



NORWEGIAN MINISTRY  
OF PETROLEUM AND ENERGY



GASSNOVA

**EUROPEAN CO<sub>2</sub> TEST CENTRE  
MONGSTAD  
NORWAY**

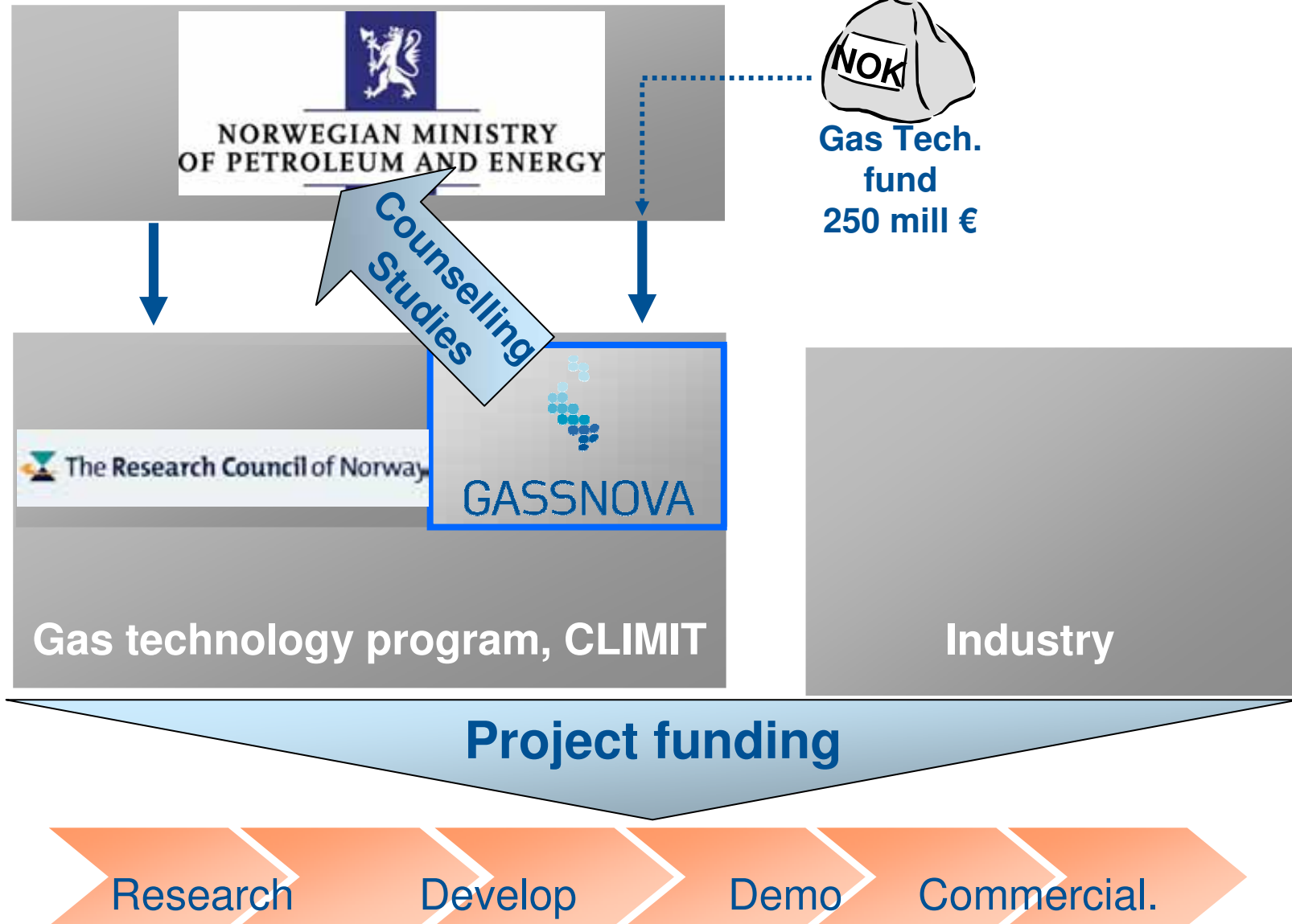
2007-02-09

Bjørn-Erik Haugan  
Gassnova  
Director

