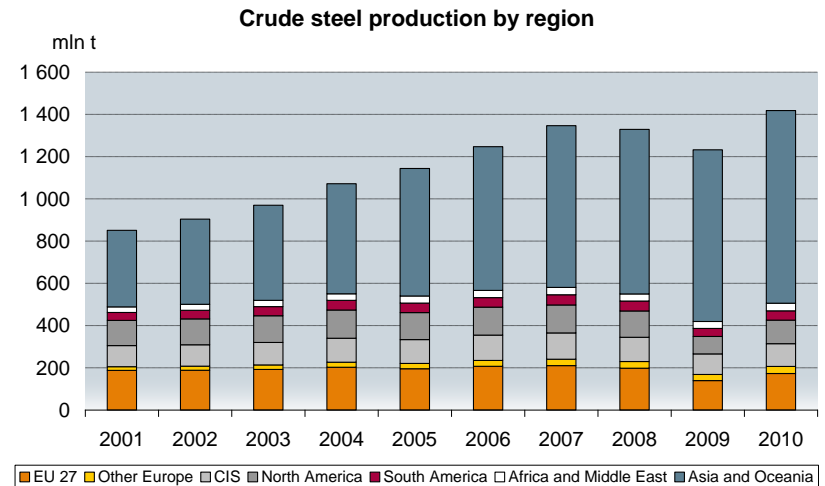
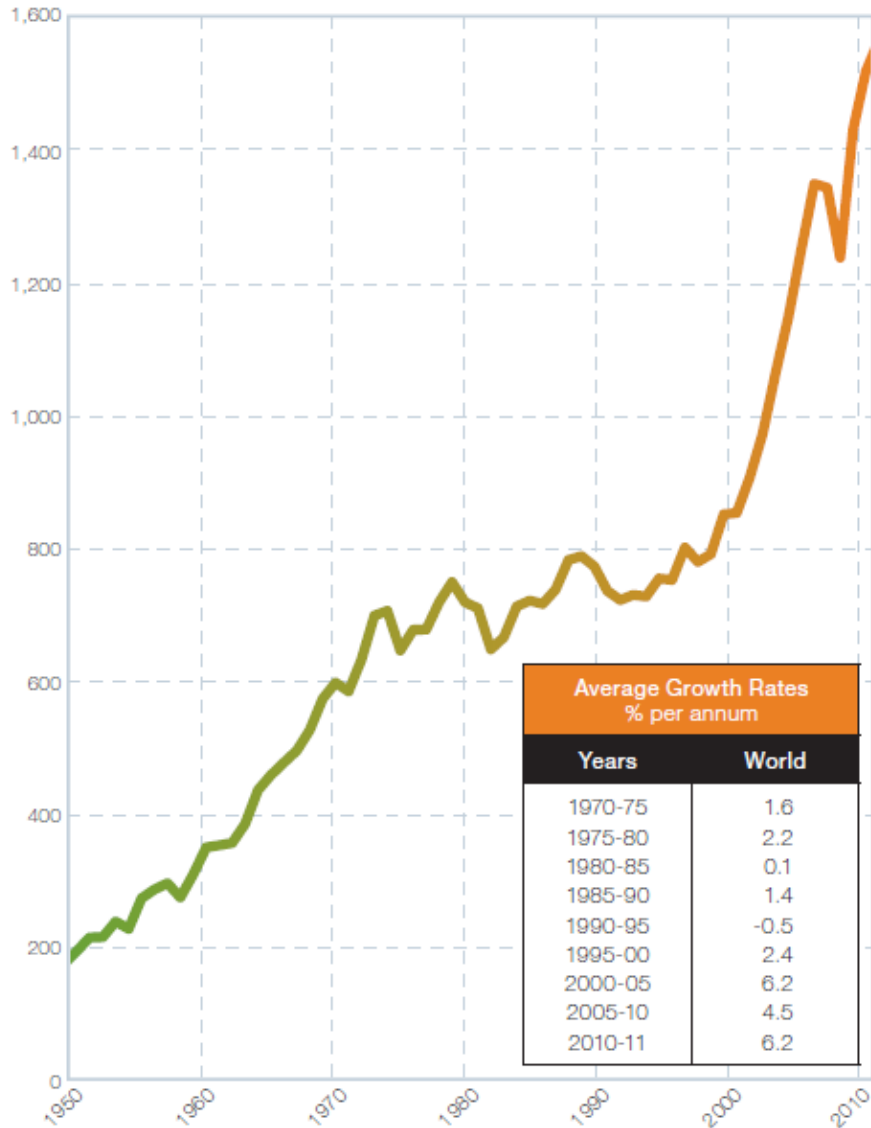


