MGM Scandinavia
CDM POTENTIAL IN THE OIL AND GAS INDUSTRY
Bali March 17. 2009
Per Oivind Johansen

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MGM Scandinavia

A Norwegian company merging the experience and resources of MGM International and Norwegian oil and gas experience

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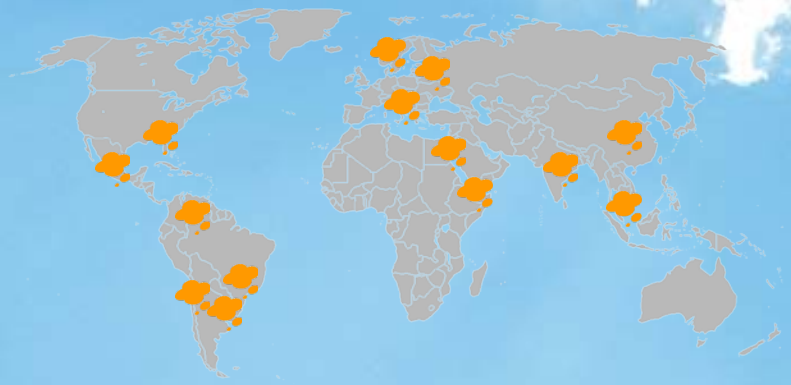

Current Offices

Services:

- Greenhouse Gas Inventories
- Project Identification
- Project Development
- Monitoring Services
- CER/ERU/VER Commercialization
- Carbon Finance

More than 160 projects

- Chemical: Nitric Acid (N_2O), Aluminum (PFC), Refrigerants (HFC-23)
- CH_4: Landfill gas, Coal mine methane Oil & Gas
- CO_2: Renewable energy Cement, Fuel switching, Energy efficiency, Forestry and others

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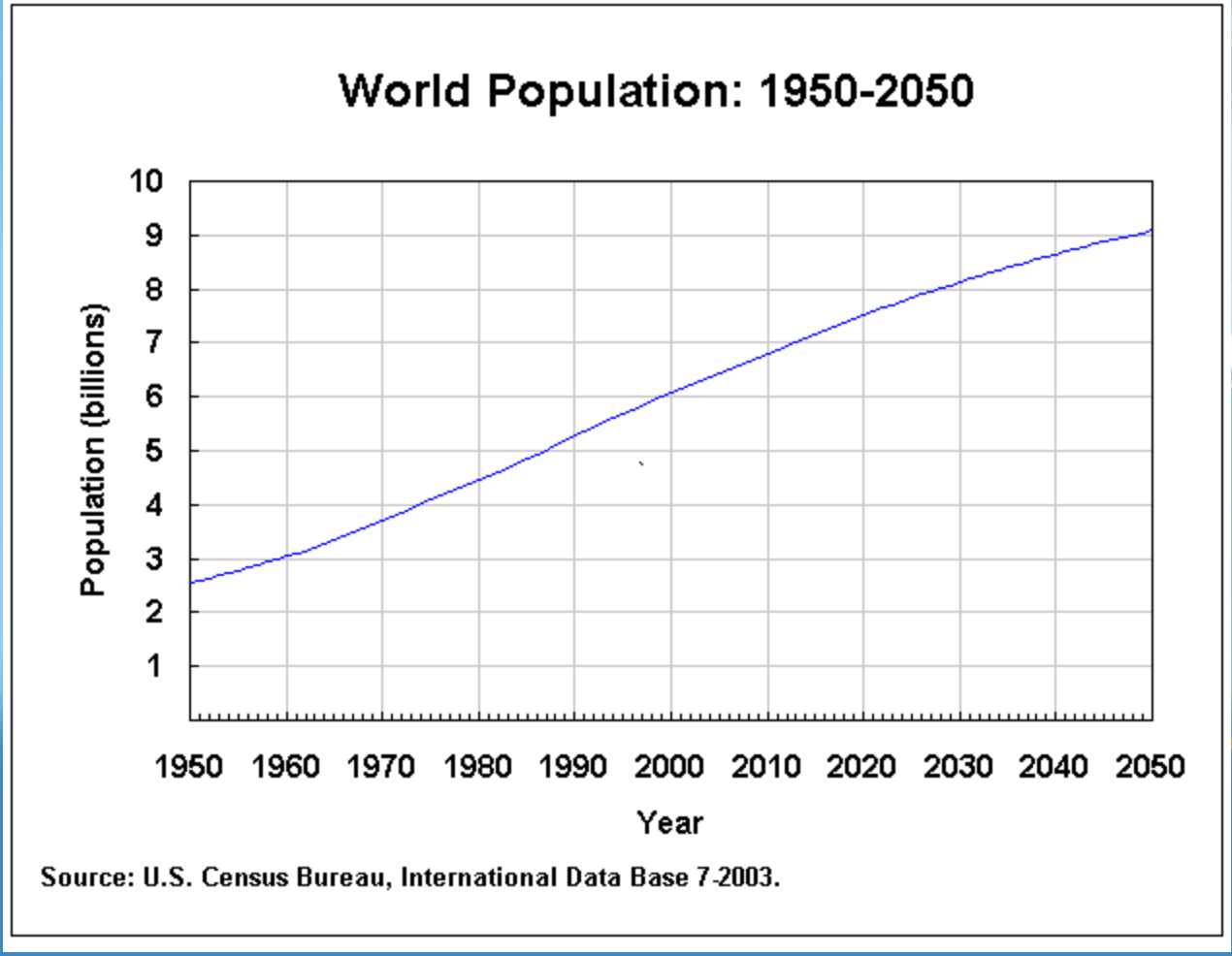
Dramatic population growth



