

## A future CO<sub>2</sub> economy: the case of Norway

### Executive Summary

*March 2015*

#### Why develop a CO<sub>2</sub> economy in Norway

- **Attains long-term climate targets in a more cost effective manner**
- **CCS ensures future use of natural gas**
- **CCS ensures future competitiveness of Norwegian industry**
- **CO<sub>2</sub> for enhanced oil recovery prolongs life, improves economy and increases oil production of existing fields**
- **Leverages current and eventual latent oil infrastructure for CCS and ensures competence and activity is maintained after the extractive oil and gas business stagnates**
- **Allows one to take a central role in European energy and climate policy and facilitates emission cuts far beyond its own borders**

#### **What you need to know about the CO<sub>2</sub> storage industry**

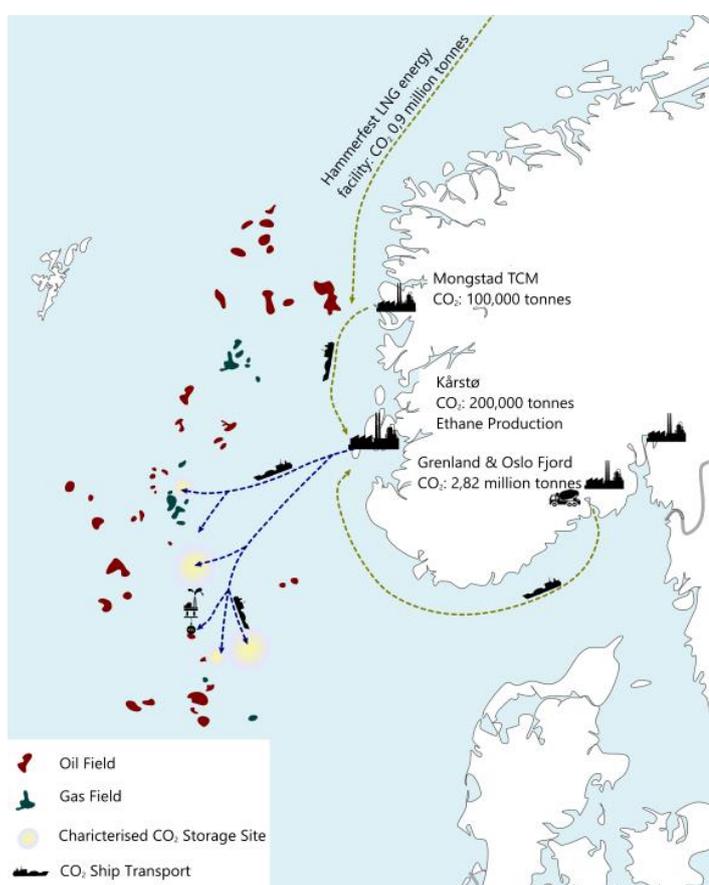
1. There are ample options for CO<sub>2</sub> capture in Norway, especially from industrial emitters
2. To ensure the storage capacity needed in 2030 is in place, annual investments in the magnitude of €500m in storage development must start in 2020
3. In a low carbon society, the scale of a CO<sub>2</sub> storage industry could be compared with today's British oil and gas sector, in both size and significance
4. It is essential to establish a flexible CO<sub>2</sub> value chain, along the lines of the six steps outlined here

## Norway's role in Europe toward 2020, 2030 and 2050

In a 2030 and 2050 perspective EU countries' climate obligations will require large amounts of CO<sub>2</sub> to be captured from both power generation and industrial processes. The EU roadmap towards 2050 estimates that by then we have to capture and store between 3.5 and 12.8 gigatonnes of CO<sub>2</sub>. The most emission-intensive areas in Northern Europe do not have good options for storing captured CO<sub>2</sub>, particularly due to resistance to CO<sub>2</sub> storage on the mainland. To follow its own roadmap, the EU countries must start between 10 and 20 full-scale CO<sub>2</sub> capture projects by 2030, which will lead to a great demand for CO<sub>2</sub> storage in Northern Europe.

The CO<sub>2</sub> storage industry in Norway in 2050 can be about the size of today's British oil and gas sector. Development of the necessary CO<sub>2</sub> storage and injection capacity to realise this, will require comprehensive seismic, characterisation, injection testing, drilling and monitoring. Betting on this path, would have the potential to safeguard, transmit and develop Norwegian expertise and knowledge.