Global Perspectives and Best Practice in the Steel Industry

World Crude Steel Production (1950 to 2011)



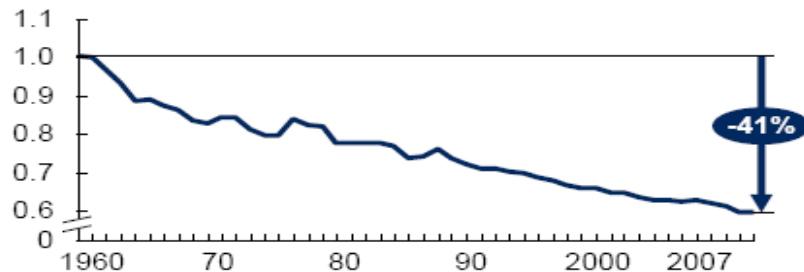
Steel Industry Improvements

The steel industry has pushed hard to reduce cost and secure sustainability

GERMANY

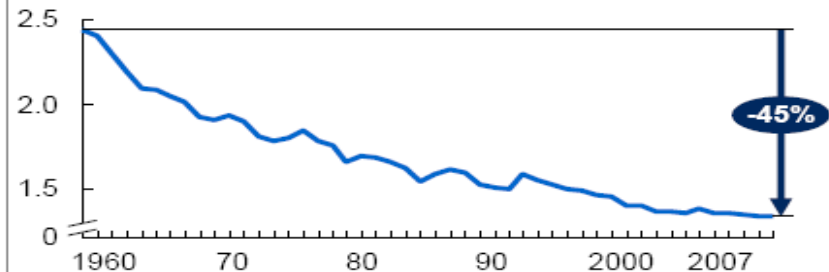
Specific energy consumption

Metric ton coal equivalent per t crude steel



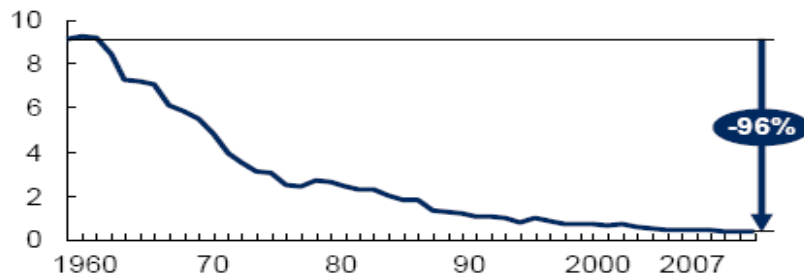
Specific CO₂ emission (Average BF/BOF and EAF)

