Setting the scene – what is CCS and why is it important?

”Clean coal” in the future?

Seminar 4.3.2009

Svenska Tekniska Vetenskapsakademin / Fortum

Petra Lundström

CTO, Fortum Corporation

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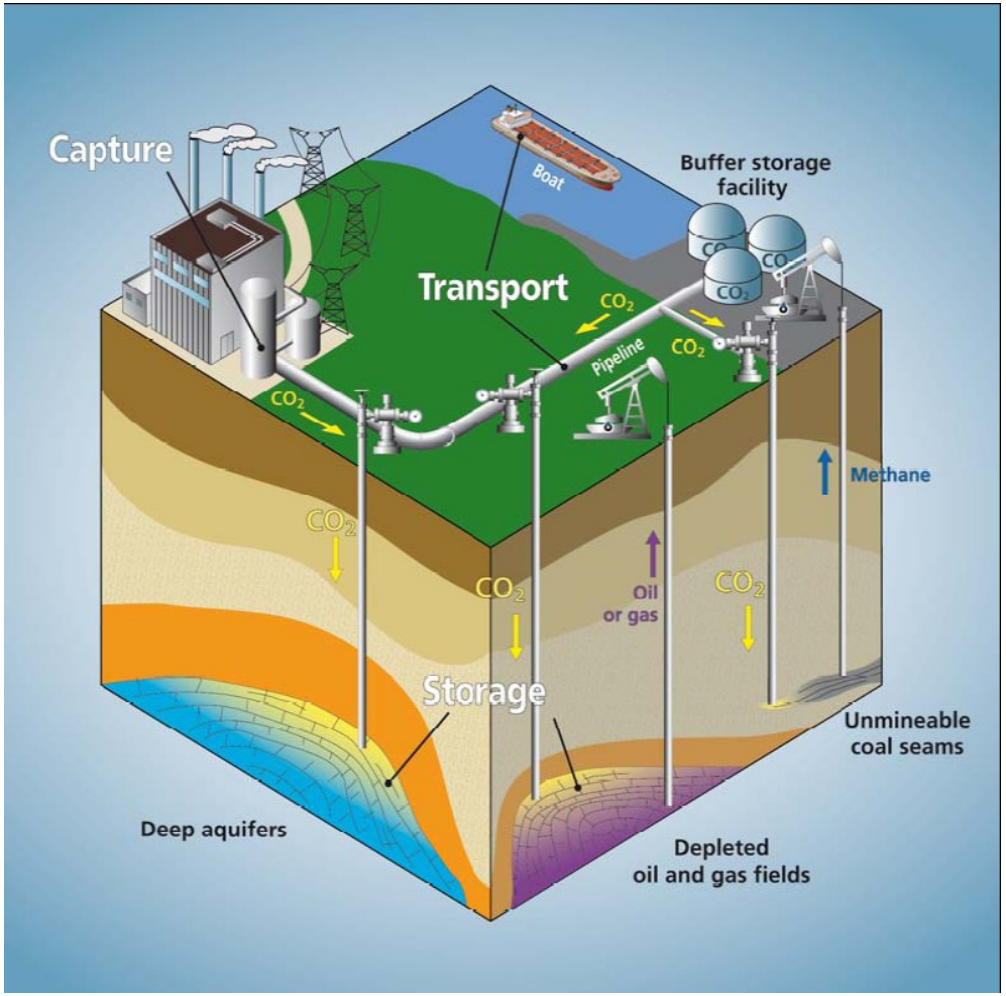
What is carbon capture and storage (CCS)?

- Capture at plant
- Pipeline, ship or truck transport
- Storage in various geological formations