The Norwegian area of the North Sea has enough CO<sub>2</sub> storage capacity to handle emissions from the entire EU fossil era. The infrastructure needed for this work is much the same as what is currently used to export oil and gas. By 2020 instruments that foster storage, characterisation and development of large-scale CO<sub>2</sub> capture and storage (CCS) must be in place throughout Europe. The first few million tonnes of CO<sub>2</sub> we capture should not be stored at a single site, but used to develop the required storage capacity, knowledge of handling and transportation infrastructure. For Norway, the storage and use of CO<sub>2</sub> can become a significant industry. Thus efforts to ensure a CO<sub>2</sub> value chain must start now.



**Bellona has therefore prepared a six-point list on how Norway can develop a CO<sub>2</sub> economy which tackles emissions reductions nationally and simultaneously develops CCS as an industry in Europe.**

The report was in December 2014 sent out for consultation to around 400 Norwegian stakeholders and was in January 2015 updated according to comments from a wide academic community.

Bellona recommends that the Norwegian government expands its CCS strategy with the purpose of establishing a profitable value chain for CO<sub>2</sub> storage and CCS.

Original report in Norwegian available at [bellona.no](http://bellona.no)  
[Bellonamelding: Norges fremtidige CO<sub>2</sub>-økonomi](#)

## Six steps to the CO<sub>2</sub> economy in Norway

### Step 1: Set up a market maker to buy CO<sub>2</sub>

Create a price setter (market maker) to ensure a buyer of CO<sub>2</sub> from capture facilities, demand in the transport industry and availability of CO<sub>2</sub> for storage characterisation, Enhanced Oil Recovery (EOR) and the long term delivery of CO<sub>2</sub> to storage providers. A market maker is a proven method for developing new markets..

- A market maker will help steer the development of primary CCS infrastructure on behalf of the state. This ensures optimal design, construction and operation in order to achieve system efficiency, including economies of scale.
- The state is the guarantor for the purchase of CO<sub>2</sub> and will secure storage for the captured CO<sub>2</sub>, thus disengaging capture from transport and storage.

### Step 2: Capturing CO<sub>2</sub> from existing sources.

The Norwegian government last year spent a lot of time arguing there are no large point sources of CO<sub>2</sub> in Norway. In this report, we found examples of relatively readily available sources of CO<sub>2</sub>, which together represent about 4 million tonnes of CO<sub>2</sub> annually. Initially, CO<sub>2</sub> from these sites can be used to characterise (through exploration and clarification) storage areas in the North Sea. The main purpose of step two is to make CO<sub>2</sub> available for storage characterisation and EOR piloting in the North Sea, in addition to fulfilling the political obligation to establish at least one Norwegian full-scale plant by 2020.

### Step 3: Transporting and using CO<sub>2</sub> for developing commercially profitable CO<sub>2</sub> storage.

Characterisation of industrial scale CO<sub>2</sub> storage sites must start by 2020 for storage and injection capacity to be available when needed. Maritime transport of CO<sub>2</sub> provides the greatest flexibility for targeted storage development and injection testing.

### Step 4: The role of EOR

CO<sub>2</sub> can also be used Enhanced Oil Recovery (EOR) projects of a moderate scale. This will strengthen the knowledge of CO<sub>2</sub> capture and maximise the potential of aging oilfields. Revenue from sales of CO<sub>2</sub> for EOR can be used to support market maker business in delivering CO<sub>2</sub> storage capacity.

### Step 5: Develop hubs

Prepare the Kårstø gas processing complex to become a CO<sub>2</sub> hub for the North Sea. The traditional hydrocarbon use of the Kårstø complex and associated infrastructure in the port and pipelines will diminish with the declining North Sea oil and gas production. This infrastructure can be reused for re-export of European CO<sub>2</sub> to North Sea CO<sub>2</sub> storage sites.

### Step 6: Contribute nationally and internationally

Norway has a market leading position on CO<sub>2</sub> storage in Europe and a large industrial sector with many jobs. By developing the North Sea for large-scale storage of CO<sub>2</sub> Norway will also have helped to characterise European climate policy and enabled a cost reduction of tackling GHG emissions from the industrial and energy sectors.

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