



# NMP research for emissions reduction

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**New generation of products**  
**DG Research**  
**European Commission**

The EU ETS is a driver for sustainable development  
with technological excellence:

Incentive to invest now in

- Implementing Best Available Technologies
- Developing advanced low carbon technologies

• *High significance & certain evidence of*

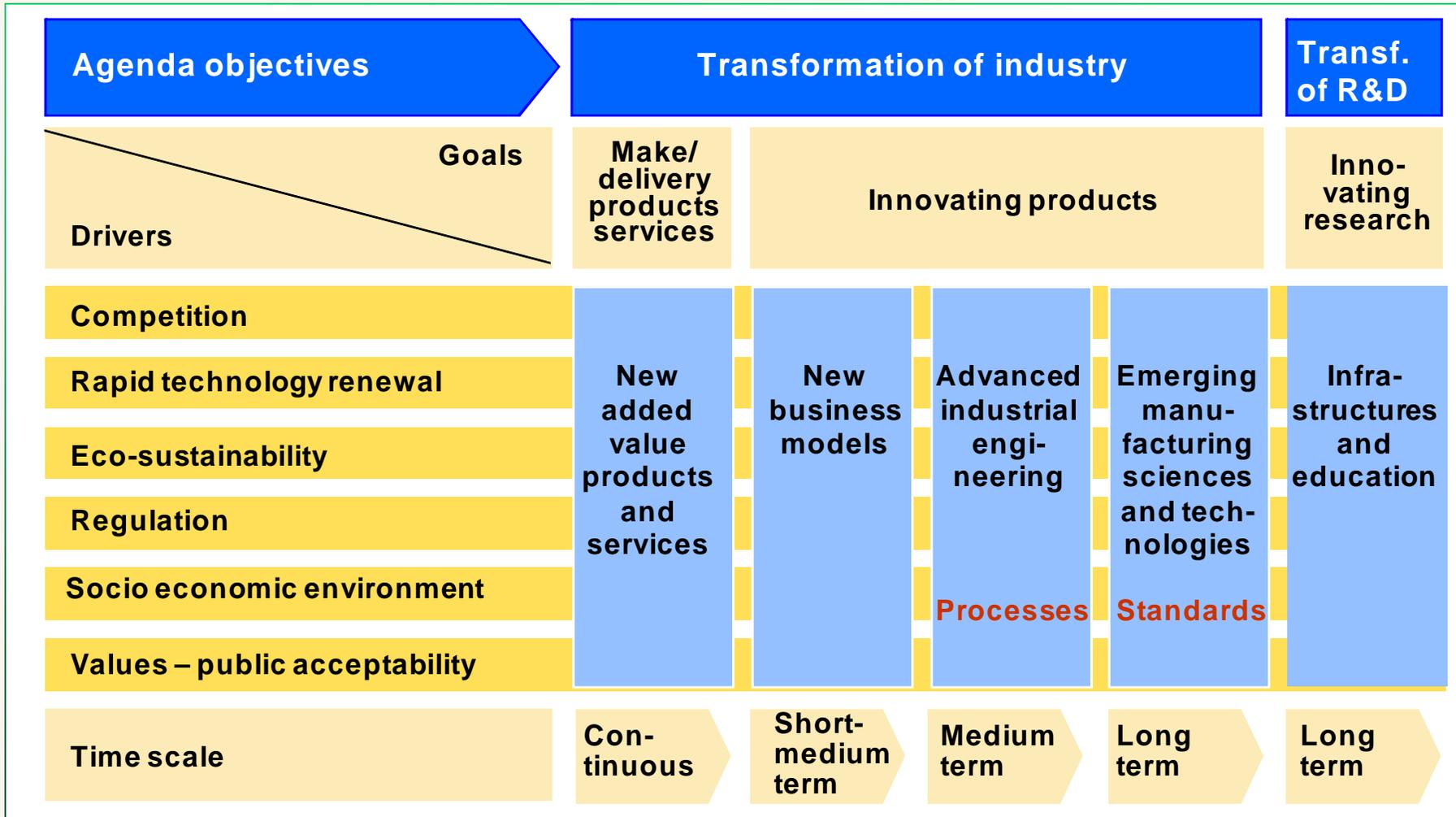
- *Impact of Carbon prices on technology development and use*
- *Potential to improve energy savings and reduce CO2 emissions*
- *Challenge to promote sustainable consumption and production*