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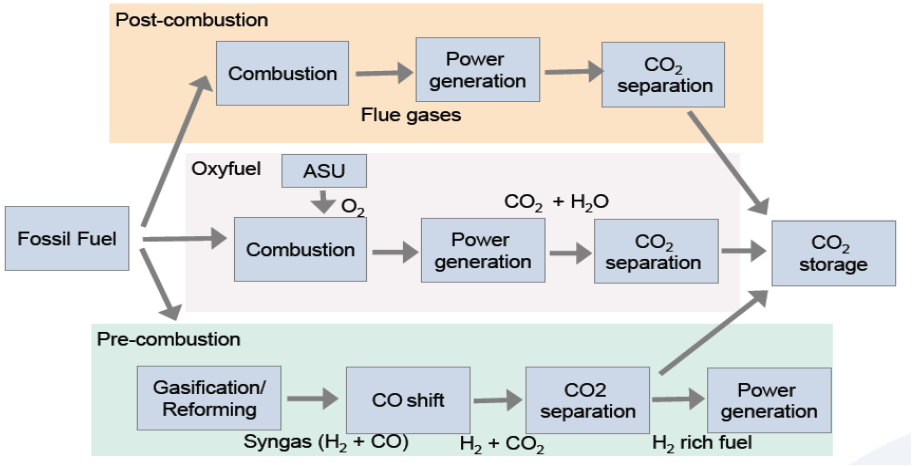
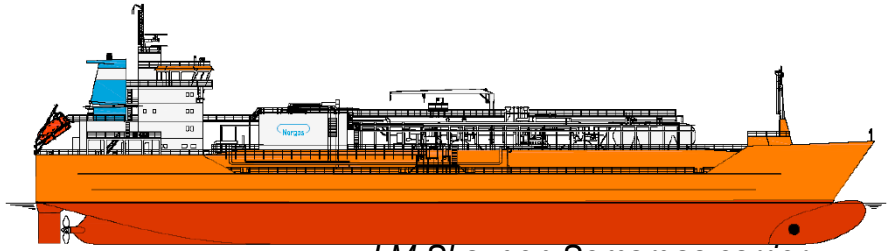
What is CCS?





I.M Skaugen Somargas carrier

- Several capture technologies
  - some of them already mature technologies (used in other industries)
  - some in development phase
  - hugely important to bring down the cost and energy consumption of capture
  - presentations today by Mr. Hotta, Mr. Scholz
- Transport of supercritical or liquefied CO_2
  - at large scale: pipeline transport
  - also possible: ship or truck transport
  - presentation today by Mr. Rauramo

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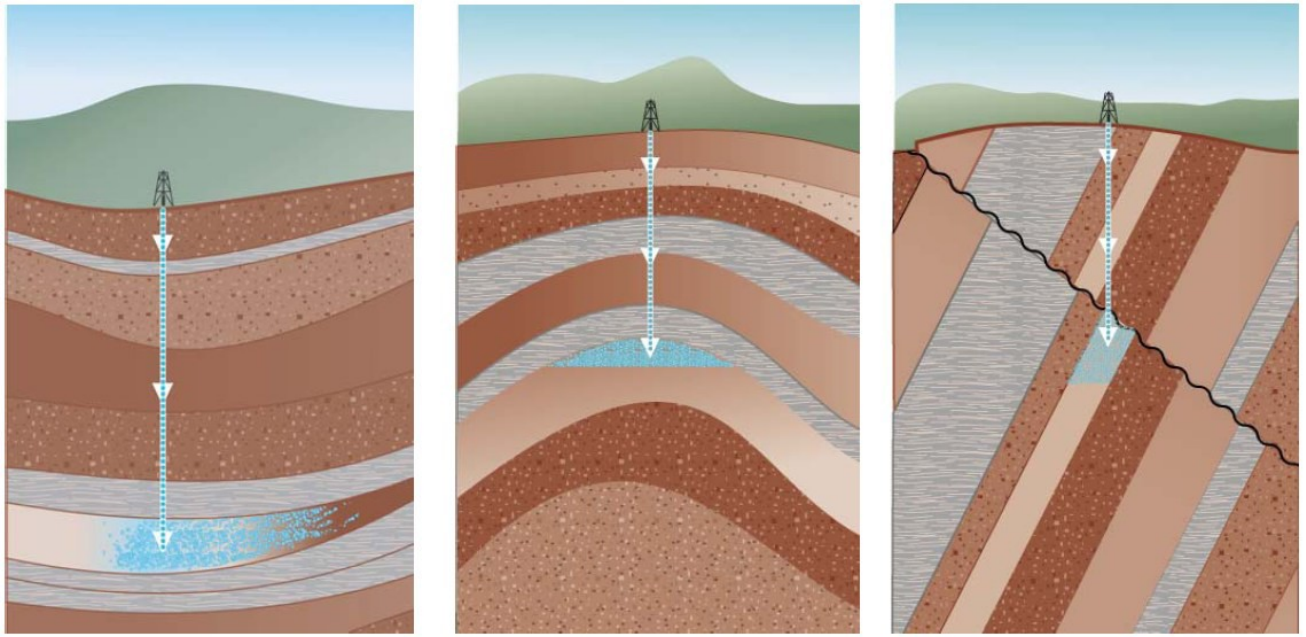
What is CCS?



