worldsteel ASSOCIATION

Industrial Technology Innovation In Meeting Climate Targets

Iron & Steel Industry

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Five key messages for the global steel industry

KEY MESSAGE 1

Steel a key indicator of the world's economy

KEY MESSAGE 2

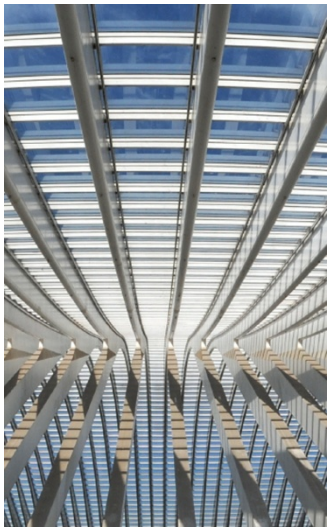
Sustainable steel

KEY MESSAGE 3

Steel is everywhere in your life

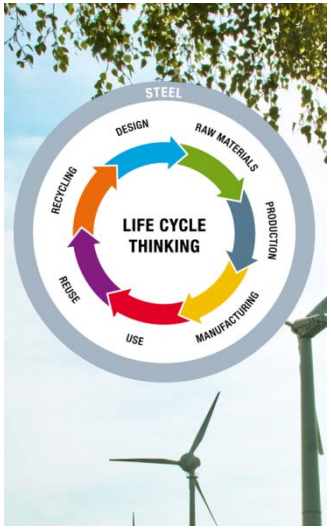
KEY MESSAGE 4

Safe, innovative and progressive steel



KEY MESSAGE 5

Life Cycle Assesment, new solutions for new times



Overview

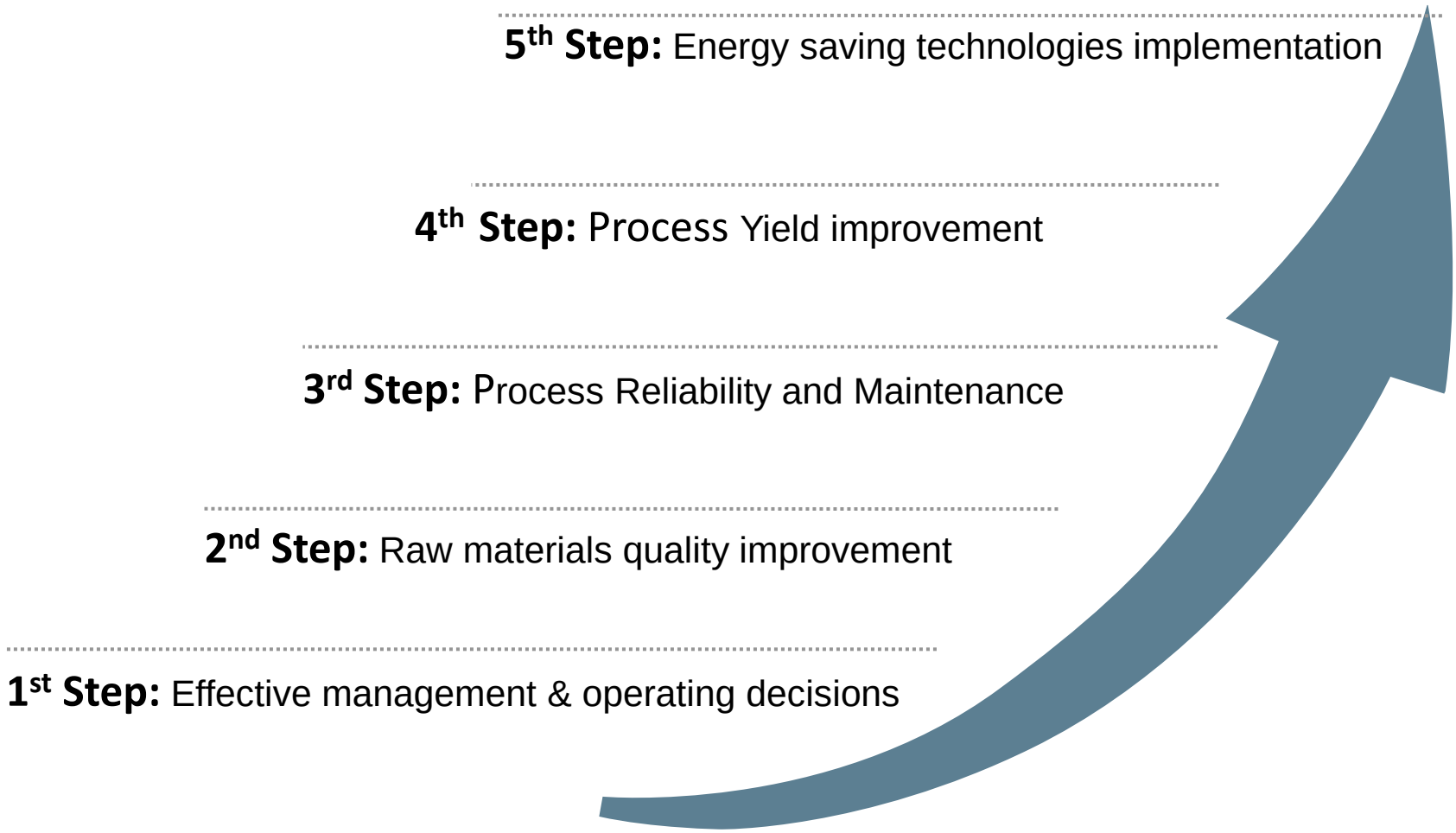
- Key factors for investment in innovative technologies
- Order of priority to invest
- Energy Use in the Iron & Steel Industry Project
- Collaborative Programmes in the iron & steel industry