Metric ton CO₂ per t crude steel



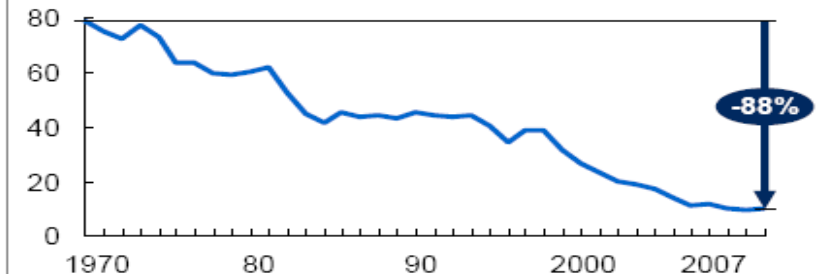
Specific dust emission

Kg dust per t crude steel



Accident rate

Number of accidents per million working hours



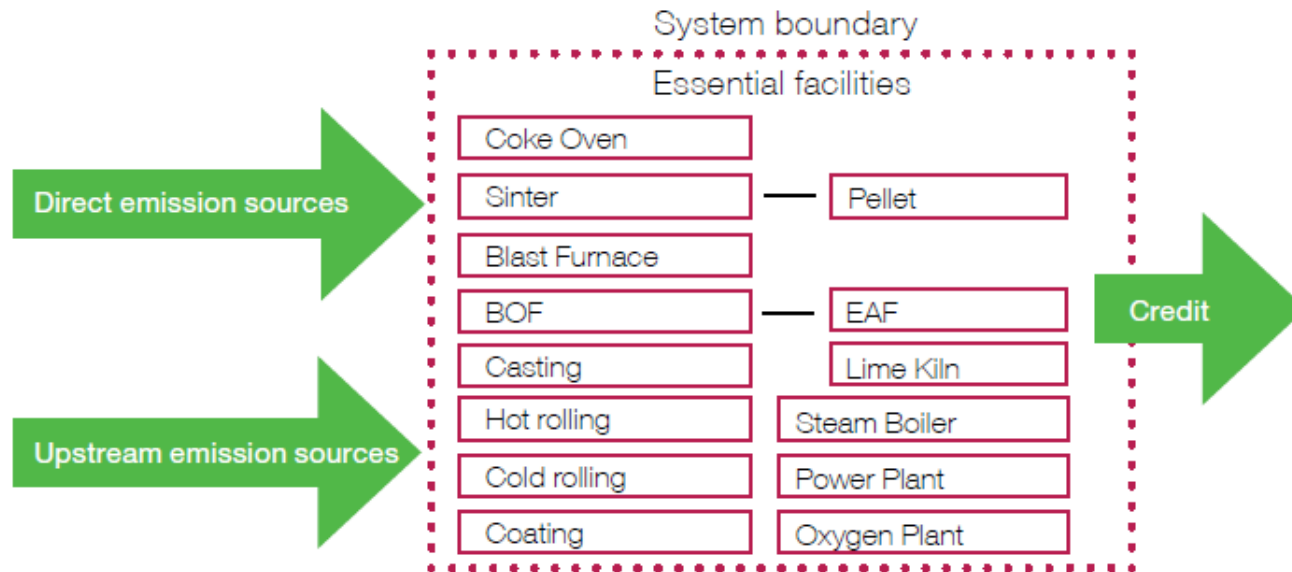
SOURCE: Wirtschaftsvereinigung Stahl

McKinsey & Company | 4

- worldsteel CO₂ Data Collection
- Energy Use in the Steel Industry
- Breakthrough technologies

worldsteel CO₂ Data Collection

CO₂ data Collection Methodology



CO₂ emissions = Direct + Indirect – Credit

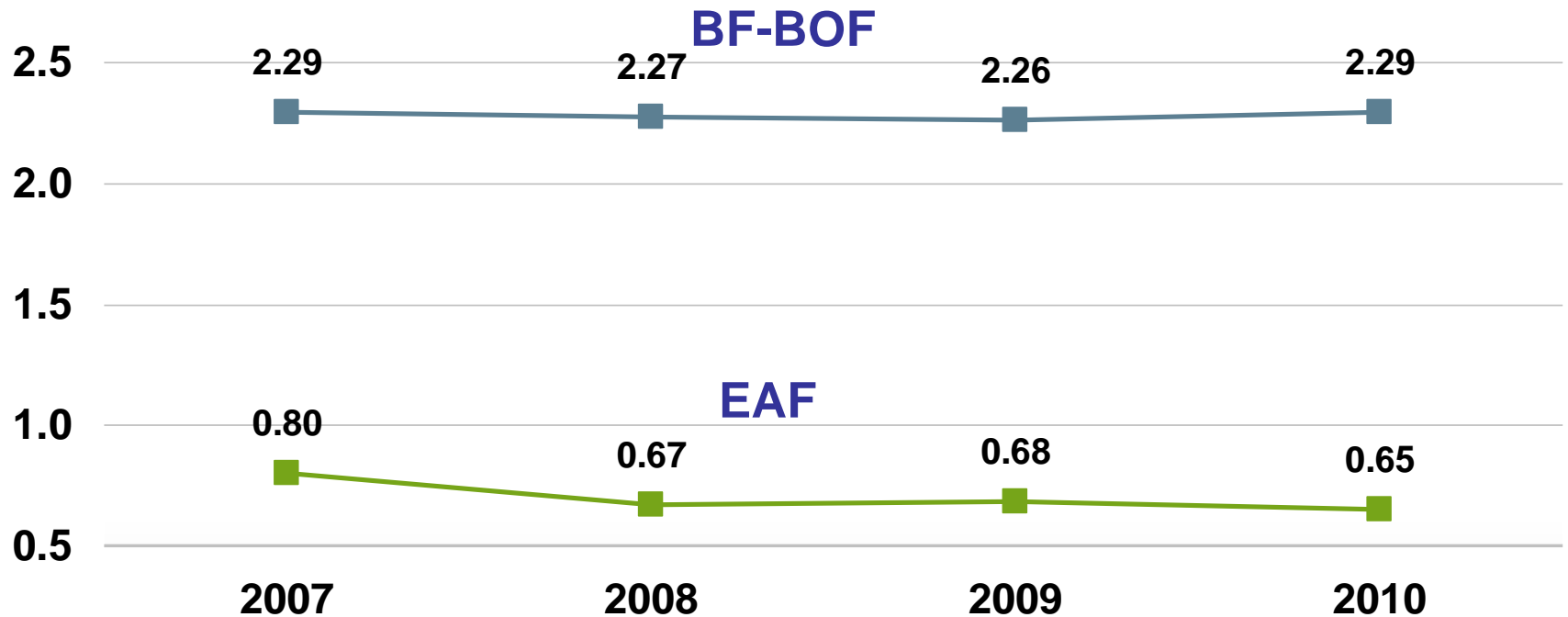
CO₂ intensity = CO₂ emissions (tonne) / crude steel (tonne)

