ArcelorMittal Europe - Long Products

ArcelorMittal

Long Steel Products for Renewable Energy

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Efficient Steel Solutions for Green Energy

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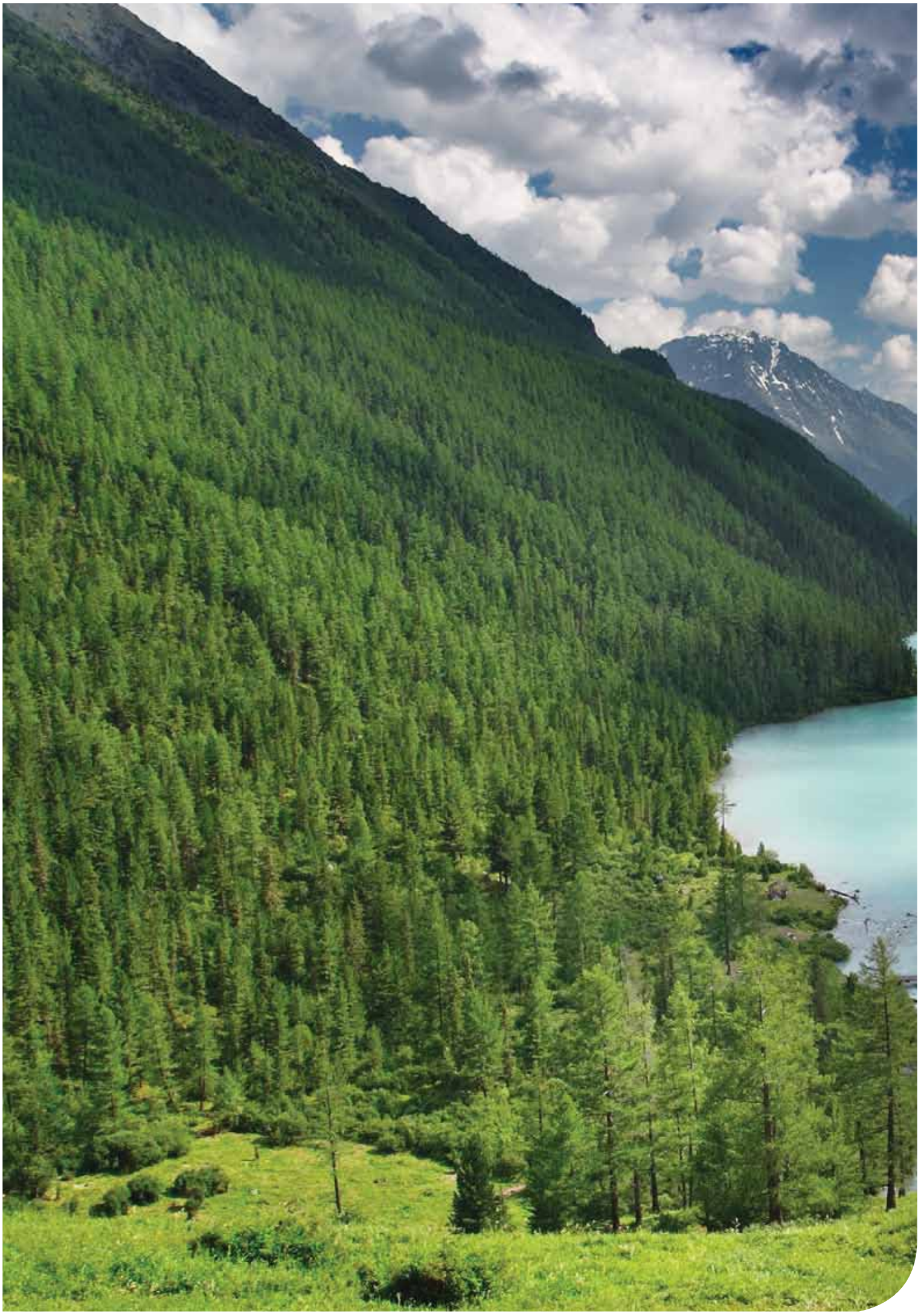


1. Introduction

Fossil fuels run out

Energy is one of the major drivers of economies.

Securing energy is one of the key issues and will have a major bearing on the growth and success of developed countries. Oil and gas supplies are dwindling, and their use is becoming increasingly expensive, while nuclear energy is becoming increasingly controversial.

The rising prices of electricity, oil, coal and gas and the problem of future energy supply are now in the consciousness of the general public. The public debate on climate change, environmental disasters and emissions trading is also widely covered in the media.

From the perspective of current technology, it has become clear that the future supply of national and international energy is only possible with a mix of fossil, nuclear and renewable energy sources.

The steel industry in a supporting role

For modern industry, steel is one of the most important materials, especially for the energy industry. In 2011, only considering energy infrastructure ArcelorMittal supplied over 4 million tons of steel.

The steel industry has therefore a great responsibility to contribute to sustainable development.

