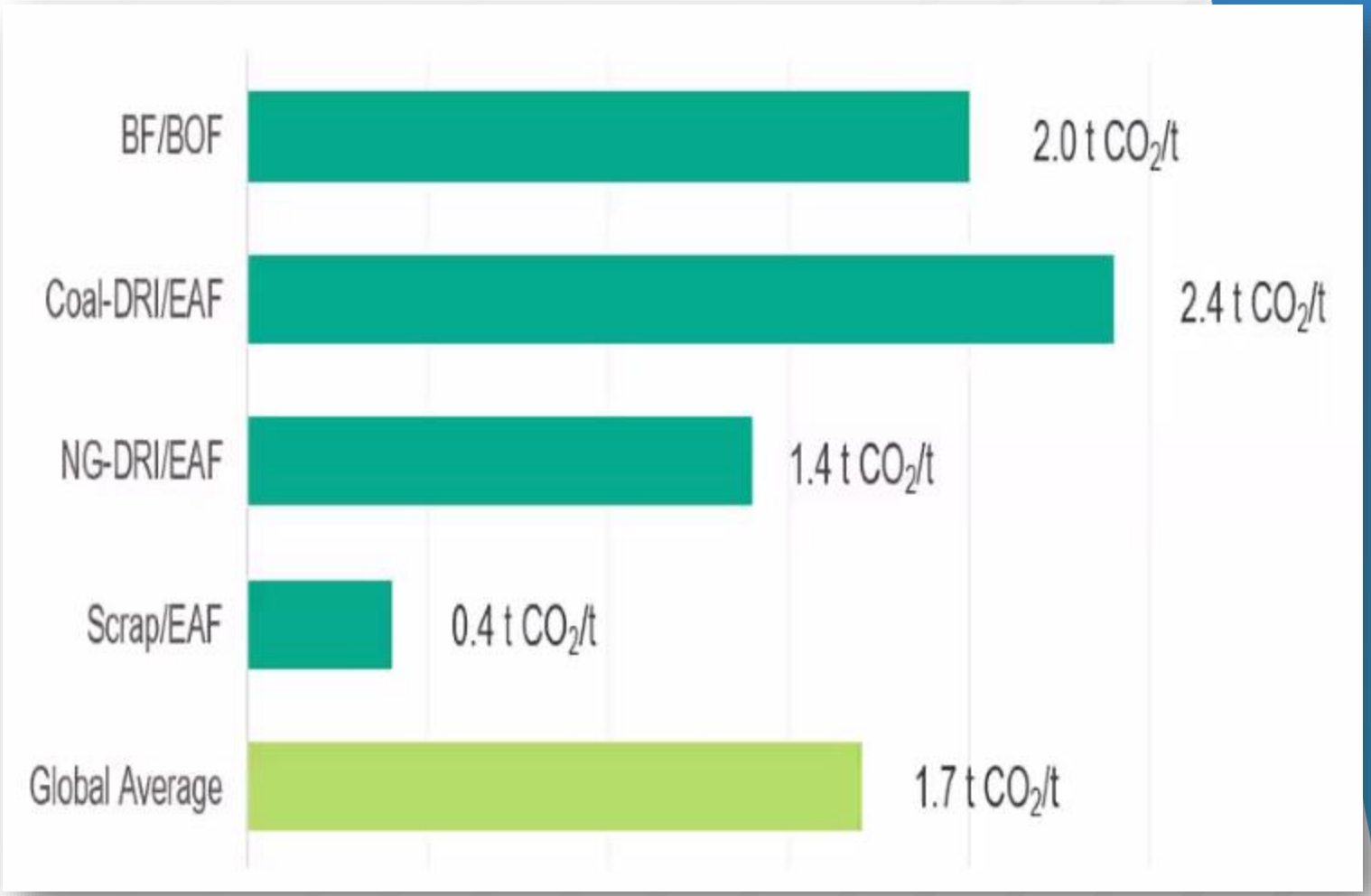
Blast Furnace/BOF steelmaking process, starts with chemical reduction of Iron Ore

