



## Strategic Vision – Buildings As Power Stations

The following presentation was recently released to the public by Tata Steel.

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### **The Technology – DYE SOLAR CELLS**

DSC technology can best be described as 'artificial photosynthesis' using an electrolyte, a layer of titania (a pigment used in white paints and tooth paste) and ruthenium dye deposited on glass, metal or polymer substrates. Light striking the dye excites electrons which are absorbed by the titania to become an electric current many times stronger than that found in natural photosynthesis in plants. Compared to conventional silicon based photovoltaic technology, Dyesol's technology has lower cost and embodied energy in manufacture, it produces electricity more efficiently even in low light conditions and can be directly incorporated into buildings by replacing conventional glass panels or metal sheets rather than taking up roof or extra land area.

### **The Company – DYESOL Limited**

Dyesol, a global company headquartered in Australia, was founded to commercialize and supply 3rd generation solar technology - Dye Solar Cells (DSC). DSC uses a form of artificial photosynthesis to capture energy like a leaf, using a dye analogous to chlorophyll. Dyesol provides photovoltaic functionality to mainstream products, by developing and supplying materials and technology to global partners which have routes to market for solar enabled components, including building products such as glass and steel for facades and roofs. The company is listed on the Australian Stock Exchange (DYE), the German Open Market, and is trading on the OTCBB (DYSOY) through its depositary BNY Mellon.

More details about the company and the technology can be found at: <http://www.dyesol.com>

**TATA STEEL**



# BIPV Development Project



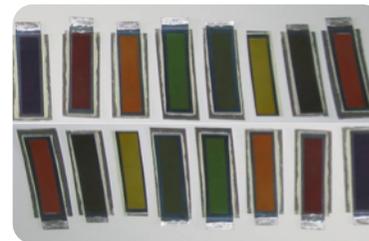
# Project Overview



- Tata are pursuing the development of truly integrated BIPV products
- The chosen photovoltaic technology is dye sensitised solar cells (DSSC)
- A three year project has been running with a technology partner, Dyesol
- The R&D project is based in the PV Accelerator, Shotton, North Wales
- The building houses a pilot line used for technology development
- The pilot phase has been completed
- Tata now intend to industrialise the manufacturing process
- Tata hope to offer commercial product in the next 2 – 3 years



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**DYESOL**  
GROUP of COMPANIES  
Global Leaders in Dye Solar Cell Technology

# Project History



- In May 2008 the Welsh Assembly Government approved a three-year project
- The award was the largest award of it's type
- The total project budget was £11m over 3 years
- The project employs a team of leading scientists and engineers
- The R&D facility houses a pilot line capable of manufacturing DSC solar cells



# Strategic Vision - Buildings As Power Stations



- Tata supplies  $> 100m^2$  of roof and wall cladding
- In our target market, large buildings approach  $100,000m^2$  in area
- Most of that roof area is 'redundant'
- The Colors vision is to functionalise the whole roof surface



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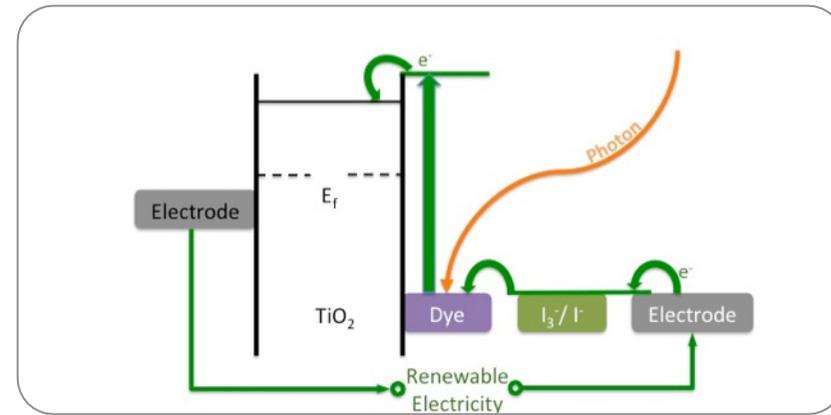
# Why DSC is the Right Technology



