

# Energy Technology Perspectives 2014

## IEA Global Industry Dialogue and Expert Review Workshop

Paris, October 7

- ETP 2014 preliminary results feedback
  - Production, energy use, fuel mix shifts
- Energy market changes and impact in
  - Fuel mix
  - Regional production shifts
  - Regional industrial competitiveness
- Views on BATs values
- Emerging technologies status, expected progress
  - Sector specific emerging technologies
  - CCS demonstration and deployment needs and prospects
  - Which role H2 can play in the future?
- ETP Industry model improvement → data availability
- ETP 2015 potential topic discussion → The role of industry in the climate negotiations

# Iron & Steel BATs

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2014

Source	Year	Sintering [GJ/t]	Hot rolling & finishing [GJ/t]	Cold rolling & finishing [GJ/t]	Coke oven net use [GJ/t]	Blast furnace net use [GJ/t]	DRI gas [GJ/t]	DRI coal [GJ/t]	Smelt reduction [GJ/t]	Combined EAF [GJ/t]
Current BAT <i>Tracking Clean Energy Progress</i>	2013	-	2.0	1.0	3.7	10.4	10.4	20.0	-	1.1
Worrell, et al. <i>Berkeley National Laboratory</i> <sup>1</sup>	2008	1.4	2.7	1.5	0.6	12.3	11.7	17.7	17.3	2.5
EU BAT Reference Report <sup>2</sup>	2012	1.4- 2.3 *EU actual	-	-	-	-	10.5 - 14.5	-	-	1.8 *EU average

1 “World Best Practice Energy Intensity Values for Selected Industrial Sectors”

2 European Commission JRC Reference Report: Best Available Techniques (BAT) Reference Document for Iron and Steel Production

## ■ Iron & Steel

- Smelt reduction deployment 2DS target: 31.1 Mt by 2025 (2% of expected total crude steel production in 2025).
  - ◆ Several processes commercially available: Finex<sup>®</sup>, Corex<sup>®</sup>, HIs melt<sup>®</sup> but with very low adoption rate
  - ◆ Others at pilot scale testing stage such as HIsarna<sup>®</sup> (integrating HIs melt<sup>®</sup> and Isarna<sup>®</sup> processes)
- Blast furnace with top gas recycling is expected to deploy in 2020. Full-scale demonstration plant operational by 2016.

- 2DS 2050 CCS targets:
  - Iron & Steel: 848 Mt CO<sub>2</sub> captured (29% of direct CO<sub>2</sub> sector emissions without capture)
  - IEA CCS Roadmap analyses actions to accelerate deployment

- Is there room for a greater use of H<sub>2</sub> in Industry?
  - Current H<sub>2</sub> generation cost makes it too valuable to be used as fuel
  - Additional burdens: H<sub>2</sub> combustion impact on process operating parameters, requirements for equipment modification leading to a significant investment
  - Iron & Steel: H<sub>2</sub> reduction Iron and Steel making process
    - ◆ H<sub>2</sub> produced by amplifying technique using BFG and COG and then used as reducing agent reducing the process coke needs.
    - ◆ Research progress, process potential??

