

CARBON CAPTURE AND STORAGE

WHAT'S THE POTENTIAL AND WHERE ARE WE?



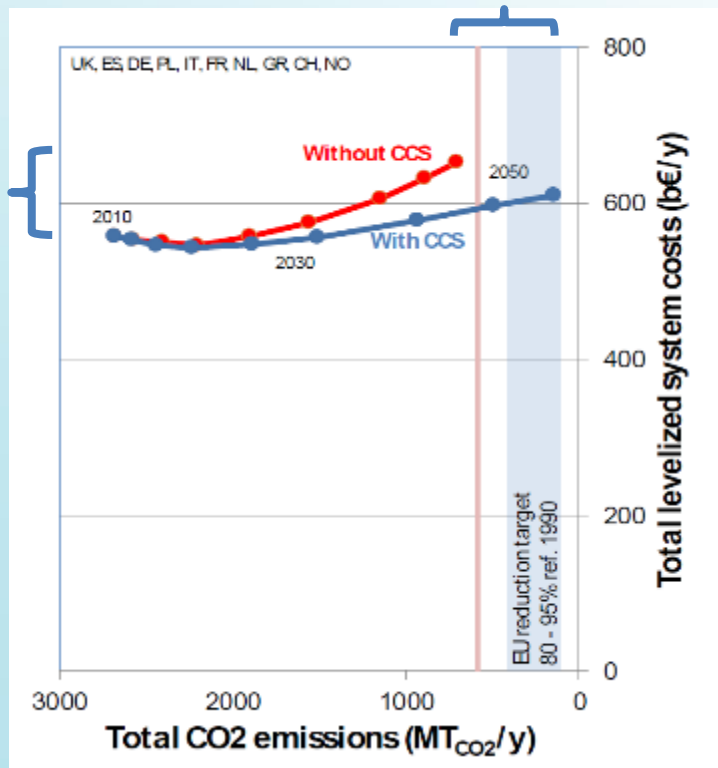
Flame Conference 9 – 12 May 2017
Ståle Aakenes, Chief Economist

