Anders Johnson, Head of Climate Mapping, Vattenfall AB

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Vattenfall in brief

- Europe's fourth largest generator of electricity and the largest generator of heat
- Vision: To be a leading European energy company
- Operations in Sweden, Finland, Denmark, Germany and Poland
- Electricity generation 167,6 TWh,
- Heat generation 36,2 TWh,
- Turn over 2007 143,6 billion SEK (13,8 B€)
- Investment program 2008-2012 173 billion SEK (16,6B€)
- More than 32,000 employees
- Vattenfall AB is wholly owned by the Swedish State

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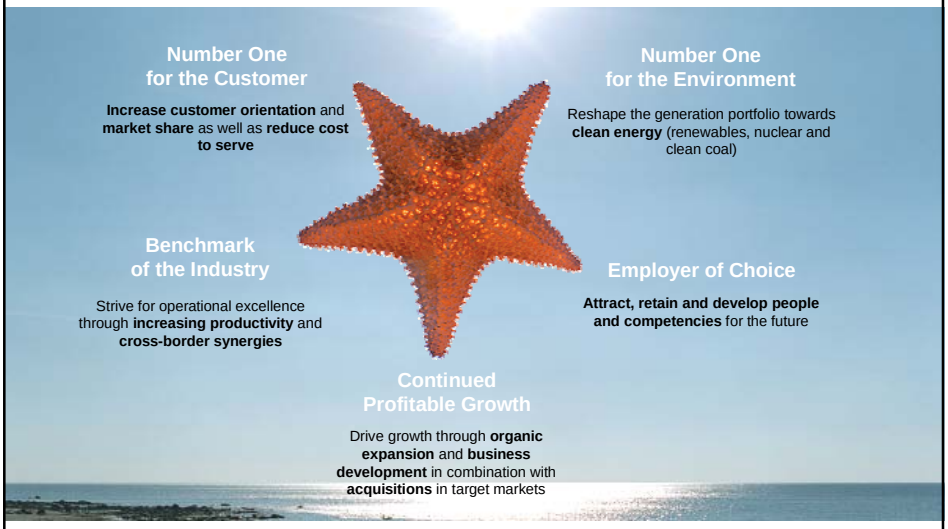
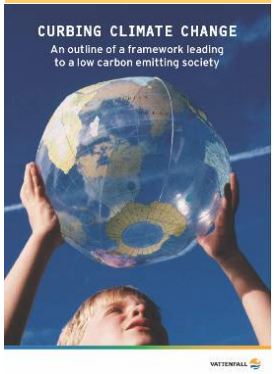
Our vision – to be a Leading European Energy Company