- Dye sensitised technology is often called “Artificial Photosynthesis”
- It works in all light conditions, even under artificial light
- The technology is ideal for use in locations where sunlight levels are low
- The PV coating can be applied to steel sheet using standard coating methods
- A roll-to-roll process makes high volumes achievable



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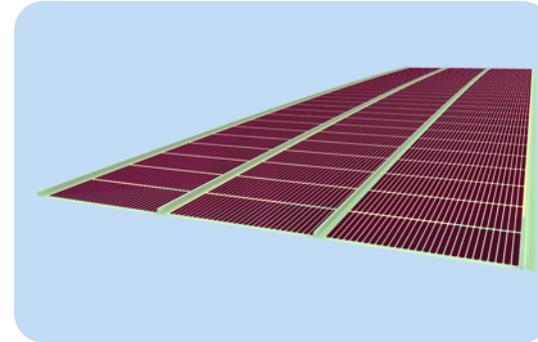


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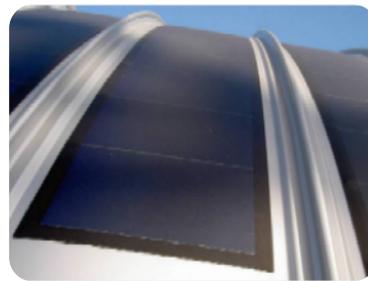
# Developing a True Building Integrated PV Solution



