THE NORTHERNMOST UNIVERSITY
of Technology in Scandinavia

BioDRI.
Gasified Biomass for greener steel

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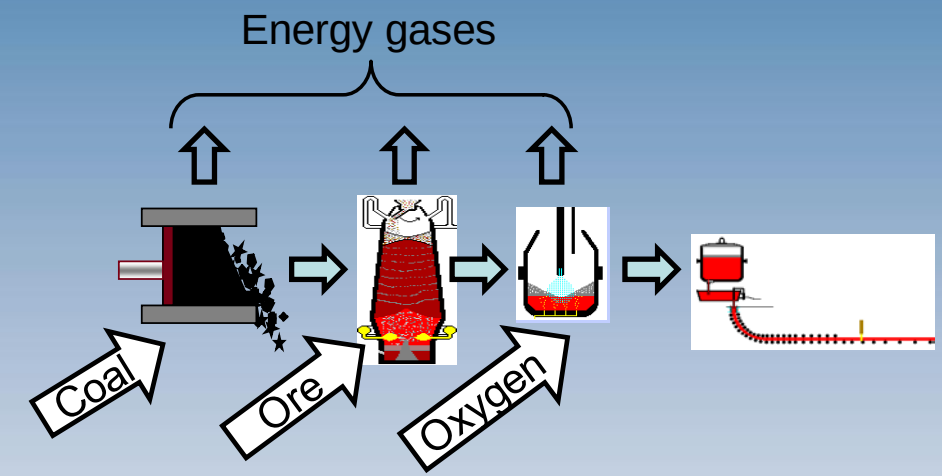
Project partners

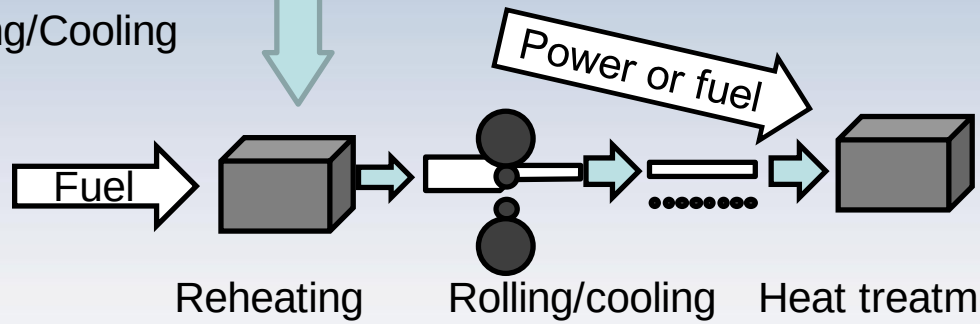
Höganäs
SVEASKOG
BILLERUDKORSNÄS
LKAB
A Member of The Linde Group | AGA
LULEÅ TEKNISKA UNIVERSITET
SP
swerea | MEFOS

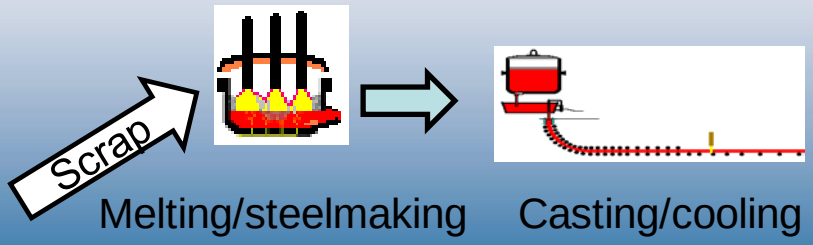
Financing: Swedish Energy Agency + Partners