Over the years, the steel industry has demonstrated important developments and improvements measurable through indicators and targets that have been achieved. ArcelorMittal is proud of its contribution to the environment delivering 99% recyclable hot rolled steel sections.

Our involvement

Through its core values of sustainability, quality and leadership, ArcelorMittal is committed to the sustainable management of the environment and of finite resources, recognizing that it has a significant responsibility to tackle the global climate challenge.

ArcelorMittal takes a leading role in the industry's efforts to develop breakthrough steelmaking technologies and is actively researching and developing steel-based technologies and solutions that contribute to combating climate change.

Who speaks about sustainability without referring to energy issues? ArcelorMittal is actively involved in offering the energy industry a complete range of products and solutions relating to each step of the energy lifecycle, from production to transformation and transport. ArcelorMittal is present both in the conventional and renewable energy industries.

This commitment is also demonstrated in our ISO 14001 certification and an environmental declaration for our products (EPD) according to ISO 14025.

Environmental Product Declaration
EPD-BFS-2010111-D

Institut Bauen und Umwelt e.V.

Sections and Merchant Bars

Sections

Beams	Columns	Bearing Piles	Channels	Merchant Bars
HE 100 - 1100 HL 920 - 1100 IPE 80 - 750 UB 127x76 - 1016x305 W 6x4 - 44x16 GOST 10B1 -50B2 JIS 150x75 - 900x300 IPN 80 - 600 J 40 - 65 S 3x5.7 - 24x121	HD 260 - 400 UC 152x152 - 356x406 W 4x4 .. 14x16 GOST 20K1 - 40K5 JIS 100x100 - 400x400	HP 200 - 400 UBP203x203-356x368 HP 8x29 - 14x117 JIS200x200-400x400	UPE 80 - 400 PFC 100x50 - 430x100 UPN 50 - 400 U 40 - 65 CH 76x38 - 432x102 C 3x4.1 - 15x50 MC 6x12 - 18x58 GOST 8Y - 20Y	L 20x20 - 300x300 L 100x65 - 200x100 L 2x2 - 12x12 FL 20 - 200 SQ 30x30 - 160x160 R 10 - 110

Sheet Piles

Z-Section	U-Section	Combi-wall HZM/AZ	Flat Sheet Pile AS500
AZ 12-770 - AZ 40-700N AZ 12 - AZ 50	AU 14 - AU 26 PU 12 - PU 32 PU 6R - PU 15R GU 6N - GU18-400	HZ 880M HZ 1080M HZ 1180M	AS500 9.5-12.7 I.S. max = 6000 kN/m

Rails

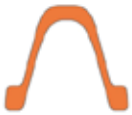
Transport Rails and Rails for Crossovers

Crane Rails

Vignole Type	Groove Type & U-Type	Rails for Crossovers	Normal Sizes	Special Sizes
EN 13674-1, EN 13674-2, DBS 918 254-1, AS 1085. 1, BS 11, GOST P51685, AREMA, NF A 45-310	EN 14811, PT-W-411/1a/98	ILK4-4510/02/08, EN 13674-2, EN 13674-3	DIN 536, ASTM, MRS, AS, CR	GCRD, GCR

Special Sections

Mining

Track Shoes	Support Sections (K&TH)	Mining Accessories	Rail Accessories	Other Special Sections
				
TS1-31 - TS1-73, TS2-49 - TS2-104, TS3-27 - TS3-60, MR 0 - MR 6	TH 16.5 - TH 44, P 28, SV 29, K 21 - K 44, V 25 - V 36	GTHN 29, J21 - J36, A 36 CLAMP, E 74 V.S	Ribbed baseplates, Tie plates (standard-inclined), Tie plates type PANDROL, Metro guide bar 150 X 100 X 25 Clamps, Fishplates, T Rails, Frog profile	Special car building sections, Hot rolled cathode collector bars

Bars and Rods

Rebars	Wire Rod	SBQ	Semis
Bars : ø 8 - 63.5 mm, Coils : ø 6 - 20 mm	ø 5.5 - 52 mm Mesh, Low and High carbon steels, Cold heading, Welding, Free-cutting, Spring, Steel cord, Bearing	Round : ø 15 - 170 mm Hexagon : ø 27 - 52.5 mm	Rolled billets : ø 120 | 42-60 - 200x200 Continuously cast billets : ø 160 and 210 | 105x105 - 220x130 Blooms : 190x220 - 280x400

Figure 1: Long Carbon Europe product range

2. ArcelorMittal Europe - Long Products

Our offering

As one of the major strategic units, ArcelorMittal Europe - Long Products produces long products at 22 plants within 10 countries in Europe and North Africa.