**PV modules bonded onto roof structure**



**PV modules mounted on top of roof structure**

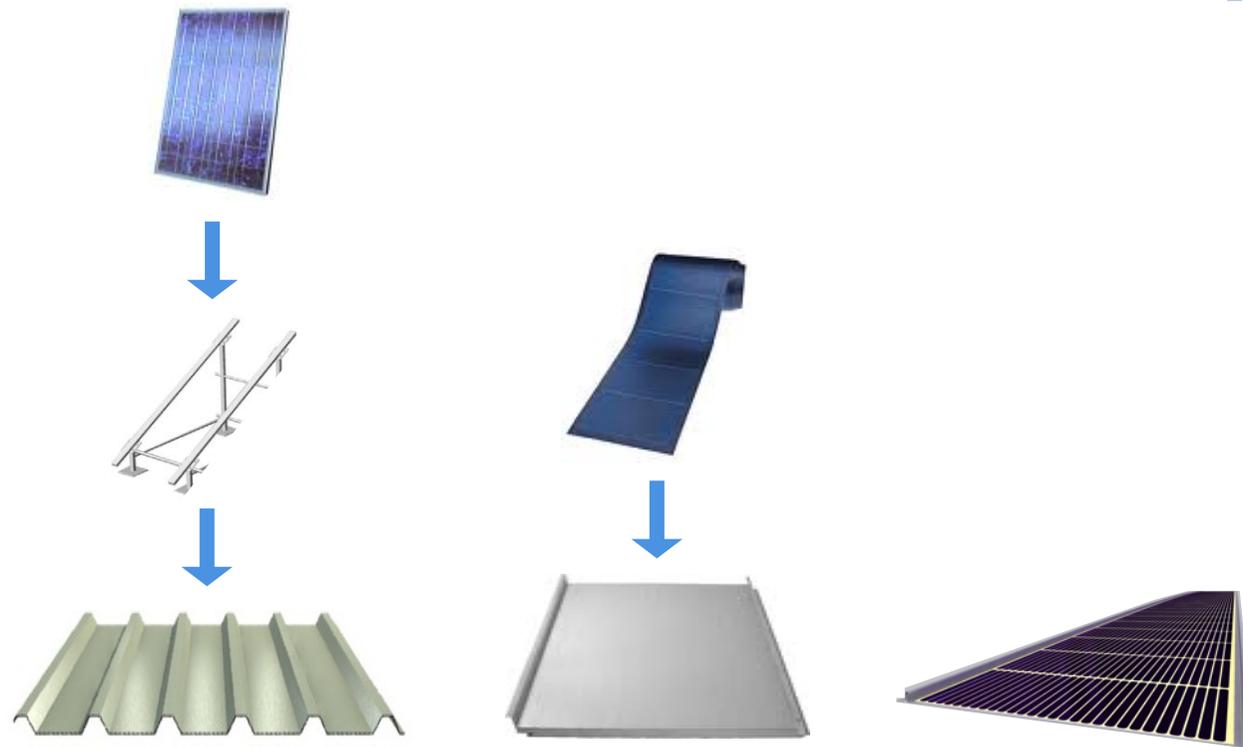


**PV modules laminated to individual roof sheets**



**Roof sheets incorporate photovoltaic function within their coating, to allow large-scale application**

# The Benefits of True Building Integrated PV



<b>Installation</b>	<b>PV</b>		
	<b>Frame</b>	<b>PV</b>	
	<b>Roof</b>	<b>Roof</b>	<b>PV Roof</b>
<b>Materials</b>	<b>Metal Roof</b>	<b>Metal Roof</b>	<b>PV is Metal Roof</b>
	<b>Glass/Glass PV</b>	<b>Metal Carrier PV</b>	
	<b>Support Frame</b>		

# The World's Largest DSC Module



## Press release – 10<sup>th</sup> June 2011

- The development partnership between Tata Steel and Dyesol has produced the world's largest dye sensitised photovoltaic module.
- The module is over 3 metres in length and approximately 1 square metre in area.
- The module was produced as a single length of coated steel, rather than separate cells connected together.
- Developing the ability to print the PV coating directly onto steel roof cladding would enable the modules to be produced in large volumes, cost effectively and integrated into building envelopes.

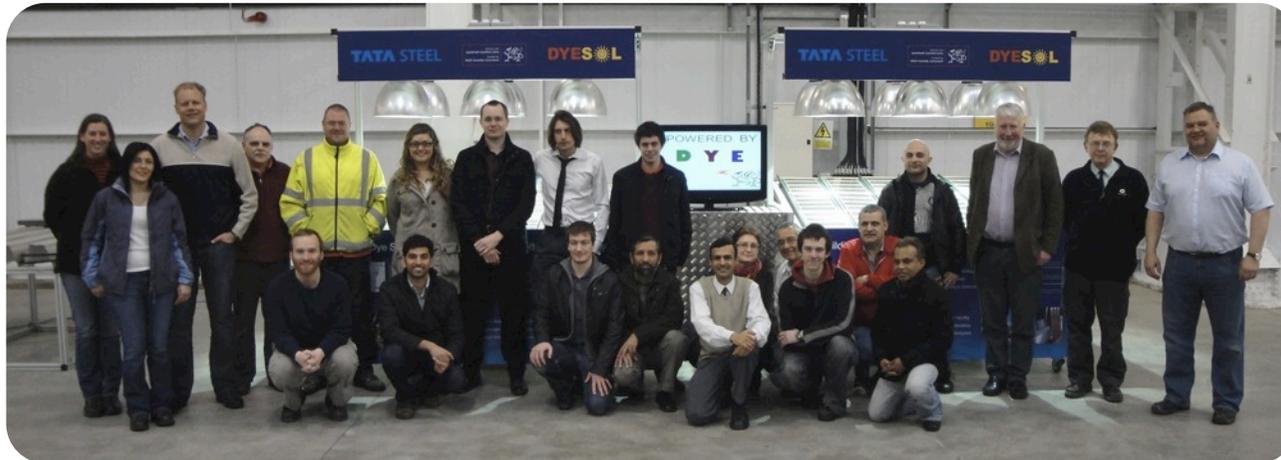


# Tata Steel and Dyesol Move to the Next Phase in Photovoltaics Project



## Press release – 29<sup>th</sup> March 2011

- Tata Steel and Dyesol have decided to expand their photovoltaics development project.
- The number of personnel working on the project will be increased from 30 to 50 and activity at the PV Accelerator centre will be scaled up.
- This expansion takes the project from its laboratory and pilot line phase into a pre-industrialisation phase.
- The technical progress will be significantly accelerated, with the objective of establishing a product, process and supply chain that can be successfully commercialised.