- Storage in geological formations:
  - enhanced oil recovery
  - large storage potential in saline aquifers
  - presentation today by Mr. Lindeberg
- CO_2 as packaging gas, in soft drinks… however, the point with CCS is to prevent the gas from going back into the atmosphere!

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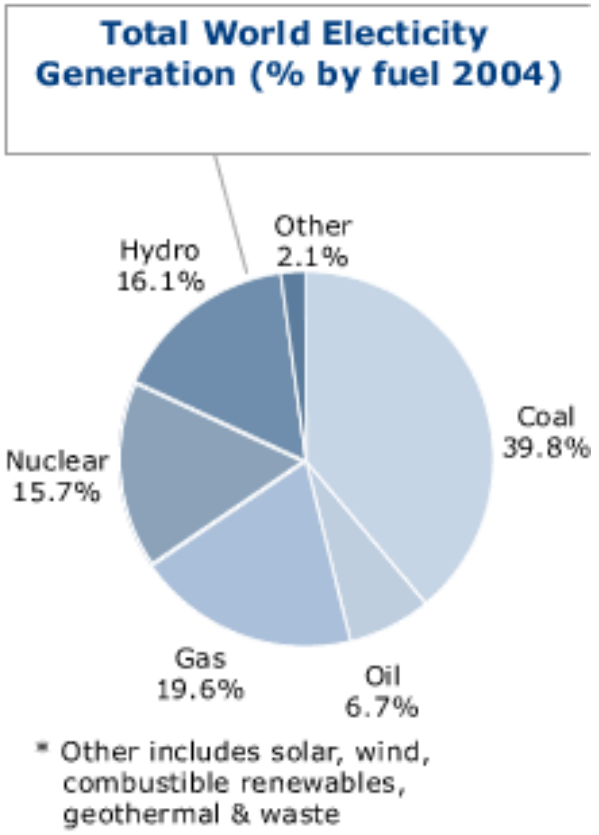
Why is CCS important?

- Today's energy system totally dependent on fossil fuels
- Coal is the most extensively used fuel for power production globally (40%)
- In Finland, coal used mainly in large condensing and CHP-plants
- Benefits: availability, price, storability
- Drawback: CO_2 emissions
- Until now, many growing economies have fuelled their growth by building numerous coal-fired power plants

