

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

Cement BATs

ETP
2014

Source	Year	Specific thermal energy use [GJ/t clinker]	Specific electricity consumption [kWh/t cement]			Clinker to cement ratio		
			Portland	Fly ash	BF slag	Portland	Fly ash	BF slag
Current BAT <i>Tracking Clean Energy Progress 2013</i>	2013	3.0	89-95			0.7		
Worrell, et al. <i>Berkeley National Laboratory</i> ¹	2008	2.85	59-62	52-57	57-65	0.95	0.65	0.35
EU BAT Conclusions ²	2013	2.9-3.3	-			-		
Madlool, et al. <i>Renewable and Sustainable Energy Reviews</i> ³	2011	2.72 (world's best)	65 (world's best)			-		

1 "World Best Practice Energy Intensity Values for Selected Industrial Sectors"

2 Commission Implementing Decision of 26 March 2013, Official Journal of the European Union

3 "A critical review on energy use and savings in the cement industries"

■ Cement

- Identify and classify suitable alternative fuels
- Clinker substitutes properties analysis and assessment of regional availability

- 2DS 2050 CCS targets:
 - Cement: 531 Mt CO₂ captured (25% of direct CO₂ sector emissions without capture)
 - IEA CCS Roadmap analyses actions to accelerate deployment

- Is there room for a greater use of H₂ in Industry?
 - Current H₂ generation cost makes it too valuable to be used as fuel
 - Additional burdens: H₂ combustion impact on process operating parameters, requirements for equipment modification leading to a significant investment

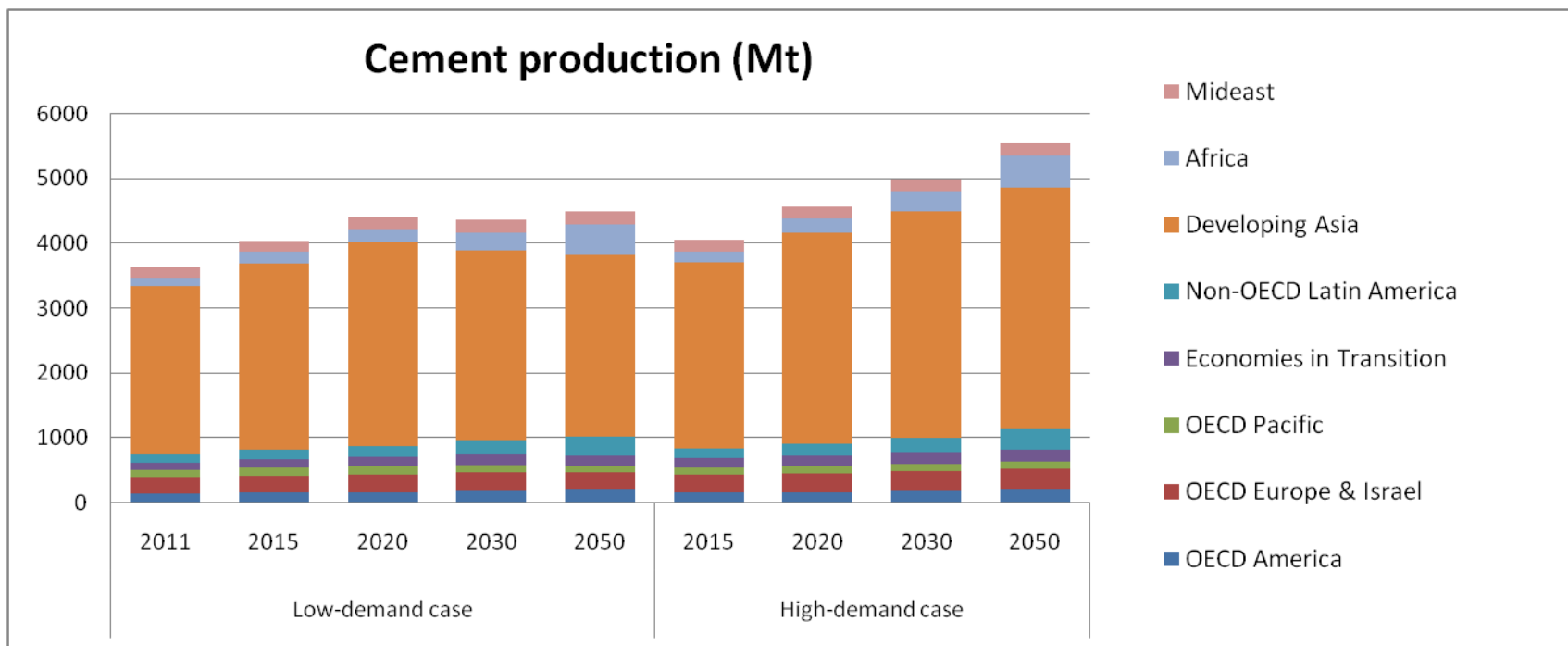
Model improvement: data requirements

- 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

Cement - Production

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Major Cement production growth

