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Implications of CCS for the Northwest European Electricity Market and for CO_2 Emissions in the Netherlands

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Main conclusions

- The Netherlands has a large potential and competitive advantage for CCS
- Observed cost escalations in years 2003-2007 and recent credit crunch make future cost estimates, and hence investments, rather uncertain.
- Wholesale electricity market price and net exports are not significantly affected by large scale CCS deployment. Fuel and CO_2 prices are more important drivers.
- With CCS, Dutch national CO_2 emissions from fossil electricity generation can be reduced by 50% in 2030 compared to a recently updated reference projection

CCS Policy EU and NL

EU
- Directive on Geological Storage of CO_2
- 10-12 Large CCS demos before 2020
- 1,25 billion € subsidy, CCS reductions in Emission Trading System (ETS)

NL
- Pilots for capture (3) and storage (2)
- Clean & Efficient: 4-10 Mton CCS feasible in 2020 2-3 large demos on new build coal-fired plants (Rotterdam and Eemshaven)
- Rotterdam Climate Initiative: -50% CO_2 reduction in 2025, CCS makes up half of it

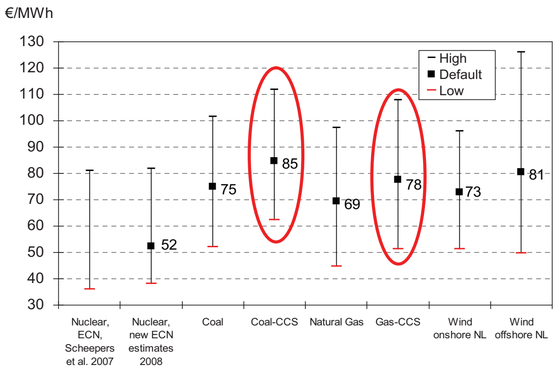
New reference projection NL 2008-2030

- New build fossil up to 2020: 3,5 GW coal and 6 GW gas (2008: 22 GW total generating capacity)
- CO_2 emissions central electricity production increase to more than 70 Mton in 2020
- Fuel prices as in PRIMES baseline ('moderate') or WEO2008 ('High')
- As sensitivity: what-if on retrofit CCS on 3,5 GW new build coal (before 2020) and on 6 GW new build gas (after 2020): rather optimistic but indication for impact on electricity market and CO_2 and other emissions

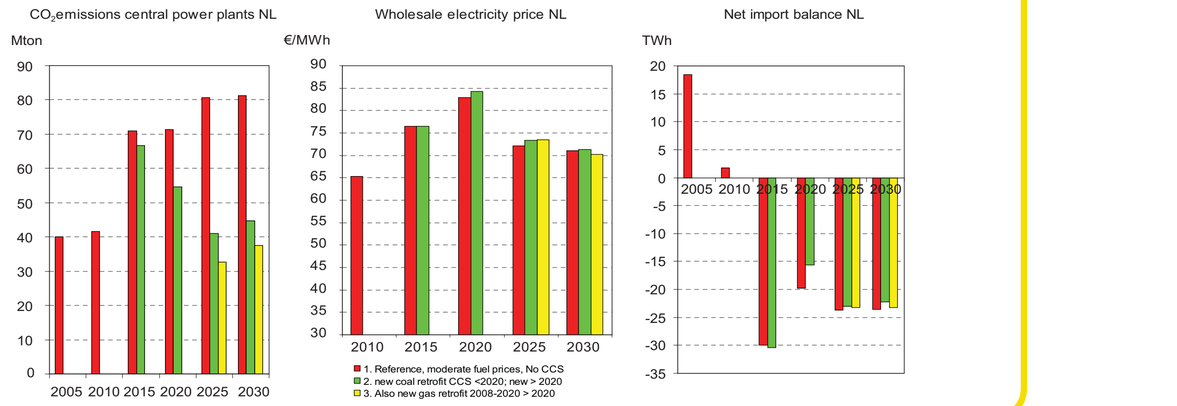
Cost of new build large scale power generation

- 2015-2020 into operation
- CO_2 price: 35 €/ton CO_2 (20-50 range)
- Coal: 3 €/GJ (2-4 range);
- Natural Gas: 7 €/GJ (4-10)
- Plus uncertainty ranges other techno-economic parameters

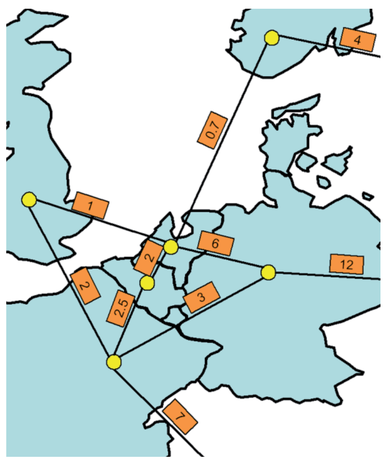
Source: (Seebregts & Jansen, 2009)



Results NL reference projections with/without CCS



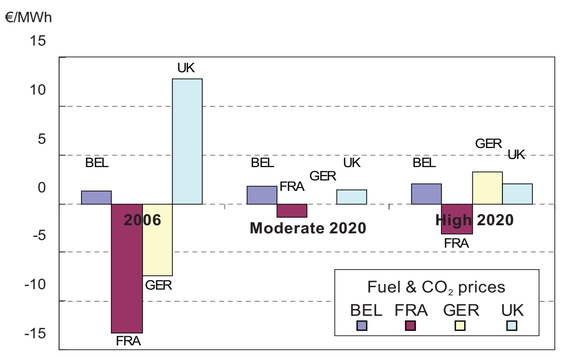
Electricity market NL and NW-Europe



Interconnections (GW) NL and neighbour countries

- Increased interconnections and electricity market coupling in North-West Europe
- Higher electricity prices (due to rising fossil fuel prices and CO_2 price)
- Convergence of price differences (irrespective of CCS)

Wholesale electricity price differences NL and neighbours



Source: (Özdemir et al, 2008)

Conclusions

The Netherlands has a large potential and competitive advantage for CCS:
- high density of CO_2 point sources
- a lot of fossil new build power plants, largely capture-ready, is under construction or is planned,
- eventually ample storage locations for CO_2
- Observed cost escalations in years 2003-2007 and recent credit crunch make future cost estimates rather uncertain. This will make investment in innovative CCS technology a financial risk

Based on recently updated Dutch reference projections, rather optimistic deployment what-if's on retrofitted new coal and gas power plants show that:
- Wholesale electricity market price and net exports are not significantly affected by large scale CCS deployment. Fuel and CO_2 prices are more important drivers
- CCS deployment can reduce the Dutch national CO_2 emissions from fossil electricity generation significantly, up to 48 Mton in 2030 (50% reduction of reference emissions in 2030
- Cost-effective CCS would need a price of about 70 to 90 euro/ton CO_2

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