Ultra Low CO$_2$ Steelmaking

Update on the ULCOS program

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

"How will employment and labor markets develop in the context of a transition towards a low-carbon economy?", Brussels, 1 March 2011
Outline

- timeline and perspective
- the ULCOS process solutions
- ULCOS-BF
- HIsarna
- ULCORED
- ULCOWin & ULCOLysis
- conclusions

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ULCOS process solutions...
ULCOS-BF with >> 50% reduction

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Virgin & recycling routes…

2050 BAU trend
2050 low-carbon economy

Mt/yr

Steel production (Mt/yr)
CO2 generation (Mt/yr)

socio-economic projections
"How will employment and labor markets develop in the context of a transition towards a low-carbon economy?", Brussels, 1 March 2011
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Cost of avoided CO₂

index

"Cost of avoided CO₂ is half of end-of-pipe CCS"

0,0
10,0
20,0
30,0
40,0
50,0
60,0
70,0
80,0
90,0
100,0

BBF
BBF+CCS(PP)
TGR-BF V4
HISARNA
HISARNA+CCS
HISARNA+EAF
HIS+CCS+EAF
MIDREX
MIDREX+CCS
ULCORED
ULCOWIN
ULCOLYSIS

2010 index

"How will employment and labor markets develop in the context of a transition towards a low-carbon economy?", Brussels, 1 March 2011
Productivity

- all ULCOS solutions expected to operate at higher productivity than the conventional process they substitute for, e.g. 30% for ULCOS-BF
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ULCOS-BF

CO₂ emissions of the steel plant: -60%

-100 kg coke/t_{steel}

Underground storage of CO₂
0.8 t/t_{steel}

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ULCOS-BF project

CO₂ storage

ULCOS I
3 projets RFCS + 1 FP

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CO₂ storage

Storage in a deep saline aquifer, with pipe transport of dense CO₂ from capture site.

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ULCOS-BF: key figures

Timeline:

- Eisenhüttenstadt project approved December 2010
- NER-300 proposal filed in Paris on 9 February 2011, to cover the Florange demonstrator
- Consortium Agreement under final stage of negotiation among members
- start up 2013 in Germany and 2014 (BF) - 2015 (Storage) in France. 10 years of operation in France planned for 2016-2025
- permitting process launched for storage; FEED studies for the BF

Important milestones

- exploration permit approved
- start of site geophysical exploration
- FEED studies for BF & pipeline
- filing of NER-300 in Brussels
- answer from the EU, etc.

Targets (demonstrator):

- 700,000 t/yr stored for 10 years
- 94% capture rate

Budgets:

- still a regret solution…

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How will employment and labor markets develop in the context of a transition towards a low-carbon economy?

ULCORED

- EDRP* planned by LKAB in Luleå (1 t/hr)
- ULCORED features implemented within an RFCS project to be proposed in 2012 at the earliest
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ULCOwin

- 4 kg samples
- pure Fe + O₂ evolution
- 110 °C (=room temperature electroreduction)
- water alkaline electrolyte

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ULCOlysis

- 1 g samples
- pure Fe + O₂ evolution
- 1550 °C = pyroelectrolysis
- slag electrolyte

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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

- however, ULCOS was a research initiative, has turned into a demonstration initiative but it IS NOT a plan for reducing the emissions of the Steel sector!
Thank you!

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