LULEÅ UNIVERSITY OF TECHNOLOGY

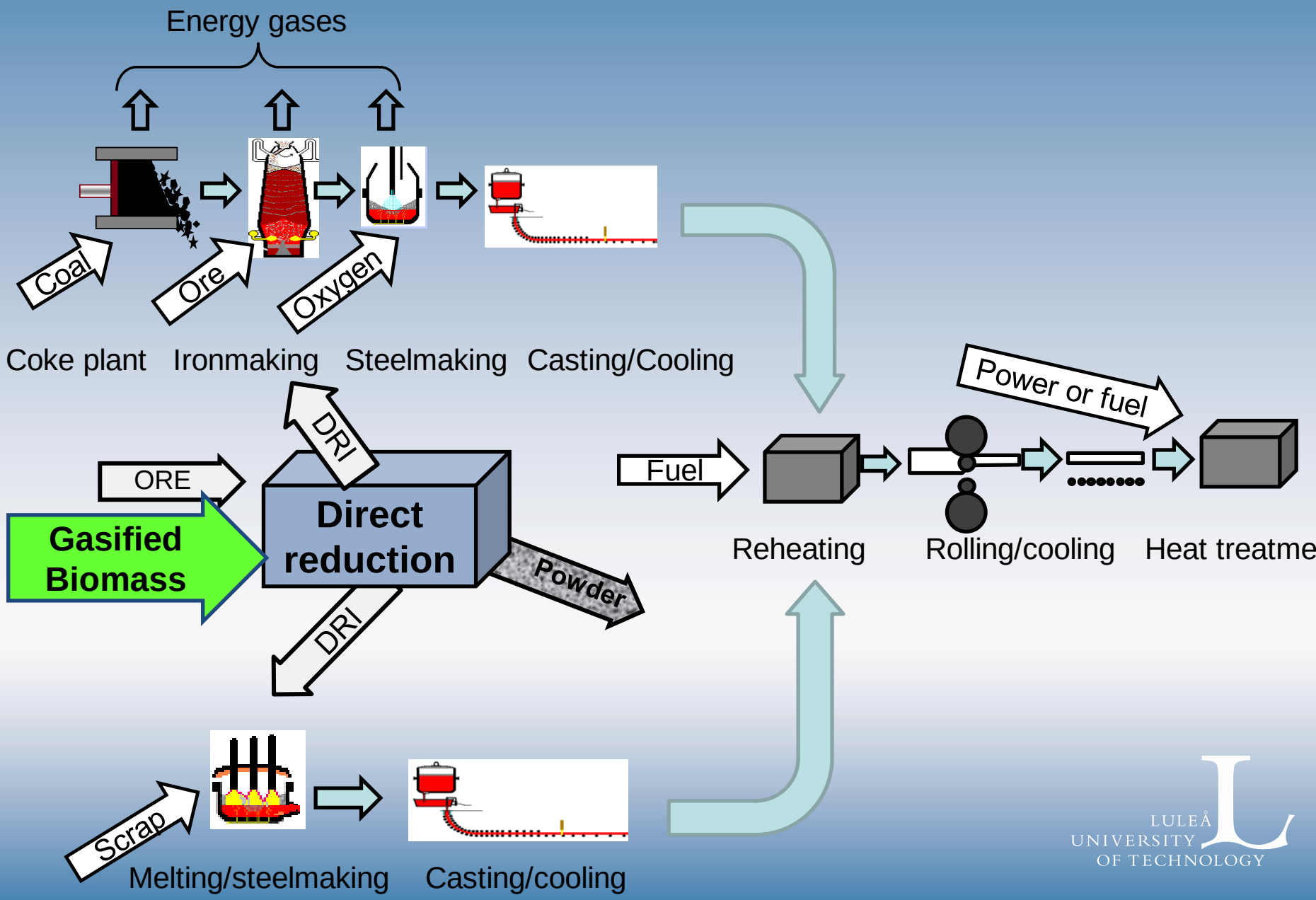
Steelmaking routes



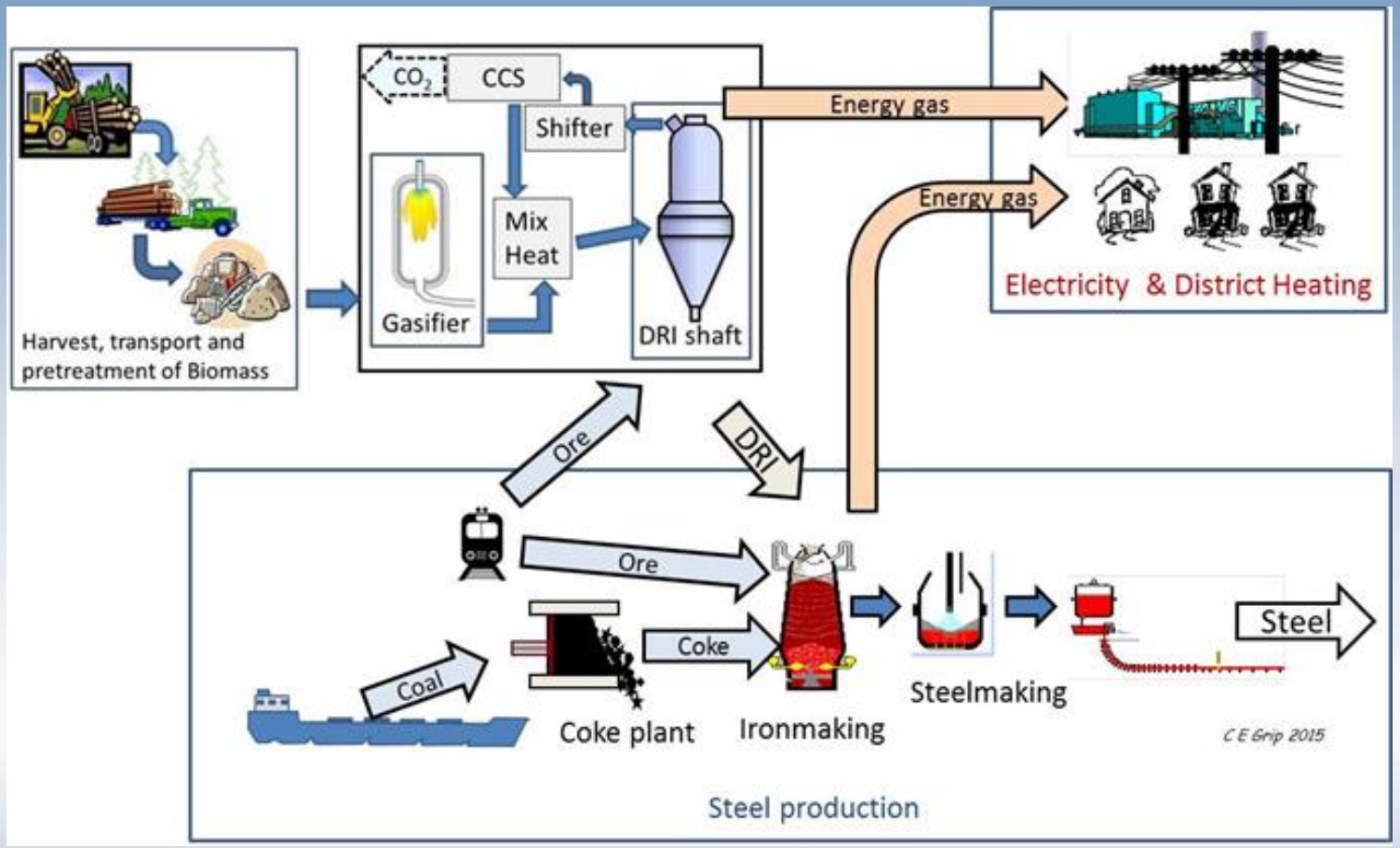




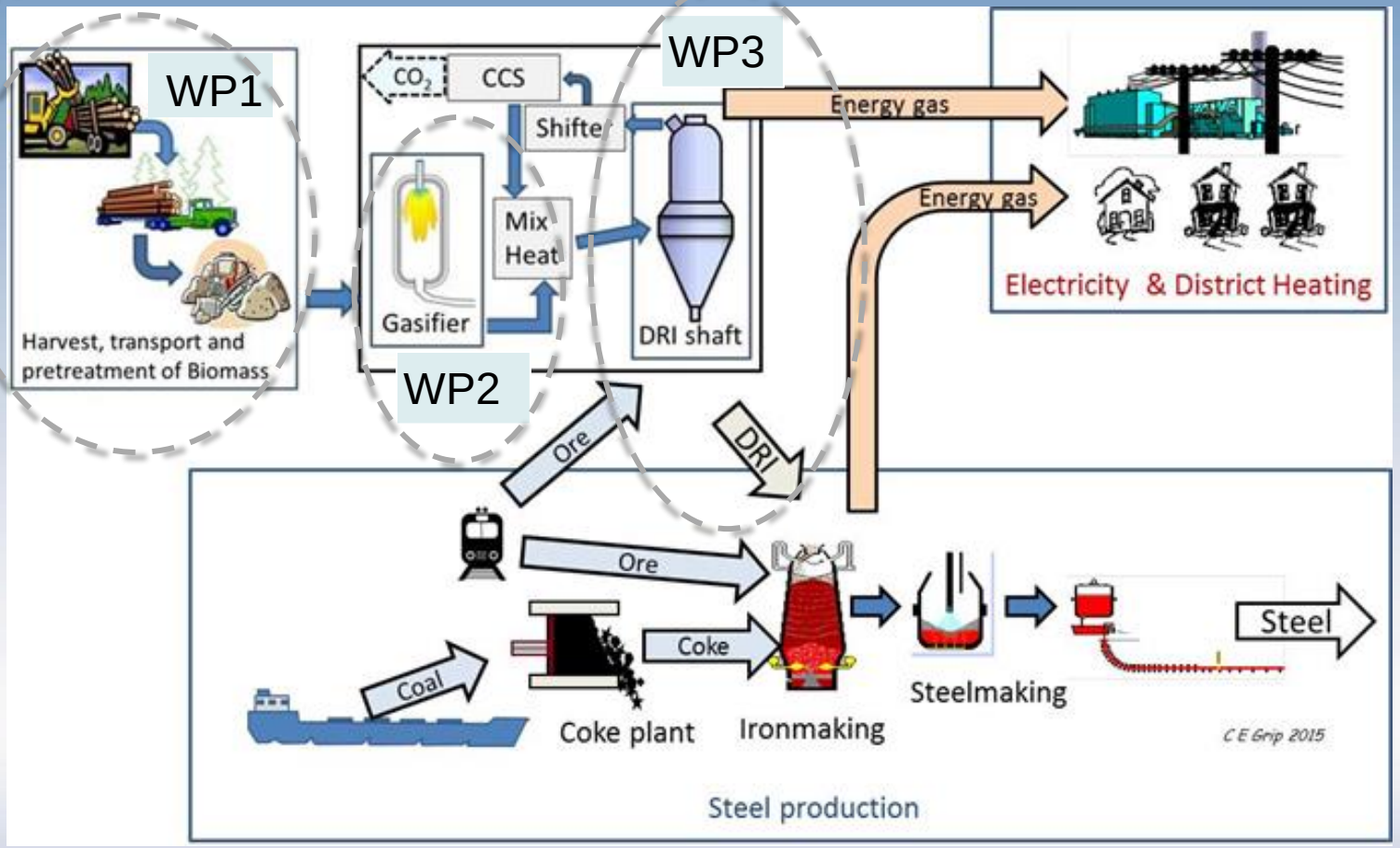