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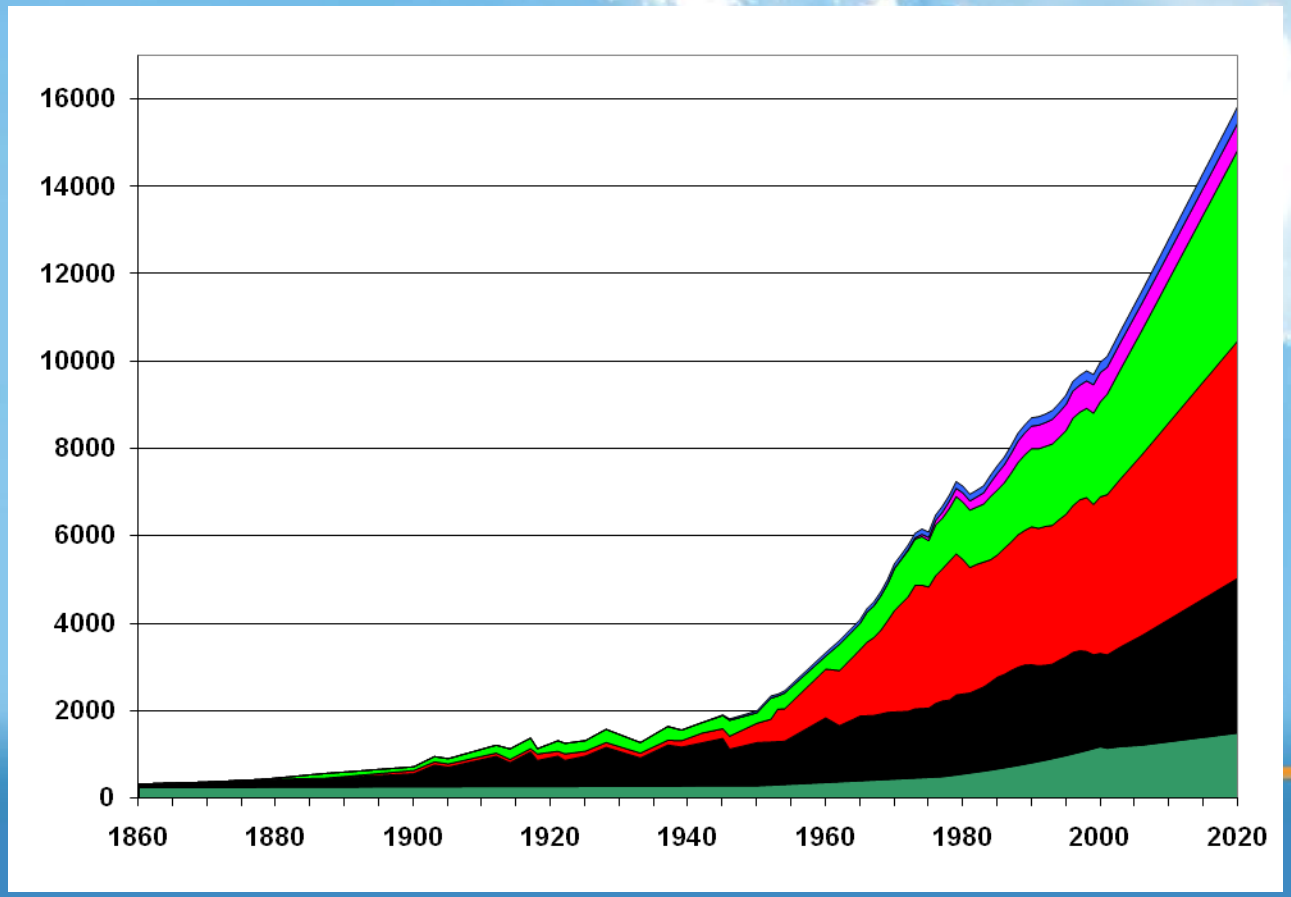
We all consume energy

Historical and forcasted data (Million ton o.e)



source: BP Stat. Rev. of World Energy 2000 og tidligere utgaver. Scientific American, Sept. 1990. Framskrivninger: DoE Internat. Energy Outlook, UNEP (befolkning)

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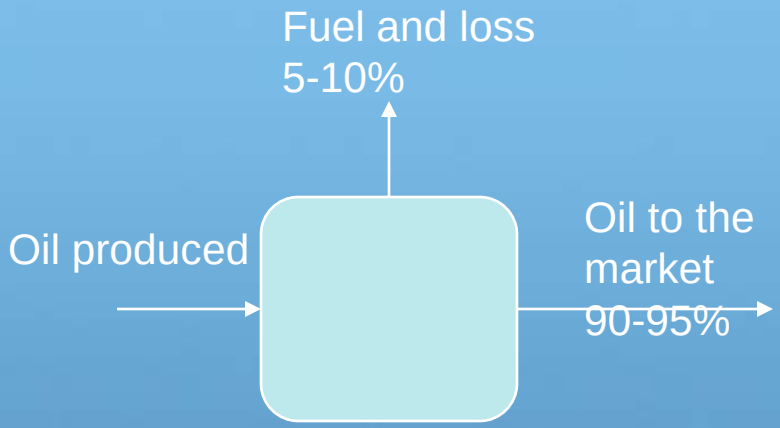
Things to remember



Main consumption trends:

Electricity and transportation are increasing

The CO_2 issue, some facts

Combustion of fossile fuels will always create CO_2

Air concentration of CO_2 has increased from 0,028% to 0,038% since the start of the industrial age

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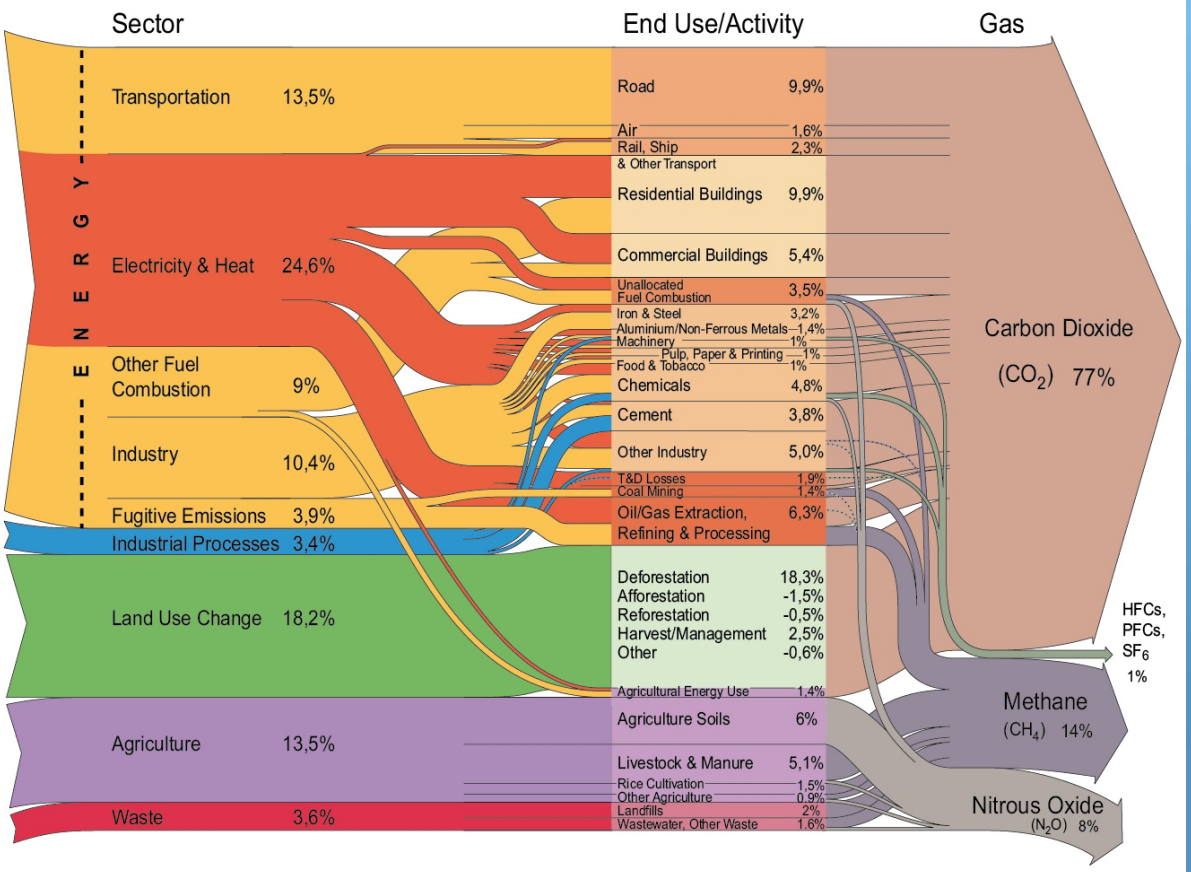
World Greenhouse gas emissions by sector



All data is for 2000. All calculations are based on CO_2 equivalents, using 100-year global warming potentials from the IPCC (1996), based on a total global estimate of 41 755 $MtCO_2$ equivalent. Land use change includes both emissions and absorptions. Dotted lines represent flows of less than 0.1% percent of total GHG emissions.