# FP7 - Cooperation

## Theme 4: NMP

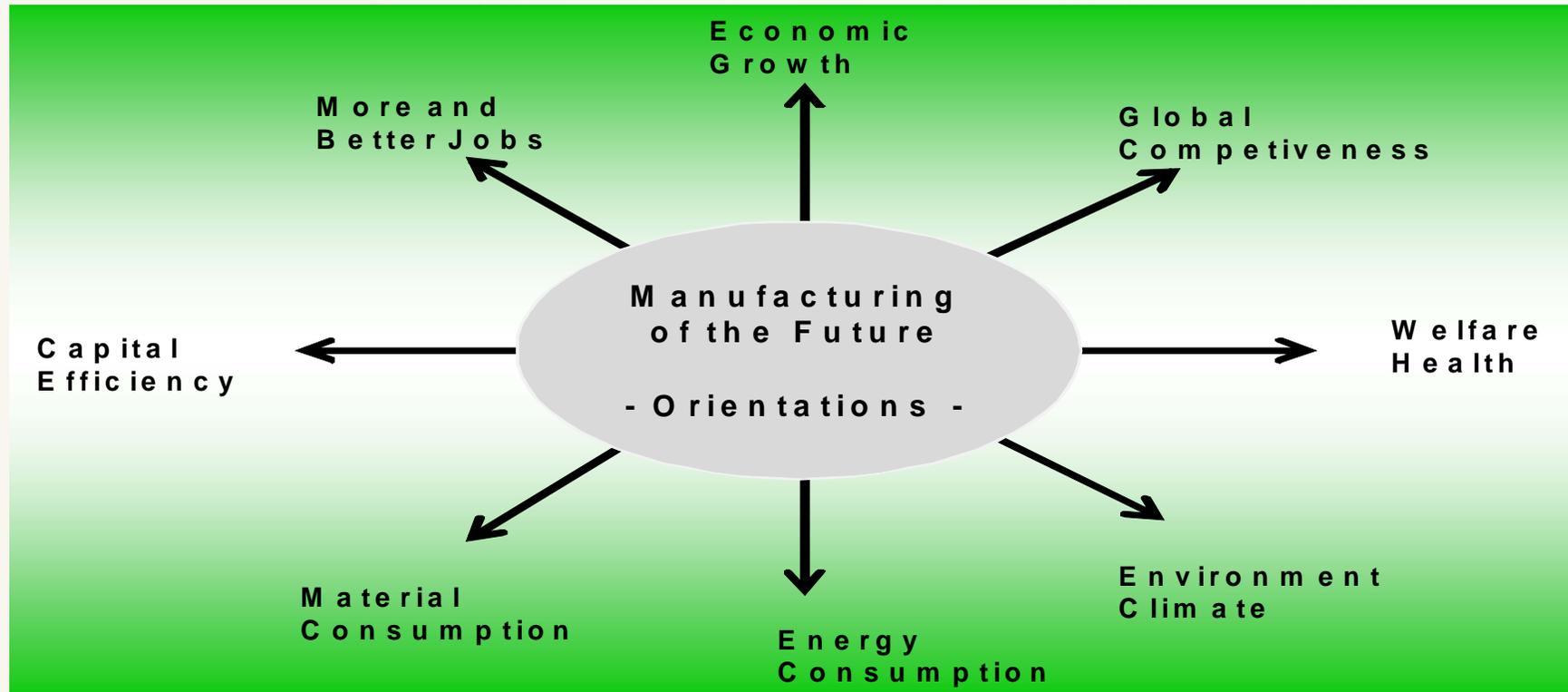
***Overall objective : To improve the competitiveness of EU industry and ensure its transformation via:***

- the effective transition from a resource-based to knowledge-based industry, meeting as well sustainability challenges
- generation of new breakthrough knowledge
- strengthening EU leadership in nanotechnologies, materials and production technologies
- emphasis on integrating different technologies and disciplines across many industrial sectors



# Manufacturing Research Policy Framework

*Sustainable development requires a wider approach ...*



**We must resolve conflicting strategic objectives to deliver the “Green” Knowledge-based Factories of the Future**

## Short term opportunities for mitigation : BAT offer a portfolio of technology options

- *Material consumption*
- *Energy consumption*
- *Environment/Climate change/GHG*
- *Health and safety*
  - *Example: recycling of Lithium batteries (FP5 project)*

# Research opportunities for long term sustainability: Enhanced industrial transformation under FP7

- *New business models;*
- *New systems of production;*
- *New processes;*
- *High added value materials and products.*