# Norway: CCS technology development



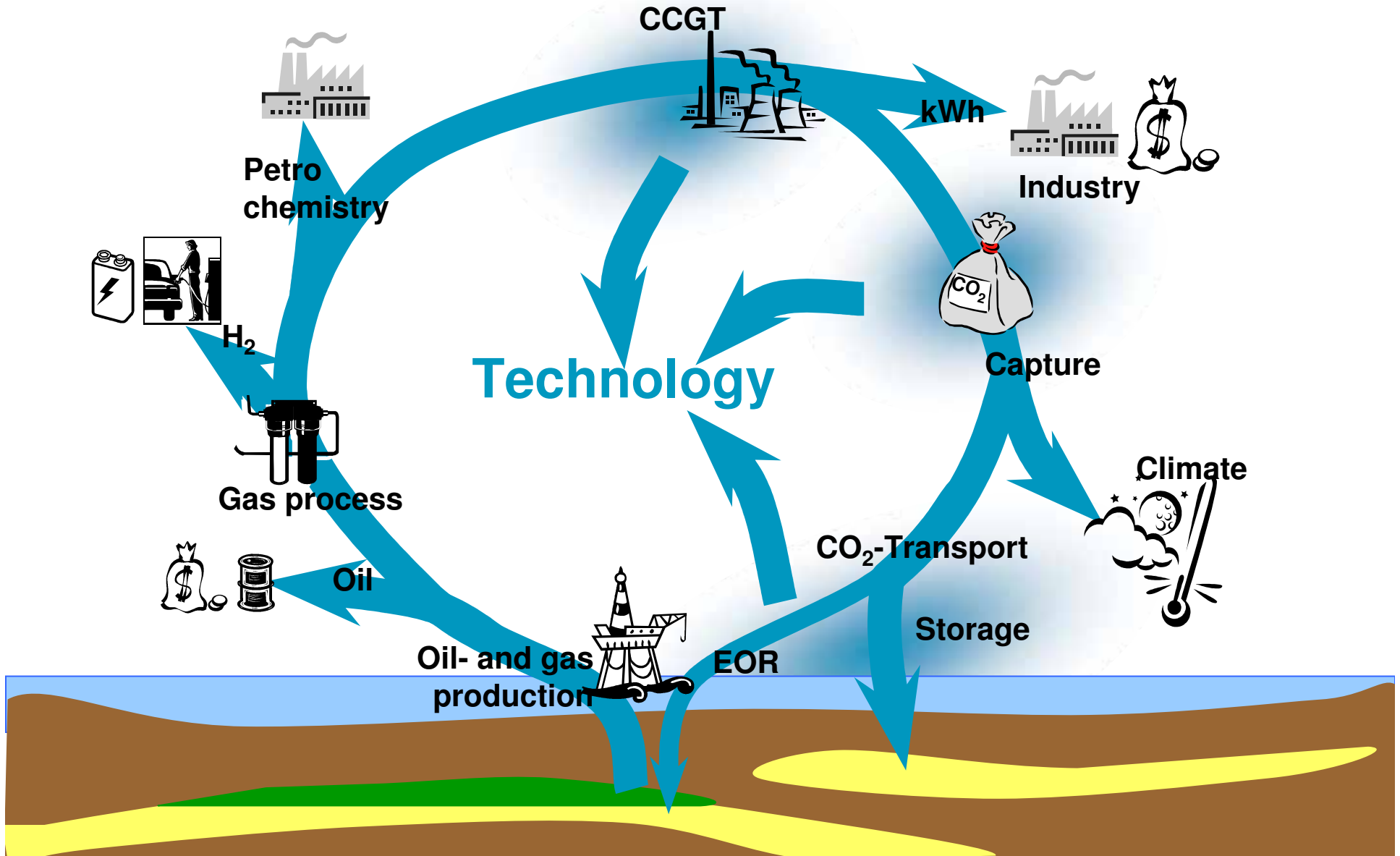
GASSNOVA



# Carbon cycle



GASSNOVA



## **Vision:**

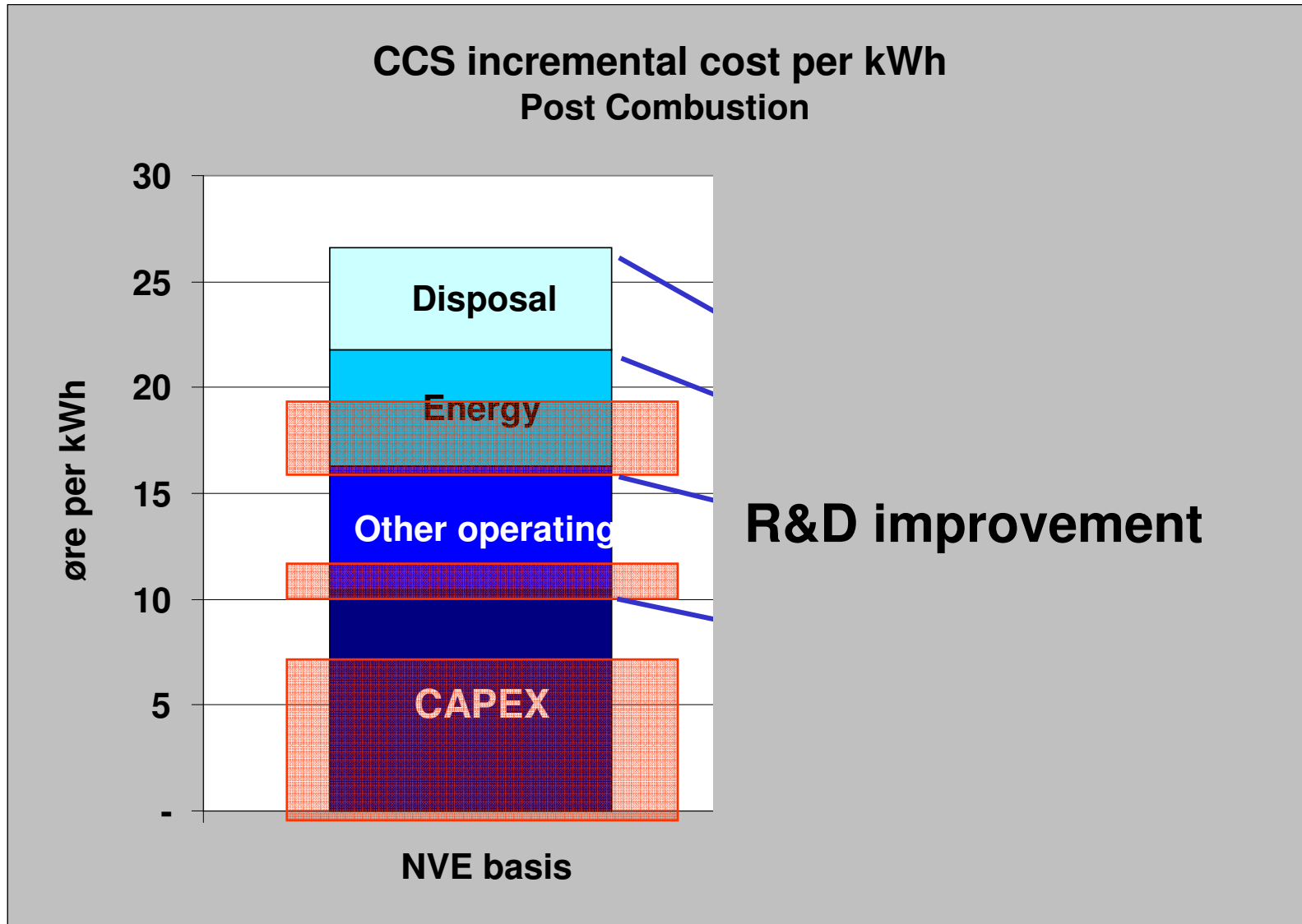
**Profitable gas power with carbon capture and storage**