Key factors for investment in innovative technologies

- The steel industry needs to be profitable in order to be able to invest. Investment must make economic sense:
  - Energy efficiency – reduction in costs
  - Low carbon technologies are linked to low energy costs
  - Yield improvement – reduction in scrap
  - Reliability – optimisation of operational units to the maximum and stop operation of units idled due to lack of demand
  - Environmental mitigation - to meet license or regulatory limits
    - Technologies are available to meet most stringent metrics

- **Most needed**: Benchmarking to bring industry performance up to best practice (without adding technologies) as most technologies installed already allow for best performance to be achieved if operated diligently and reliably

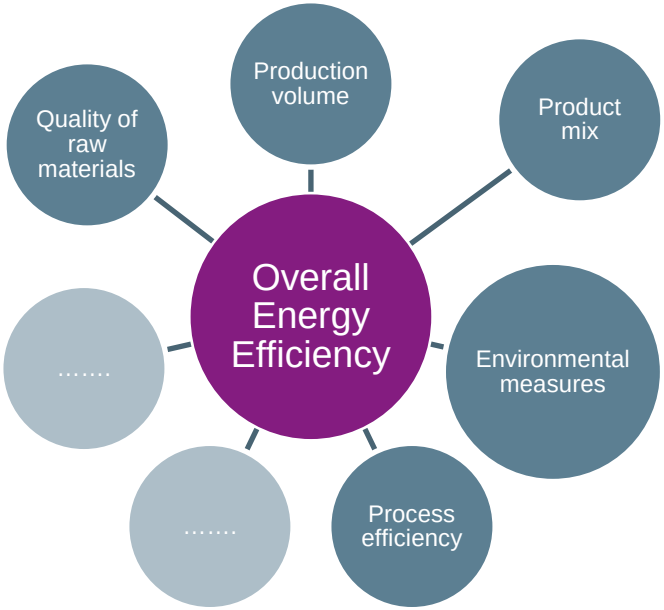
Order of priority to invest



Energy Use in the Iron & Steel Industry Project

Factoral analysis of the overall energy efficiency

- The efficiency of steelworks depends on various factors
  - Mere introduction of energy-efficient technologies does not make a difference – It is important to consider the effect of several factors to identify the extent of efficiency improvement
  - Evaluation of technologies needs to the done using commonly agreed methodology