Steelmaking routes



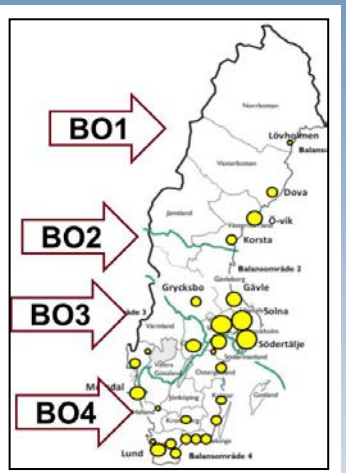
BIODRI: Production chain.



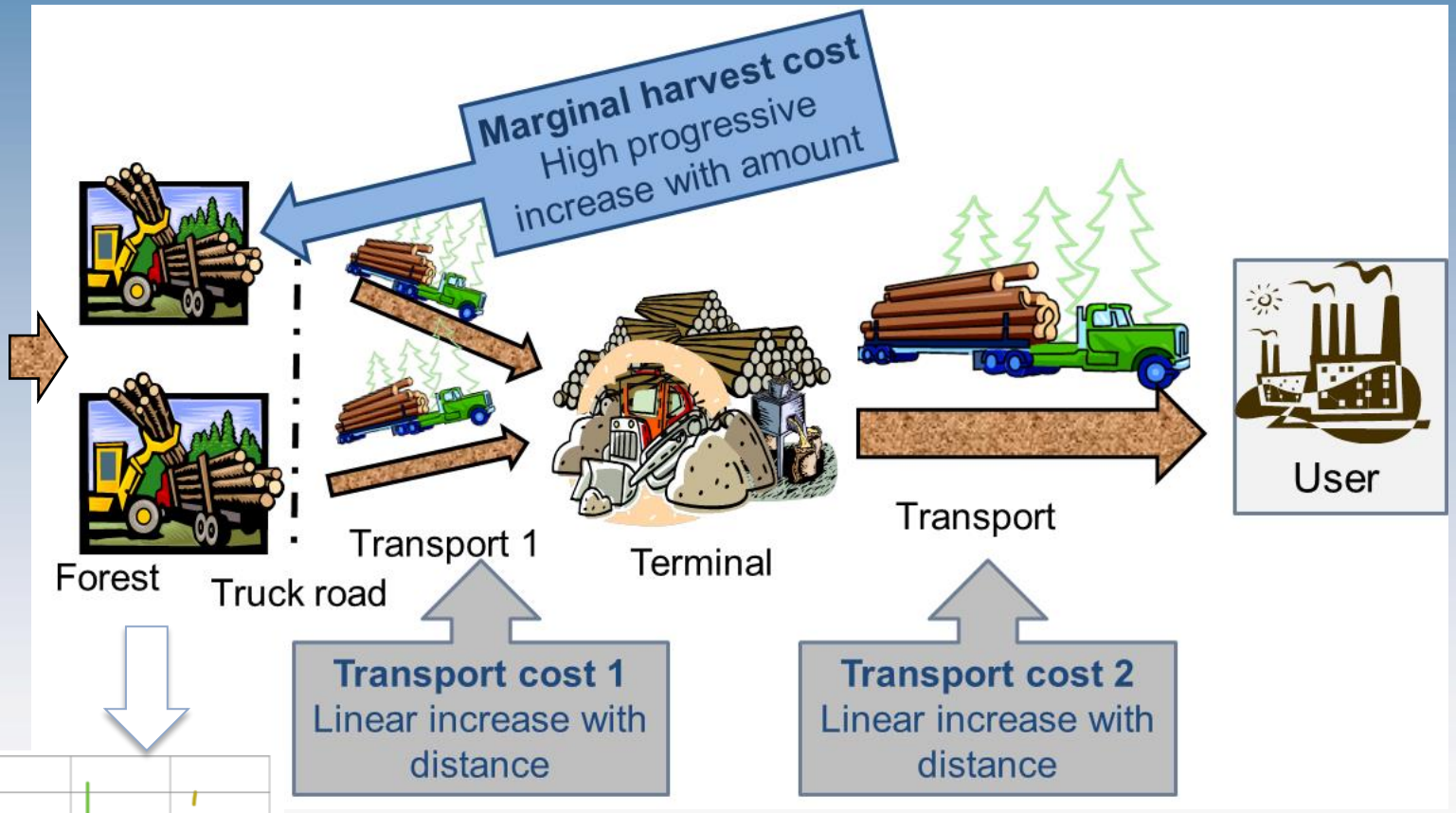
BIODRI: Production chain.