*Focus on Energy Intensive Industries (EIs) as a paradigm of industrial change;*

*Other energy intensive sectors treated elsewhere :*

*construction and ENERGY EFFICIENT BUILD ENVIRONMENT;  
transport and SUSTAINABLE MOBILITY*

## Energy Intensive Industries (EIs)

*The magnitude of the problem: 30 Gtons of CO<sub>2</sub>/year*

- HEAT and POWER: 12.0
- TRANSPORT: 7.2
- INDUSTRY: 6.6 (or 22%)
- OTHER SECTORS: 4.2

Energy Intensive Industries are 72% of industry's share

Steel and Cement give 3.0 Gtons, or 50% of industry's share

**SOLUTIONS: Examples of Industrial Research for the EIs:**

- FP6 : Steel ULCOS (*case 1*).

- FP7 Call NMP2009:

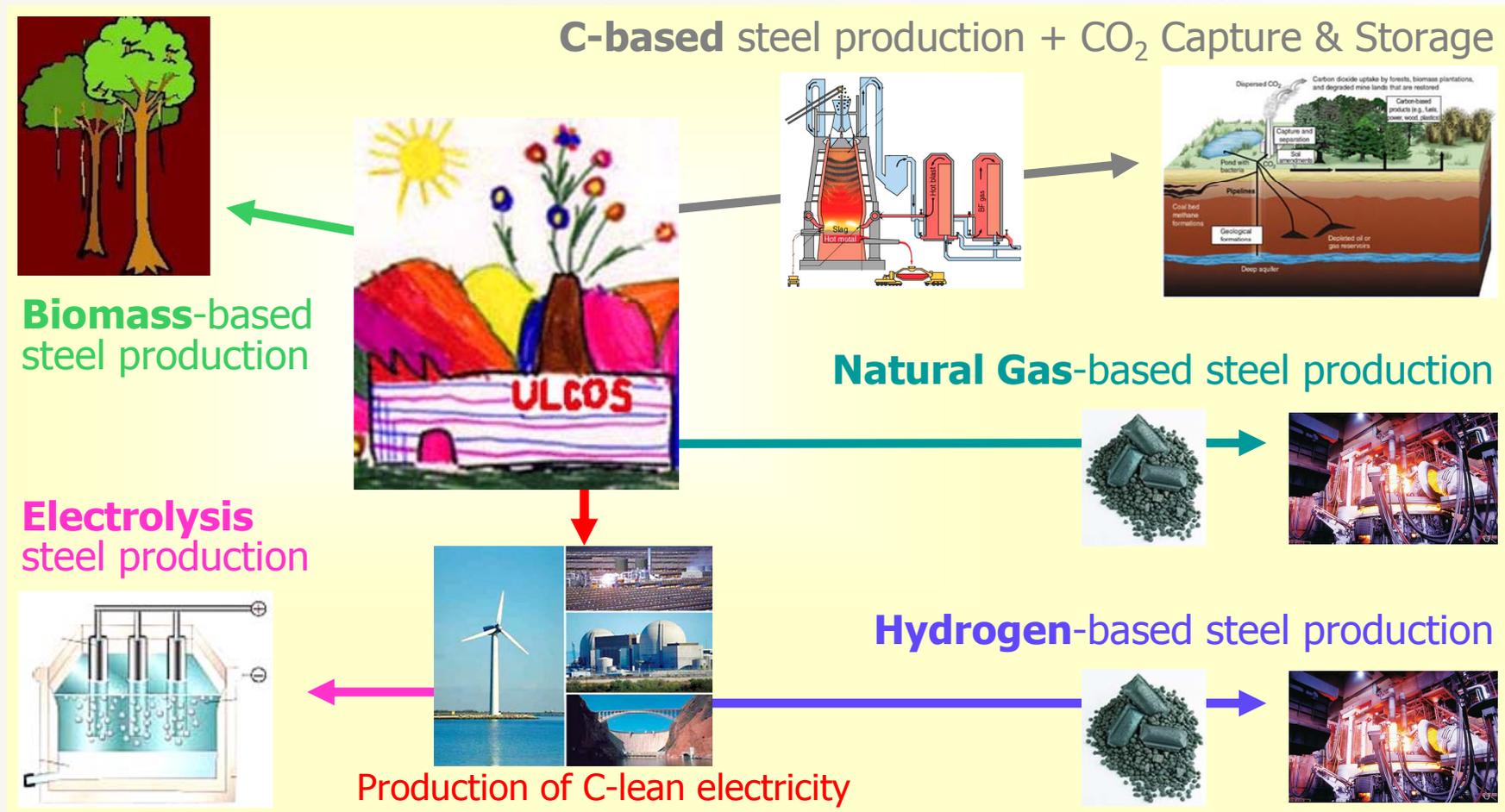
- Cement : Case of co-processing (*case 2*),

- Pulp & Paper BIOREFINERY (*case 3*).