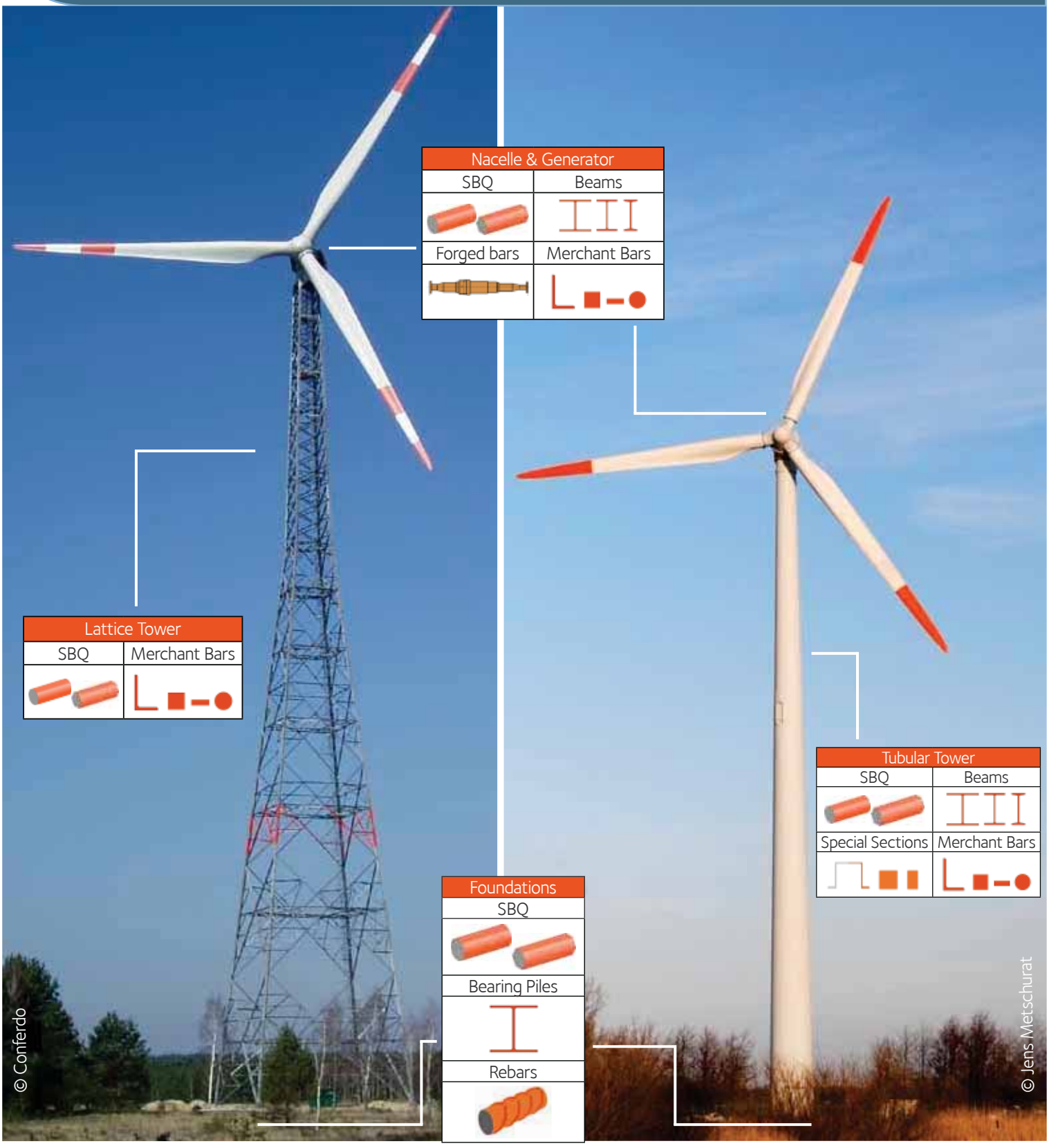
We deliver Sections, Merchant bars, Rails, Piles, Bars, Rods and special sections, whereby we offer the widest product range of its kind, meeting the strictest technical, quality and environmental requirements.

Our quality steels cover:

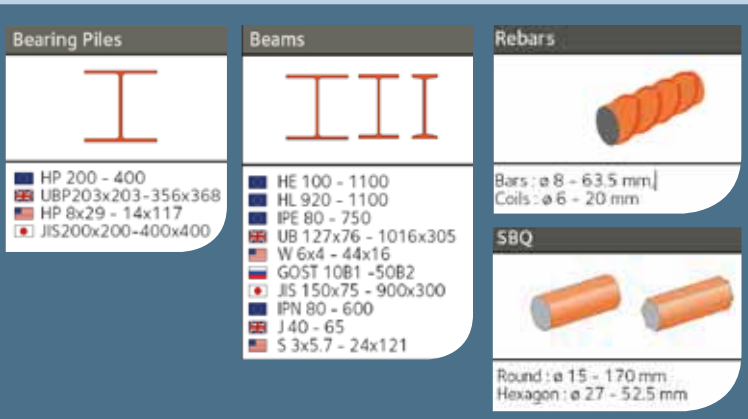
- carbon steel,
- structural steel grades,
- low and high alloy steels,
- automatic steel,
- off-shore steel grades

Additionally, we offer stock and finishing processes to better suit our customers needs.