$2FeO + C \rightarrow 2Fe + CO_2$

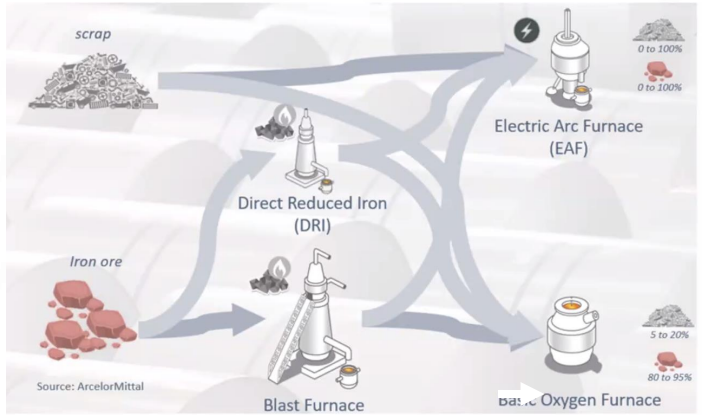


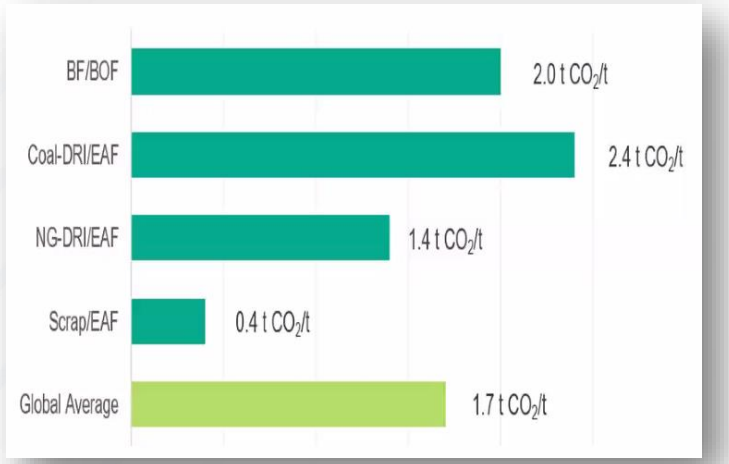
Steel Evolution – Decarbonization & Sustainability