# Case 1: ULCOS project in FP6

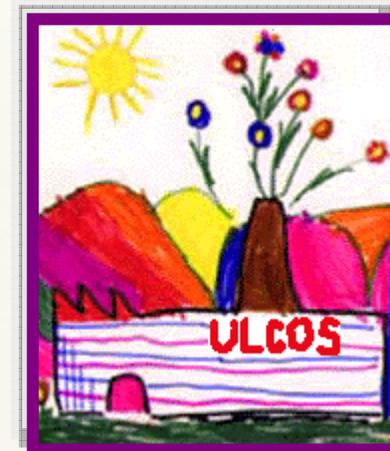
Budget: € 54 Millions (44% is EU funds)

**Objective:** Identify steel production routes with the potential of mitigating specific CO<sub>2</sub> emissions by a *factor 2* or more

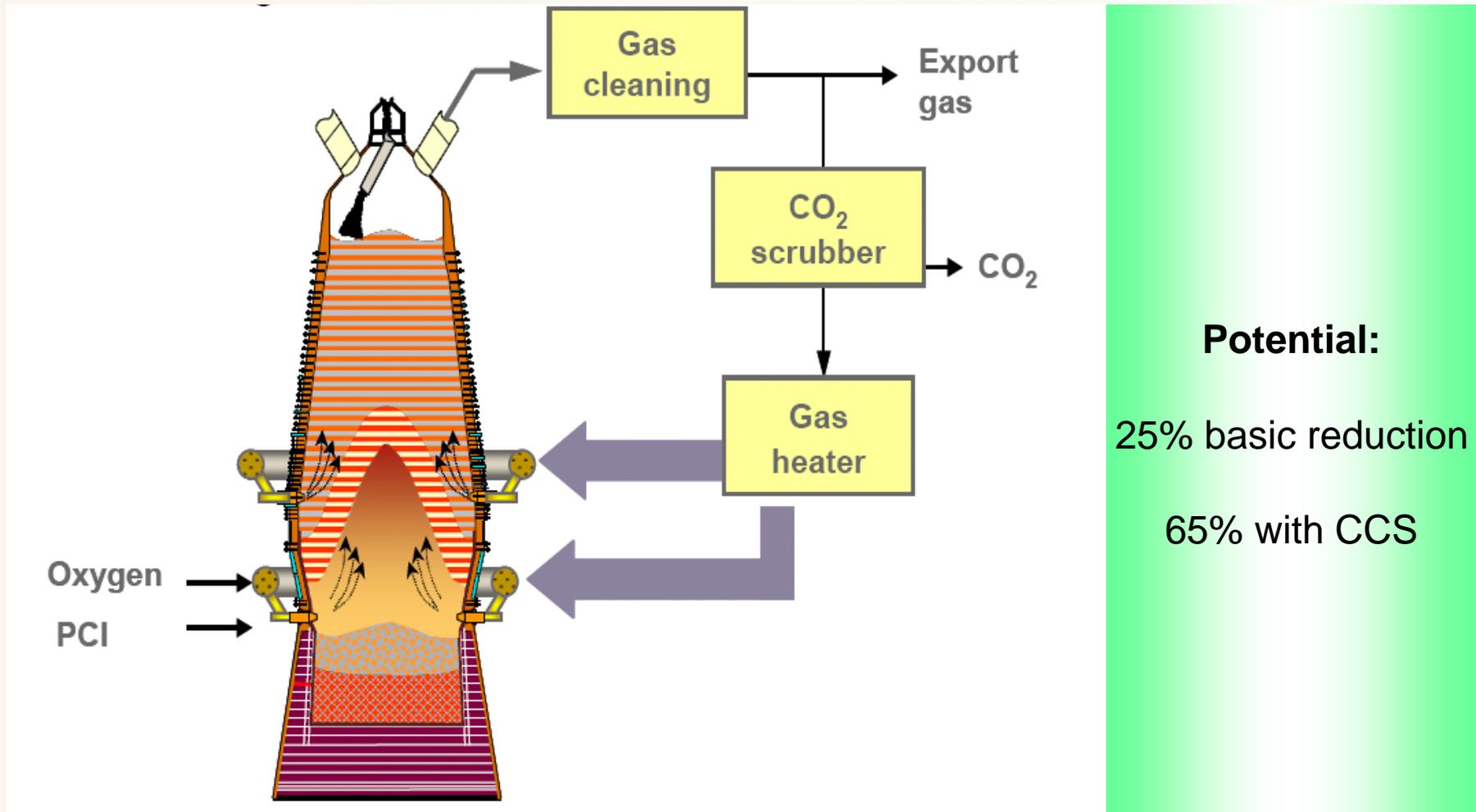


# Strong Consortium

- 48 initial partners