3. Wind Energy



Foundations



Long Carbon Europe has been involved with foundations for decades. Initially with rebars, progressively with bearing piles and finally sheet piling and anchoring.

Thanks to this expertise, we have developed over time a specific offer for foundations adapted to each application.

Wind energy requires specific and reliable foundation solutions adapted to high loads and dynamics but also reducing the total environmental footprint of the foundation.

Therefore ArcelorMittal offers and delivers :

HP bearing piles: well suited to use in cases where very soft clay or loose sand and gravel is present in the soil. Ranging from HP 200 x 43 (42,5 kg/m) to HP 400 x 231 (231 kg/m).

Rebar: available in every country with national certification in a range from 6 mm to 50 mm.

SBQ (Special Bar Quality) and threaded bars: available in carbon grades, low and high alloy grades in dimensions from 15 to 170 mm diameter.

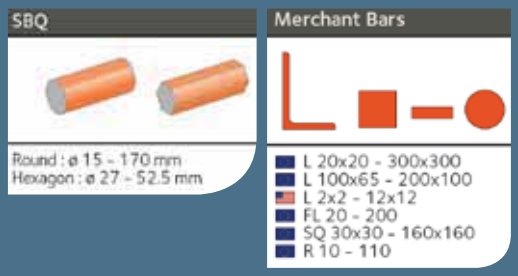
Sections and merchant bars for transition pieces: our wide size range allows an adapted design for every platform.

figure 2: Rebars for on-shore foundations

figure 3: SBQ for anchoring

figure 4: Sections for transition pieces

Lattice tower



Rediscovery of a proven design

Lattice tower wind turbines seemed to have been almost crowded out by the tubular tower, but they have experienced a renaissance in recent years.

They are ecologically attractive, being the most cost-effective solution to reach the the greatest heights. Especially for on-shore applications, reaching great heights allows increased wind speeds to be utilized increasing efficiency and turbine power. Additionally, wind shear decreases with height, thus fatigue stresses are reduced as well.

The design provides a reduced frontal area, optical transparency, and reduced weight in combination with high bending stiffness.

The low cost structure, reduced foundations combined with a corrosion protection through galvanizing makes it the best investment over the long-term.

Lattice towers have numerous advantages

- Less expensive
- Increased power with increased wind speed through greater height
- Minimum 20 % lighter
- 60% less foundations
- Easier to deliver in restricted areas (hills, forest)
- Corrosion protected by galvanizing
- Easier logistic
- Lowest life cycle costs for sustainable energy production.

Entering new heights for higher efficiency

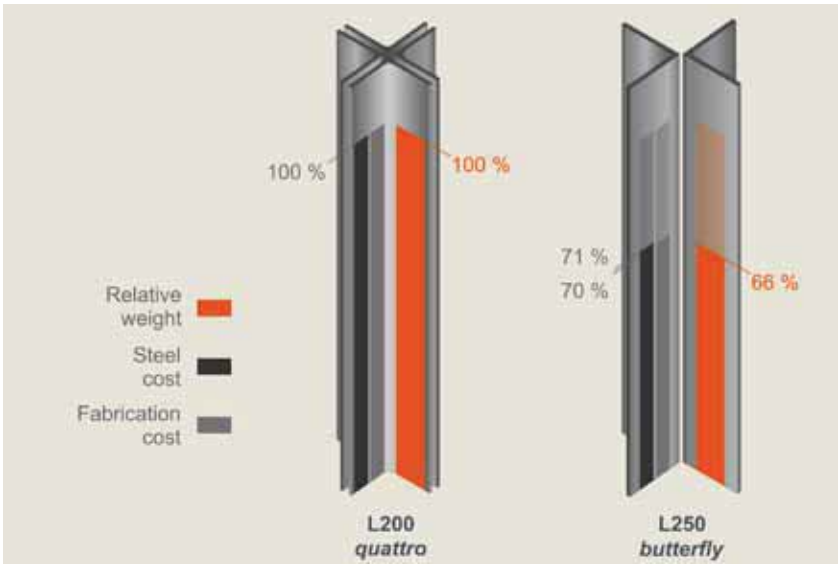
Some 15 km west of Cottbus in Laasow (Germany) the world's tallest wind turbine reaches 160 m hub height floor-to-wingtip which gives this unit an imposing height of 205 m.

figure 4: Laasow 160 m wind turbine (Fuhrländer)

New products

ArcelorMittal holds a leading position with its new ranges of big angles L250 and L300 in non-alloy structural steels and thermomechanically rolled steels (according to EN 10025-2 and -4).

This combination of profiles and grades brings increased stiffness to reach the greatest heights, specifically for those between 100 and 160 m.