Source: World Resources Institute, Climate Analysis Indicator Tool (CAIT), Navigating the Numbers: Greenhouse Gas Data and International Climate Policy, December 2005; Intergovernmental Panel on Climate Change, 1996

The Climate is Changing

- Recognition that human activities have greatly increased emissions of some greenhouse gases.
- World's countries signed the United Nations Framework Convention on Climate Change (UNFCCC) in 1992, and the Kyoto Protocol in 1997 to reduce emissions in the period 2008-1012.
- Objective: Mitigate Effects of Climate Change.
  - Global Problem.
  - Obligation on Industrialized Countries to reduce emissions collectively and obligation on developing countries to contribute.

Greenhouse gases

CO_2 e	GHG	Sector
23,900	SF6 sulphur hexafluoride	Magnesium, transformers
11,700	HFC hydrofluorcarbons	Refrigerant producers
6,700	PFC perfluorcarbons	Aluminum, semi conductors
310	N_2O nitrous oxide	Nitric Acid, Adipic Acid
21	‘CH_4 methane	Oil and Gas,Coal Mine Methane, Landfill Gas, Wastewater treatment, Animal Waste
1	CO_2 carbon dioxide	Oil and Gas, Cement, Biofuels, Energy Efficiency, Carbon Sequestration, Hydro Power Plants, Cogeneration, Biomass, Switching to lower carbon fuels,Forestry, Pulp and Paper.

Oil and gas sector: CO2 and methane

Kyoto Protocol options

The following mechanisms are in place to comply with the Kyoto Protocol:

- **Reductions at home**
- **Trade quotas between Annex 1 countries**
- **Develop GHG reduction projects in non-Annex 1 countries (CDM).**
- **Annex 1 countries cooperate to develop climate gas reduction projects (JI).**

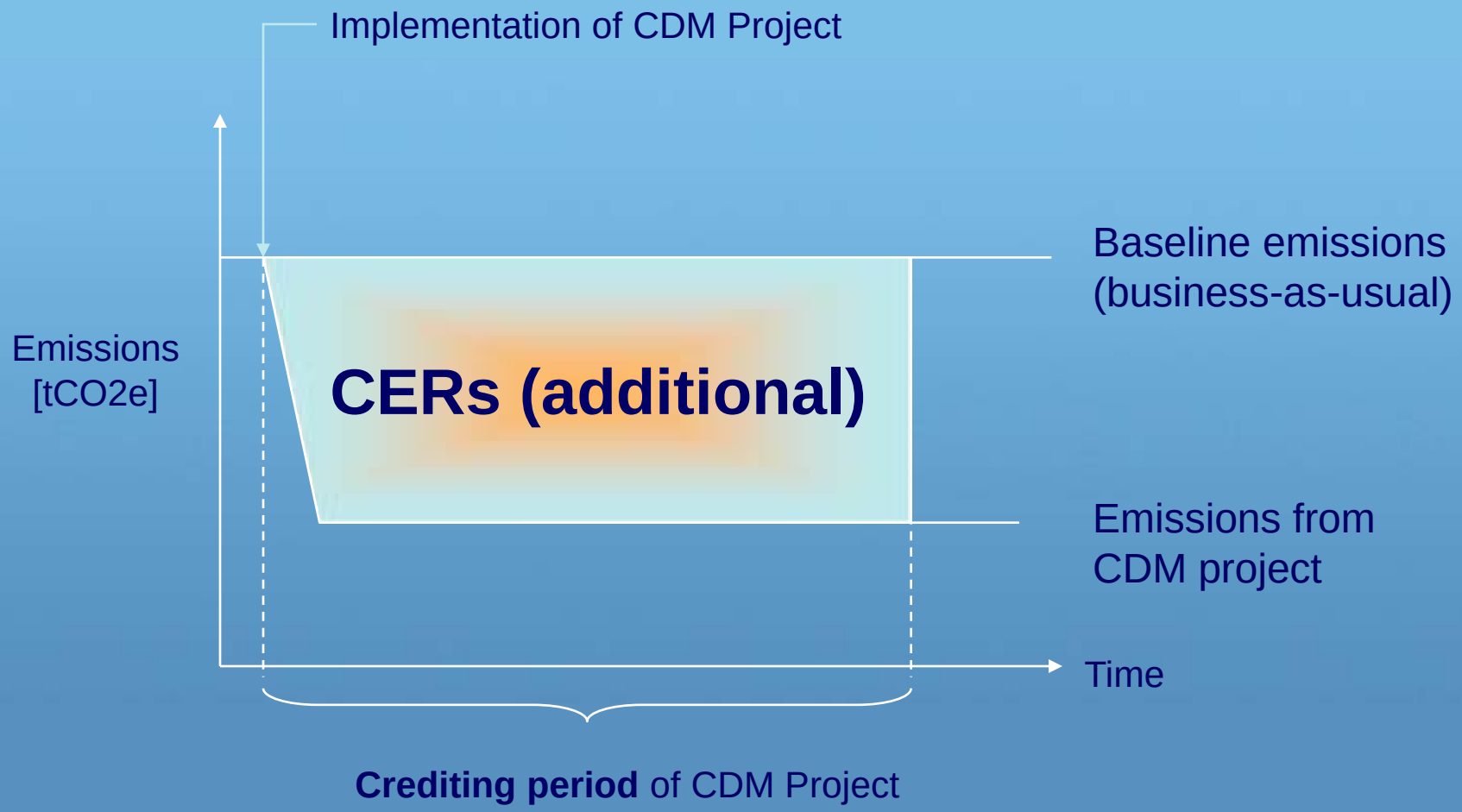
Kyoto Project Cycle

CDM basic requirements

- **Approved methodology;**
  - **How do you measure the emissions? Procedures must be approved. Monitoring must be specified and approved**
- **Baseline;**
  - **What would be the situation if there were no CDM project?**
  - **How much GHG will be emitted year by year?**
- **Additionality;**

  The project to reduce emissions are justifiable only with contribution from CDM because:
  - **Improved profitability**
  - **Barriers are overcome**

CERs from a CDM Project



Examples additional or not?

1. A flare reduction project is profitable without CDM?
2. An energy efficient project gives an IRR of 5%?
3. Flaring is not allowed exept for safety reasons?
4. Emission of CO2 is not allowed above a specified level?

Approved CDM O&G related methodologies

GHG Mitigation Activity Name of Methodology	AM	ACM	AMS
Recovery and utilization of associated gas at oil wells	AM0009	----------	---------
Natural gas-based package cogeneration	AM0014	---------	--------
Steam system efficiency improvements by replacing steam traps and returning condensate	AM0017	----------	---------
Steam optimization systems	AM0018	---------	--------
Leak reduction from natural gas pipeline compressors or gate stations	AM0023	---------	--------
Flare (or vent) reduction and utilization of gas from oil wells as feedstock	AM0037	----------	---------
Leak reduction from a natural gas distribution grid by replacing old cast iron pipes with polyethylene pipes	AM0043	---------	--------

CDM Cycle takes time

The CDM cycle (from the project identification to registration) could take:

- **With existing AM: 8 months – 1 year**
- **If a NM is required: 1.5 – 2 years**

Major bottlenecks are currently the validation and NM approval processes.