2011 CO₂ Data Collection – in progress

Region	Number of companies					Number of sites				
	2007	2008	2009	2010	2011	2007	2008	2009	2010	2011
Global	38	49	45	51	32	188	207	208	212	148
EU-27	13	16	13	17	13	69	69	66	67	58
Other Europe	0	3	4	2	2	3	6	7	5	3
C.I.S.	2	2	2	1	2	5	7	5	4	2
North America	5	6	6	7	4	61	61	63	65	51
South America	2	4	4	5	2	11	14	22	19	8
Africa	0	0	0	0	0	6	6	6	6	6
Middle East	1	2	3	2	0	1	2	3	3	0
Developed Asia	8	10	8	11	6	20	36	31	32	17
Other Asia (excl. China & India)	0	1	1	1	1	0	1	1	1	1
China	0	0	0	0	0	0	0	0	0	0
India	7	5	4	5	2	12	5	4	10	2

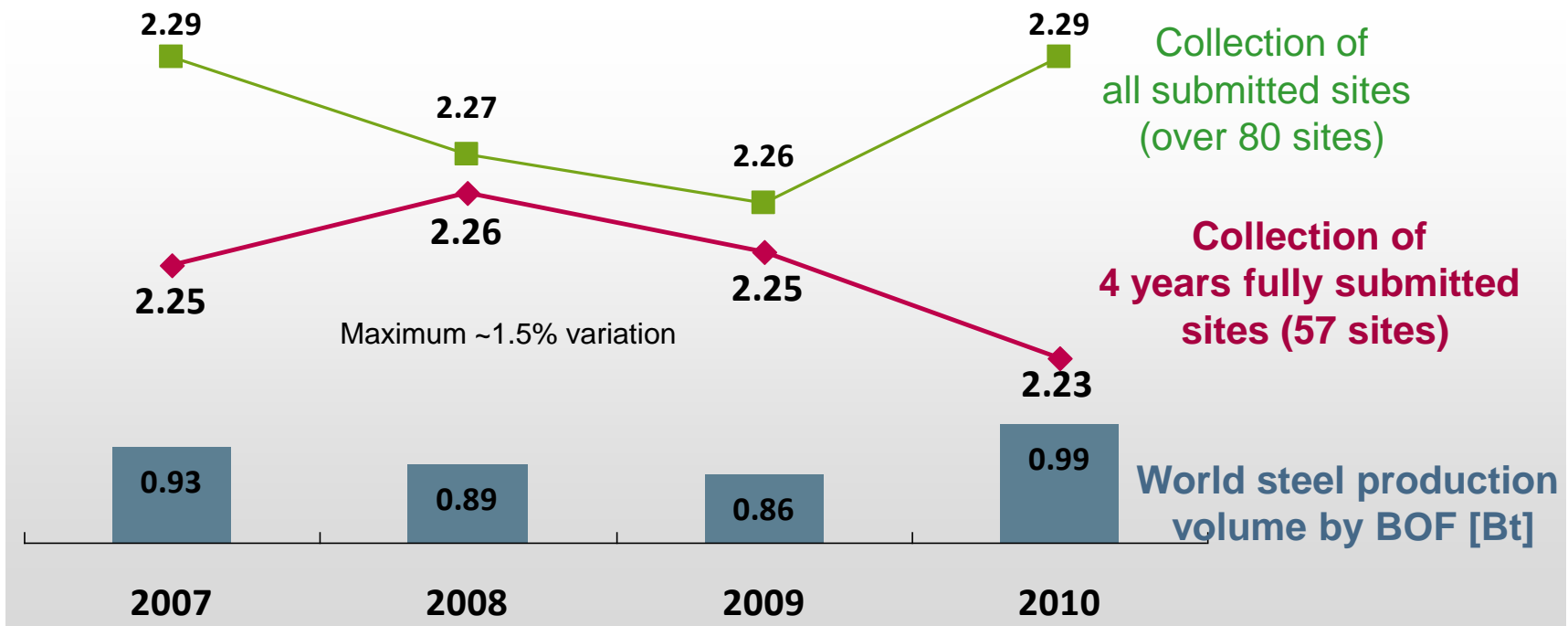
Trend of Averages 4 Survey Years of CO₂ data