"Clean" coal-fired power plants would reduce CO_2 emissions very significantly



Lähde: www.worldcoal.org

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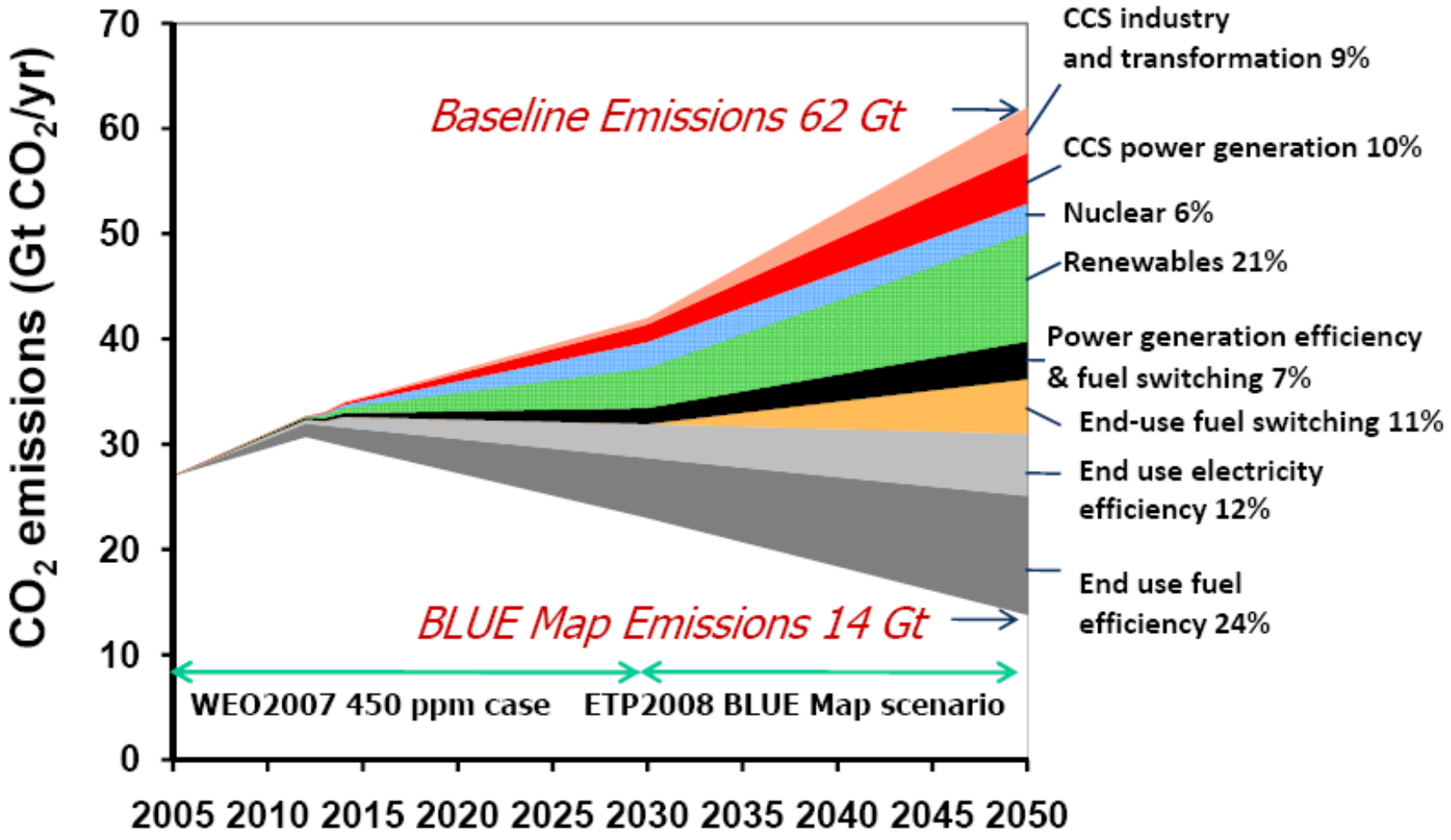
Several technologies needed for significantly cutting emissions by 2050