Steel Evolution – Decarbonization & Sustainability



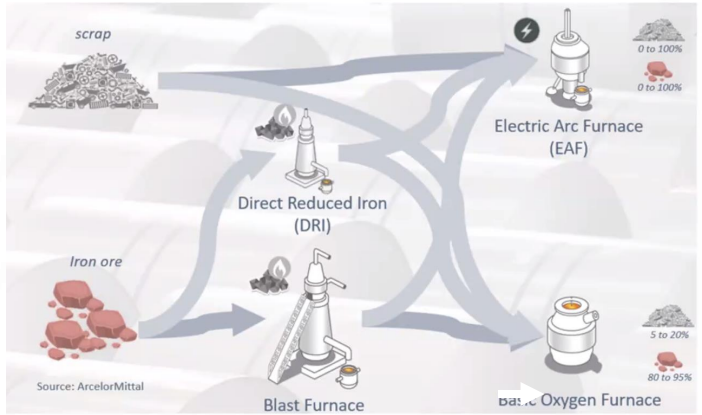


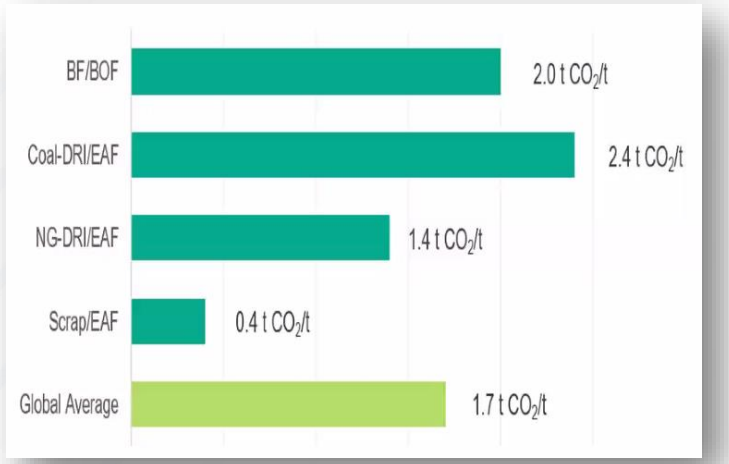
Continuing Efforts to Enhance Sustainability

- Further advancements in DRI / HBI production
  - Low carbon technology
  - Reuse of waste gas and heat
- Increasing use of renewable energy in steel industry facilities
- Where carbon is required
  - Utilize carbon capture / storage
  - Alternative carbon sources (biomass)
- Increase use of H_2 as fuel and reductant

Replacing coal by hydrogen generated with renewable energy would make it possible to largely decarbonize the industry