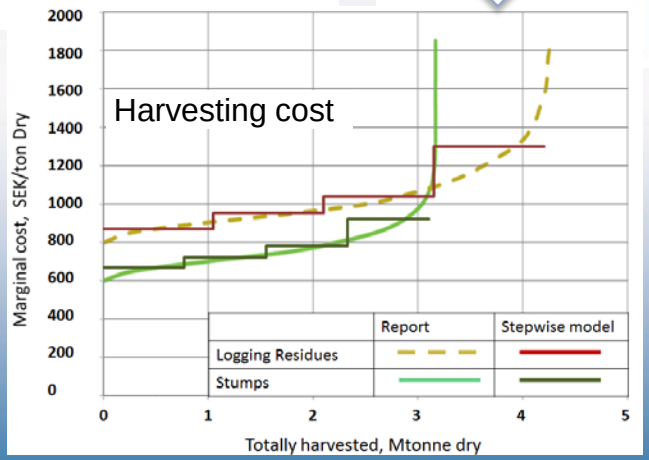


WP 1 Biomass Supply

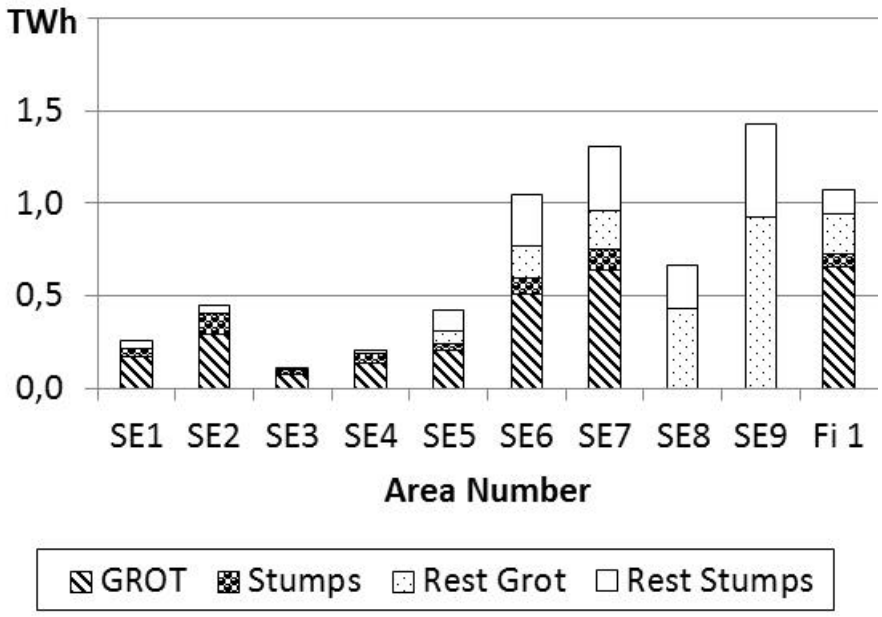


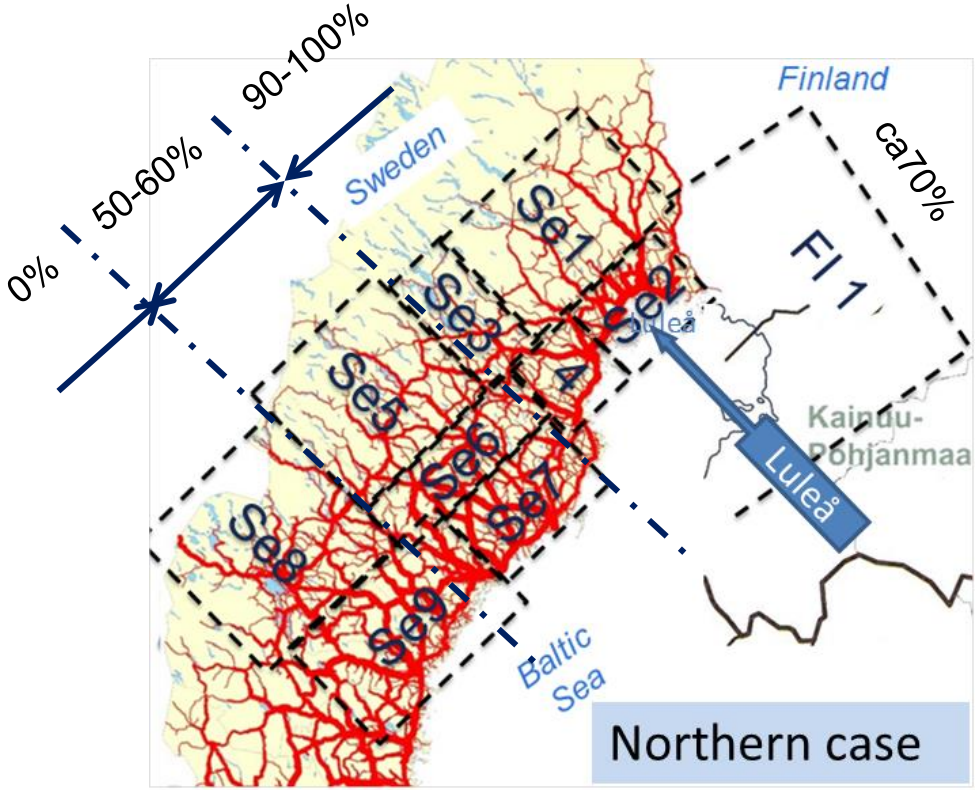
Structure of Availability Statistics



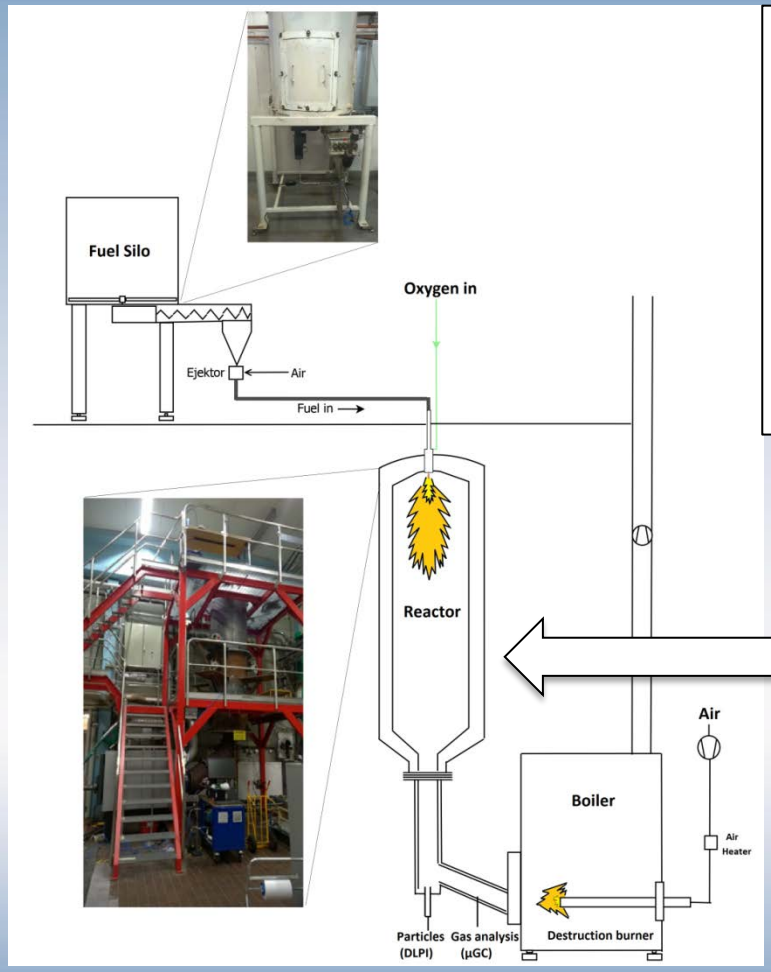


Biomass for 925000 tonne BioDRI





WP2 Pilot trials of Entrained flow gasification



Estimated composition at full scale

Lambda	CO	CO_2	H_2	CH_4	H_2O	N_2
0,3	46,5	8,9	32,1	2	8,5	2,0
0,35	46,7	8,4	26,6	1,5	14,4	2,3
0,4	46,0	8,9	22,1	1	19,3	2,6

Problem: Heat loss influenced result

Wp3: Metallurgical studies (Laboratory and pilot scale)

A) BioDRI for BF (Pot furnace Reduction tests and ITH at LKAB)

- The Reduction gas will be OK if the Syngas is dried before mixing
- If it is wet it will be detrimental to production (low reduction rate)
- BioDRI strength is OK
- It would improve cost if lower metallisation and %C could be used

B) BioDRI for powder production:

1) Annealing road

- Production of test material was made LKAB. High demand on pellets
- Pilot annealing and study of properties was made at HÖGANÄS. Chemical composition of product can be made OK. Some factors influencing physical properties should be studied further

2) Remelting road

- Replacing HBI with BioDRI in EAF seems OK. Potential to save energy with up to 20% and CO_2 with up to 60%