- Technology development
- Commercial basis

# Costs and potential



GASSNOVA



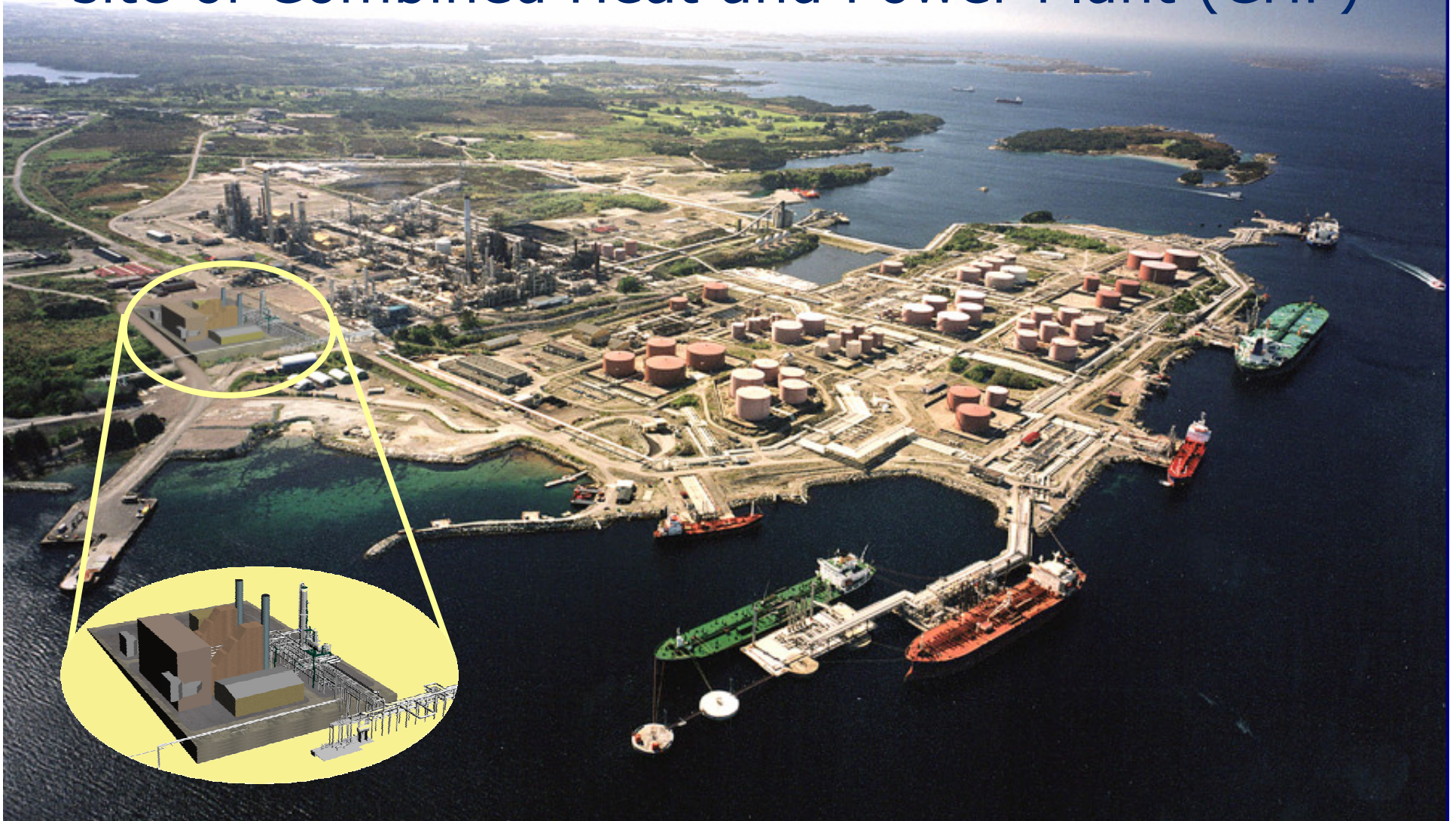
# The Norwegian setting



GASSNOVA

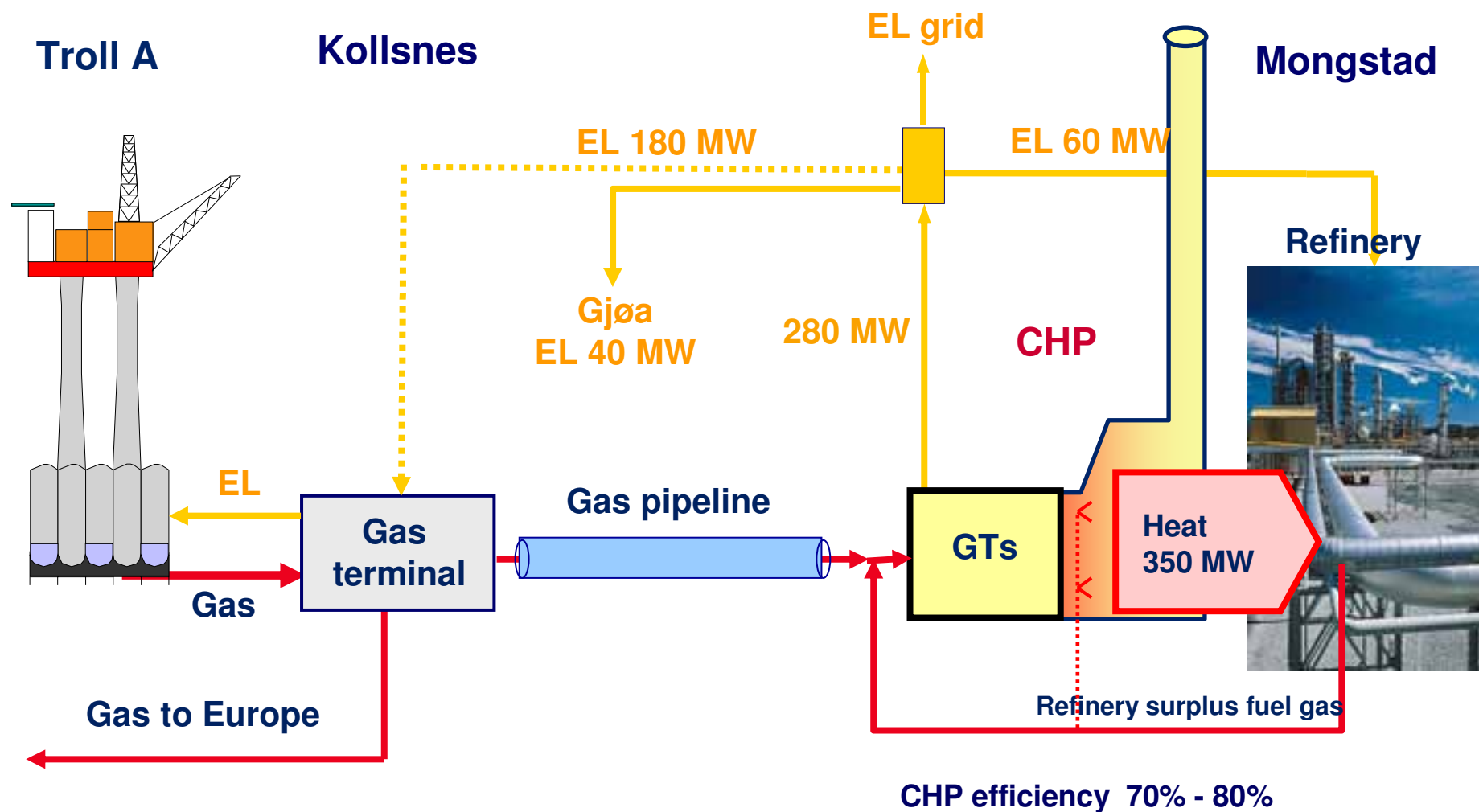
- Government declaration: CCS at new CCGT
- Climate issues and CCS broad acceptance
- 10 year large scale CO<sub>2</sub> storage experience at Sleipner
- Pioneering environment: Oil industry largely built on R&D and new Offshore technology
- Strong research community

# Mongstad Refinery, Norway -site of Combined Heat and Power Plant (CHP)



# Mongstad CHP

## Project description





# The CO<sub>2</sub> sources at the Mongstad refinery:

A few major and a number of smaller sources



A significant number of CO<sub>2</sub>-source today. Some will disappear and some will merge with EVM.

Most relevant for future CO<sub>2</sub> capture:

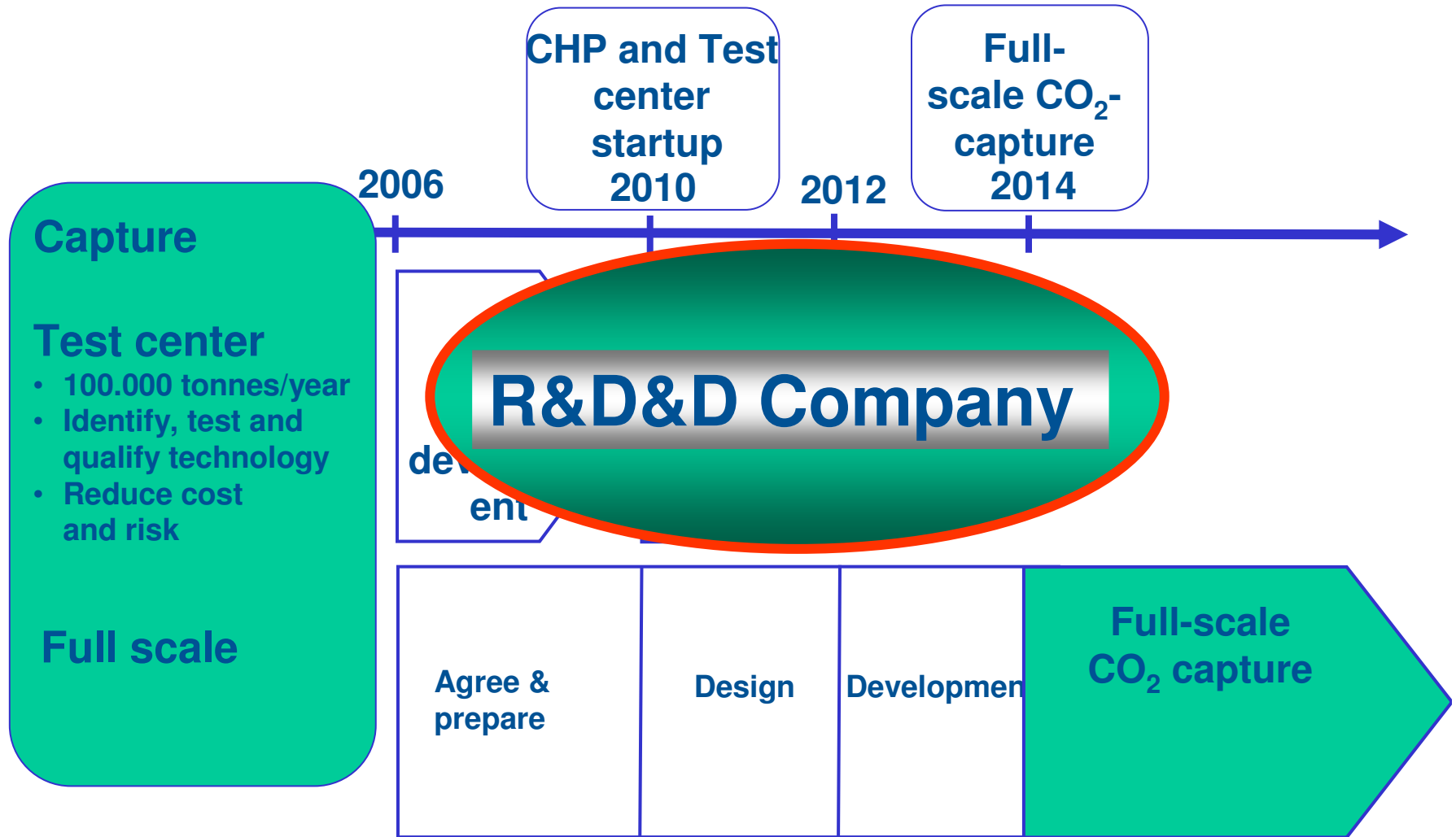
- EVM (CHP plant)
- Cracker
- Reformer

Future CHP plant location

# Full scale CO<sub>2</sub> management in two stages

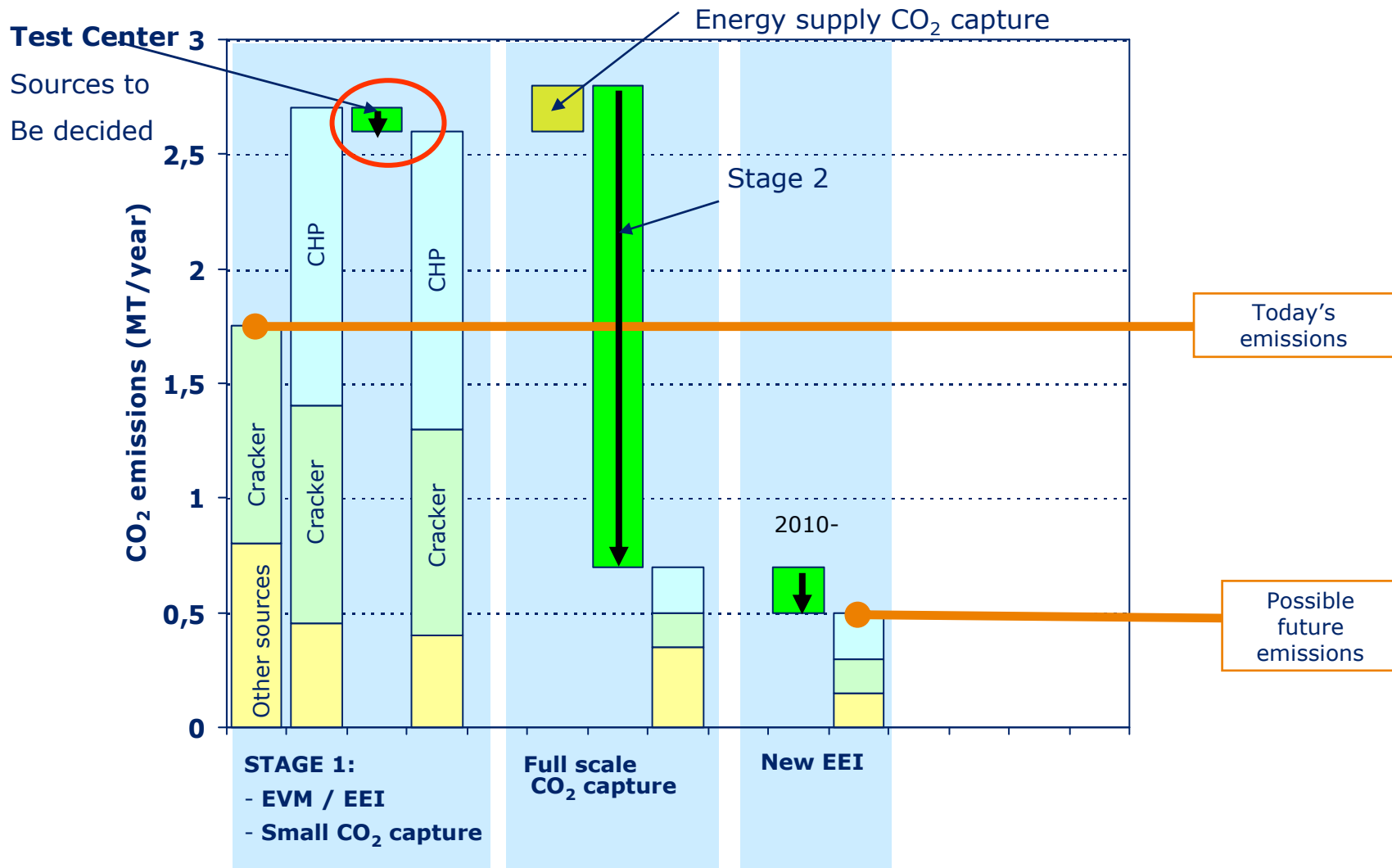


GASSNOVA



# Mongstad CHP

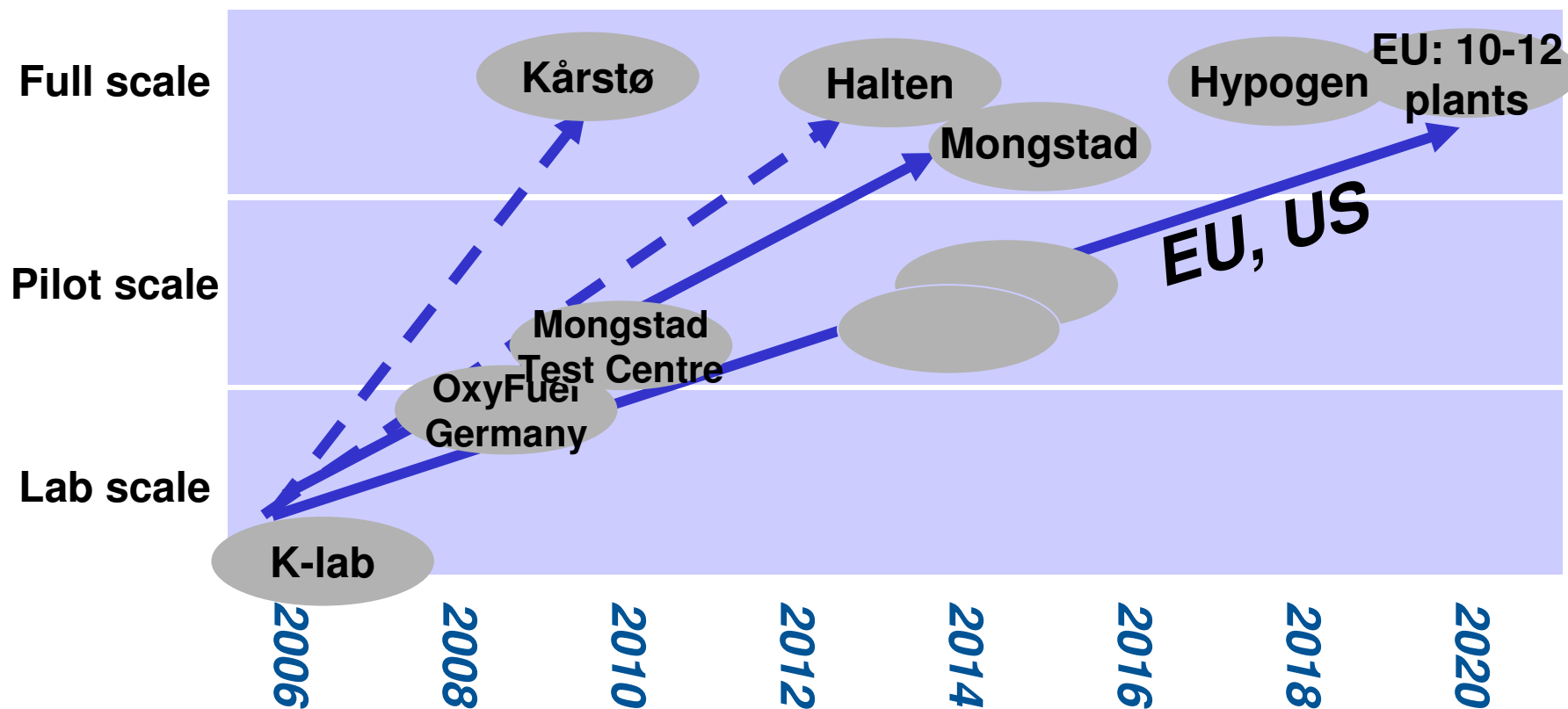
## CO<sub>2</sub> emissions from Mongstad



# Towards full scale CO<sub>2</sub> capture



GASSNOVA



