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DECISION MAKERS, DOERS AND ADVISORS – JOINING FORCES TO ENHANCE UTILITY OF INVESTMENTS

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Symposium web-site: http://www.conceptsymposium.no/
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Carbon capture and storage – a viable option?

(Reflections based on the Kårstø CCS project)

Presentation at the 2010 Concept Symposium

Mandate

- The consulting companies Terramar and Asplan Viak have performed a Quality Assurance (QA1) of the proposed concept for carbon capture and storage (CCS) at the Kårstø gas-fired power plant
- The task was carried out for The Ministry of Finance and The Ministry of Petroleum and Energy in the period June 2009 - January 2010
- This presentation is based on the observations made during QA1
- Terramar and Asplan Viak is one of five consultancy constellations authorized by The Ministry of Finance to perform Quality Assurance of major public projects

The Ministry of Finance QA Scheme

- Established in 2000 by The Ministry of Finance, where QA is performed of all public projects with a budget exceeding NOK 0,5 bn (EUR 60 mill)
- QA is carried out at two project development stages:
  - after the pre-study phase (QA1)
  - after the pre-engineering phase (QA2)

Main purpose of QA1

- To ensure that the chosen concept is the alternative with the highest economic return and best use of public funds

The Project

- In 2006 the Government started the planning of a full size (CCS) project in connection with the gas-fired power plant at Kårstø
- In December 2007 the power plant was completed, with a yearly production capacity of 3,5 TWh
- Yearly CO_2 emissions are 1,2 mill ton
- The power plant has had an unstable production pattern (periodically non-profitable)
- In the spring 2009 the Government decided to halt the procurement process for building the carbon capture facility

Other related projects

Gassnova SF is established to manage governmental interests related to CCS, and is in charge of the construction and operation of the facilities and infrastructure for the planned CCS solutions at Kårstø and Mongstad:

- Kårstø CCS
- Technology Center Mongstad (TCM)
- Mongstad full scale CCS

The purpose of the Kårstø CCS project

The needs for society to be met by the project are defined as twofold:

- The need for reducing global CO_2 emissions
- The need for maturing CCS technologies

Uncertain project foundation

- The CCS facility can only operate when the power plant is running, largely determined by the price difference between electricity and gas
- The uncertain production pattern of the power plant adds a huge uncertainty to the economic position of the CCS project
- The CCS facility should be considered as an economically distinct project from the gas-fired power plant

The key question

On this background; Can a project with a net investment cost of more than NOK 16 bn (EUR 2 bn) and a negative NPV exceeding NOK 20 bn be justified in order to achieve the two needs defined for the project;

- reducing global CO_2 emissions and
- maturing CCS technologies?

In order to answer this question another question must be addressed;

Can NOK 16 bn be spent in a more efficient way and with less risk, in order to obtain the needs defined for the project?

