

# CCS – From Pilot to Demo

## Results from the world's first oxyfuel-firing Carbon Capture & Storage pilot plant

EPPSA's 3<sup>rd</sup> annual technology evening

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# The Oxyfuel Pilot Plant

Thermal capacity: 30 MW<sub>th</sub>  
Coal demand: 5.2 t/h  
Oxygen demand: 10 t/h  
CO<sub>2</sub> (liq.) production: 9 t/h

Electrostatic precipitator

Flue gas desulphurization

Flue gas condenser

Boiler

Air separation unit

Social and switchgear building

CO<sub>2</sub>-plant

Webcam: [www.Vattenfall.de/CCS](http://www.Vattenfall.de/CCS)

# Challenges

- Implementation of approx. 15 new technical concepts and specifications.
- Miscellaneous innovations where necessary to fulfill the new requirements of the Oxyfuel process in comparison to conventional power plants, e.g.:
  - Provision of Oxygen
  - Operation on both air and oxygen
  - Flue gas recirculation
  - FGD: external oxidation and high sulfur removal
  - Flue gas condensation and high aerosol precipitation
  - CO<sub>2</sub> processing and liquefaction under pressure



# Status of the Oxyfuel Pilot Plant

- Commissioning of all components and systems finished (Aug. 2008).
- Security and function test by technical authority (TÜV) finished (Sept. 2008).
- Permission for regular operation by technical authority granted (Sept. 2008 for air operation, Oct. 2008 for Oxyfuel operation).
- Optimization and verification of warranted characteristics finished.
- Functionality of the Oxyfuel process is verified in pilot scale, until December 2008 separation and liquefaction of >100 t CO<sub>2</sub>.
- After first measurement campaigns in November/December 2008, start of the test program in January 2009.



# Lessons learned

- The integration of chemical plant parts (ASU, CO<sub>2</sub>P) needs more attention regarding technical regulations, nomenclature and standards.
- New operating concepts for bigger Oxyfuel units have to be developed, considering different behavior of the whole plant in start up and shut down.
- Oxyfuel power plants will have a demand of high skilled employees for operation, engineering and maintenance of the new components (ASU, CO<sub>2</sub>P).
- For engineering and erection the time schedule of “conventional” power plants fits for Oxyfuel power plants too, but there will be more time needed for commissioning.



# Summary

- Oxyfuel works in pilot scale, emission limits are kept.
- Successful integration of plant parts from chemical engineering (ASU, CO<sub>2</sub>P).
- Gained experiences from approval process and implementation of secondary clauses for CCS power plants.
- CO<sub>2</sub> monitoring over the whole technology chain (capture – transport – storage) developed for the first time world wide.
- World wide first application for participation in the emission trading market for a CCS plant.



**Thank you for your attention!**