# Technology Company



GASSNOVA

## **Main objective**

Testing, verification and demonstration of CO<sub>2</sub>-capture technology with reduced costs and risks

Capable of wide national and international deployment

## **Specific objective**

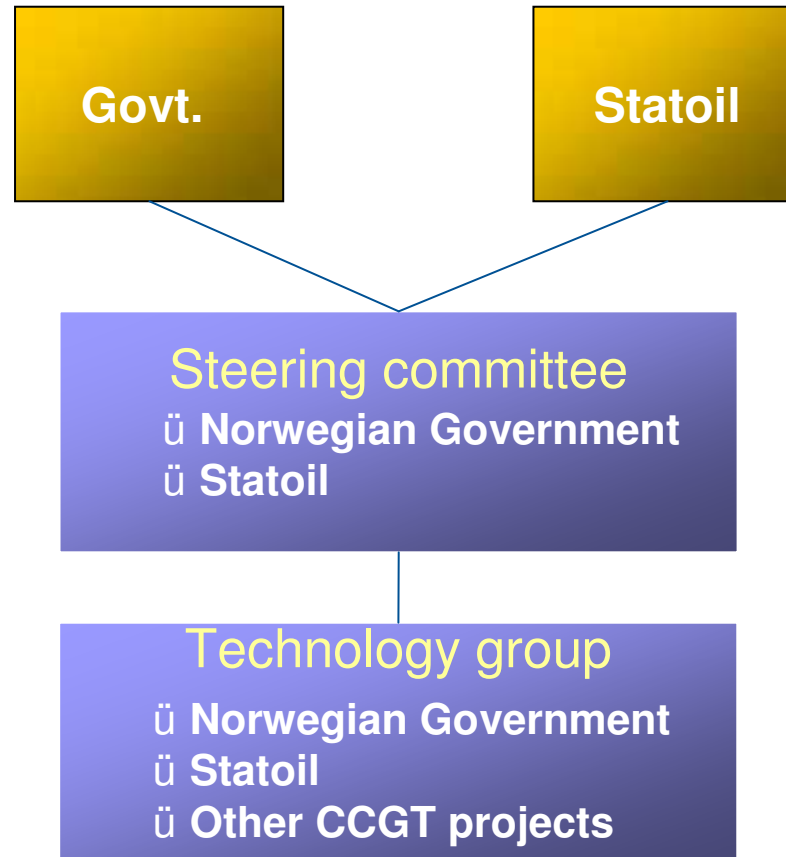
... technology capable of reducing cost and risk related to full scale CO<sub>2</sub> capture, including full scale CO<sub>2</sub>-capture at Mongstad Refinery to be decided upon in 2012

# Organisation

*..as of January 2007*



GASSNOVA



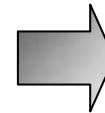
# Activities 2007



GASSNOVA

- **Technology screening**

- Up to March

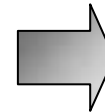


## ***Framework of cooperation***

Bilateral  
Agreement of  
Implementation  
(Govt. – Statoil)