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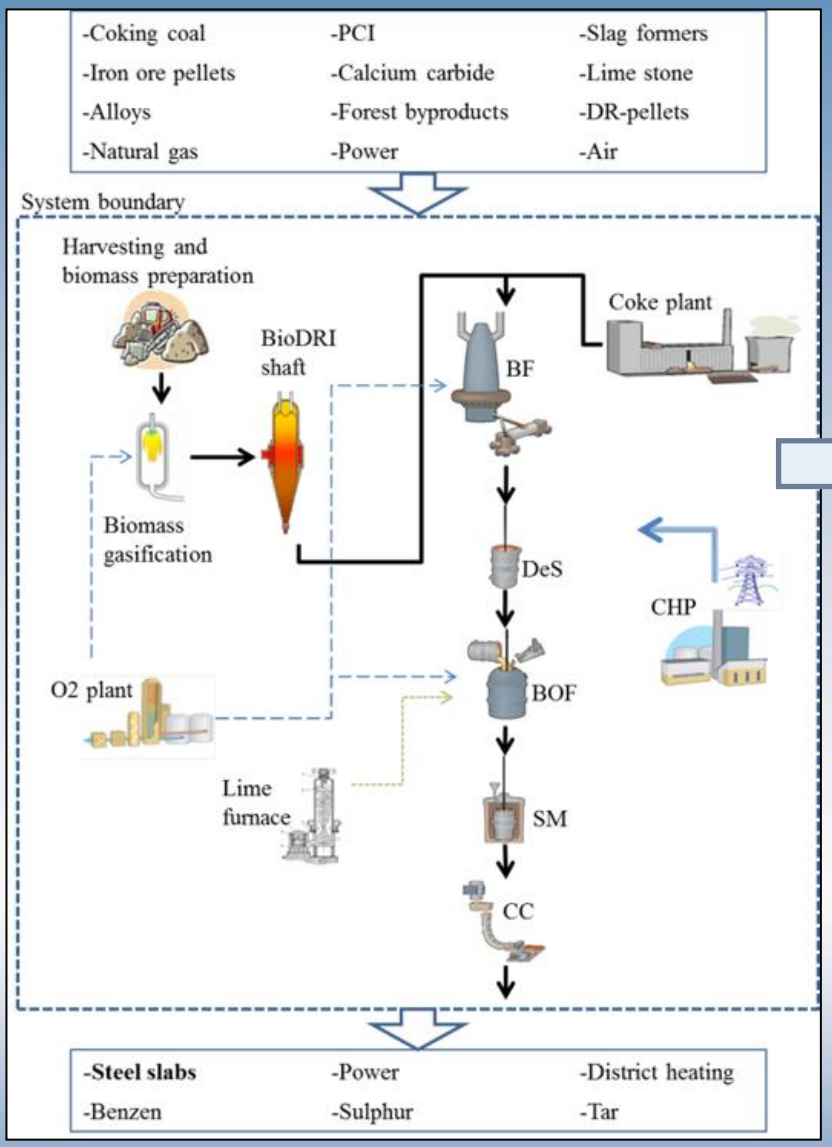
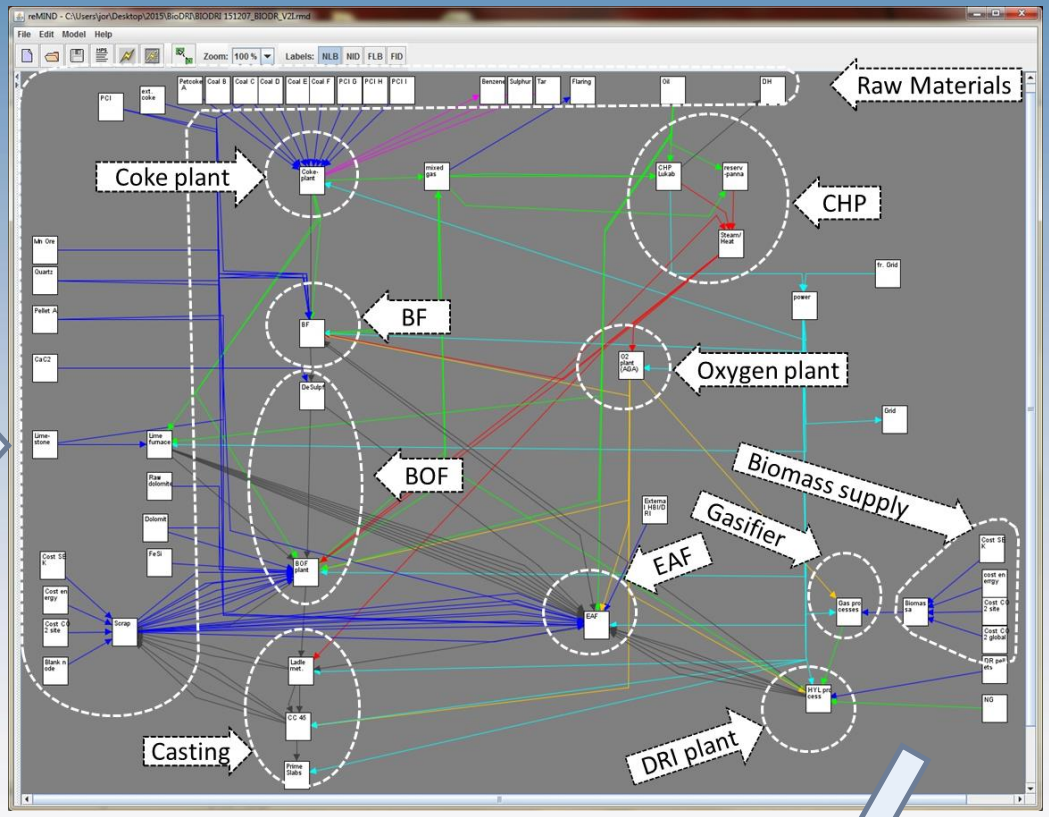