Gassnova SF - The Norwegian State Enterprise for CCS

ZEP: CCS AND EUROPE'S CONTRIBUTION TO THE PARIS AGREEMENT

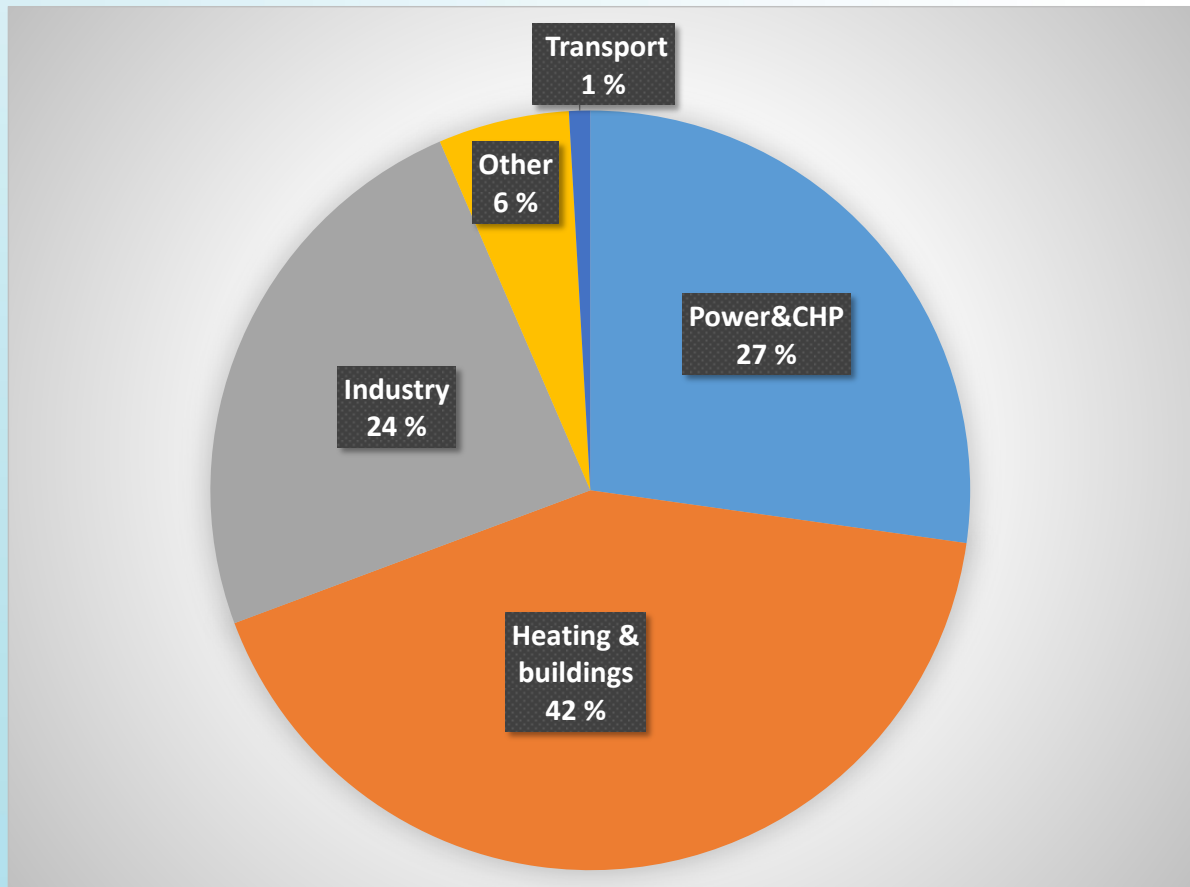
3-4x the CO₂ emission, if not CCS

Half the additional cost for climate target in 2050 – if CCS



Close to €50b/year saved in 2050 – if CCS

CONSUMPTION NATURAL GAS EU-28 2015



Who we are



GASSNOVA SF: The Norwegian State Enterprise for CCS

- Contribute to technology development and knowledge-sharing
- Advise the Ministry of Petroleum and Energy
- Manage the State's interests in CCS

The basis:

Extensive R&D & D

CLIMIT

- Since 2005
- More than 300 projects – €250m – along the entire CCS chain
- Annual budget €23m
- Significant results achieved, ready to be deployed
- Wide international effect

Ongoing: Industrial scale technology verification

TCM - CO₂ Technology Centre Mongstad

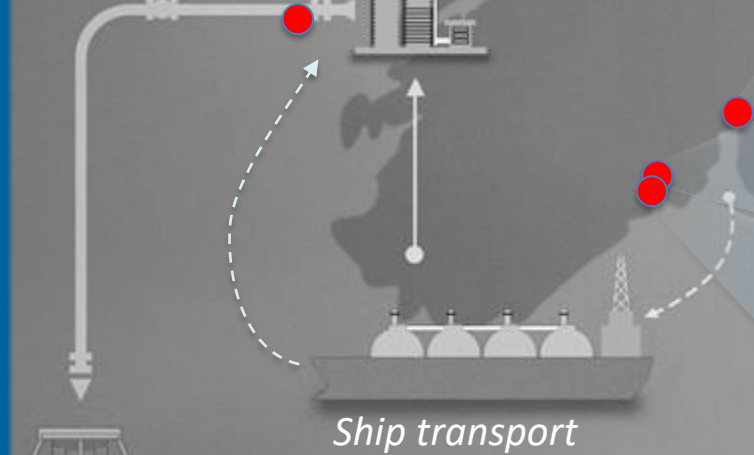
- The world's largest and most flexible test facility for CO₂ capture
- Since startup in 2012, Aker Solutions, Alstom (now GE), Cansolv Tech., Carbon Clean Solutions and ION Engineering have been successfully testing their technologies

Where we are heading: Full-scale CCS by 2022

- Chain responsibility disconnection; State as a facilitator
- Industrial partners with unique capabilities
- Compensation for execution and operation
- Flexible solution; further extensions are possible

CO₂ storage

- CO₂ receiving terminal
- Oversized offshore aquifer



CO₂ capture



KLEMETRUDANLEGGET



NORCEM HEIDELBERG



YARA PORSGRUNN

Norcem Heidelberg
Cement plant

DEDICATED
INDUSTRIES

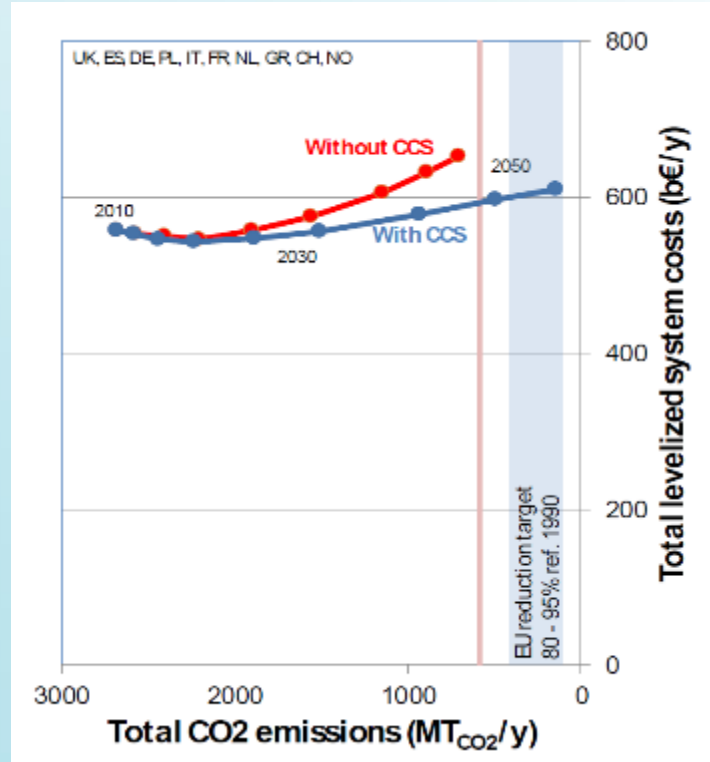
Yara Porsgrunn
Fertilizer plant



Klemetsrudanlegget AS
Waste-to-energy plant



ZEP: CCS AND EUROPE'S CONTRIBUTION TO THE PARIS AGREEMENT



**If no CCS;
Pay more and achieve
less on the way to Paris**



The race toward Paris

How can natural gas build new advantages?

Thank you for your attention!

Ståle Aakenes

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