- **Pre Engineering**

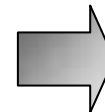
- April to December



Co-operation  
Agreement,  
(multilateral)

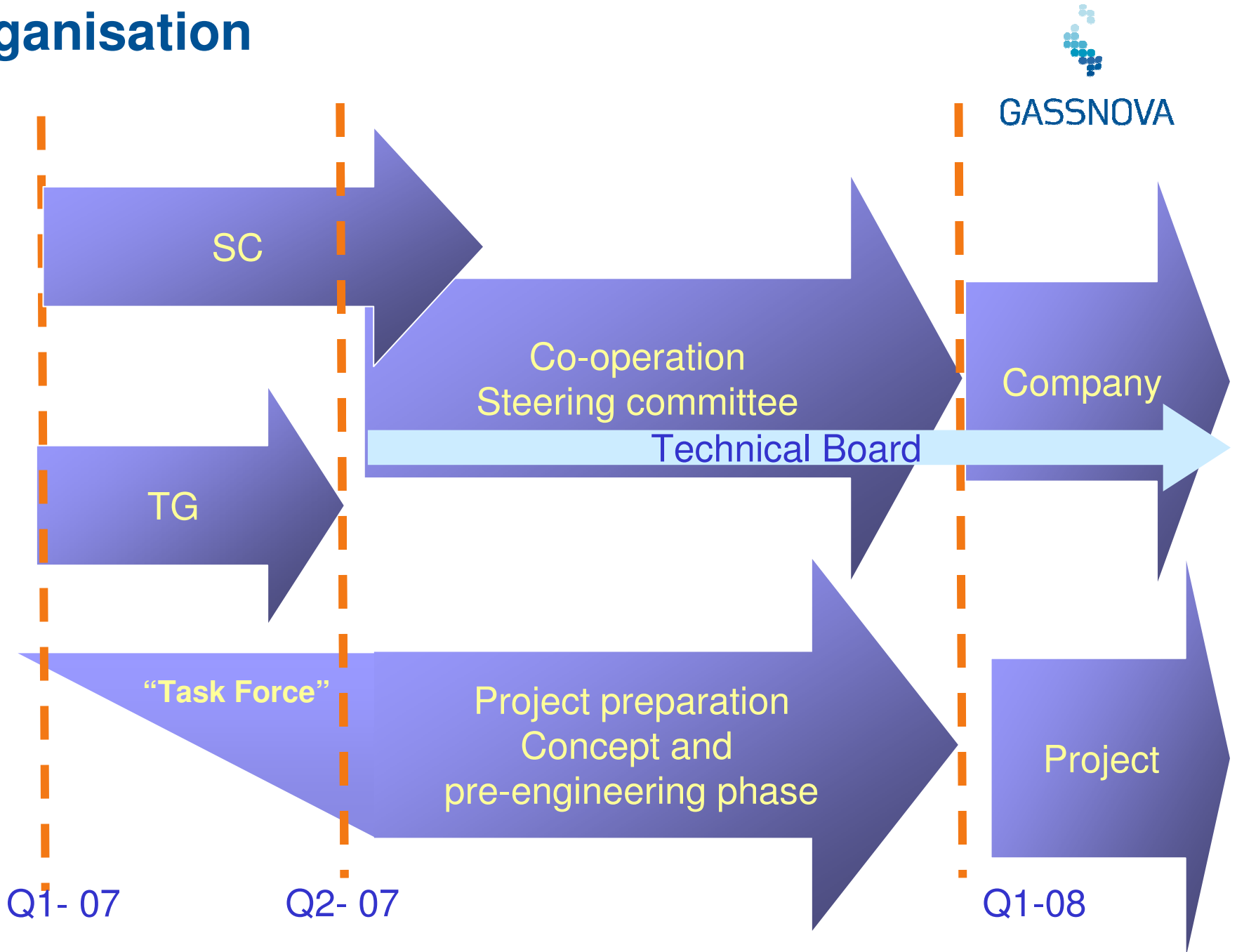
- **Engineering**

- End/07 and onwards



Company  
Participants agreement

# Organisation





## Technical objectives, initial phase



GASSNOVA

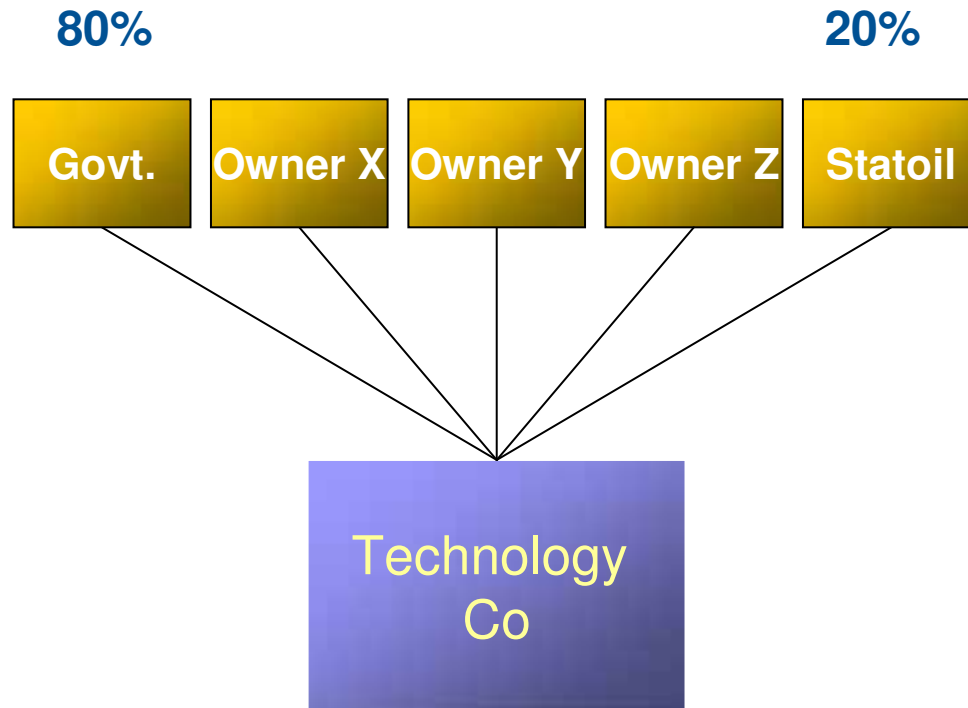
- Investigate technical conditions e.g. tie-in, utilities, fluegas sources and location at Mongstad site
- Identify necessary project timeframe and results for Mongstad and for other planned full scale CO<sub>2</sub> projects
- Propose project intentions and ambitions
- Propose project execution strategy
- Perform technology screening