- CO₂ emissions intensity of each route [tCO₂/tCS]



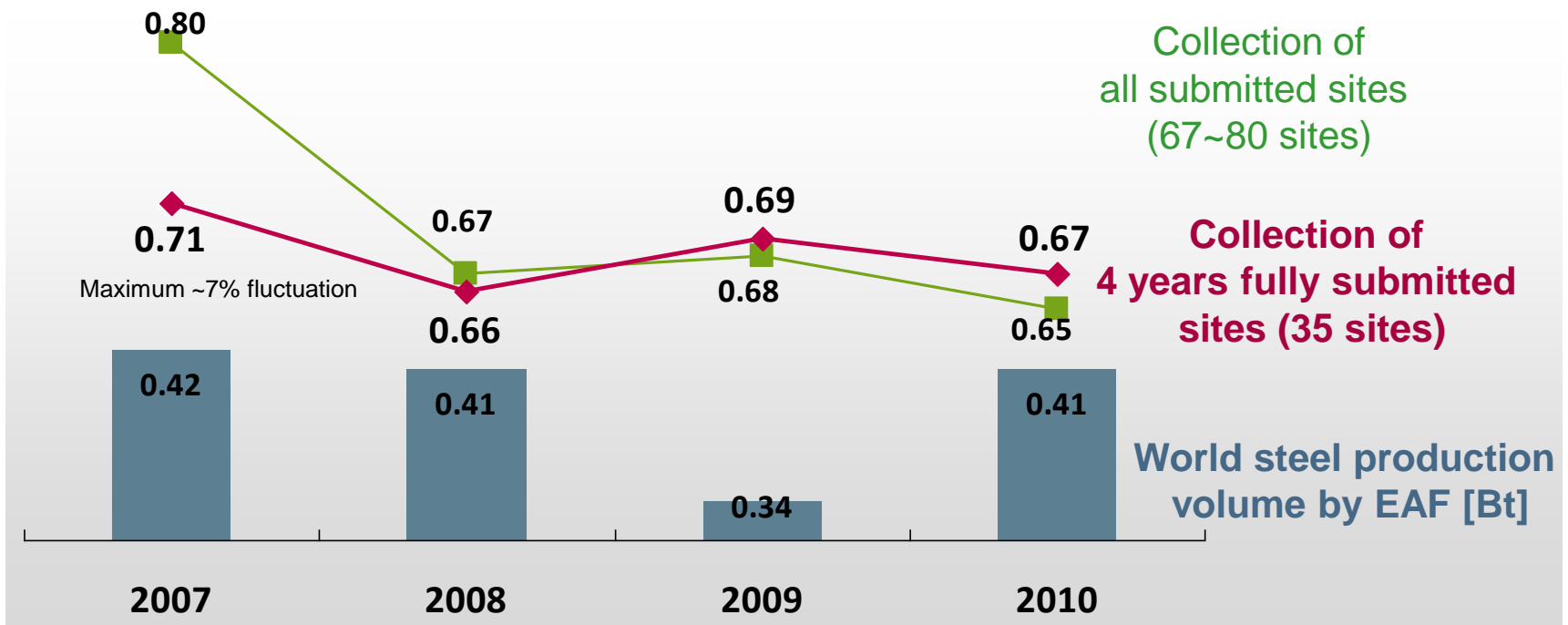
4 year trend of CO₂ intensity for BF-BOF route