Pros and cons

The pros

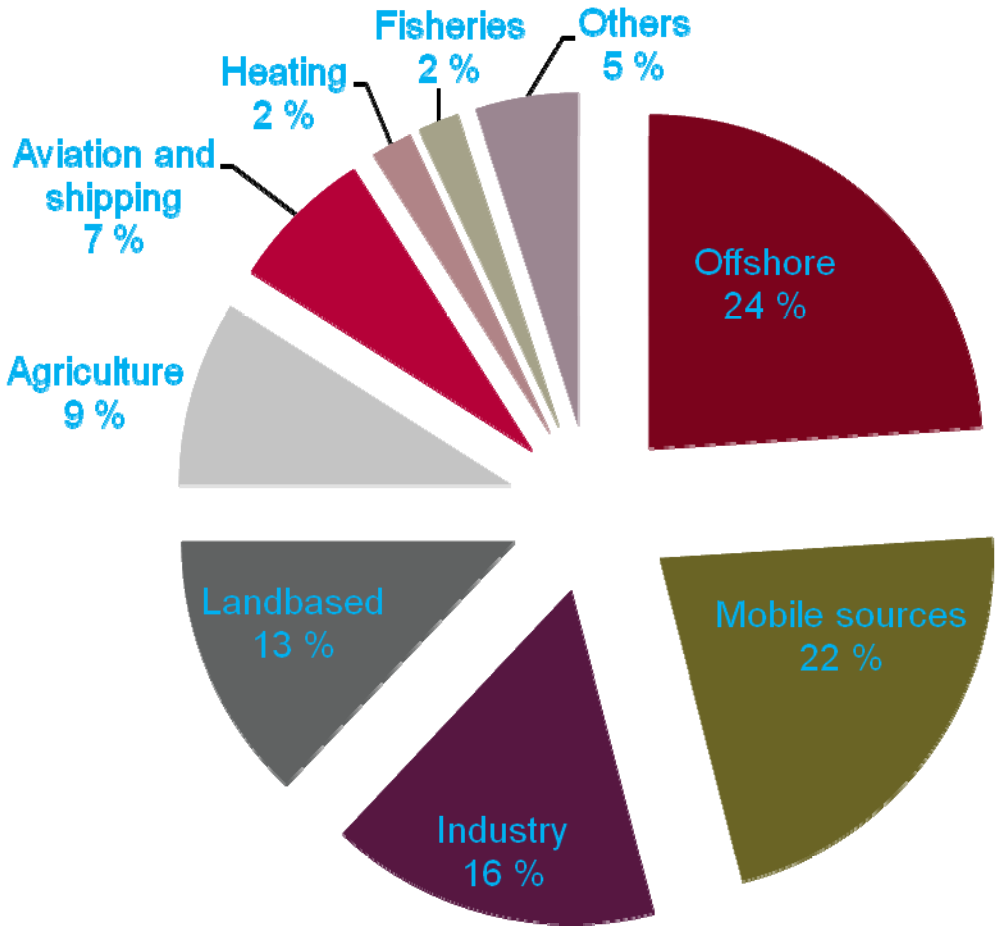
- The project will contribute to a reduction of CO_2 emissions in Norway
- The project may contribute to developing Norwegian supply industry in this field
- The project may contribute to confirming that safe geological storage of CO_2 beneath the North Sea is feasible
- The positive signal effect of a successful project may be significant – but the risk of failure is also considerable

The cons

- Providing the full scale Mongstad CCS is realized it is difficult to see additional benefits related to technological development by realizing the Kårstø CCS
- There exist many more cost effective ways of contributing to a reduction in global CO_2 emissions

