ULCOS program: status & progress

Jean-Pierre Birat, European Coordinator of the ULCOS program
Outline

• what is ULCOS?
  – a vision, a methodology for choosing breakthrough processes, a set of dedicated partners and talented people, more than 20 CO$_2$-lean processes and 4 ULCOS breakthrough processes (CO$_2$ cuts>50%)

• the ULCOS processes
• socio-economic analysis of the ULCOS solutions
• foresight and long-term vision
• conclusion
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The 48 partners...
Partners active in phase II of ULCOS I
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# ULCOS processes

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<th>Coal &amp; <strong>sustainable biomass</strong></th>
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<td>Demonstration under way</td>
<td>start-up 2010</td>
<td>to be erected in 2011 ?</td>
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- **CCS**
- REVAMPED BF
- GREENFIELD
- ULCORED
- ULCOWIN
- ULCOLYSIS
- Pilot plant (1 t/h) to be erected in 2011
- Laboratory

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Mirror Group, Brussels, 9 November 2010
On-going & future projects

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Program either on-going or under construction
On-going program's uncertainty on time scope
New programs to be organized
Concept - no programs under construction
ULCOS-BF

CO₂ emissions of the steel plant: - 60%

-100 kg coke/tₘₚₜ

Underground storage of CO₂
0.8 t/tₘₚₜ
Hlsarna

Iron ore
Oxygen

CCF cyclone (CORUS)

Oxygen
Coal
Smelter (HIsmelt)

iron

CCS

Mirror Group, Brussels, 9 November 2010
ULCORED

- **EDRP*** planned by LKAB in Luleå
- **ULCORED features** implemented within an **RFCS project** to be proposed in 2011

* Experimental Direct Reduction Pilot
ULCOWIN

- alkaline electrolyte with dispersed hematite particles
- 3.5 kg samples of pure iron
- 3 MWh/t, 90% Faradic yield targets
- 0.1 A/m², 1.8 V (target: 1.6)
- electrode materials identified
- inert anode
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CO₂ emissions – 370 g/kWh

Mirror Group, Brussels, 9 November 2010
CO\textsubscript{2} emissions – 5 g/kWh
CO\textsubscript{2} emissions – 160 g/kWh

Mirror Group, Brussels, 9 November 2010
OPEX index - 2050

F2 World DCV scenario
POLES model
ULCOS-BF with $>>50\%$ CCS

Rate of CO2 capture (each bar means adding one more plant to the Steel Mill)

- ULCOS-BF
- Sinter plant
- Reheating furnace
- Steel plant
- Hot stoves
- Lime kiln
- Coke ovens

Compared to ULCOS-BF Mill emissions
Compared to emissions of the benchmark Mill
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Virgin & recycling routes…
Ligne de temps…

dates are of course only a rough estimate...

TGR-BF with CCS

ULCORED

ULCOWIN, ULCOLYSIS

Hlsarna

500 M€

1,500 M€

2010

2015

2020

2030

Start-up date! duration until 2016
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Conclusion: innovation & risks

- **if the demonstrators are successful**
- **... and if the economic conditions for implementing the ULCOS routes are right**
- **... then deployment should follow up for most of the Steel Mills in Europe, and, eventually in the world, for the Steel Industry to meet its post-Kyoto targets**
Thank you!
Program, projects

FP6: ULCOS, 2004-2010
RFCS: ULCOS, 2004-2009
RFCS: IDEOGAS, 2006-2011
RFCS: TGR-BF, 2009-2011
RFCS: IERO, 2010-2012

ADEME: ULCOS II
ANR: ASCOPE

RFCS: HIsarna
RFCS: ULCORED, etc.