CDM Cycle development cost

Start-up costs:

Validation fee:	25 000- 50 000 USD
Reg fee UNFCCC:	0- 35 000 USD (deductable)
Verification report:	20,000-30 000 USD
Sum:	45 000- 115 000 USD

Annual costs:

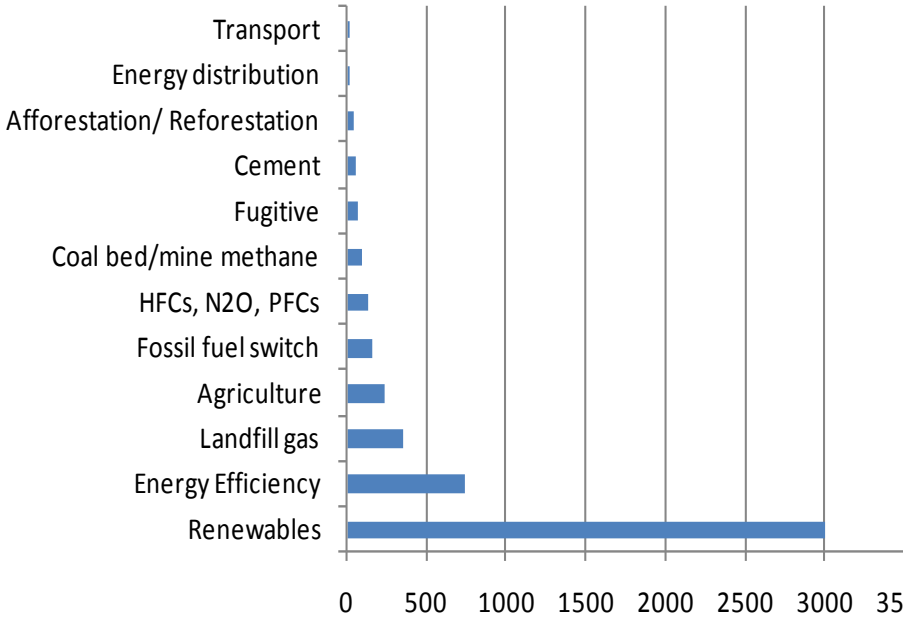
Verification:	20 000 USD
Share of proceeds: 15000x0,1+ 35 000x 0,2=	8 500 USD
Adaption fee:	2% of CERs issued

DNA fee : country specific but could be some % of CERs issued

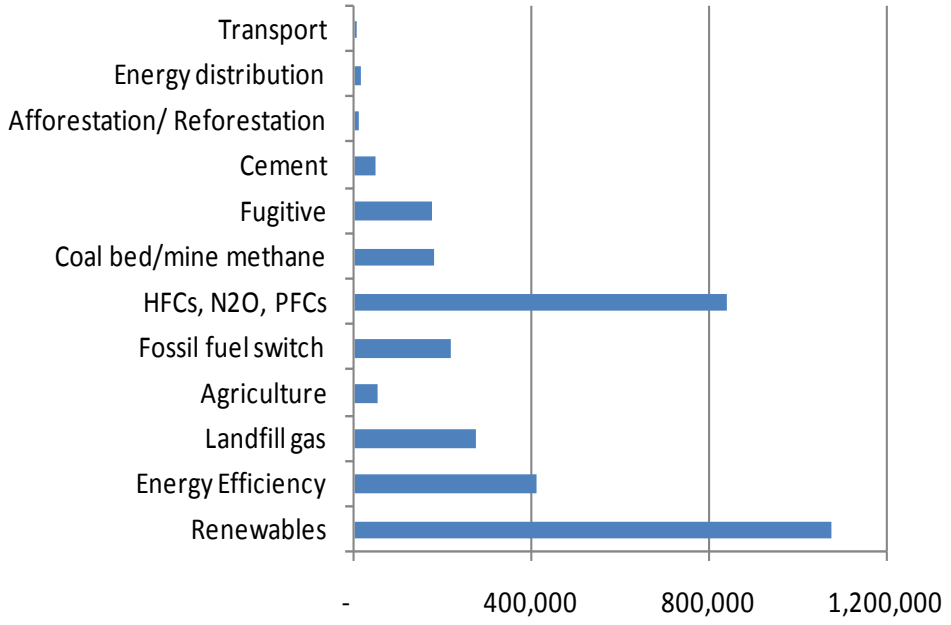
In addition: the cost of developing a PDD