- CO₂ Intensity [tCO₂/tCS] weighted by production volume
 - Every year the data collection includes different participations
 - Averaged only for those who submitted data 4 years in a row.
- CO₂ methodology model reflects the economic trend
 - Production drop under BF capacity decrease its efficiency



4 year trend of CO₂ intensity for EAF route

- CO₂ Intensity [tCO₂/tCS] weighted by production volume
 - Every year the data collection includes different participations
 - Averaged only for those who submitted data 4 years in a row.
- The data collection model reflects the economic trend
 - Economic recession likely reduce external scrap level → CI ↑



Energy Use in the Steel Industry

Objectives of the Energy Project:

- Provide opportunities to decrease the energy intensity / ton of crude steel.
- Provide best or good practices to utilize energy sources more effectively.
- Provide best or good practices to recover energy (heat, gas) where practical.
- Enabling companies to develop plans for plant energy intensity reduction.
- Practice benchmarking allows prioritization of investments to improve energy efficiency with the biggest impact.

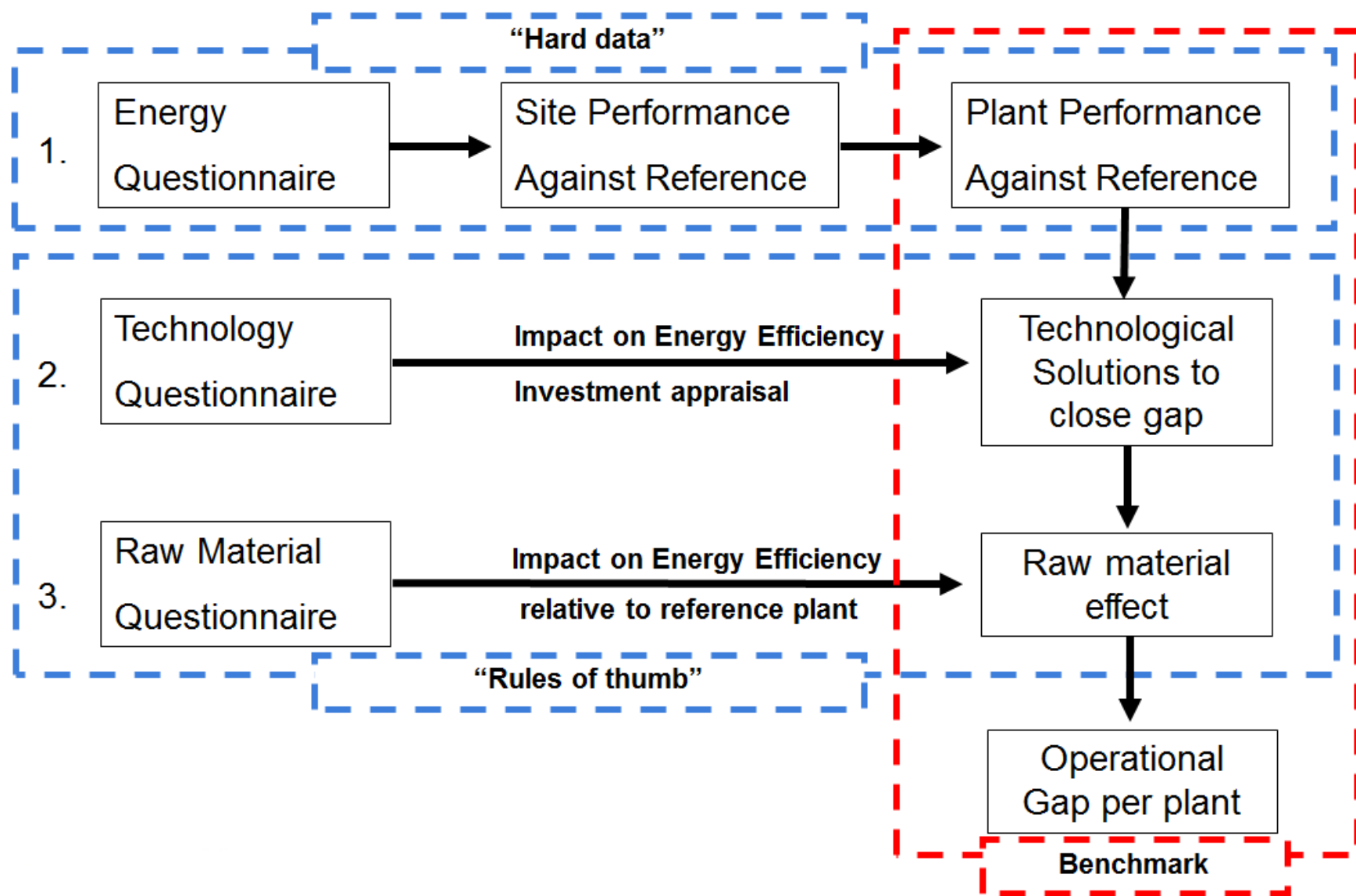
Energy project coverage members steel production in 2010