Source: IEA Energy Technology Perspectives 2008

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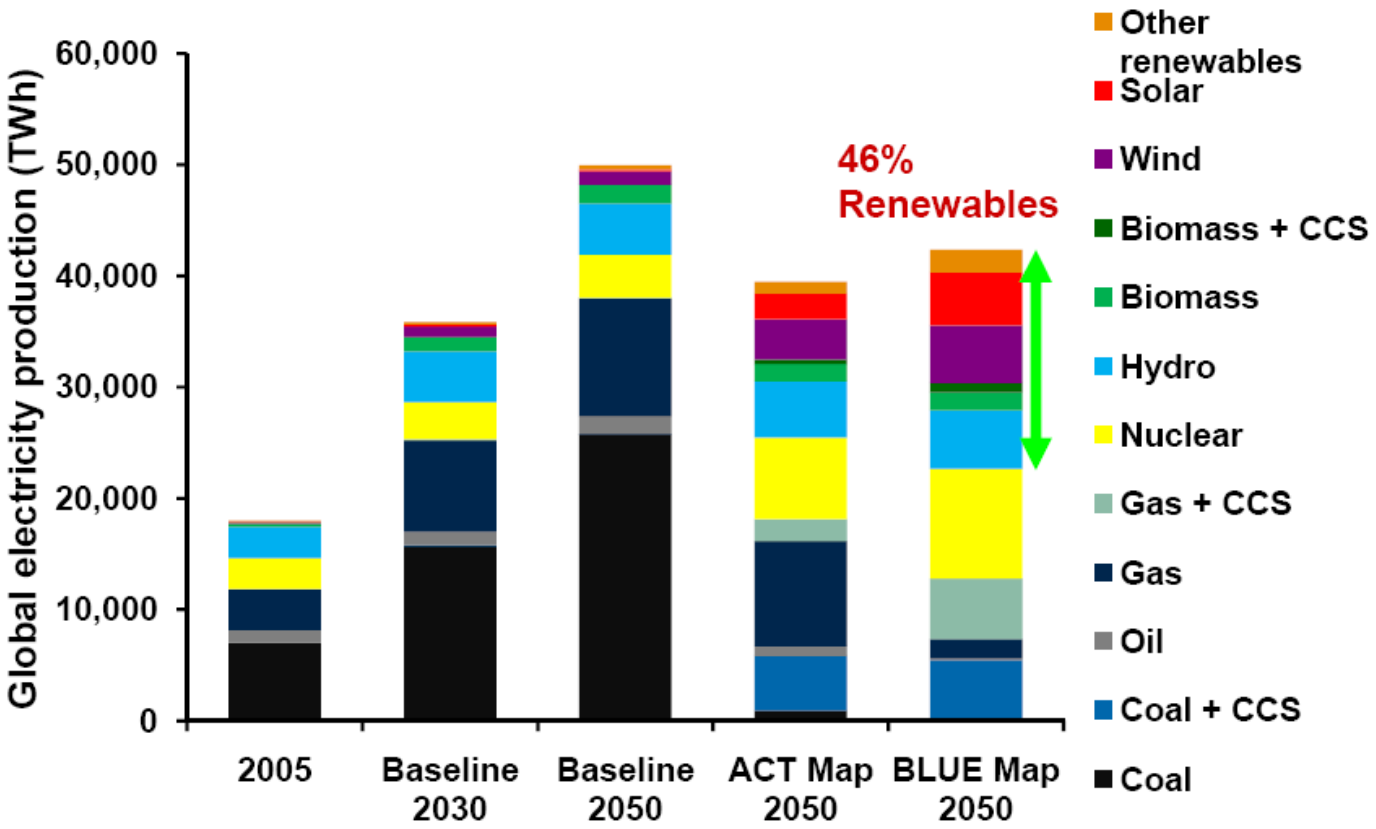
Power production portfolio 2050



Source: IEA Energy Technology Perspectives 2008

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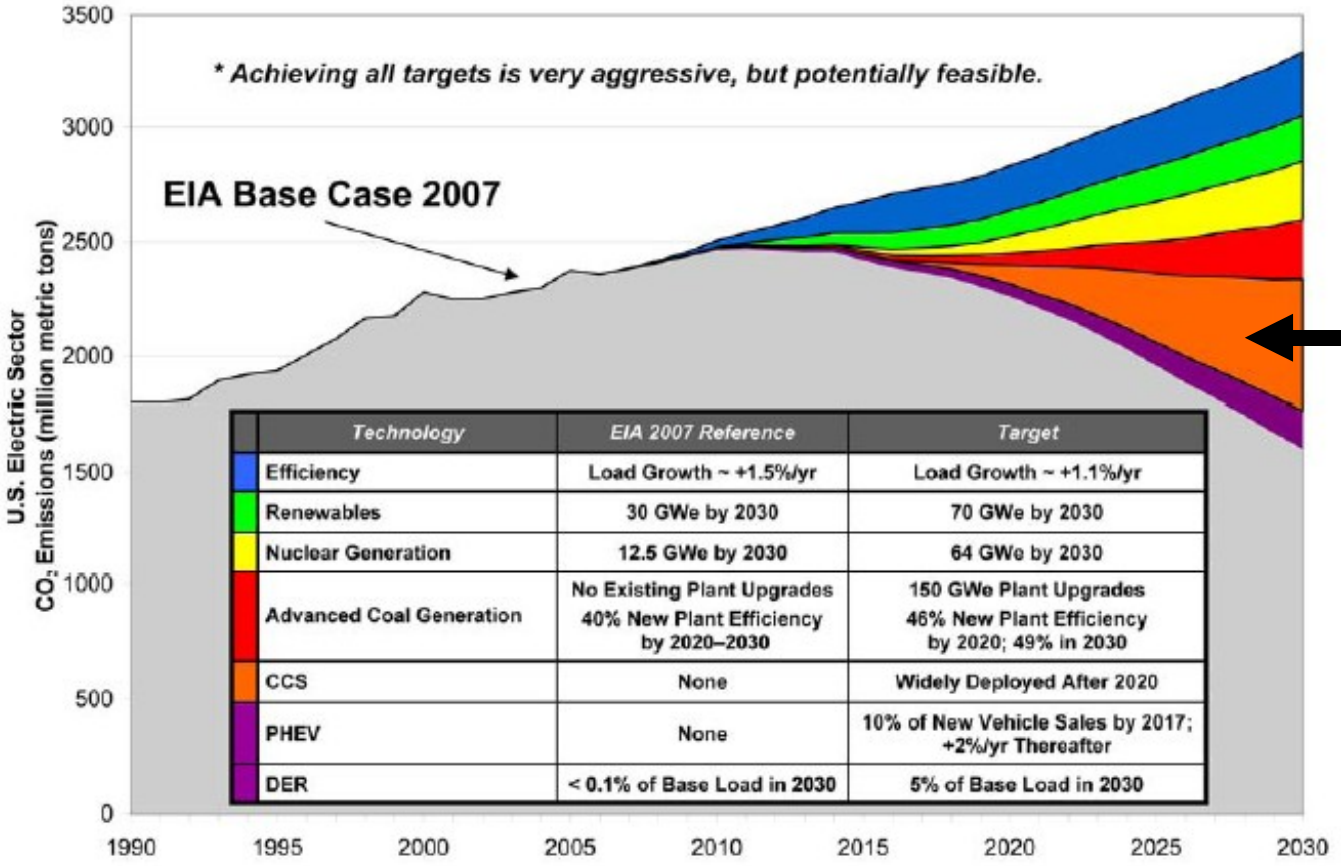
Impact on U.S. electric sector emissions