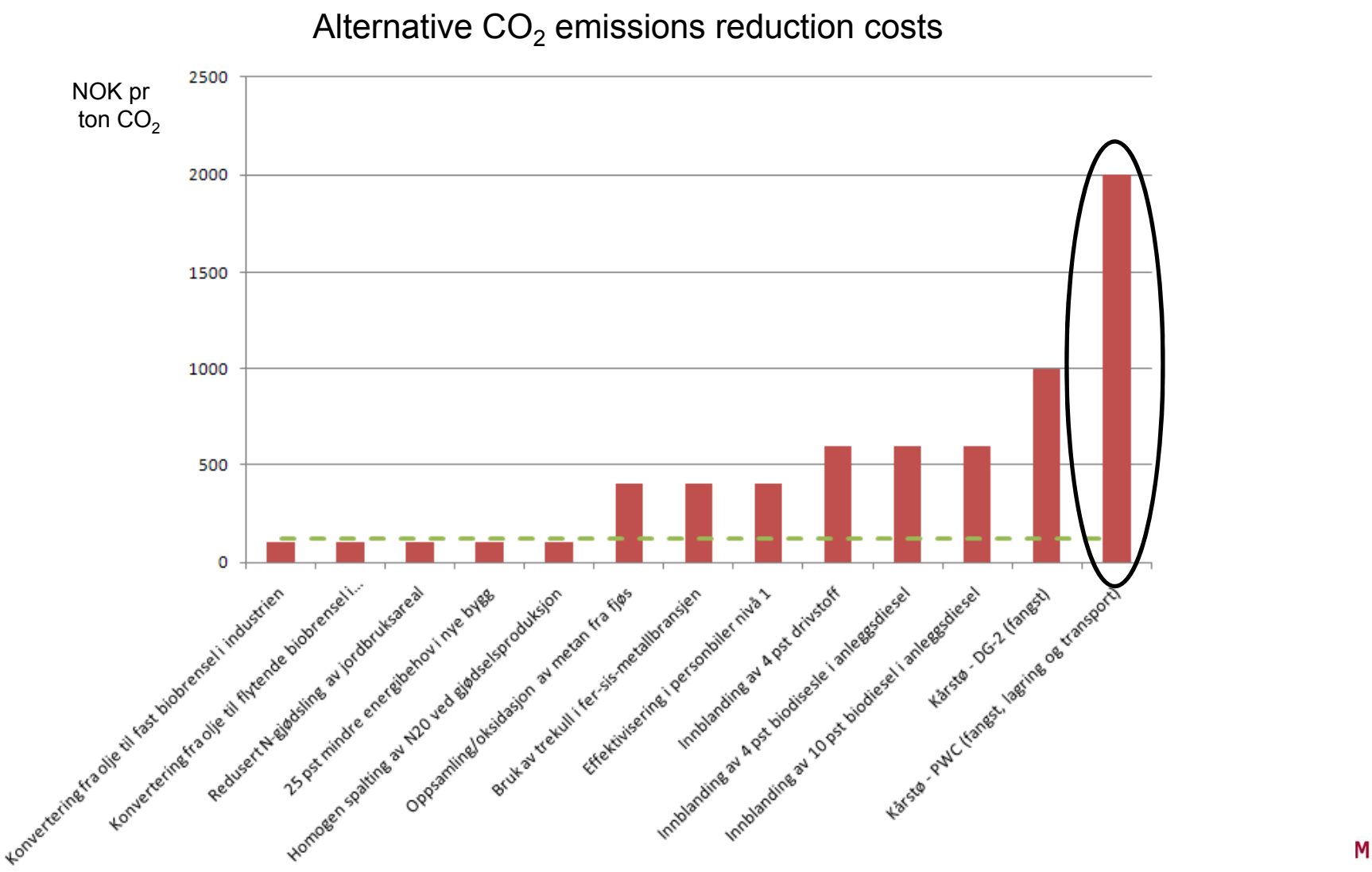
Norwegian climate gas discharges

Source; NOU 2009:16



Alternative climate measures

Source; KLIF 2007



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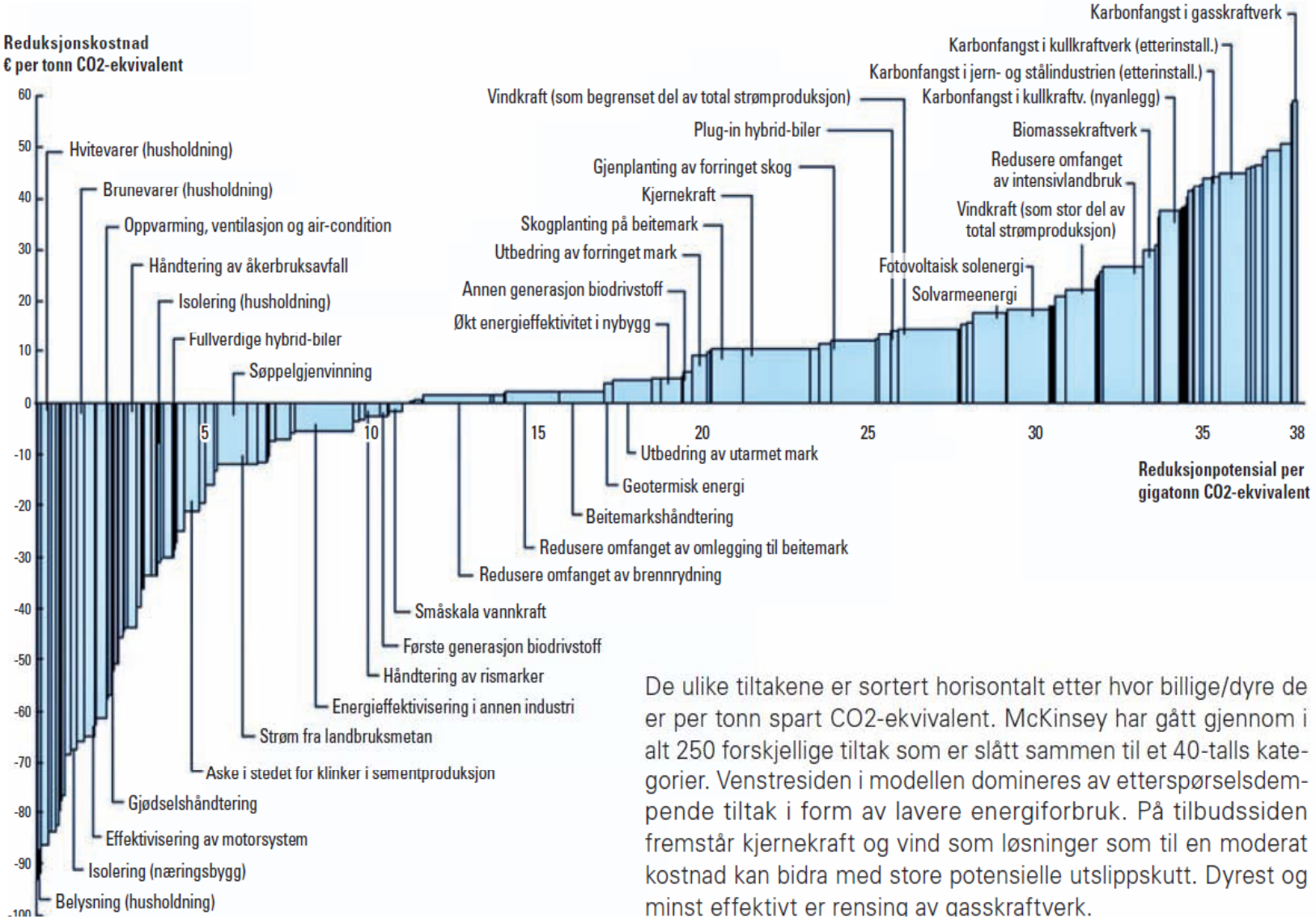
Cost pr ton abated CO_2 - 2030

