



CCS / Commercial scale perspective

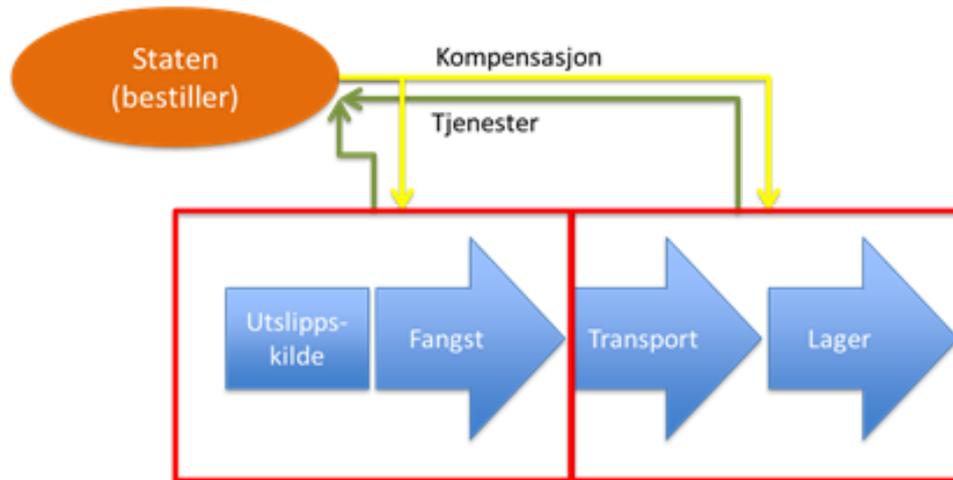
Langesund, 21 May 2015

Per Brevik | Director Sustainability and Alt. fuels HC NE

How to proceed towards commercialisation?

- **From yesterday's discussion; are the technologies available?**
 - Maturity
 - Experience
- **A “full chain” from the emission source to storage/reuse must be established and studied**
- **Next step; a feasibility study**
 - Risk reduction
 - Recommendation to continue?
- **Evaluation of**
 - Business case
 - Funding (both of CAPEX and OPEX)
 - Regulations (EU ETS, storage etc.)

Establishing a «full chain» / One possible model



- The Ministry has asked Gassnova to co-ordinate a study. A first report was submitted beginning of May
- Norcem taking responsibility for capture and conditioning
- Delivering agreed volumes and quality for transport by ship
- Similar «agreements» for transport and storage

What's "full scale" for Norcem?

- Our input to Gassnova's report is based on preliminary results from the ongoing project
- The Concept study (Aker Solutions) will be reported in September
- Capturing CO₂ based on available excess heat (40 – 50 %)
- In addition to the "pure" technical and economic issues regarding the capture and conditioning there are critical issues connected to
 - Industry standards
 - Available space in Brevik
 - Integration into the cement production process
- The time perspective; must be a measure for emission reduction!

We are still optimistic; but there is a long list of issues to be studied in much more detail!