Steel Evolution – Decarbonization & Sustainability



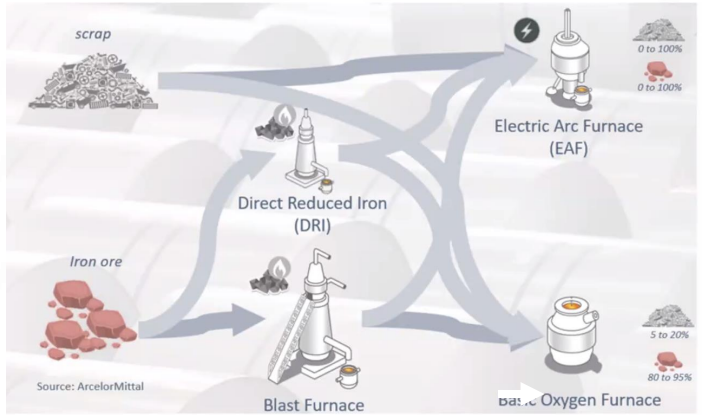


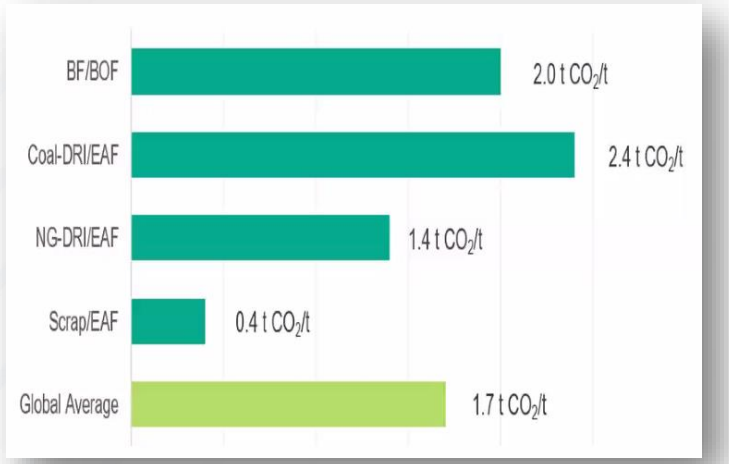
Change the main reduction reaction

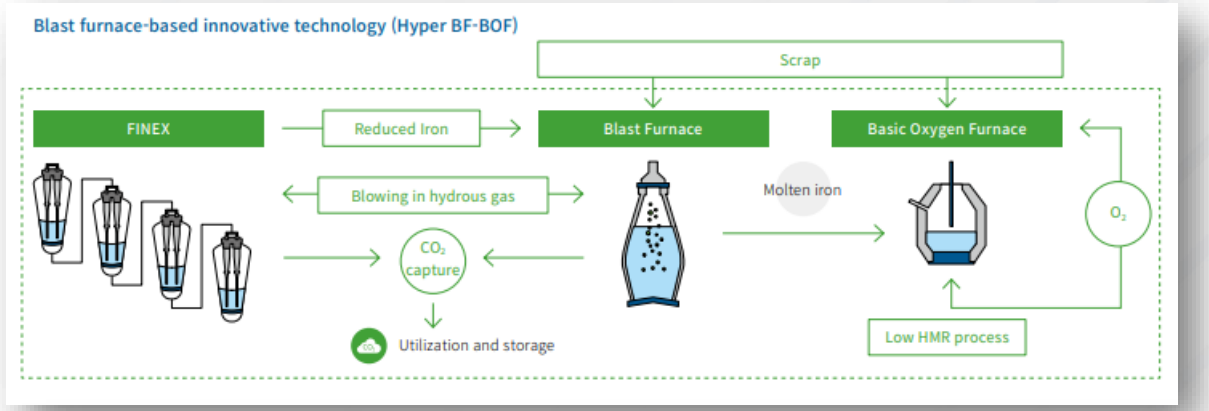
$FeO + H_2 \rightarrow Fe + H_2O$

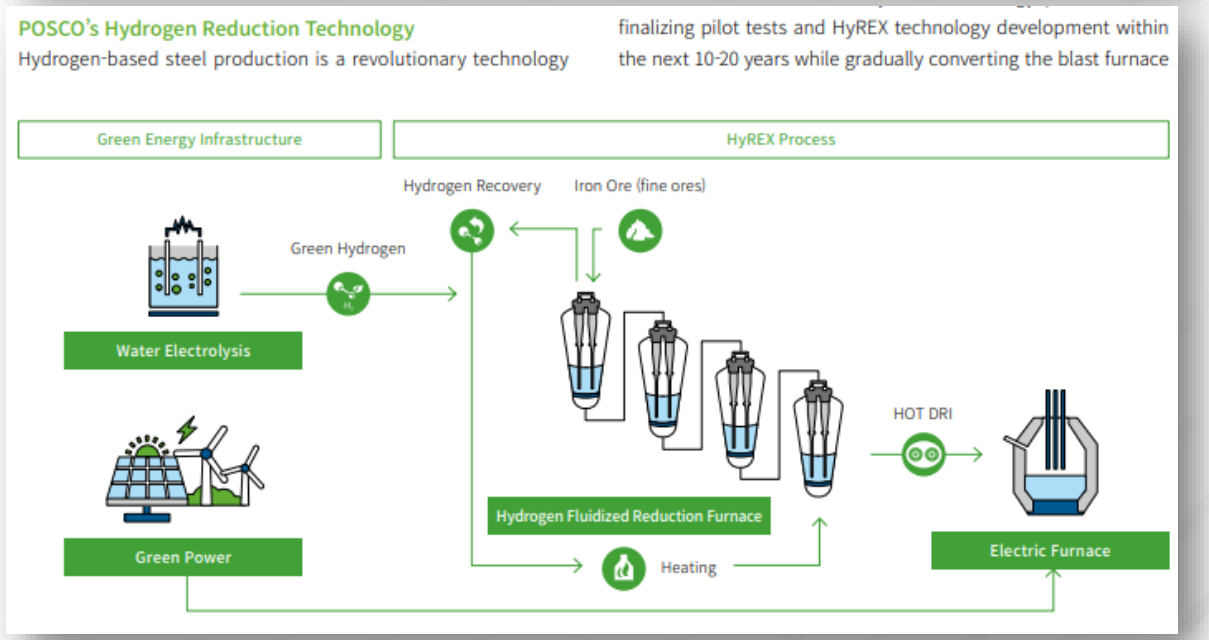
Replacing coal by hydrogen generated with renewable energy would make it possible to largely decarbonize the industry

Steel Evolution – Decarbonization & Sustainability









Make it Personal

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The last major Automotive Revolution

Safety

1990's ....