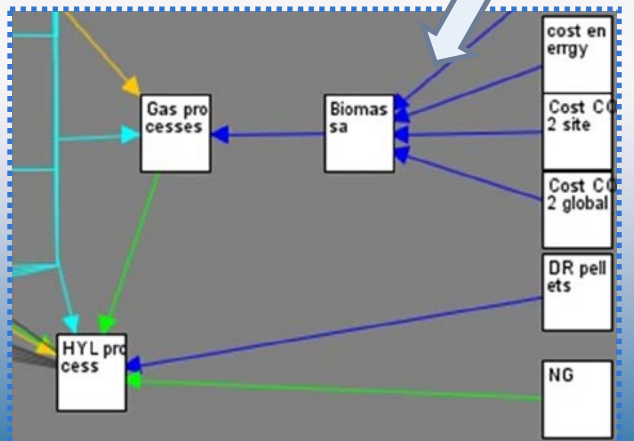
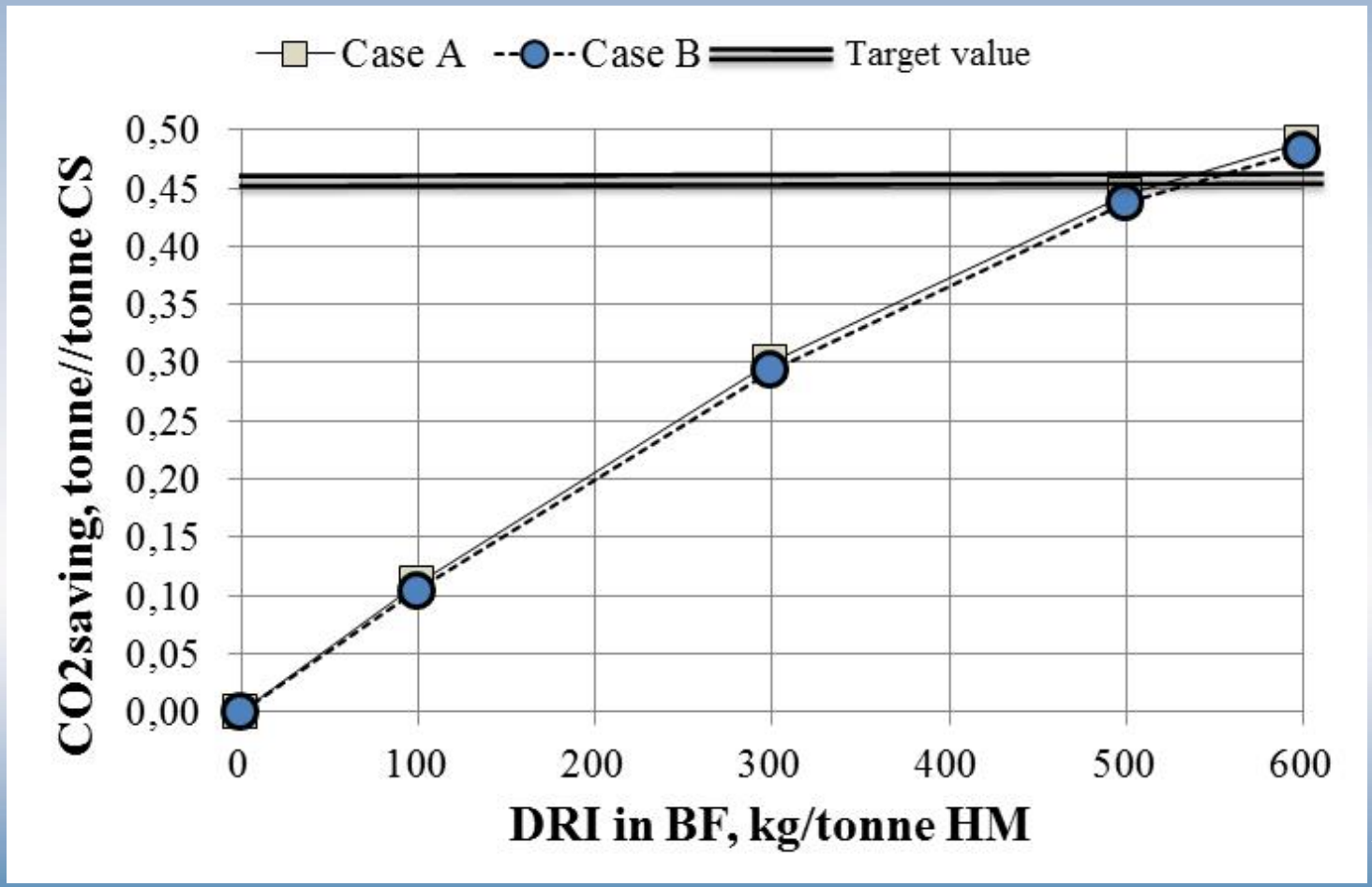
WP4 Systemanalysis (reMIND)