# Prince Andrew, HRH The Duke of York visits the PV Accelerator



## Press release – 7<sup>th</sup> April 2010

- Prince Andrew, HRH The Duke of York, arrived in Shotton for a tour around the company's manufacturing lines and the PV Accelerator
- The Duke of York's Royal duties include the role of UK Special Representative for International Trade and Investment.
- Part of this role involves visiting industrial businesses to find out more about them.
- He was joined by other high profile visitors, Lady Janet Jones (High Sheriff of Clwyd), Lord Barry Jones, Councillor Colin Legg and Mr Colin Everett of Flintshire County Council, and Councillor David Barratt, Chair of the Council at Connahs Quay



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# Colors Opens a New Development Facility



## Press release – 30<sup>th</sup> October 2008

- Corus (now Tata Steel) has once again demonstrated its commitment to innovation and sustainability through investment in a new facility at its Shotton site in North Wales
- The project is a joint collaboration between Corus and Australian company Dyesol, who are a world leader in dye sensitised systems
- The ambitious £11 million project has been supported by the Welsh Assembly Government
- The facility was officially opened by Rhodri Morgan, First Minister for Wales – “These investments...are yet another example of how Corus continually looks to innovate and invest in delivering some of the most sustainable products available to today’s construction sector”



# Colors and Dyesol Secure Funding for Project Investigating DSC Technology on Steel



## Press release – 29<sup>th</sup> February 2008

- Corus (now Tata Steel), Dyesol and the Welsh Assembly Government have agreed significant funding to further progress the development of dye solar cell technology on steel for building integrated photovoltaic applications
- Corus and Dyesol have been working closely for the past two years, and in January 2008 successfully completed a detailed 12-month study, which confirmed the feasibility of this technology for large-scale manufacture on steel.
- Funding has been secured from the Welsh Assembly Government under the SMARTCymru mechanism
- Corus and Dyesol will be expanding the scope of their development activities and accelerating progress towards large-scale manufacture.