- Science and Fact Based
- New Regulations
- Usage of High-Strength Steels
- Airbag Adoption

Make it Personal

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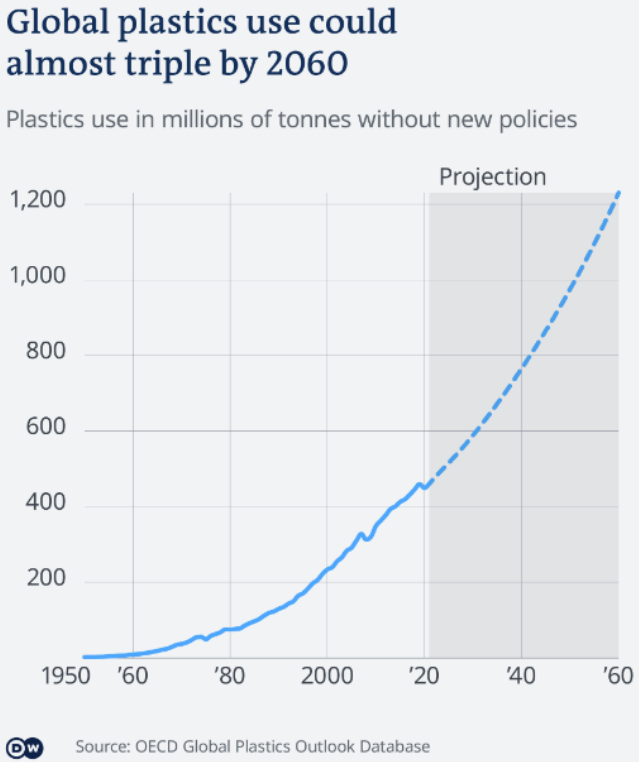
Recyclable vs. Recycled

Recycled Counts

With only 9% of annual plastic waste recycled, the myth that we can recycle our way out of a mounting plastic pollution crisis doesn't add up. About 85% of plastic packaging worldwide ends up in landfills. Mar 17,2023



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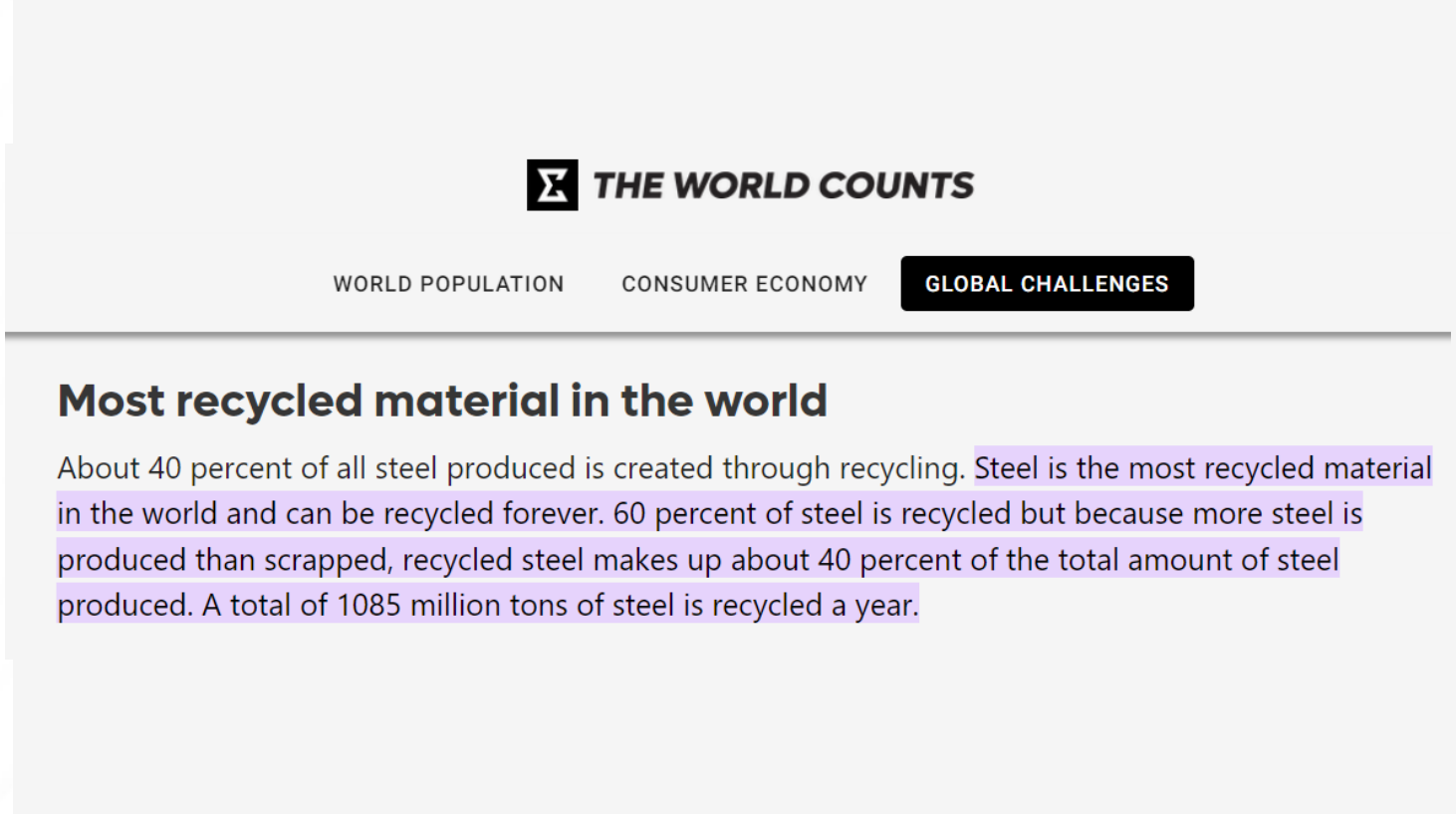
Recyclable vs. Recycled