# Model improvement: data requirements

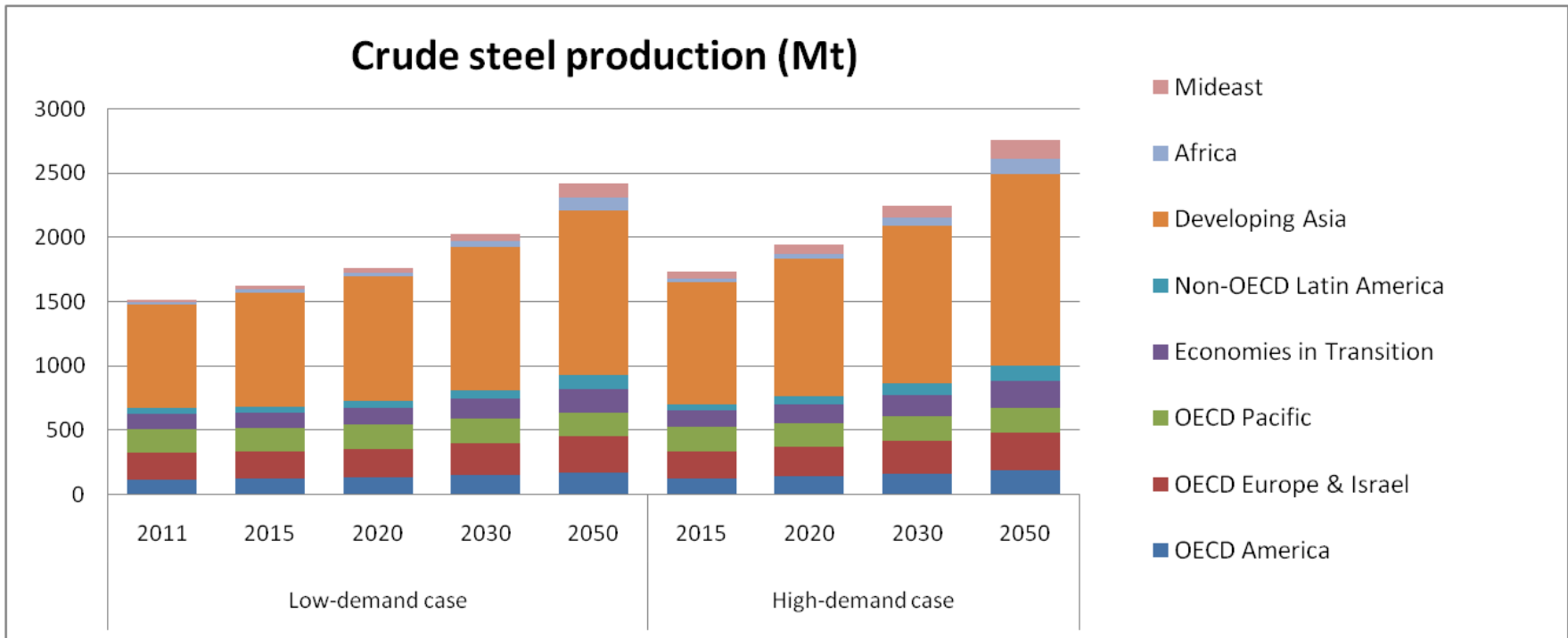
- Start conversion to a different platform, future structural changes:
  - Capacity vs production → level of capacity utilisation
  - Capacity characterization by plant size categories
  - Full segregation of energy use by process requirements, heat/elec generation (CHP) and separate heat generation
  - Separate modeling of waste heat recovery potentials
  - Segregation of biomass, waste and renewable energy sources
  - Improve technologies capital and operational costs assessment
  
- Waste heat recovery potential by sector
  - Cement industry analysis through IEA India Cement Roadmap → 550 MW existing potential

Back up slides



# Iron & Steel - Production

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## Major Crude Steel production growth

Developing Asia  
OECD Europe  
EITs

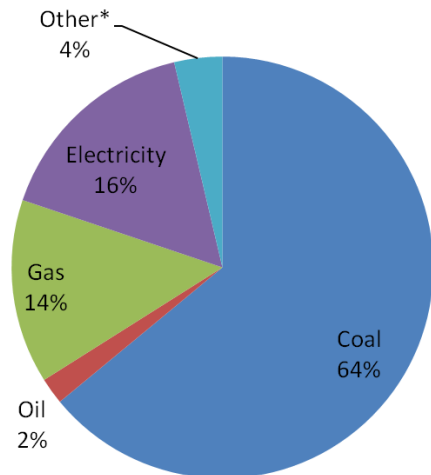
## 2050 vs 2011 low demand

53%  
11%  
8%

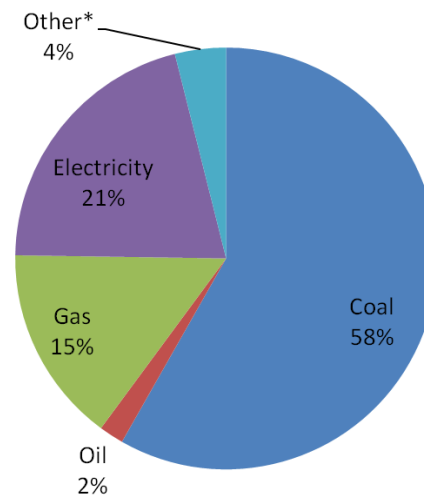
# Iron & Steel - Energy use

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Iron & Steel energy use 2050 (6DS) (Total 1077 Mtoe)