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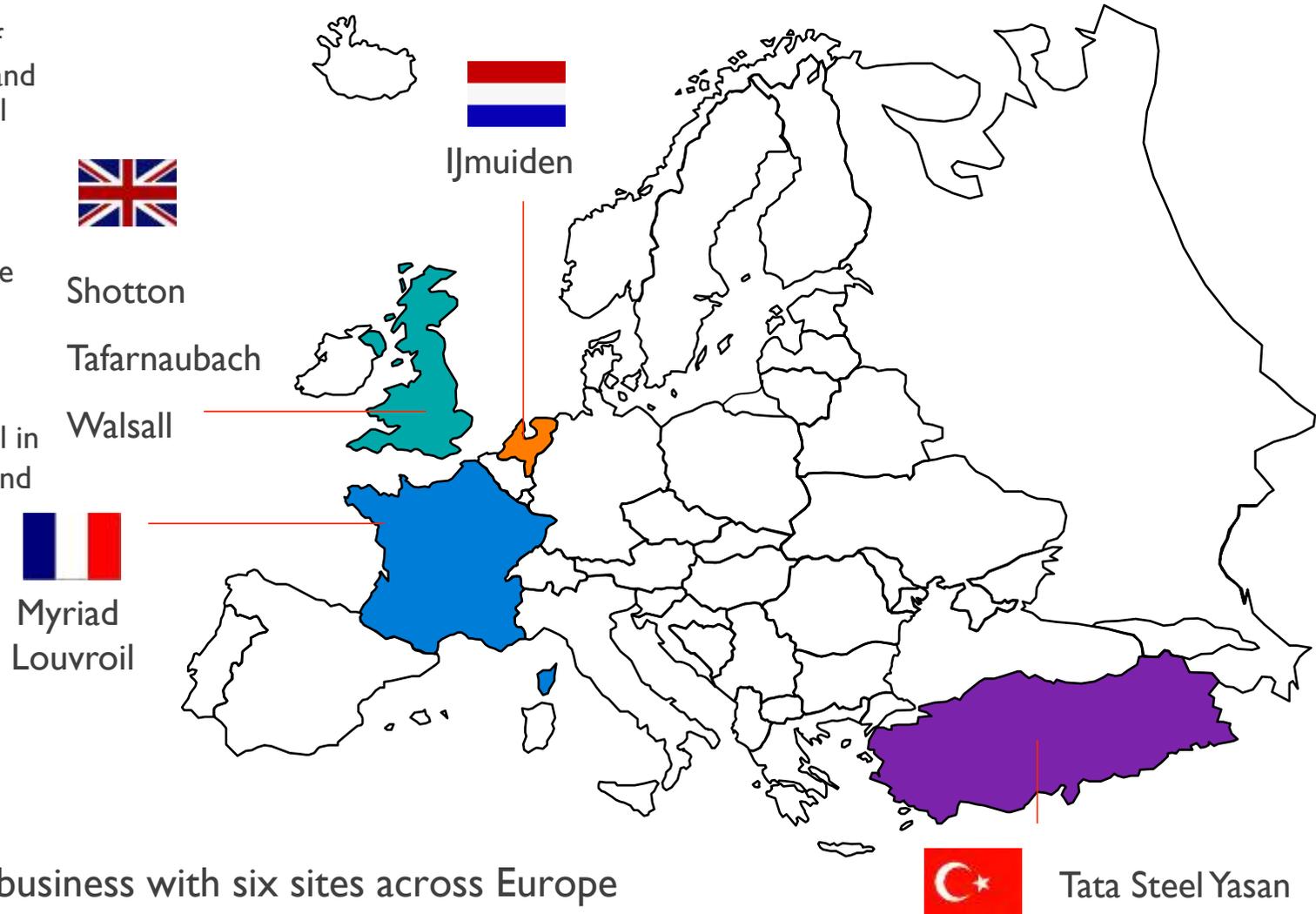


# **Tata Steel Colors Introduction**

# Tata Steel Colors sites in Europe



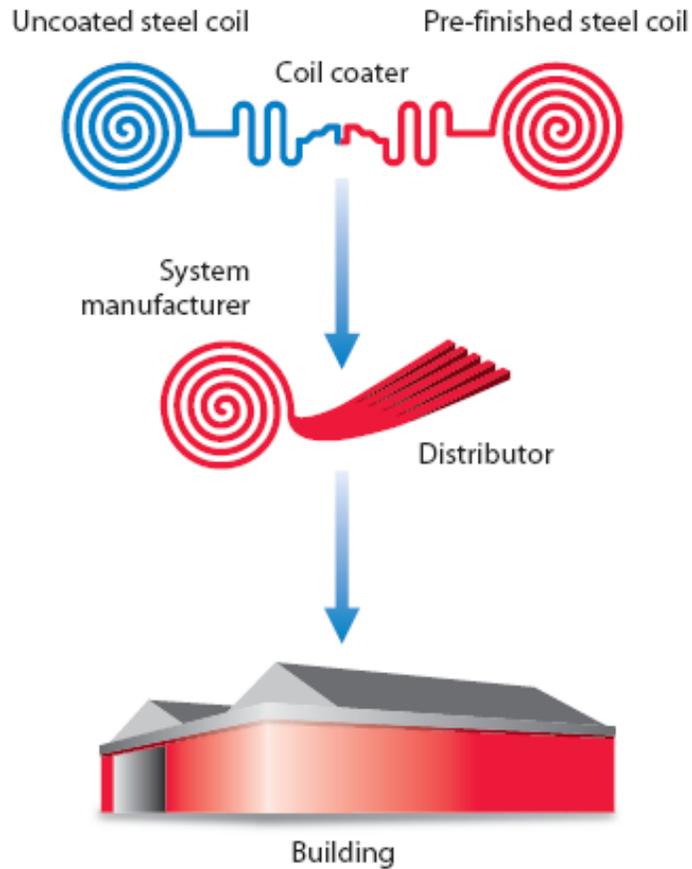
- Manufacturer of metallic coated and pre-finished steel products
- 40 years experience supplying into the construction market
- Most specified pre-finished steel in the UK and Ireland