CDM &JI Project Types: Number & Volumes as of March 2009

Number of projects



Total volume of CERs expected by the end of 2012 in TCO_2



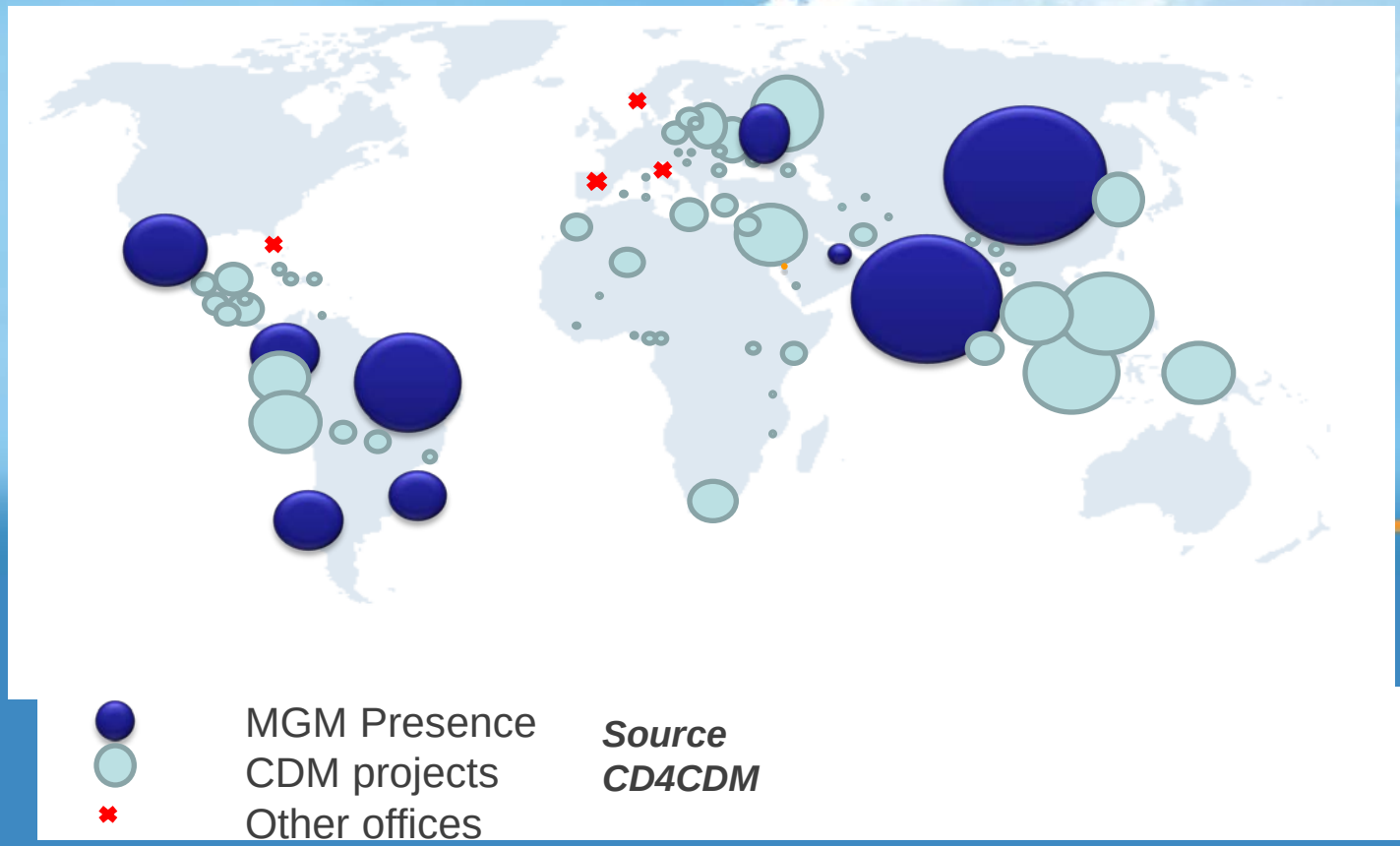
Total number of projects: 4854

Potential CERs: 3.3 $GTCO_2$

(Source CD4CDM pipeline)

Geographic Distribution: Number of Projects

- The map represents the CDM and JI pipeline as of March 1st 2009; the dots are proportional to the number of projects in a country.
- The dark blue dots are where MGM has offices; with offices and representatives in 13 countries, MGM has a local presence to monitor the projects around the world.



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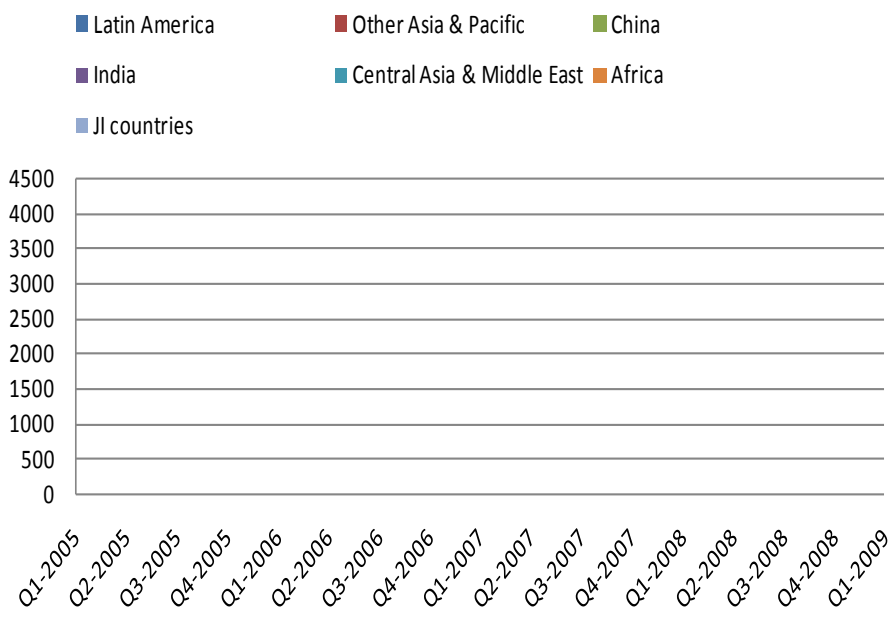
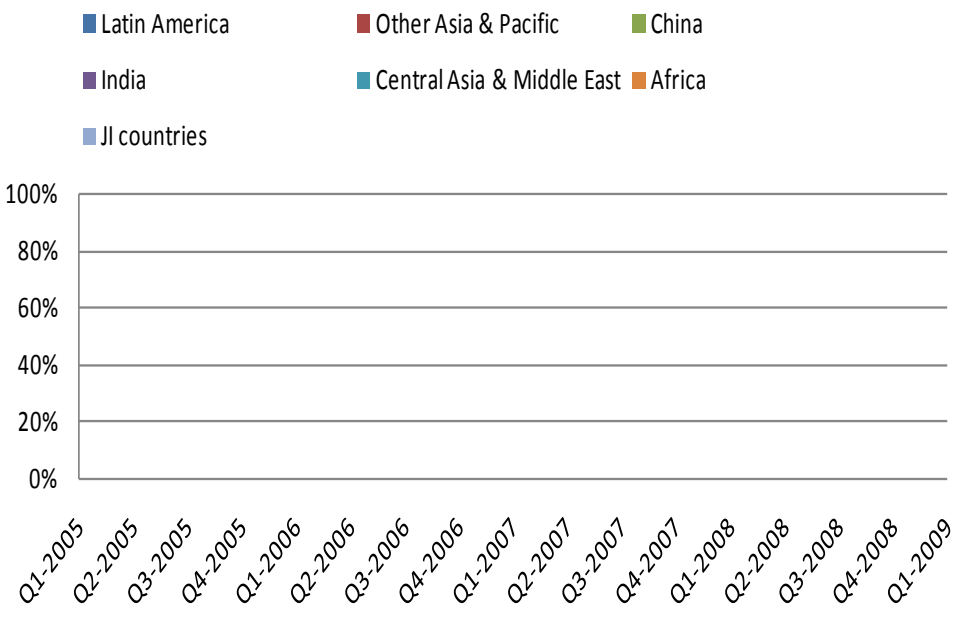
Number of projects evolution per region



Relative regional weighting



The challenge of oil and gas companies

WHY so little activities in the oil and gas sector??

- **EB lack of interest?**
- **Industry reluctant or ignorant of possibilities?**
- **Other legislative regulations?**
- **Large and costly projects**

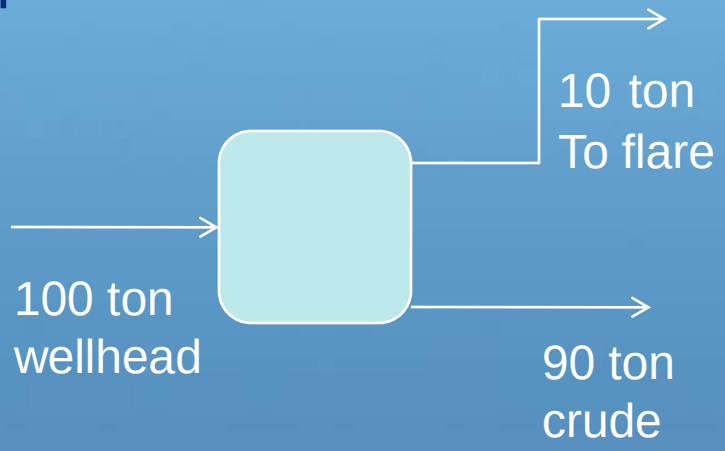
Oil and gas experience

- Things take time
- Management awareness:
  - How much will it cost to buy us out? Reducing emissions by 10 m tons will have an annual cost of 100 m Euro in purchasing quotas. For companies with a bottom line of ~100,000 m Euro (considering the tax effects) it might not be overwhelming. How much can you save anyway by CDM development?
- However, image and environmental awareness is clear to top managers.
- The importance of proper energy resource management

CER contribution vs oil price, increased challenge in the oil and gas sector

- Oil price is 40 US$/bbl (270 Euro/ton)
- Secondary CER price 10 Euro/ ton CO2

Simplified scheme



Value of crude:
90x268= 24 120 (Euro)
Value of gas being flared (assumed at half crude price):
10x268/2= 1340 Euro.