As shown in figure 5, the use of a very wide angle can significantly reduce the weight of a lattice tower submitted to the highest loads.

The benefit can reach 34% of weight reduction reducing not only the total material cost but also the total fabrication cost.

Using a wide angle reduces the number of parts, number of connections and the area to galvanize, thus it greatly reduces the costs across the whole supply chain and associated handling risks.

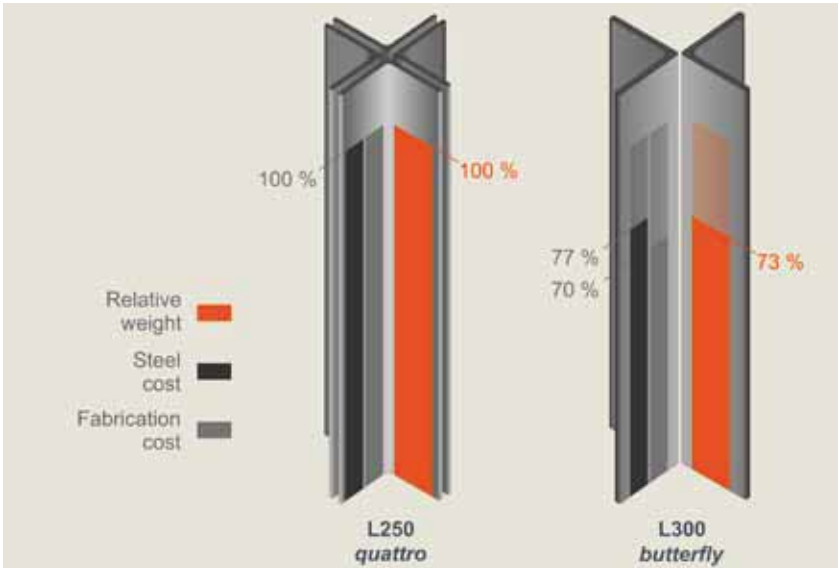


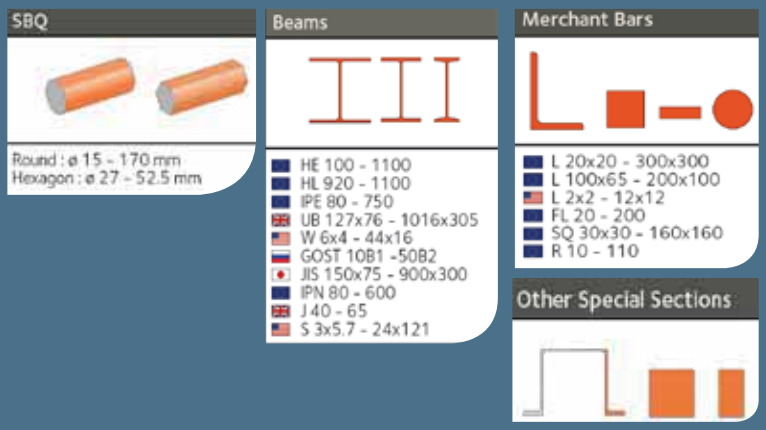
figure 5: Weight and cost reduction by using large angles

Designation	Steel grades													
	EN 10025-2: 2004										EN 10025-4: 2004			
	S235 JR	S235 JO	S275 JR	S275 JO	S355 JR	S355 JO	S355 J2	S355 K2	S450 JO	+ M	S355M	S355ML @-40°C	S420M	S460M
L30 to L110	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓[1)]			
L 120 to L200	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	for t > 15 mm	✓[2)]
L 250 and L 300	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		for t < 31 mm	

figure 6: ArcelorMittal range of structural and micro alloyed grades for angles acc. to EN 10025-2 and 10025-4

[1)] Upon agreement [2)] L 160 excluded

Tubular tower



Tubular tower and long steel profiles?

A tubular tower is made of a cylindrical steel tube with diameters and wall thicknesses varying according to power.

In addition to flat products delivered by ArcelorMittal Europe, Long Products delivers specific long products extending from the nacelle down to the tower base as well as steel for connecting the different tubes of each tower.

Our products and services meet the specific criteria of every tower :

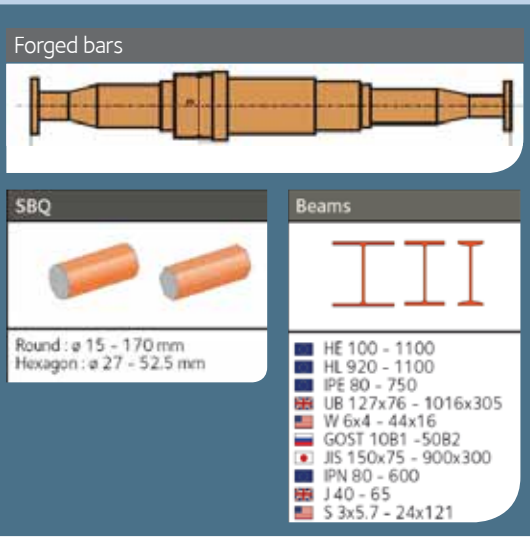
- steel for flanges with metric weight exceeding 300 kg/m
- bars for bolts with diameters up to 65 mm
- merchant bars and sections for cable ducts, ladders and platforms
- galvanized sections for transformers, control panels and cooling systems

figure 7: Inner part of a tower.