- International business with six sites across Europe

# Tata Steel Colors

## Where do we fit in?



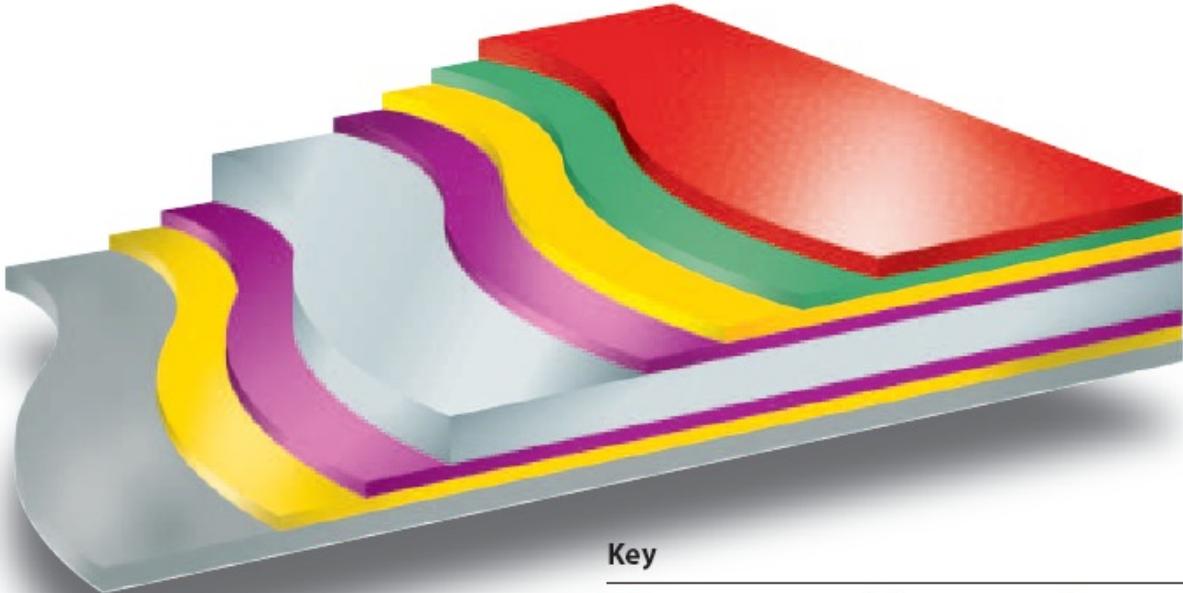
## TATA STEEL

Colorcoat® pre-finished steel

We supply through a reputable Colorcoat® assessed supply chain and Colorcoat® accredited distributors

Colorcoat® products are used in a wide range of buildings including stadia, commercial, education, residential and industrial. Some examples include Manchester United's stadium, IKEA in Coventry and Tesco's stores

# What is pre-finished steel?



**Key**

- |                  |           |               |
|------------------|-----------|---------------|
| Topcoat          | Primer    | Pre-treatment |
| Metallic coating | Substrate | Backing coat  |