Iron & Steel energy use 2050 (2DS) (Total 863 Mtoe)



**Fuel share in energy  
use change**

**2050 2DS vs 6DS  
low demand**

**Coal**

-6%

**Oil**

0%

**Gas**

+1%

**Electricity**

+5%

**Other**

0%

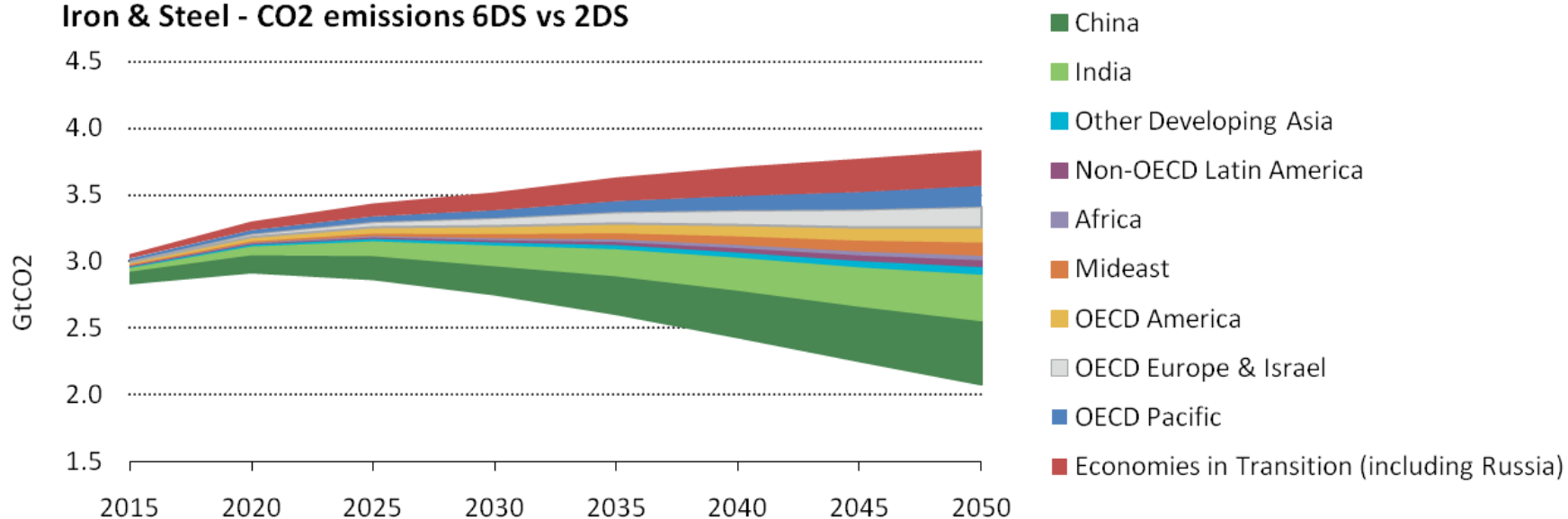
Note 1: Other includes: heat, combustible biomass, waste and other renewables.

Note 2: Energy use includes blast furnaces and coke ovens.

# Iron & Steel - Direct CO<sub>2</sub> emission reductions

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Iron & Steel - CO<sub>2</sub> emissions 6DS vs 2DS



**Major CO<sub>2</sub> emission reduction contributions**

**6DS vs 2DS (2050)  
low demand**

**China**

27%

**India**

20%

**EITs**

15%