Vattenfall meet the CO_2 challenge on broad front

By co-operating with other companies and industries, around the world



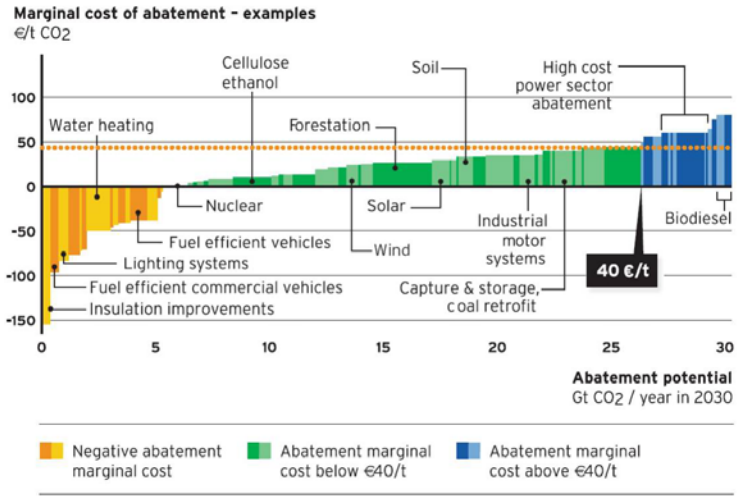
Global emission trading system

By increasing energy efficiency for our customers

By improving our own energy production

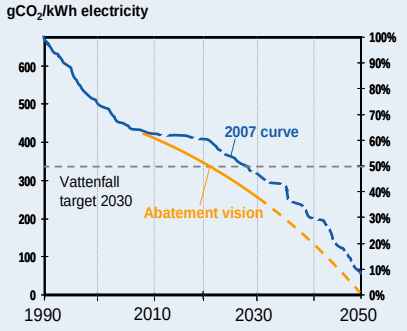
CCS - the pilot plant

Combating climate change is possible



Making Electricity Clean

Vattenfall's clean energy road map



Key success factors

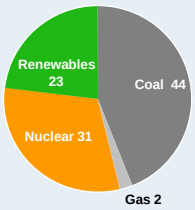
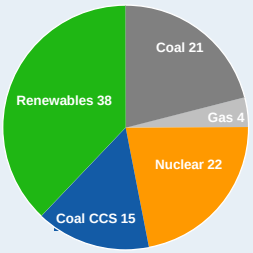
- Investment and growth strategy adapted to climate change
- Strategic market positioning and climate development of our products and services
- Shape the regulatory system to our advantage
- Include climate perspective in all key decisions

Reduction CO_2 - extensive growth of renewables

Portfolio strategy - reshape the generation portfolio towards clean energy

Drivers:

- Emissions reduction
- Technological development/R&D
- Increasing financial attractiveness of renewables
- Preference for base load
- Public opinion

2008	Resulting development given growth target 2030 (incl. acquisitions)
Per cent Total = **170 TWh**	Per cent Total = **390 TWh**
	
Low CO_2 emitting: 90 TWh	Low CO_2 emitting: 290 TWh 200 TWh increase in low emitting

Reduction of CO_2 - extensive growth of renewables

- Target to double size to 2030
- Improvements of old power plants
- Enhance efficiency in new plants
- Power and Heat generation without fossil fuels
- CCS, carbon capture and storage
- R & D (Wind, Wave, Hybrids)

3C – A Business Leaders' Initiative

COMBAT CLIMATE CHANGE
A Business Leaders' Initiative

ABB
AIG
Al-Amoudi Group
Alstom
Areva
Bayer
BC Hydro
BP
British Sky Broadcasting
Centrica
CEZ Group
China National Offshore Oil Corp.
Citigroup
Constellation Energy
Corus
Deutsche Bahn
Deutsche Post
DONG Energy
Dow Chemical
Duke Energy
E.ON
EnBW
Endesa
Enel
Eskom
Fortum
General Electric
Hewlett Packard
Hitachi
Iberdrola
Lufthansa
MAN
Munich Re Group
MVM
Norske Skog
NRG Energy
Nuon
Otto Group
PG & E
PNM Resources
RAO UESR
Reuters
SAP
SAS
Siemens
SUEZ
TAQA
The Tata Power Company
Union Fenosa
Vattenfall
Veolia
Volvo
Wallenius Lines

- 53 companies (2/3 in Fortune 500)
- 4,5 million employees
- EUR 1300 billion turnover (10 times EU budget)
- Active in 220 countries and territories
- HQ in 11 of the G8+5 nations
- 15% of global electricity generation
- Across all sectors

The Overall 3C Objectives

- **Integration of climate issues into the world of markets**
- **A new global climate change agreement to come into force in 2013**
- **To support this process by providing guidance and recommendations to global policy makers**

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Climate Manifesto
http://climatesignature.vattenfall.com/

- **We need a global price on CO2 emissions**
- **We need more support for climate friendly technologies**
- **We need to implement climate requirements for products**

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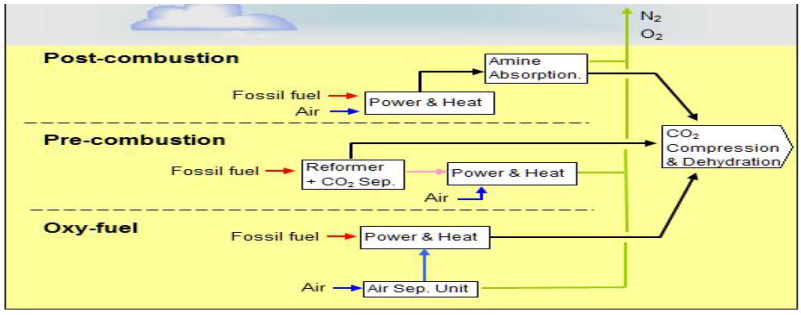
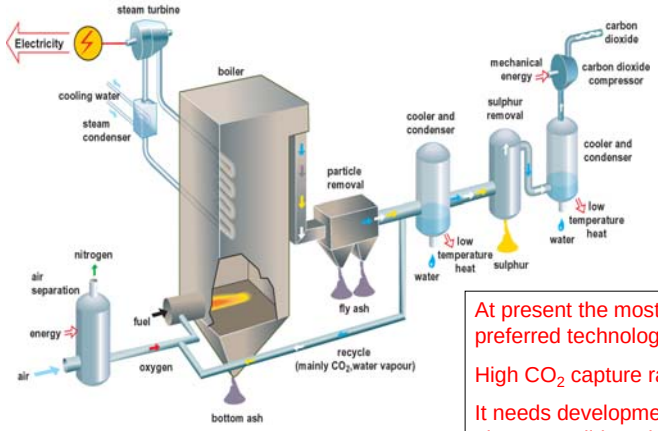
Carbon dioxide capture & storage (CCS)