  - Led by a core of steel producers
  - Industries in the supply chain
  - Research institutes
  - Small and medium businesses
  - Universities
- 
- Largest research project of the steel industry (worldwide)



# TGRBF: Top Gas Recycling Blast Furnace



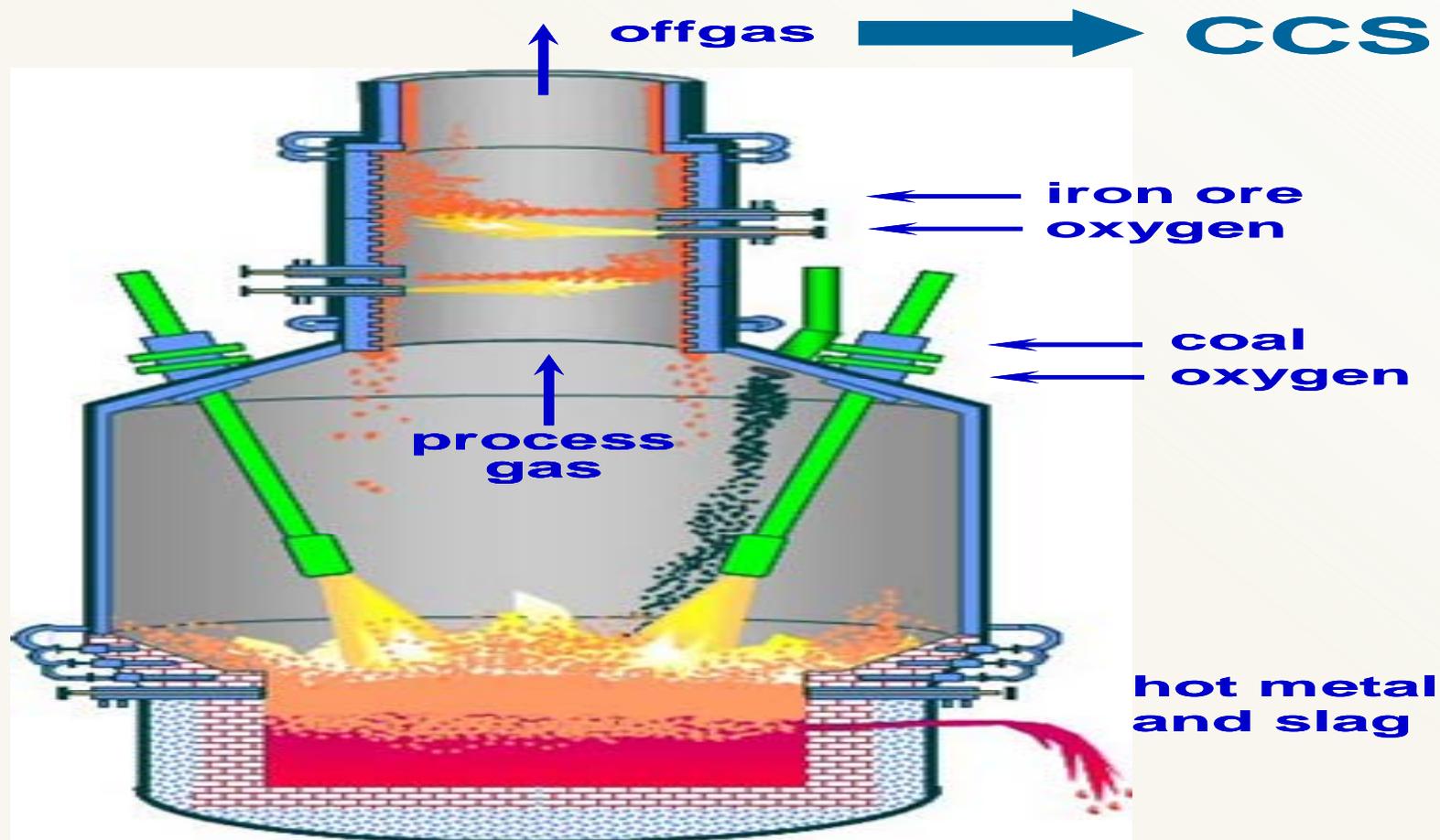
**Potential:**  
25% basic reduction  
65% with CCS