Technology survey & analysis

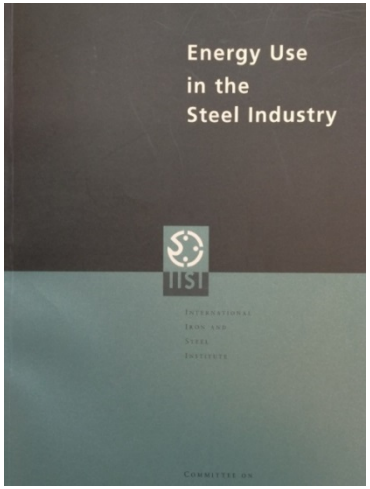
- Analysis of impact on energy intensity for technologies by process and site in GJ/t
- Covers more than **190** energy efficiency techniques and technologies and analyses the impact of these on the total energy intensity of plant as well as impact on the site when rolled up
- Each technology implemented must **reduce energy intensity** of the steel production processes or **increase the productivity** or **quality** of the products
- Site roll up check performed for compatibility between technologies

Technology survey & analysis

- Project members analysed the implemented technologies and determined:
  - The reason(s) for implementing these technologies
  - What process or its component is deviating from best practice
  - If the installed technologies meet best practice performance levels

List of techniques and technologies

- Based on the IISI report from 1998
  - 100 Energy Efficiency Techniques & Technologies were identified
- On the base of other reports
  - 90 Energy Efficiency Techniques and & Technologies were identified



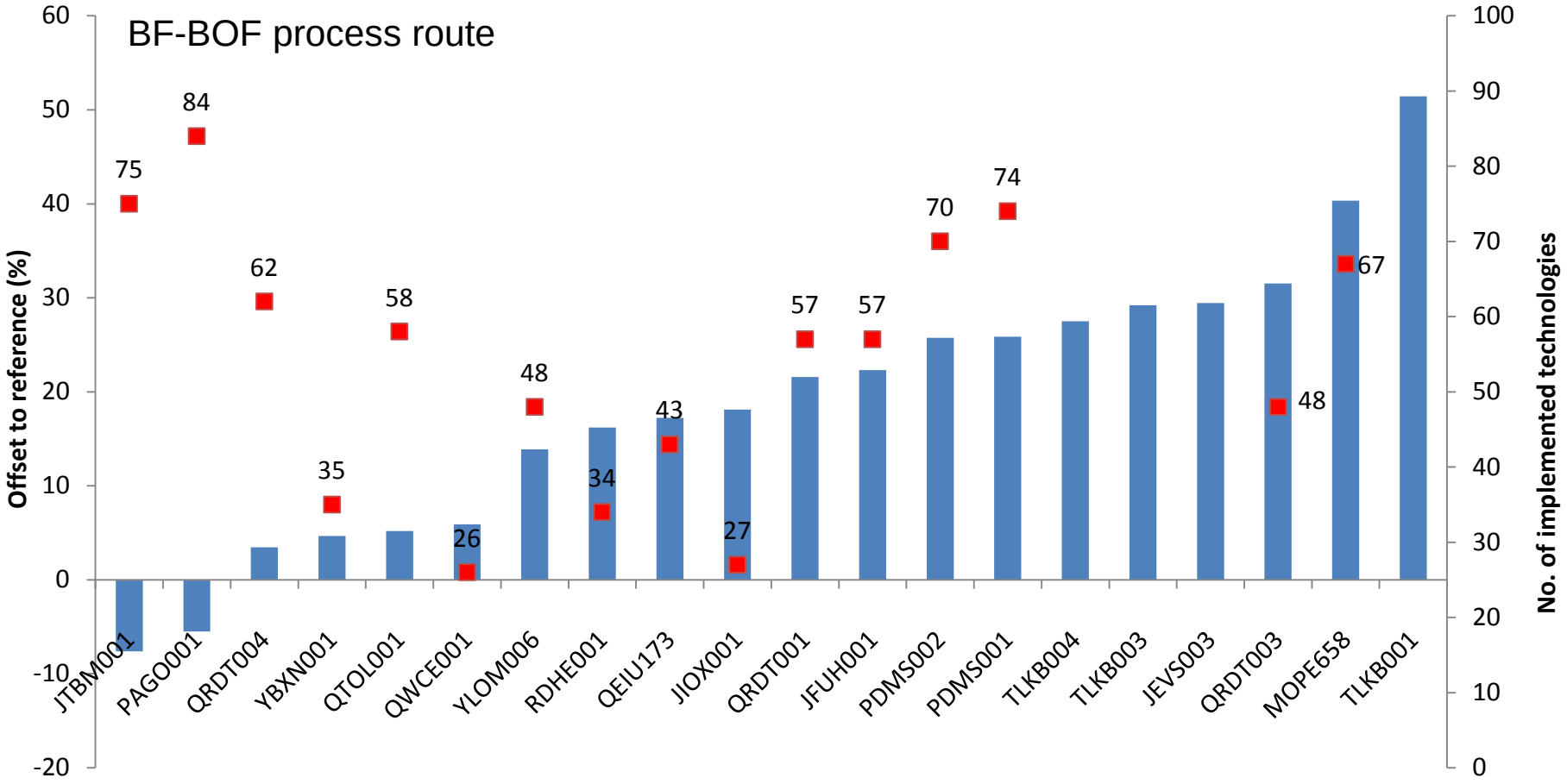
Basic questions in the survey:

- **Are these techniques and technologies used in your plant?**
- **The main drivers / reasons for implementation**
- **Years of experience with these technologies**
- **Did the technologies deliver the expected performance or improvement? (improvement levels used in the reference plants)**
- **Do you have plans to implement this energy reducing technology?**

Energy Saving Technologies – status of implementation

Facility type	Reported energy saving technologies	Implemented
Coking plants	20	30%
Sinter plants	15	27%
BF plants	20	40%
BOF plants	23	30%
EAF plants	28	14%

Site Energy Intensity reported by project members versus Number of Energy Efficiency Technologies used



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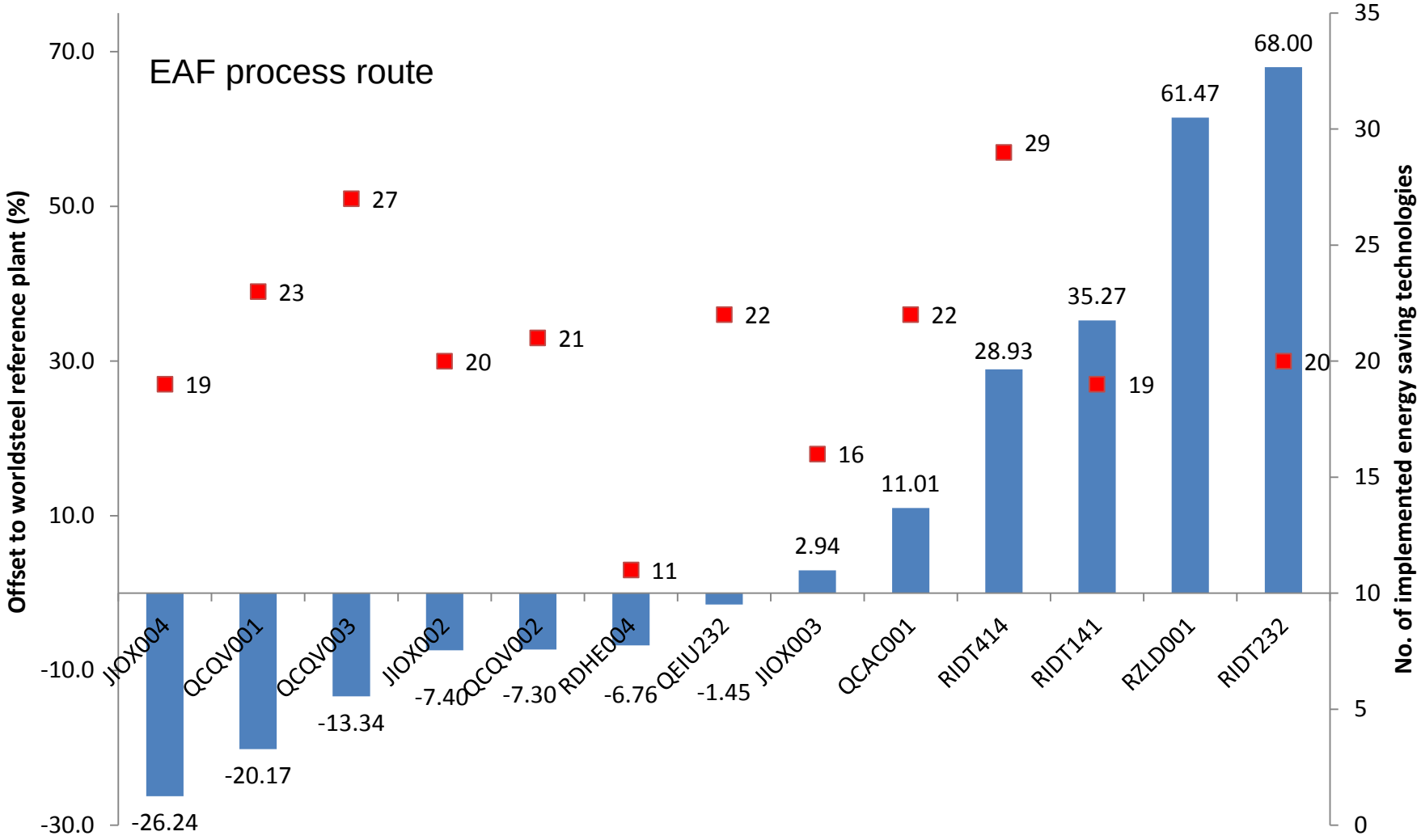
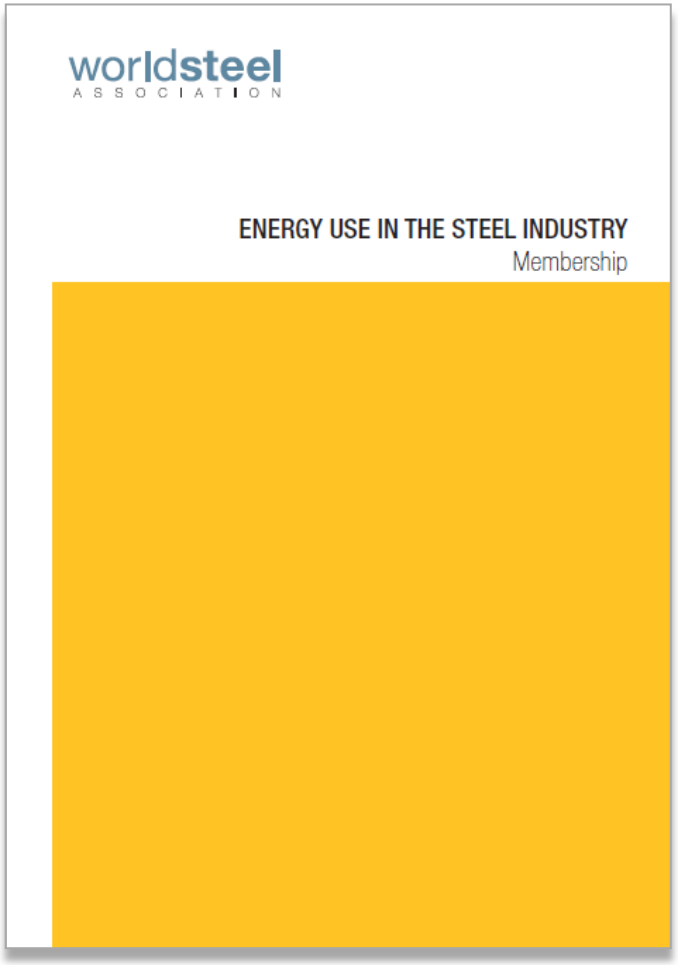