Recycled Counts

- Each of two main steelmaking processes utilize scrap, from 30% to 100% of each new furnace charge.
- United States processes enough ferrous scrap to build 25 Eiffel Towers every day of the year.
- Typically, 60 to 80 million tons of non-closed loop steel scrap is recycled every year into new steel products in North America.



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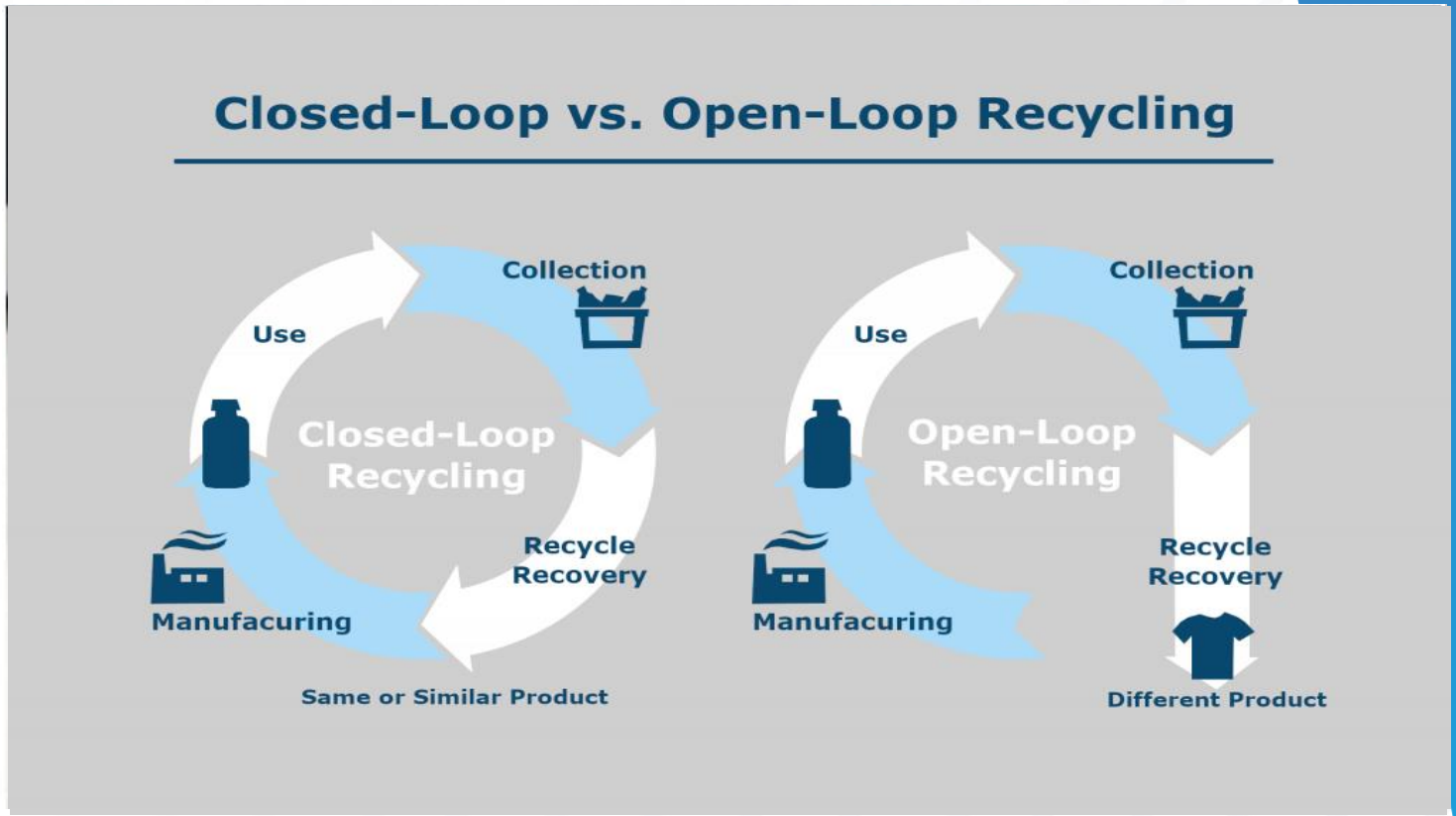
Open Loop Counts

100% of steel can be recycled and is repeatedly recycled into the same or different steel products of the same quality.

Closed Loop vs. Open Loop Recycling



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Facts Count

Environmental Product Declarations are starting to become available, and continued work should be done to standardize reporting.

Recent OEM presentations stated that they would start purchasing 10% “low carbon” materials.

Steel < 0.4 t/t CO_2

Alum < 3.0 t/t CO_2

Claims vs. Facts

Summary of EPDs, converted to MT, as measured in 2021 ESG reporting

Product	A1 (Raw material supply)	A2 (Transport)	A3 (Manufacturing)	Total	Units
HR	0.90	0.06	0.22	1.18	Metric tonne CO_2e
CR	0.91	0.07	0.30	1.27	Metric tonne CO_2e
Coated	1.07	0.07	0.38	1.52	Metric tonne CO_2e

1.27

Table 2. LCIA results, per 1 metric ton

Parameter	Unit	A1	A2	A3	Tota
GWP 100	kg CO_2 eq.	1.10E+03	1.07E+01	1.10E+02	**1.22E+03**

1.22

Table 8. EU Impact Assessment Results

CML v4.2	Unit	A1-A3	C1	C2	C3	C4	D
GWP 100	[kg CO_2 eq]	3.80E+03	-	9.88E+00	-	2.16E+00	-8.88E+02

3.79

* All converted to metric tons of CO2 per metric ton of material

Make it Personal

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Safety

A group of people can implement change when working toward a common company goal.

A TEAM can make **INCREDIBLE CHANGE** when working toward a common **CAUSE**.

Make it Personal

The last major Automotive Revolution

Safety

1990's ....

- Science and Fact Based
- New Regulations
- Usage of High Strength Steels
- Airbag Adoption

What were the results of the Automotive Safety Revolution?