Developing Asia

Africa

Non-OECD Latin America

2050 vs 2011 low demand

63%

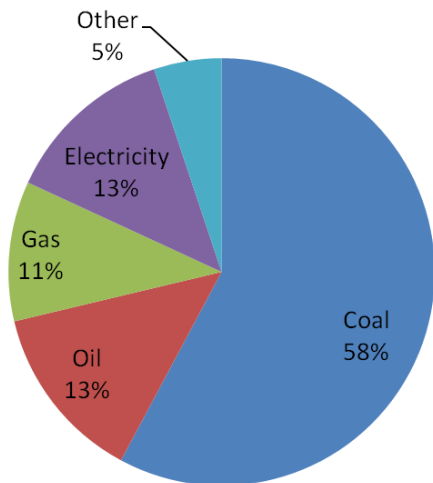
10%

6%

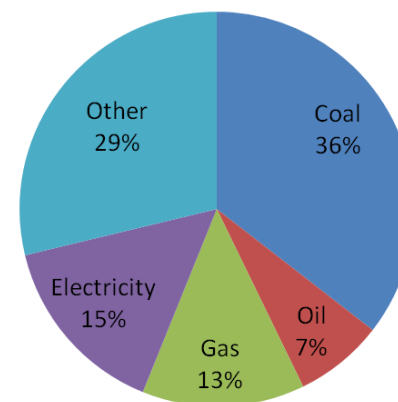
Cement - Energy use

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Cement energy use 6DS 2050 (Total 301 Mtoe)



Cement energy use 2DS 2050 (2DS) (Total 266 Mtoe)



**Fuel share in energy
use change**

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

Coal

-22%

Oil

-6%

Gas

+2%

Electricity

+2%

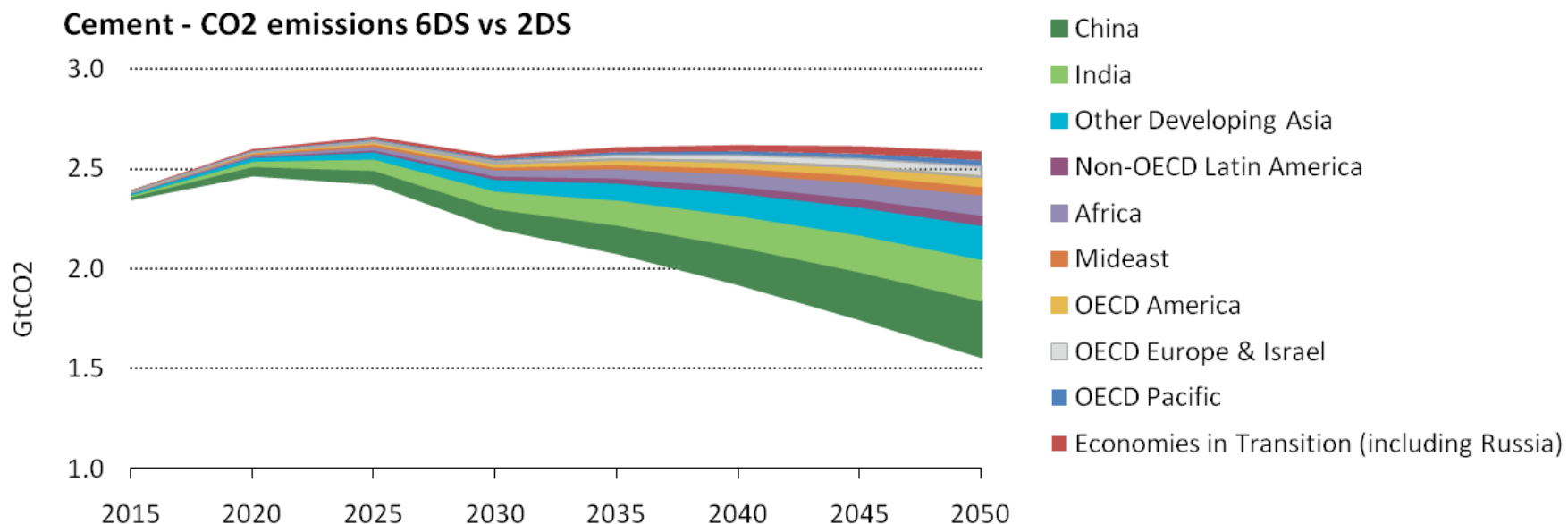
Other

+24%

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

Cement - Direct CO₂ emission reductions

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Major CO ₂ emission reduction contributions	6DS vs 2DS (2050) low demand
China	28%
India	20%
Other Developing Asia	16%