Energy use Project Reporting

- Distribution
  - 17 April, 2014
  - To 21 companies only those who contributed
  - Appendices circulated via CD
- Two versions
  - Confidential version
  - Public version with methodology and process information and global results included



Future prospects

- Promote further participation by presenting to technical / industry forums & workshops
- Keep improving energy model and data collection system through the worldsteel Energy Expert group
- CO2, Maintenance & Reliability, Safety data collection systems
- Link CO2 / Energy into one system report / analysis
- Add specific environmental mitigation technologies to the energy intensity system (evaluate energy impact versus savings in emissions)

Collaborative Programmes in the iron & steel industry

Regional collaborations - examples

- 2005 –
  - Japan–China Steel Industry Advanced Technology Exchange Meetings
    - Environmental Preservation and Energy-saving industry exchange
- 2006 –
  - APP (Asia-Pacific Partnership on Clean Development and Climate) - The Steel Task Force (7 countries)
    - Information exchange in energy-saving/environmental technology
    - state-of-the-art clean technology handbook (SOACT handbook)
- 2011 –
  - Global Superior Energy Performance Partnership (GSEP) – Steel section Working Group (WG)

Other Collaborative Global programmes of worldsteel

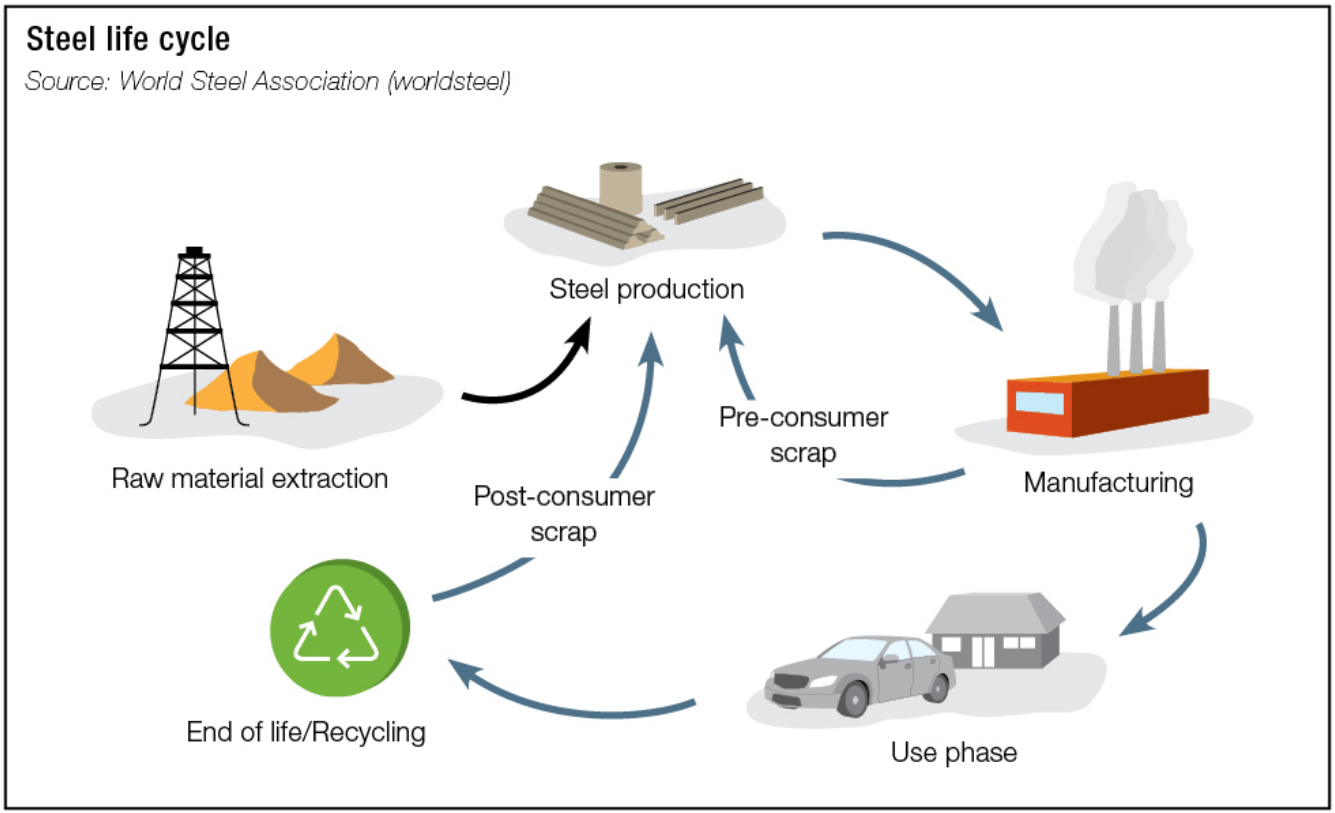
- **Climate Action Programme**
  - Steel industry's global steel sectoral approach to climate change – **48 members** as of 2013-2014
  - Participation open to all steel-producing sites or companies, worldsteel members and non-members
  - CO2 emissions data collection programme
    - Strictly confidential and secure system for data entry
    - Common methodology, definitions and agreed boundaries
    - Individual steel plants to compare themselves against both average and best performance and identify its scope for improvement
    - Methodology lead to development of **ISO 14404-1:2013**