Cost estimation and choice of concept is NOT part of this project phase

# Ownership and framework



GASSNOVA



- Statoil 20%
- Govt. 80% will invite others and dilute
- Duration: 2010 + 5 years
- Government responsible for CO<sub>2</sub>

# Participants, Criteria



GASSNOVA

- **Technology users: Energy-Co, Oil-Co**
- **Corresponding interest**
  - **CO<sub>2</sub> technology and CO<sub>2</sub> management a strategic priority**
  - **Technology Co important for the participants**
  - **No conflicting interests**
  - **Not competitors within this area of technology**
- **Contribution**
  - **Capital, Competence, know-how and/or IPR**
- **Significant holding**
- **Complementarity**
- **Government discretion to select invitees**

# IPR and know-how



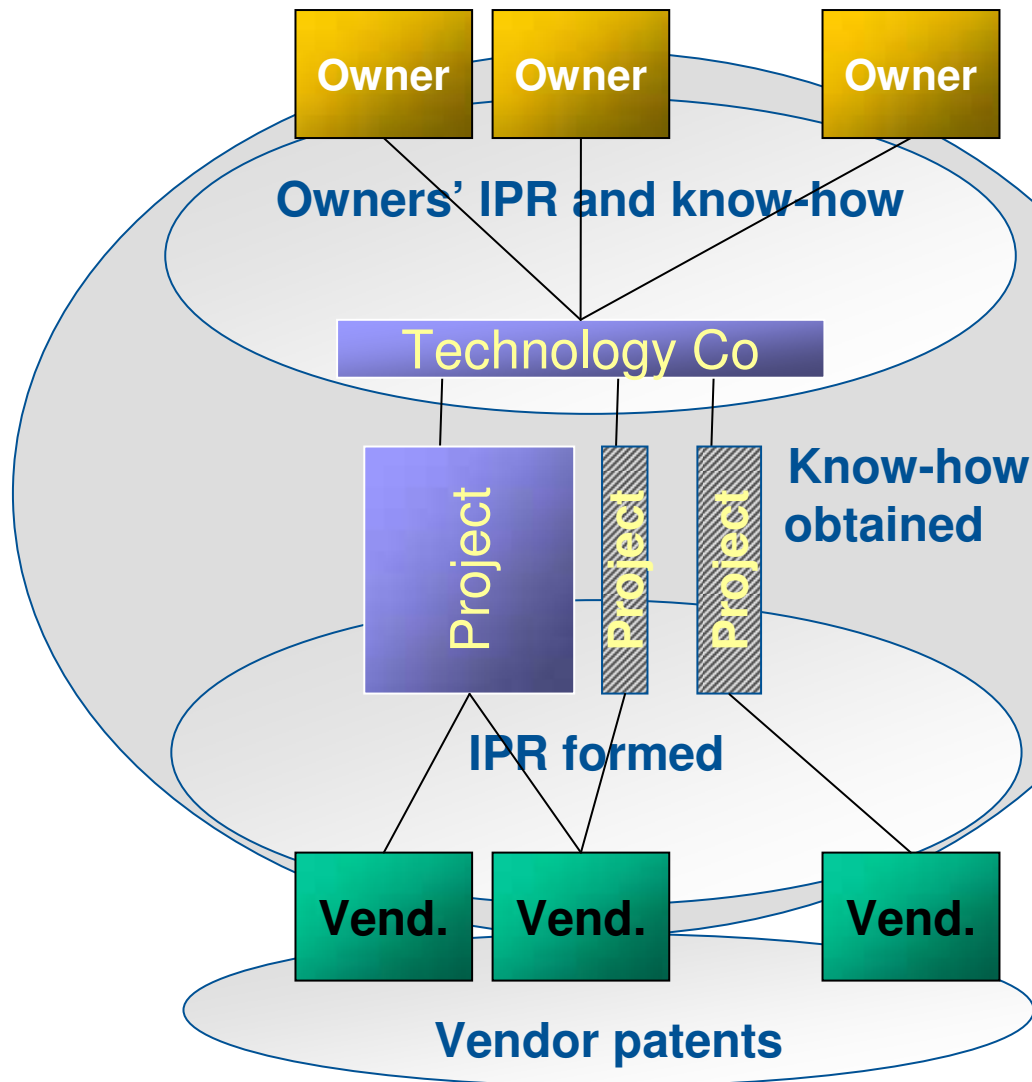
GASSNOVA

- **Fundamental principle**
  - Add value to the owners: primarily through their core business
- **IP origin**
  - Made available to Technology Co from owners and/or vendors
  - Generated in Technology Co / projects
- **Regulated through:**
  - Technical Co Partnership agreement
  - Project agreements with vendors and participating partners  
Regulates IPR gained in individual projects

# Business model



GASSNOVA



- Development projects (to be defined)
- Owners participate with competence, IPR and capital
- Vendors' participation based on competition
- IPR and know-how agreed in development contracts between Technical Co and vendors