# Colors pre-finished steel branding approach



**TATA STEEL**



**Building envelope**



**Manufactured goods**



**Domestic appliances**

**Colorcoat®**

**Advantica®**

**Motiva®**

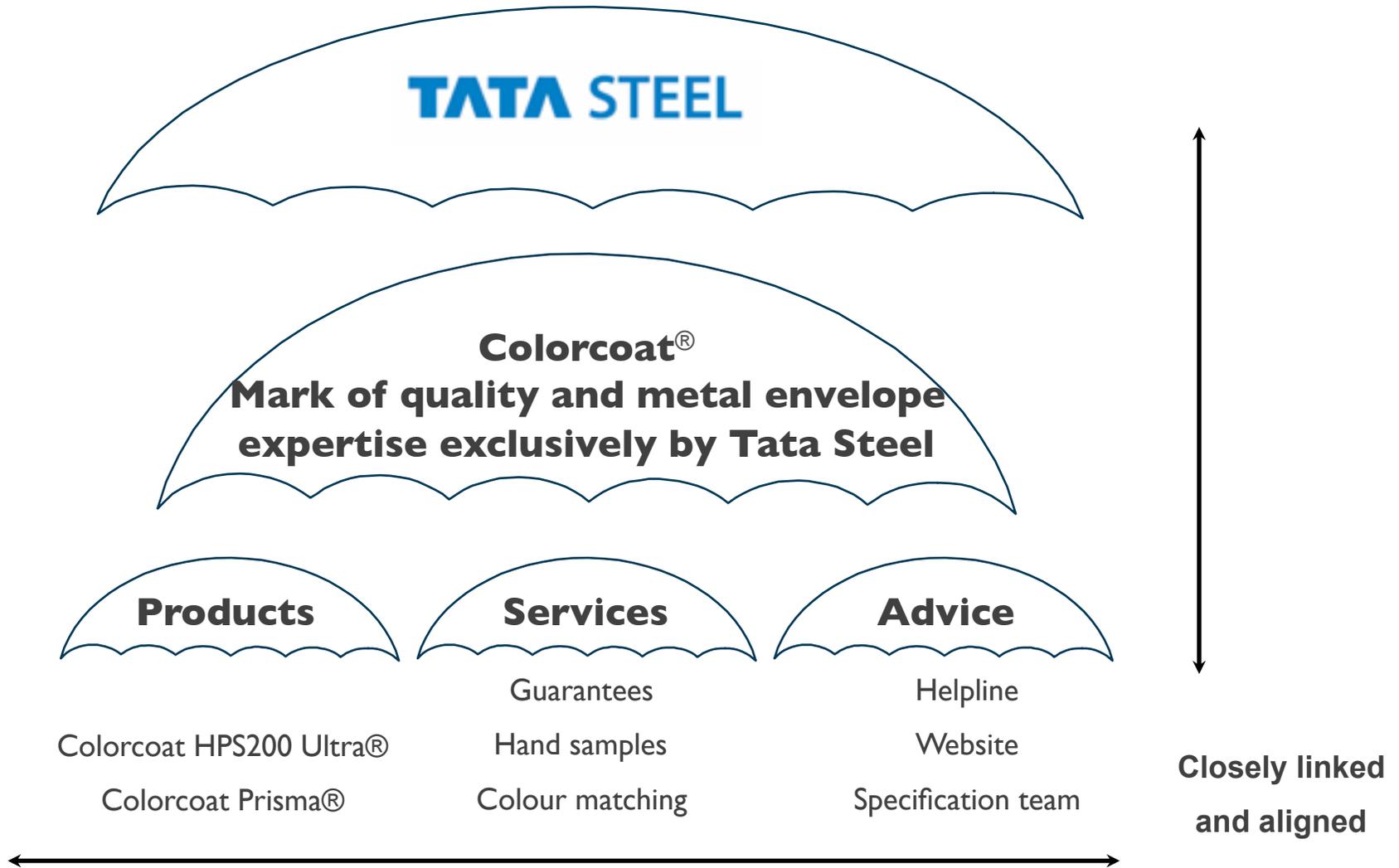
Tailored for DA applications e.g  
Hot, Cold and Wet.

**Myriad service offerings  
eg. Myriaplus™**

Service brand available across sectors for selected products.  
Focus on flexibility and rapid delivery



# What is the Colorcoat® brand?



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