1,413.6 mmt of crude steel was total world steel production in 2010

Energy use project members produced 373,3 mmt of crude steel in 2010

346 mmt of steel represent approximately 26.4% of the total world steel production in 2010

Energy Benchmarking Process



Breakthrough Technologies

Programme Status / Update reports.

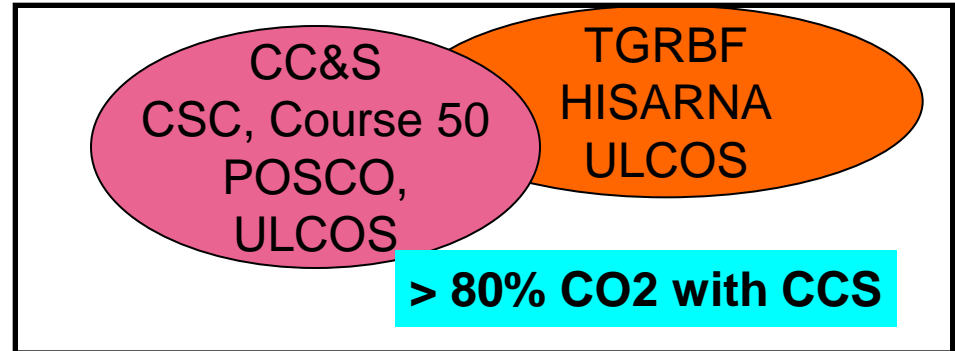
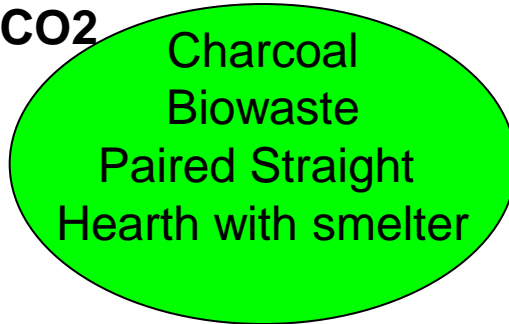
- **ULCOS:** TGR – BF, Hisarna, ULCORED, ULCOWIN / ULCOLYSIS
- **AISI:** Hydrogen Flash Melting
- **Australian Program:** Heat Recovery of Molten Slag,
Extend Biomass Use
- **China Steel Corporation:** CO₂ capturing technologies (including adsorption, absorption, etc.)
- **JISF Course 50:** Development of technologies to reduce CO₂ emissions from Blast Furnaces
Development of technologies to capture CO₂ from Blast Furnace Gas.
- **POSCO CO₂:** Carbon-lean Steelmaking
Carbon Capture & Storage of Steelmaking
Hydrogen Steelmaking