Make it Personal

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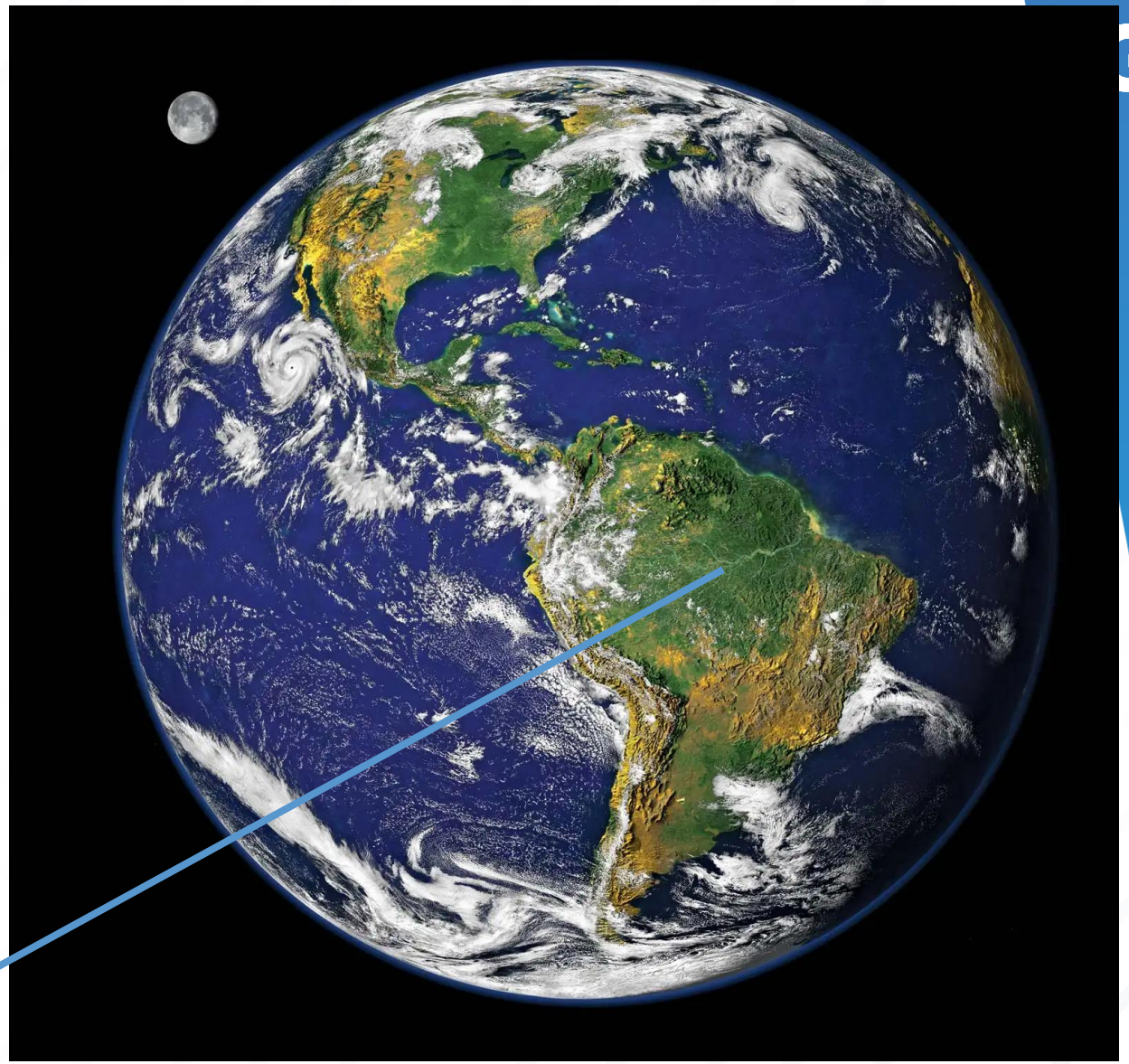
Someday, will someone write you a thank you note?



… sincerely thank you and your company …

For more information

Auto/Steel Partnership

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