Technology	EIA 2007 Reference	Target
Efficiency	Load Growth ~ +1.5%/yr	Load Growth ~ +1.1%/yr
Renewables	30 GWe by 2030	70 GWe by 2030
Nuclear Generation	12.5 GWe by 2030	64 GWe by 2030
Advanced Coal Generation	No Existing Plant Upgrades 40% New Plant Efficiency by 2020–2030	150 GWe Plant Upgrades 46% New Plant Efficiency by 2020; 49% in 2030
CCS	None	Widely Deployed After 2020
PHEV	None	10% of New Vehicle Sales by 2017; +2%/yr Thereafter
DER	< 0.1% of Base Load in 2030	5% of Base Load in 2030

Impact of CCS on emissions reduction until 2030

Source: Electric Power Research Institute: "The Power to Reduce CO2 Emissions The Full Portfolio", Discussion paper 2007

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”Clean coal” in the future – technology status and implications to Finland
Organized by Swedish Academy of Engineering Sciences (STV) and Fortum Corporation

Date and venue: 4.3.2009, Fortum Corporation, Keilaniementie 1, (Auditorium 1st floor)

9.30 Opening words and background of the STV project Björn Wahlström, STV

9.40 Welcome to Fortum Mikael Lilius, CEO, Fortum

9.50 Setting the scene: What is CCS and why is it important? Petra Lundström, CTO, Fortum

10.00 Oxycombustion development by Foster Wheeler Arto Hotta, R&D Director, Foster Wheeler Energia

10.25 Pre-combustion capture Marcus Scholz, Sales Director, GE Energy - Europe

Coffee break 10.50 – 11.05

11.05 Carbon dioxide transport possibilities Joonas Rauramo, Business Development Manager, Fortum

11.30 Carbon dioxide storage experiences Erik Lindeberg, Seismic and Reservoir Technology, SINTEF, Norway

Lunch 12.10 – 13.10

13.10 EU’s ambitions within CCS Chris Bolesta, DG TREN, EU Commission

13.50 Status of carbon capture and storage technologies – conclusions from new STV prestudy Sebastian Teir, Research Scientist, VTT

14.40 Facilitated discussion and formulation of conclusions:

- Significance of CCS to climate change mitigation globally?
- Importance of CCS to climate change mitigation within EU?

Coffee break 15.10 – 15.25

- The time constant – when will CCS be a commercial technology? Is it soon enough?
- Signficance to Finland? Applicability to Finnish energy system, export market for Finnish technology manufacturers?

16.30 Round-up Björn Wahlström, STV

17.00 – 19.00 Dinner (buffet) at Fortum

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