If CDM project to stop flare:
10 ton CH4 gives 27,5 ton CO_2
Value of CERs:
27,5x10= 275 Euro

Income stream increased value to defend investment:
275/(1340+275)=0,17

CERs could add 10-20% to income to justify a flare reduction project and more if the value of gas is lower

CDM OPTIONS

CDM options related to production and export of oil and gas
UPSTREAM

- Flare/ vent reductions
- Reduced leakages
- Reduced vaporization
- Energy efficiency
- CCS?

CDM options related to the development of the domestic energy market
DOWNSTREAM

- Consider biocomponents in gasoline and diesel
- Biogas and natural gas for heating and electricity
- Renewables for heating
- Energy efficient solutions
- Distributed heating/ cooling and power

Project Identification and Selection

The MGM project identification includes:

- 13 Oil & Gas Fields
- 14 Refineries
- 1 NGL Facility
- 2 Thermal Power Plants
- 1 Nitric Acid Plant

The Norwegian experience

Actions were taken due to a high tax on emission of CO2

Tax level, oil and gas sector, Norway some 40 Euro/ton

Major studies were made to reduce emissions including measures like:

1. Zero flaring
2. Process optimalization

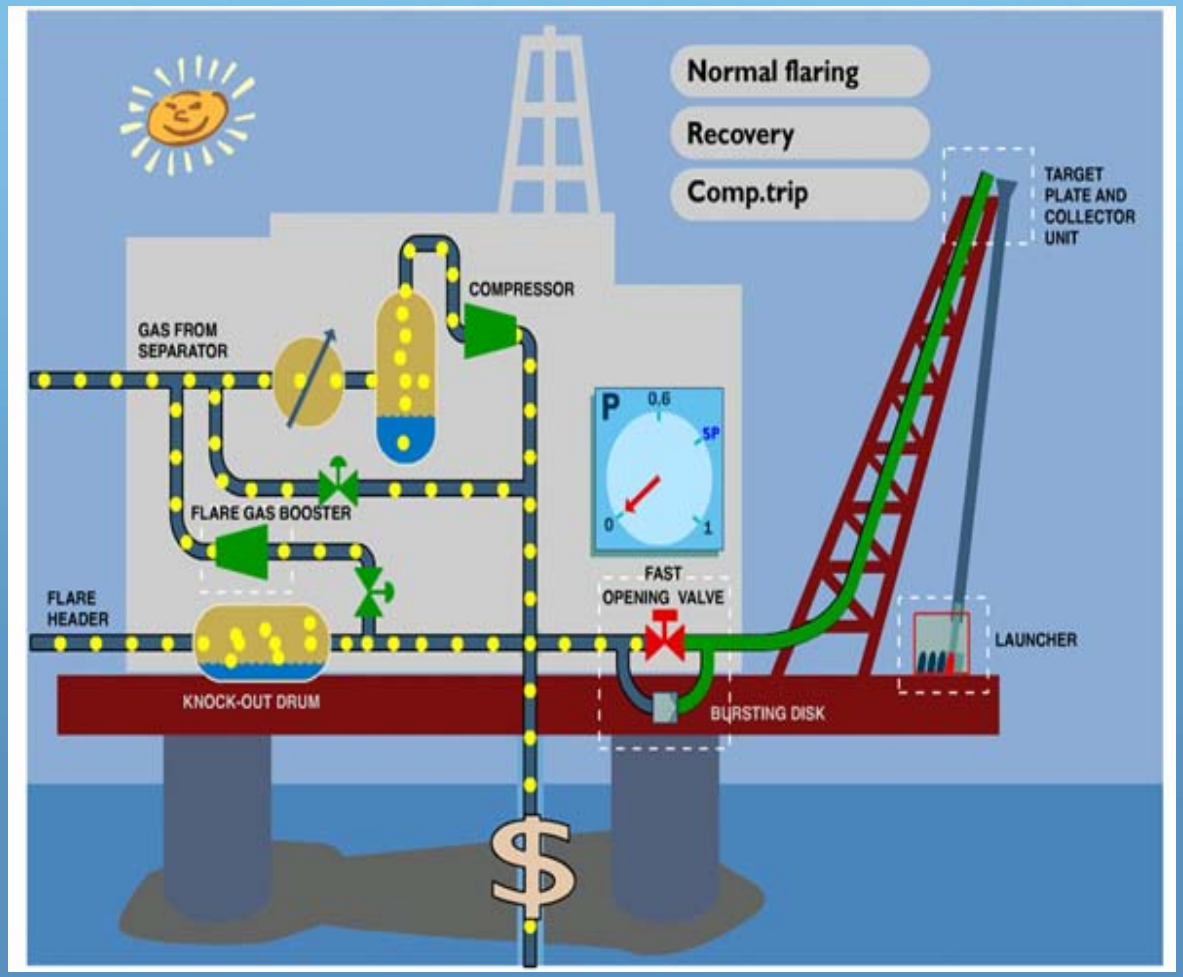
The process generated technology development.

Reducing emissions by introducing combined cycle powergeneration and CCS will be even more costly

The Norwegian development. Zero Flaring

New technology
regulations
Cost efficiency

Zero flaring:
Possible if gas can be sold to market or injected



AM 0009, version 03.2

Applicability

The methodology is applicable to project activities that recover and utilize associated gas from oil wells that was previously flared or vented. The methodology is applicable under the following conditions:

- Associated gas at oil wells is recovered and transported to: A processing plant where dry gas, liquefied petroleum gas (LPG), and condensate are produced; and/or An existing natural gas pipeline without processing.

-All associate gas recovered comes from oil wells that are in operation and are producing oil at the time of the recovery of the associated gas;

- The recovered gas and the products (dry gas, LPG and condensate) are likely to substitute in the market only the same type of fuels or fuels with a higher carbon content per unit of energy;

-The utilization of the associated gas due to the project activity is unlikely to lead to an increase of fuel consumption in the respective market;

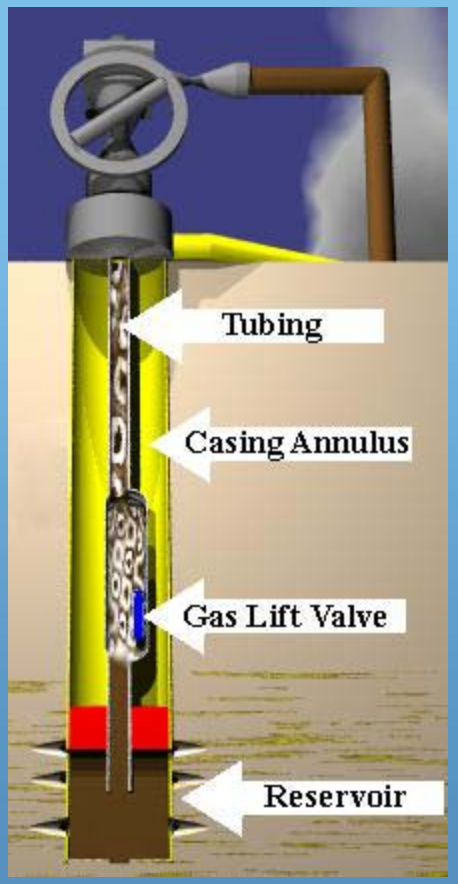
- The project activity will not lead to changes (negative or positive) in the volume or composition of oil or high-pressure gas extracted at the production site;

- Data (quantity and fraction of carbon) are accessible on the products of the gas processing plant and on the gas recovered from other oil exploration facilities in cases where these facilities supply recovered gas to the same gas processing plant;

- No gas coming from a gas lift system is used by the project activity.