figure 8: Transformer and switch equimpent

figure 9: Hot dip galvanized sections

Nacelle, Generator



Long standing quality production experience and our research & development leadership have enabled us to develop the best quality grades not only in terms of cleanliness, formability and machining but also in development of specific heat treatments and quality controls to meet our customers' high standards.

figure 10: Connection for wings

Our offering also covers quality steels :

- Forged parts up to 17 tons for generators and gear boxes
- Forging grades in bars, squares and rounds
- Bars for hydraulic pistons and gears
- Jumbo sections for the nacelle frame as well as engine girders

figure 11: SBQ for bolts

figure 12: forged bars for main shaft

figure13: Forged bar

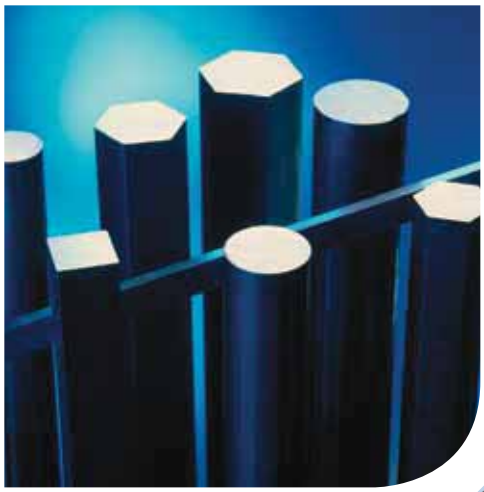
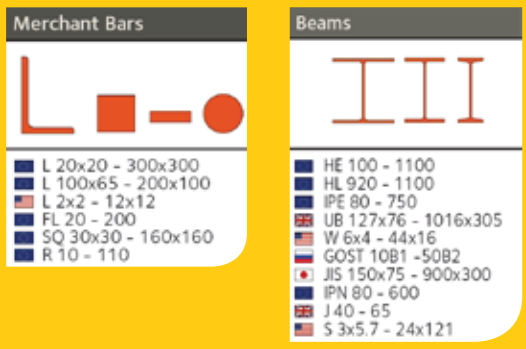


figure 14: SBQ

Courtesy of Gehrlicher Solar AG

4. Solar Energy



Solar technology makes use of the daily incoming solar energy, the so-called «global radiation». Both heat and power from the radiation can be harnessed. Today we can collect the sun's energy with two different methods: with photovoltaic cells or with collectors heated by the sun.

Solar power plants require various long products.

Planning principles of Substructures

Speed of construction and thus investment costs can be particularly reduced by pre-assembly. The use of long products makes an essential contribution. Due to the various available profile dimensions the design can be optimized and the dimensions of the solar modules can be closely coordinated.

The corrosion protection of hot dip galvanizing is performed and is thus virtually maintenance free.

Long Carbon Europe has facilities all over Europe so as to be able to deliver locally the most appropriate merchant bars for panel cladding and sections for frames.

figure 15: Solar Parcs

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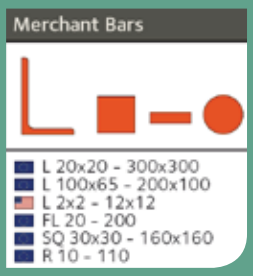
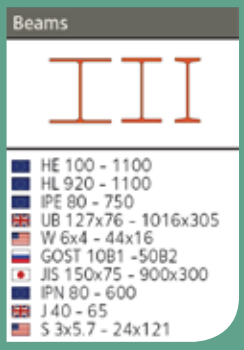
5. Biomass power plants





Biomass, as a renewable energy source is biological material from living matter. As an energy source, biomass can either be used directly, or converted into other energy products such as biofuel. Biomass helps to reduce the global human environmental footprint by recycling waste into energy.

Technical assistance

For years, ArcelorMittal Europe - Long Products has being developing partnerships in power plant buildings.

Our technical teams are supporting engineers in the design of structural elements, construction details, surface protection, fire safety, metallurgy and welding processes.

Specific steel grades

Histar

Over the years, through this expertise we introduced new products such as Histar® steel grades combining high yield strength with excellent toughness at low temperatures and outstanding weldability.

For the same bearing capacity, Histar® 460 High strength steel sections are 25 to 50% lighter than conventional steel profiles (S235 & S355).

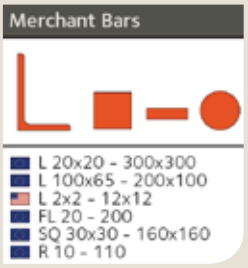
Thanks to this improved performance, construction cost, weight and carbon footprint are significantly reduced.