Three capture technologies have chance to reach commercial status in 2020
There is no „ silver bullet“ and several technologies will coexist in future, adopted to different plants and situations.
All technologies are known, its components and systems, but need scale-up and integration



Oxyfuel, the preferred option

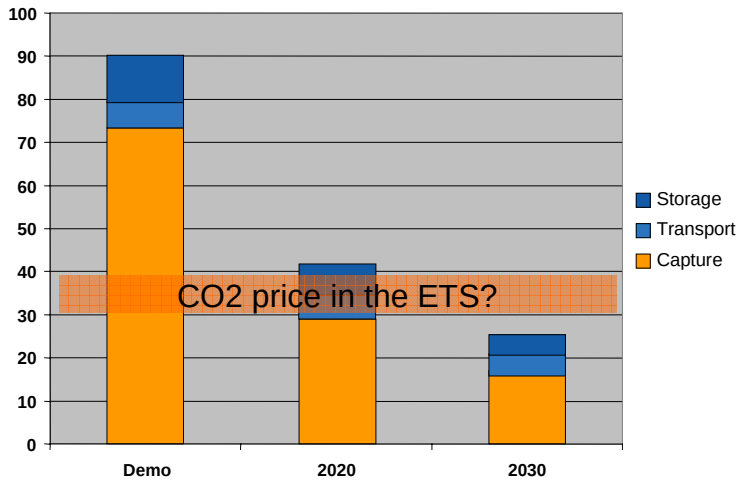


At present the most competitive and preferred technology for coal.

High CO_2 capture rate

It needs development, pilot and demo plants to validate design data

Total cost, including transport and storage (€/ton CO_2)



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View of the Schwarze Pumpe Pilot Plant June 2008

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10 years of continuous research – now resulting in several larger CCS projects

Plant	**Schwarze Pumpe**, Germany	**Mongstad**, Norway	**Altmark** Germany	**Demoplants**, Germany, Denmark, Poland
Type	Large scale pilot	Large scale pilot	Storage testing, EGR	Demonstration plants
Capacity	30 MW	100 kton CO_2/a (~35 MW)	100 kton CO_2 (3 yr test phase)	250 - 350 MW
Fuel	Lignite, hard coal	Gas from refinery	-	Hard coal, Lignite
Techn.	Oxyfuel	Post-combustion	EGR,Old gas field, 400Mton	Post-combustion and oxyfuel
Operation	2008	2010	2009	Ca 2015

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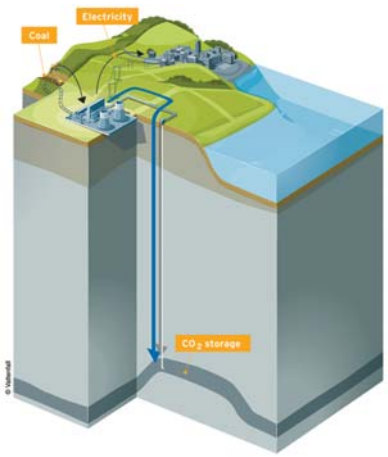
Carbon capture and storage, 12 years of progress



We have come a far way now. From the SACS project 1996 to

- ✓A ready proposal for a new EU law regulating CCS, and one including CCS in the emission trading system
- ✓The EU has expressed a wish to support 10 – 12 demo plants
- ✓Some member states have their own support systems

Our oxyfuel pilot plant has produced it's first tons of liquid CO_2

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Making Electricity clean
Summary

Vision to be CO2 Neutral 2050

- All energy sources are needed and will be used in the foreseeable future.
  - Renewable, Nuclear and Clean Coal with CCS are key technologies to reduce environmental impact
  - Vattenfall will demonstrate excellent performance and efficiency
- An increased use of clean electricity and heat in society can push out less efficient energy sources and enable technologies with high environmental performance

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