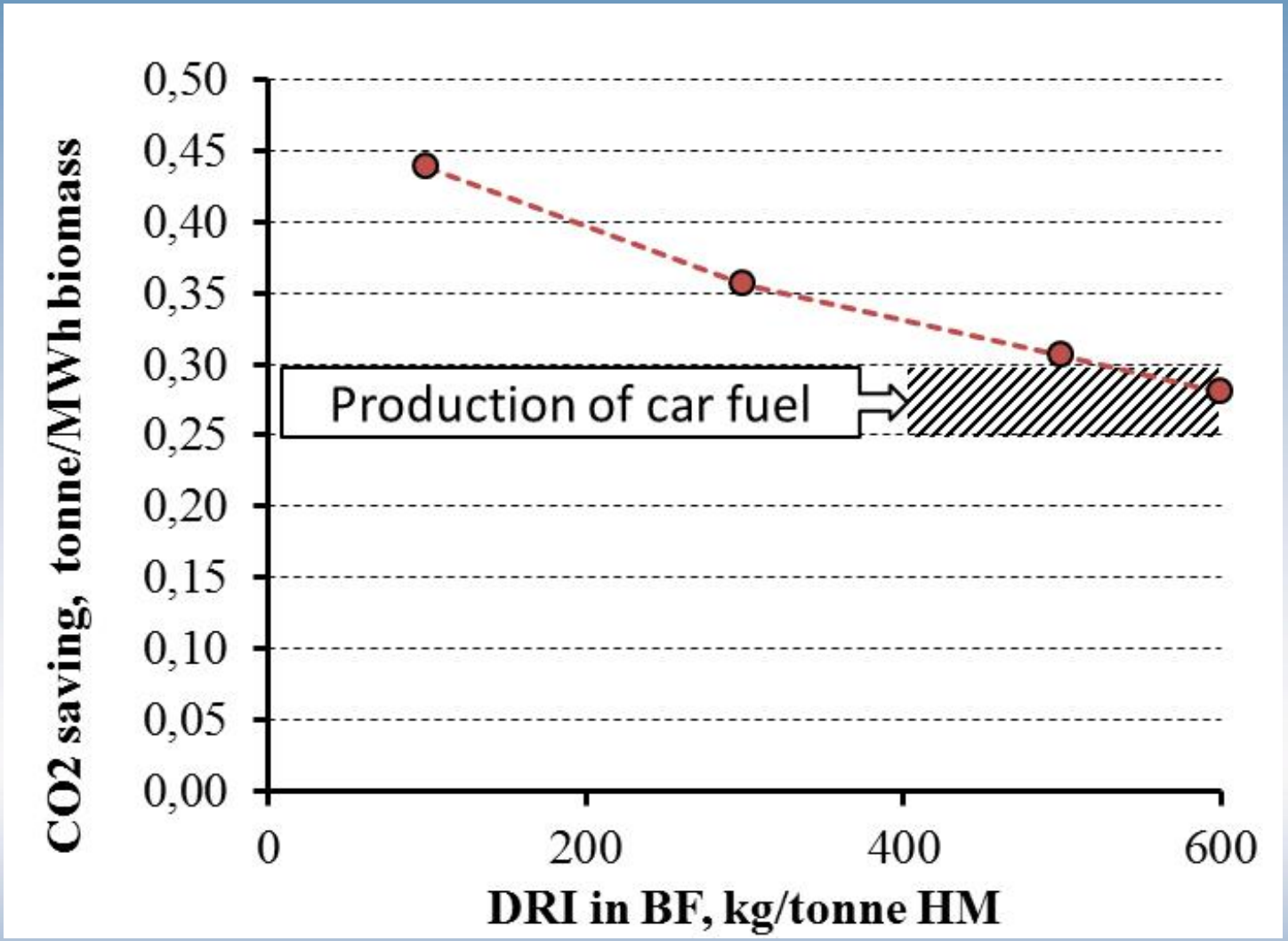




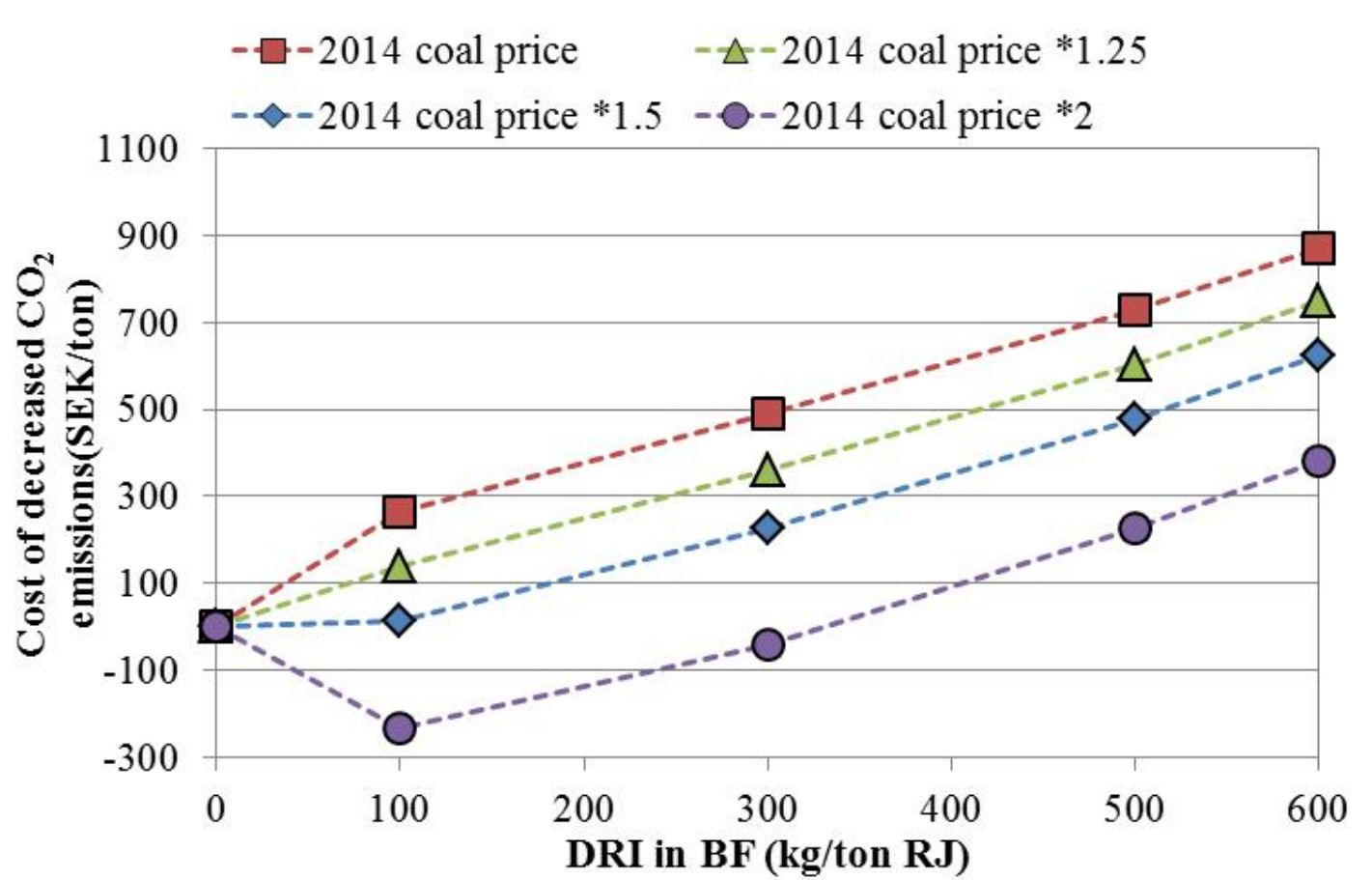
Norhern case. Effect on fossil CO_2



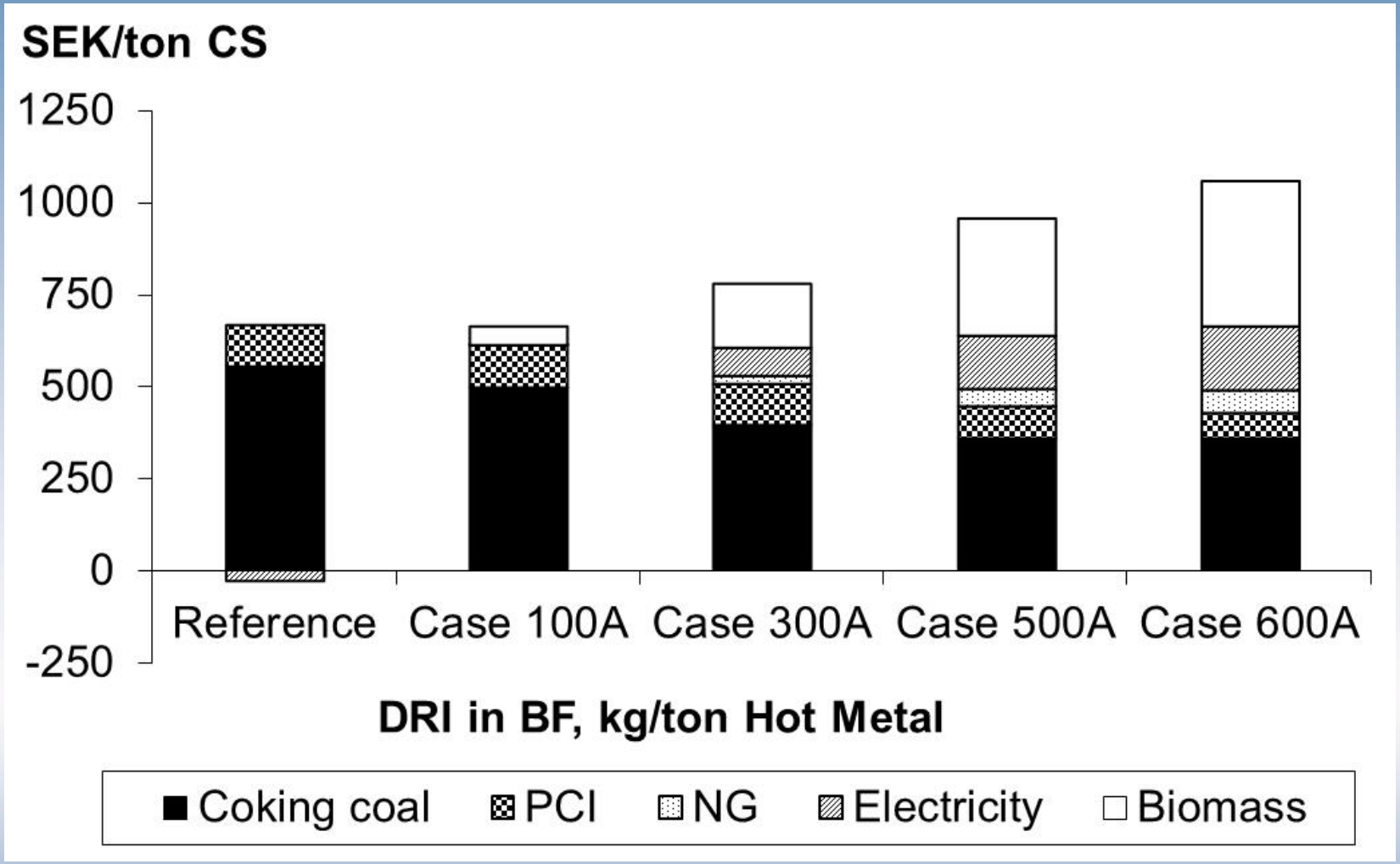
CO_2 yield of biomass



Cost per ton CO_2 and its sensitivity to price



Northern case: Cost effects



Conclusions

- BioDRI is technically possible. Up to 1 Mton/year Fossil CO_2 is eliminated for the northern case .
- However, it is more expensive than fossil routes. The cost increases with high specific addition. Perhaps it is better to divide the BioDRI addition between several blast furnaces?
- The efficiency (CO_2 decrease/unit of biomass) was compared to that for use for car fuel. It is the same at at high addition, better at low rate.
- Research to decrease process costs is important, (*e.g.: cheap CCS, lower DRI metallization and C content + cost rationalisation for harvest and transport of large biomass amounts)*
- Governmental incentives are needed to make renewable practice competitive. They must be independent of political winds and formed so they do not kill the industry!!!!
- Different renewable ideas compete for the same biomass but are now studied separately. A project for unified evaluation has been granted.