Gas lift

- Gas lift is one of a number of processes used to artificially lift oil or water from wells where there is insufficient reservoir pressure to produce the well. The process involves injecting gas through the tubing-casing annulus. Injected gas aerates the fluid to reduce its density; the formation pressure is then able to lift the oil column and forces the fluid out of the wellbore. Gas may be injected continuously or intermittently, depending on the producing characteristics of the well and the arrangement of the gas-lift equipment.
- Although the gas is recovered from the oil at a later separation stage, the process requires energy to drive a compressor in order to raise the pressure of the gas to a level where it can be re-injected.



AM 0009 version 03.2

What is the concern of gas lift systems?

- Used for increased oil and gas production?
- Artificially increase the baseline and thereby increase the number of credits?

Vaporization from storage tanks and vessels

Stabilized crude still contain volatile matter
Vapor pressure of of light products

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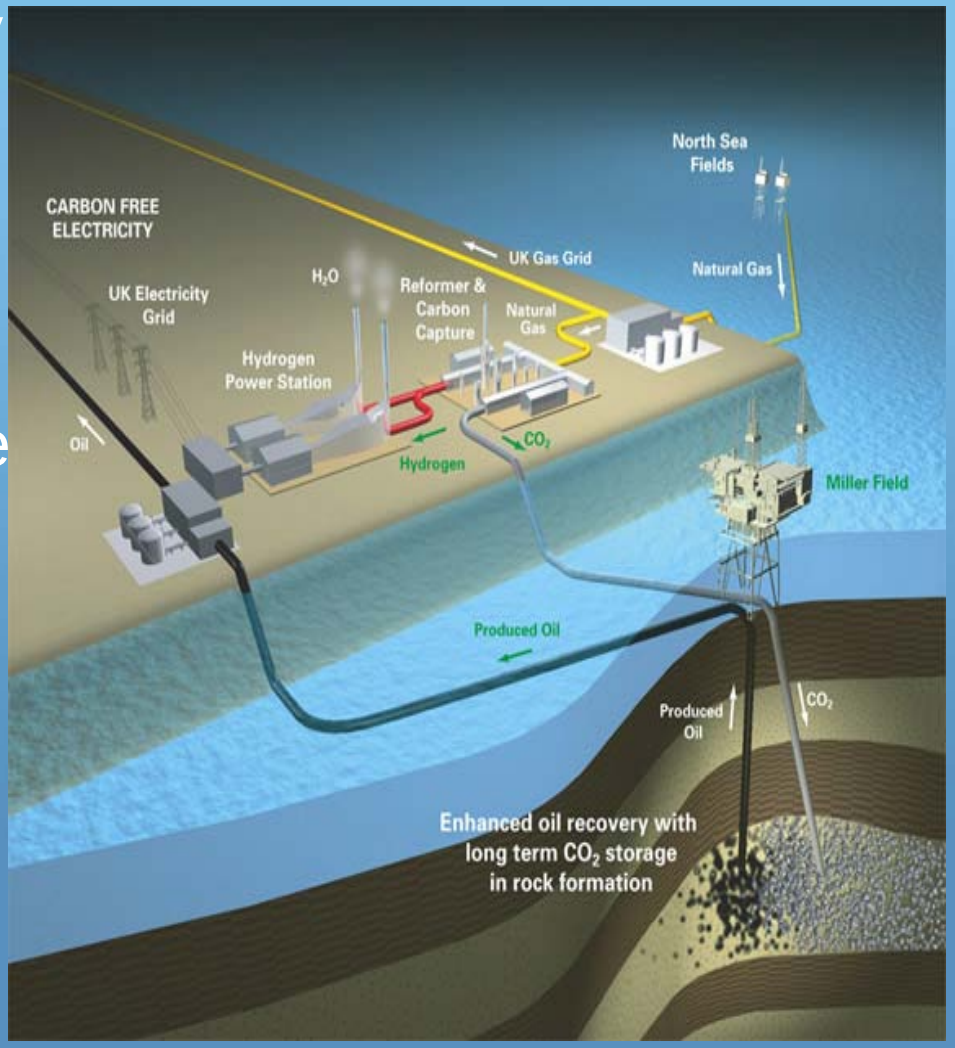
CCS

- Not accepted as a way to generate CERs
- Need an approved methodology
- Need to convince permanency of storage
- Need to regulate legal and liability issues
- Norway has long experience with convincing results



CCS

Challenges for CCS to be an attractive way of generating CERs?:

- Cost must come down for CERs to be significant
- The additionality is a challenge
- Prohibition to emit CO2 will exclude CDM as an alternative

In summary

- CDM is a great opportunity also for the oil and gas industry
- Major areas of attentions upstream are:
  - flare reductions,
  - energy efficiency,
  - vaporization
  - CCS
- For development of the domestic energy supply chain intelligent ways to combine fossile fuels with new technology and renewable for local solutions is a great opportunity

Areas of special attention

- Additionality and regulations
- Existing methodologies
- What happens after 2012?

BUT:

- The market will continue and grow
- The market will eventually be global
- It might become the world's largest commodity market

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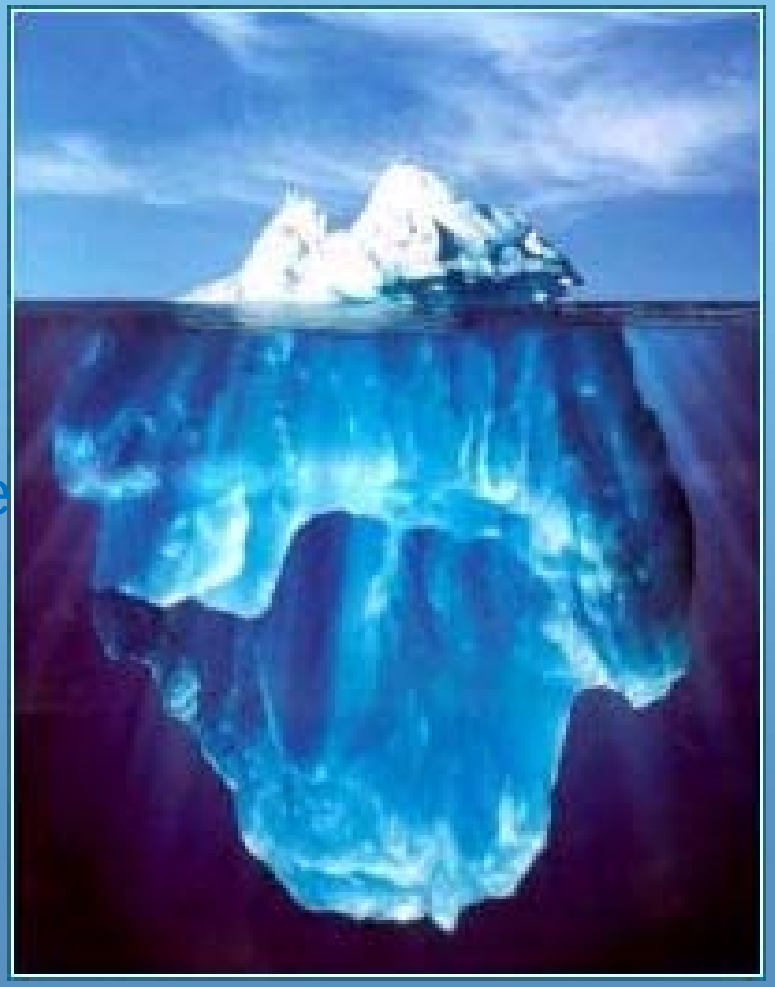
An interesting question:

This iceberg weighs some 300 mill tonn. Will the level of sea rise when the iceberg melts?



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Thank you!

Per Øivind Johansen
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MGM Oil & Gas CDM Ongoing Projects

Project	Type	Methodology	Sector
CO_2 re-injection project	Carbon capture and storage	MGM – NM developed	Upstream
CO_2 recovery and utilization from refinery tail gas	CO_2 avoidance	AM0063 – MGM – NM developed	Downstream
Waste heat recovery steam superheater project	Energy efficiency	AMS-II.D	Downstream
Waste gases turboexpander project - (2 different projects)	Energy efficiency	ACM0012	Downstream
Tres Hermanos Oilfield gas recovery and utilization project	Gas recovery and utilization at oilfields	AM0009	Upstream
Cogeneration at an oilfield	Energy efficiency	AM0048	Upstream

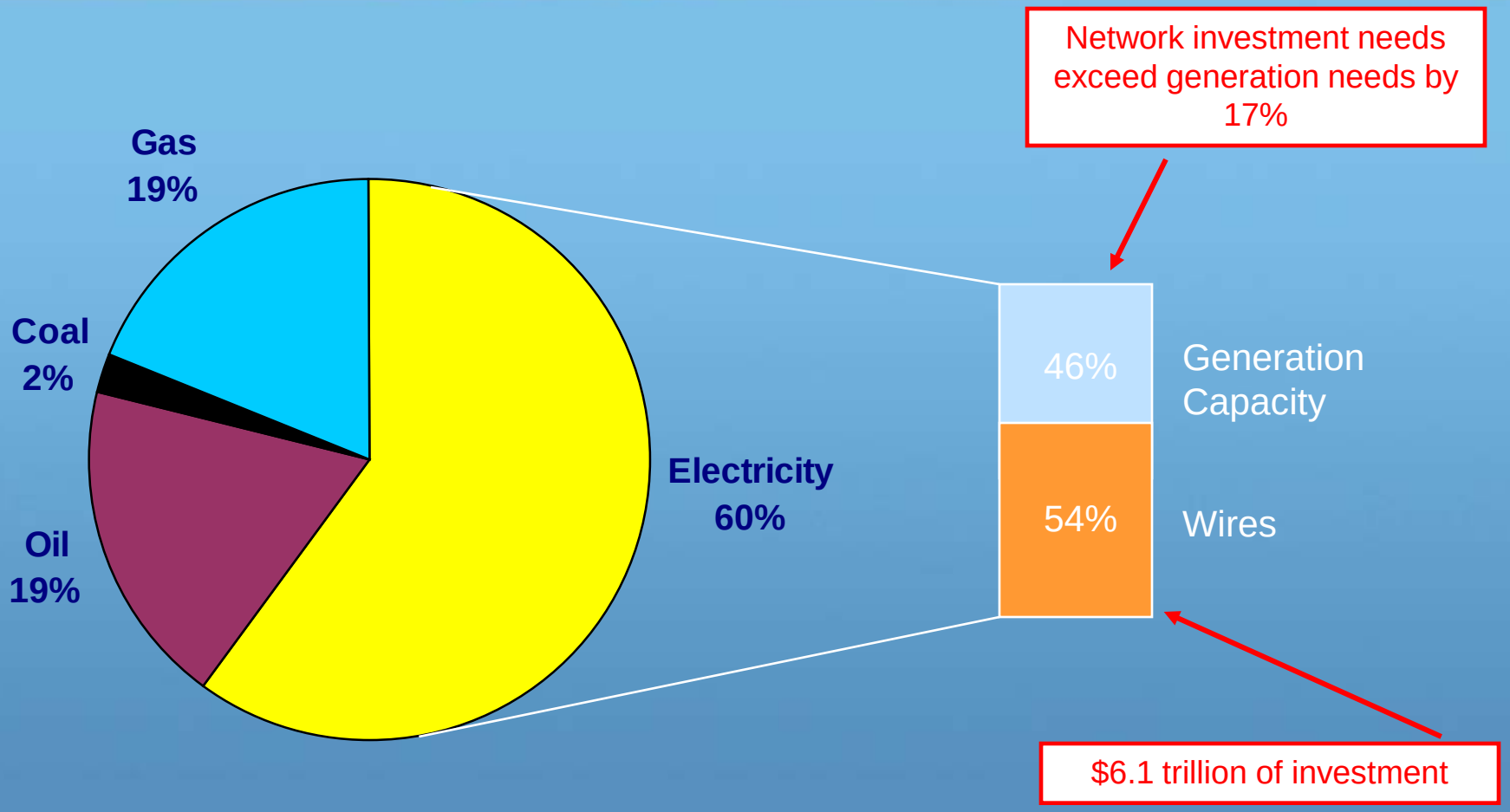
Approved CDM O&G related methodologies

GHG Mitigation Activity Name of Methodology	AM	ACM	AMS
Energy efficiency improvement projects: boiler rehabilitation or replacement in industrial and district heating sectors	AM0044	----------	---------
New cogeneration facilities supplying electricity and/or steam to multiple customers and displacing grid/off-grid steam and electricity generation with more carbon intensive fuels	AM0048	---------	--------
Energy efficiency improvement of a boiler by introducing oil/water emulsion technology	AM0054	----------	---------
Baseline and monitoring methodology for the recovery and utilization of waste gas in refinery facilities	AM0055	---------	--------

Approved CDM O&G related methodologies

GHG Mitigation Activity Name of Methodology	AM	ACM	AMS
Conversion from single cycle to combined cycle power	----------	ACM007	---------
Fuel switching from coal or petroleum fuel to natural gas	----------	ACM009	AMS-III.B
Waste gas and/or heat and/or pressure for power generation	----------	ACM012	AMS-III.Q
Energy efficiency and fuel switching measures for industrial facilities	----------	----------	AMS-II.D
Recovery of CO_2 from tail gas in industrial facilities to substitute the use of fossil fuels for production of CO_2	AM0063	----------	----------
Recovery and utilization of waste gas in refinery facilities	----------	----------	AMS-III.P
Supply side energy efficiency improvements	----------	----------	AMS-II.B

World Energy Investment, 2001 - 2030



Source: IEA World Energy Outlook, 2006