# Experimental Pilot TGRBF

LKAB (Sweden); [next demonstration plant in Europe](#)



# A new Smelting reduction (ISARNA) Longer term BAT (pilot plant in Germany)



# Results: Four technologies are developed

- **TGRBF: Top Gas Recycling Blast Furnace** using pure oxygen will be fully tested in a pilot plant in Sweden ; this new process is likely to be implemented fast;
- **ISARNA: New Smelting Reduction process** (with oxygen, and capture and storage of CO<sub>2</sub>); a large pilot plant will be built in Germany in 2009
- **DRI: Direct Reduction of Iron Ore** using Natural Gas with 80% hydrogen, other options: gasification of coal, pure hydrogen, biomass from agricultural waste are still under investigation; a pilot plant might be implemented in Sweden
- **ELECTROLYSIS** : Cold (100°C, alkaline solution) and hot (1600 °C, liquid slag) Electrolysis will consume around 3000 kwh/t; this is a long term research

# ULCOS achievement at this stage

- ULCOS can be considered as a success, opening the way to a series of carbon-lean iron and steel making technologies to use in a post-Kyoto, carbon constrained world
- It should be followed by a demonstration project (ULCOS2) and a full scale plant (ULCOS3), with the support of the European steel TP

# FP7: support to EIs

- Steel
- **Cement (Case 2)**
- Non Ferrous Metals
- **Pulp and Paper (Case 3)**
- Glass
- Ceramics
- Chemicals

## Case 2 : CEMENT co-processing

- **Waste (Alternative Fuels and Materials)** provides 30-50% of cement energy needs: large reduction on CO<sub>2</sub> emissions;
- The use of this BAT could be expanded: mainly in emerging countries;
- Transfer of this technology to other EIs should be encouraged;
- FP7 support: 2009 NMP Call topic on EIs.

# WP 2009 - NMP

## **Reducing the environmental footprint of EIs**

- Development of new more cost and energy efficient processes and technologies
- For eco-efficient products contributing to the CO<sub>2</sub> reduction goal
- Large-scale integrating Collaborative Projects
- Industrial leadership, multisectoral approach & large-scale demonstration give added value

# Case 3: Flexible Pulp & Paper Biorefinery concept



## New products:

- ✓ Bio-Fuels
- ✓ Bio-Composites
- ✓ Speciality Chemicals
- ✓ Heat & Power

Flexible production (best value from production of pulp, chemicals & energy)  
Maximizes the utilisation of biomass  
**Conflict of aims (e.g. energy demand increase as "waste" is not used for heat)**

# WP 2009 - NMP

## **Joint Call on Biorefinery**

- 4 Themes: Biotech, Energy, Ind. Tech. & Envir.
- Sustainable processing of biomass into value-added products and energy
- Sustainable biorefineries: Large CP addressing bioproducts & bioenergy – € 55 million
- Enhancing exchange of information & synergies between projects – Coord. Action - € 2 million

# Prospects for effective CO<sub>2</sub> stabilisation

- **Integrated S&T plan for mitigation**  
based on sound modelling and monitoring within a policy framework that removes all constraints for fast track RTD deployment
- *Future technologies needed,*
  - *Alternative Fuels and Materials*
  - *CO<sub>2</sub> Capture and Storage (CCS)*
  - *Heat recovery (recycling of gases)*
  - *New thermal technologies*
  - *use of hydrogen*
  - *use of natural gases*
  - *utilisation of biomass*
  - *recycling technologies*

# Prospects for effective CO<sub>2</sub> stabilisation

**If, 20% for 2020 (European Council of Ministers, 2007);  
50% for 2050 (4ARP of IPCC, 2007)  
emission targets are to be reached through Mitigation;**

**Then,**

- **Achieving targeted stabilisation levels require heavy early investments and substantially more rapid development, validation, diffusion and commercialisation of advanced low-carbon emission technologies**
- **Appropriate carbon pricing levels have to be set to leverage investment in low carbon technologies**
- **Multi-stakeholder collaborative research schemes must be strongly encouraged**