Projects potential impact

Key activities high impact

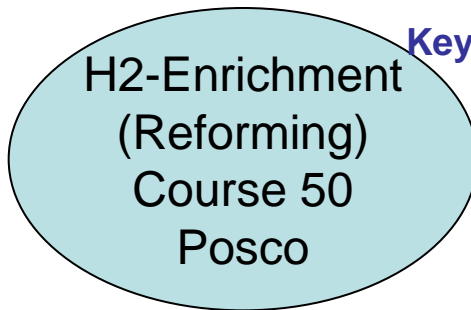
-20 % alone

-30% - 50% CO₂

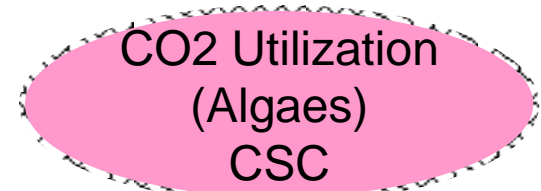


Key activities with lesser impact

Longer term projects



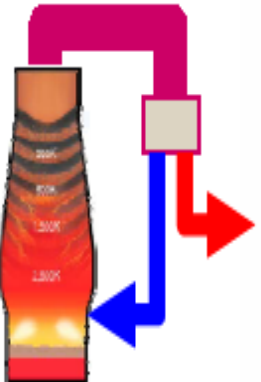


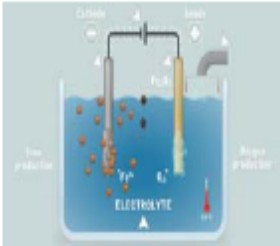
-10% to-20% CO₂



L Level of impact H

L Likely hood of early success H

ULCOS Projects

Coal & sustainable biomass	Natural gas	Electricity
Revamping BF	Revamping DR	Greenfield
<p>TGR-BF</p> 	<p>Hlsarna</p> 	<p>ULCORED</p> 
<p>Pilot tests (1.5 t/h)</p> <p>Demo phase launched</p>	<p>Pilot plant (8 t/h)</p> <p>start-up 2010</p>	<p>ULCOWIN</p> <p>ULCOLYSIS</p>  <p>Laboratory pilot</p>

Potential Development Timeline

2010

2015

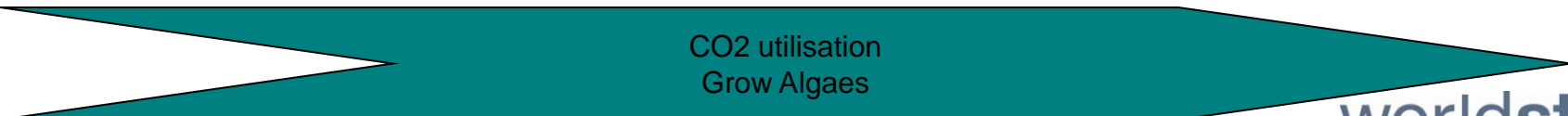
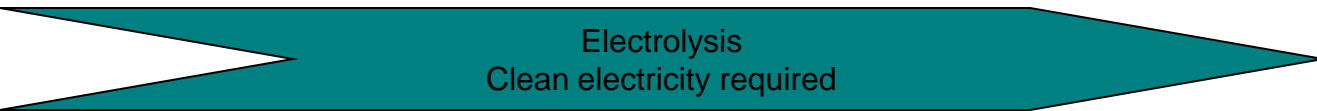
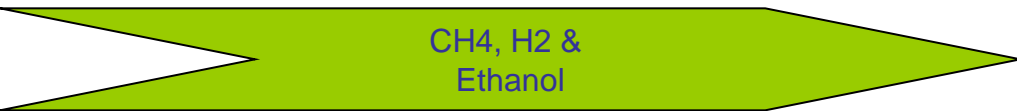
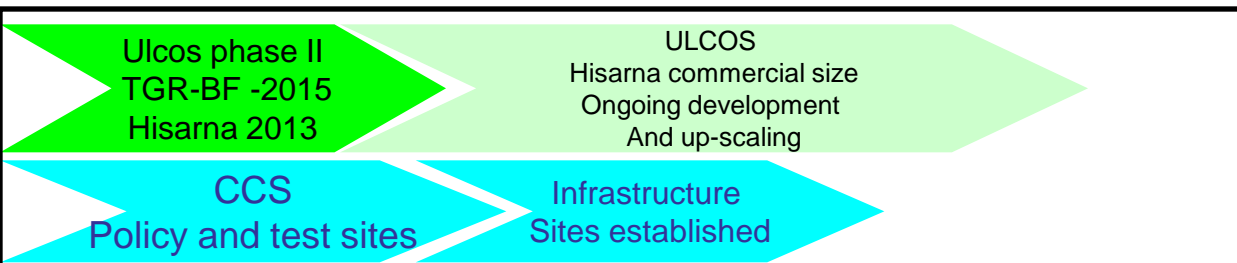
2020

2025

2030

2040

2050



worldsteel

A S S O C I A T I O N

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