(McKinsey 2009)



De ulike tiltakene er sortert horisontalt etter hvor billige/dyre de er per tonn spart CO2-ekvivalent. McKinsey har gått gjennom i alt 250 forskjellige tiltak som er slått sammen til et 40-talls kategorier. Venstresiden i modellen domineres av etterspørselsdempende tiltak i form av lavere energiforbruk. På tilbudssiden fremstår kjernekraft og vind som løsninger som til en moderat kostnad kan bidra med store potensielle utslippskutt. Dyrest og minst effektivt er rensing av gasskraftverk.

CCS as a suitable climate measure

- CO_2 abatement costs from the gas-fired power plant at Kårstø is high;
  - measured against alternative domestic climate measures
  - measured against international measures expressed by the quota price
- The project can not be expected to ever become a cost effective measure for abating climate gas emissions
- This CCS-project is one of the most expensive instruments for abating climate gas emissions
- Some CCS-processes are already cost effective (e.g. capture from gas under pressure – ref. Sleipner and Snøhvit CCS projects)
- Retrofitting CCS facilities to capture CO_2 from existing power plants or industrial processes is a lot more challenging and less cost effective

Alternatives for maturing technology

- The Kårstø CCS project is not planned as a step by step learning process like Mongstad, but as a full scale development
- This generates a high risk project with respect to costs and time for implementation
- The project will implement technology for abatement of emissions from gas-fired power plants. Project experiences will only have limited transfer value to CCS projects at coal-fired plants and industrial processes
- The global market for CCS is many times larger for coal-fired power plants and industrial processes than for gas-fired plants

Alternatives for maturing technology

Mongstad is a more feasible project than Kårstø for maturing technology;

- Gives operational experience from a large scale carbon capture facility (TCM) before building a full scale plant
- Gives lower project risk and hence a higher probability for success – and thus promoting the global deployment of CCS
- Has a broader global relevance by developing competence on capturing CO_2 not only from gas-fired power plants but also from exhaust with higher CO_2 content such as coal-fired power plants and certain industrial processes (at TCM)

Political challenge

- The Government has decided to halt the procurement process for construction of the capture facility at Kårstø, until the gas-fired power plant's operational pattern becomes clearer or other solutions that ensure regularity of production and emission of CO_2 become evident
- This can be no surprise to those who have observed the distance between political ambitions and underlying facts
- The Kårstø CCS project is a good example of projects where it seems more appropriate for the state to promote its desires through framework conditions, rather than take the role as both investor, inventor and project manager

So – what is the answer?

Is carbon capture and storage a viable option?

- CCS from natural gas under pressure – yes
- CCS built into future power plants – probably
- CCS retrofitted to existing power plants – possibly, but certainly not yet

- but there is more to politics than common sense