CO2 Breakthrough Technology

- Coordination of the six key programmes for development work
  - ULCOS in Europe (5 projects)
  - Course50 in Japan (one large project with multi-facets of sub-projects)
  - POSCO programme in South Korea (minimise, and use)
  - Australian programme (Biomass and heat recovery from slag)
  - AISI programme in the US (paired furnaces, molten hydrogen flash melting)
  - CSC programme in Taiwan (minimise and use)
- Best expectation from any of these programmes is a 20 – 25% reduction in CO_2 emissions from the process
- Carbon Capture and Storage or Utilisation is required to reduce to + 80% from existing intensity emission levels.

Life Cycle Thinking

- Life cycle assessment (LCA) takes into account all of the emissions created during the life of a product from raw material production through to end-of-life recycling or disposal



WorldAutoSteel

- WorldAutoSteel is committed to a low carbon future, through **continuous research**, **manufacturing processes**, and advancement of lightweight automotive steel products
- Legislation currently focuses on ‘tailpipe’ or use-phase emissions. A more thorough way of measuring automotive CO2 emissions is by using life cycle assessment (LCA), which takes into account all of the emissions created during production, use and end-of-life recycling or disposal
  - As the use-phase CO_2 decreases in future, the embodied impacts of the vehicles themselves will become more of a focus for further decarbonisation

Concluding remarks

- Removal of obstacles to the introduction of energy-saving technologies:
  - Cross-sectoral collaboration would be an effective measure
    - Sharing the list of technologies
    - Dissemination of technologies via exchange of experts
  - A global database and common methodology to calculate the overall energy efficiency of steelworks (*worldsteel initiative*)
- Support for such activities through public–private partnerships

Thank you for your attention, Questions????.

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