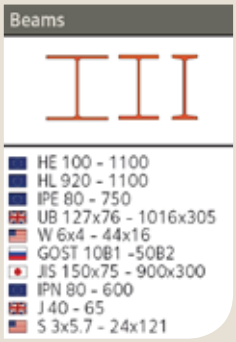
16Mo3

Where service temperature is an issue, we also deliver a 16Mo3 alloyed steel grade. Thanks to its improved mechanical properties (specified up to 500°C), this weldable grade is particularly recommended for use at elevated service temperatures such as powerplant equipment.

Moreover this special quality grade is available in rolled sections and merchant bars which are far more economical than cutting and welding plates to build up sections in 16Mo3.

6. Applications in related markets





Transformation stations for offshore wind farms

Through our long term partnership with the off-shore oil industry we have developed special off-shore grades which may be used in any off-shore wind farm transformation stations. Off-shore grades combined with our HISTAR process allow a structure weight reduction of up to 15 %. Typical examples are our beams HE700A, HE800A and HE800B in grades:

- HISTAR 355 TZ OS
- HISTAR 355 TZK OS
- HISTAR 460 TZ OS
- HISTAR 460 TZK OS
- FRITENAR 355 OS
- FRITENAR 355 TZK OS

Transmission line

For power transportation, we deliver angles from L20x20x3 to L300X300x35 covering the widest range in the world.

Electricity transport requires even more technical sections to renew and increase network coverage. Long Carbon Europe can deliver angles in grades from S235 to S460 M and in Arcorox®.

Arcorox® weathering steel is an atmospheric corrosion resistant, low alloy steel for sustainable applications with a focus on long service life with low maintenance costs.

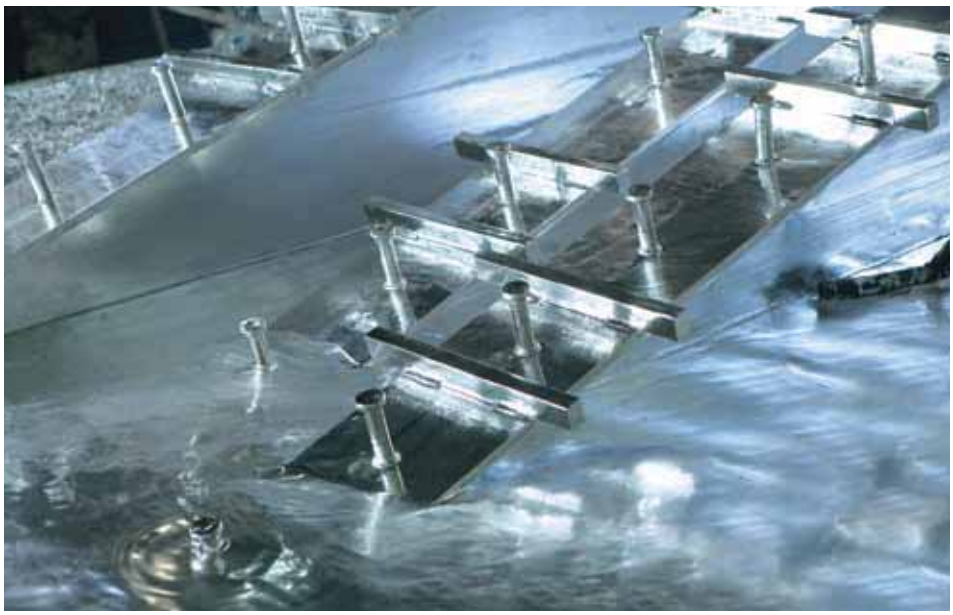
7. Finishing

As a complement to the technical capacities of our partners, we are equipped with high-performance finishing tools and offer a wide range of services, such as:

- drilling
- flame cutting
- T cut-outs
- notching
- curving
- straightening
- cold sawing to exact length
- cambering
- welding and fitting of studs
- shot and sand blasting
- surface treatment

Our fabrication and finishing operations enable significant time and cost savings by:

- shortening the production chain
- complementing the clients finishing capacity
- using powerful tools on an integrated site where the widest range of structural steel sections in Europe are rolled
- customized fabrication and surface treatment services
- providing high-performance capabilities and logistics, adapted to any constraints



8. Long steel products in sustainable construction

The preservation of natural resources in industrialized societies has become a priority in the creation of the built environment.

Consequently, building and energy concepts have to comply with changing economic parameters such as integration of life cycle analyses as well as with technological changes in order to consider at an equal level sustainability goals with respect to the environment and society.

These sustainability goals are in nature:

- ecological
- economical
- socio-cultural
- technical oriented

They are interdependent as well as being ambiguous, providing a coherent response to complex questions and protecting the environment for future generations. Renewable energy with long steel products is fully consistent with the different aspects of the sustainability goals.

Ecological aspects of sustainability

The aim of the main ecological goals of using construction materials that are safe from the perspective of health and the environment, of reducing structure waste when dismantling structures at the end of their service life, and of preserving the majority of their energy content and efficiency.

Here, long steels products offer high material efficiency: rolled sections, are for example, the most recycled construction material in the world.

In the modern electric arc furnace (EAF) supply chain, steel is produced using 100% scrap as a raw material (upcycling). Further, used steel elements can be deployed for further use in renovation and refurbishment of existing buildings. In addition, the EAF technology of steel allows for significant reductions of noise, particle- and CO_2-emissions as well as water and primary energy consumption in production mills.

Economic aspects of sustainability

In this respect, the reduction of investment costs, the optimisation of operating costs as well as long service lives along with high conversion flexibility have priority for investors.

Steel opens up unimagined possibilities, high quality, functionality and aesthetics, as well as lightweight and fast construction form a holistic symbiosis which allows the requirements of investors to be met.

Recovered steel can be recycled indefinitely, and reusing the steel structure as a whole or as individual steel components offers significant economic advantages.

Socio-cultural aspects of sustainability

This aspect allows project planners to combine their own aesthetic aspirations regarding building while bearing in mind the social expectations of the surrounding environment. Again, long steel products offer the user, thanks to their modular construction method, a high degree of transportability along with high load capacity and structural safety.

Technical aspects of sustainability

These structures have the advantage of being able to resist high level utilisation and are adaptable to changes in use.

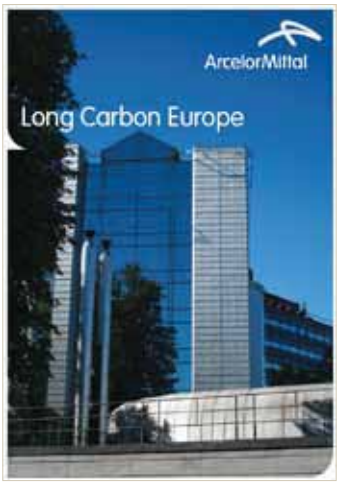
These robust construction solutions are capable of coping well with variations in use during service life without damage or loss of functionality.

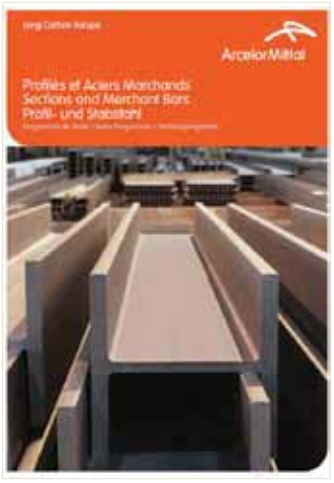
To document in a standardized way the environmentally relevant information, an EPD (Environmental Product Declaration) in accordance with ISO 14025 is available for structural steel upon request (sections.arcelormittal.com).

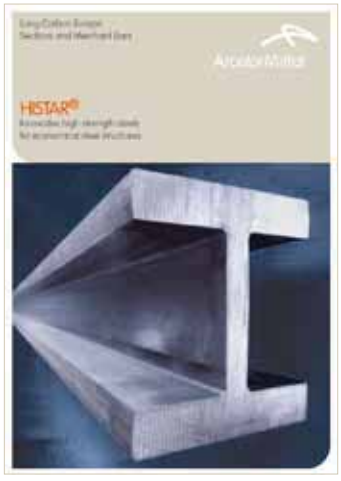
9. Product summary

		Bearing Piles	Beams	Rebars	SBQ	Special Sections	Merchant Bars	Forged bars
Wind Energy	Foundations	✓		✓	✓			
	Tubular Tower		✓		✓	✓	✓	
	Lattice Tower				✓		✓	
	Nacelle		✓		✓		✓	
	Generator				✓			✓
Solar Energy			✓				✓	
Parallel Markets	Transformation Station		✓		✓		✓	
	Power lines				✓		✓	

10. Technical documentation







http://sections.arcelormittal.com

Technical Advisory

We are happy to provide free technical advice to optimise the use of our products and solutions in your projects and to answer your questions about the use of sections and merchant bars. This technical advice covers the design of structural elements, construction details, surface protection, fire safety, metallurgy and welding.

Our specialists are ready to support your initiatives anywhere in the world.

sections.tecom@arcelormittal.com

To facilitate the design of your projects,we also offer free software and technical documentation that you can consult or download from our website:

sections.arcelormittal.com

We operate in more than 60 countries on all five continents. Please have a look at our website under “About us” to find our local agency in your country.

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ArcelorMittal
Commercial Sections

66, rue de Luxembourg
L-4221 Esch-sur-Alzette
LUXEMBOURG
Tel: + 352 5313 3010
Fax: + 352 5313 2799

sections.tecom@arcelormittal.com

sections.arcelormittal.com

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