

The Carbon Disclosure Project 5 (CDP5) Greenhouse Gas Emissions Questionnaire, Norsk Hydro's response

1. Climate Change Risks, Opportunities and Strategy

For each question, please state the time period and where possible the associated financial implications.

- **Risks:** *What commercial risks does climate change present to your company including, but not limited to, those listed below?*
 - *Regulatory risks associated with current and/or expected government policy on climate change e.g. emissions limits or energy efficiency standards.*
 - *Physical risks to your business operations from scenarios identified by the Intergovernmental Panel on Climate Change or other expert bodies, such as sea level rise, extreme weather events and resource shortages.*
 - *Other risks including shifts in consumer attitude and demand.*

The aluminium industry supplies a metal that finds its way into innovative applications within transport, building, packaging, machinery and equipment, electrical applications and consumer durables.

The environmental footprint of the aluminium value chain must be seen in the context of the life cycle – where aluminium in use offsets the energy input in the primary aluminium production;

Lighter vehicles give reduced fuel consumption. New, smart solutions can make more energy efficient buildings, protect food, drink and pharmaceuticals, reduce the need for maintenance and use of harmful substances – and at the end of its use, aluminium is totally recyclable.

Regulatory risks:

Norsk Hydro recognises that the risk of long-term climate change requires action now to reduce global greenhouse gas emissions. To meet the climate change challenge in a cost efficient way it is essential for governments to develop equitable, global policy frameworks that utilise the markets and ensure long-term predictability.

Norsk Hydro participates in the global policy framework dialogues and is committed to be in the forefront with regard to its own emission reductions and the development of climate benign products and systems.

As a global aluminium supplier – active in all steps of the value chain - and a leading offshore producer of oil and gas with a significant activity in the development of

renewable energy resources, policy responses to climate change will represent both business risks and opportunities for Norsk Hydro.

In 2005 the EU introduced an Emissions Trading Scheme (EU ETS) for CO₂, which does not – and will not before 2013 – include aluminium production. Although there is only a minor direct impact of the EU ETS, the EU ETS in combination with high fuel process and a non-liberalised European power market has led to a significant price increase for power that has initialised a restructuring of European aluminium industry. Hydro has significant assets in Norway and Germany, in the shorter term the German assets are most affected due to earlier expiry of power contracts.

Future growth of primary aluminium production capacity is expected to take place in regions where local energy potentials (hydro, gas, coal) exceed local needs for general consumption. Key requirements for investments in new capacity are long term competitive power supply and a predictable regulatory framework that allows the management of the climate risk. New capacity will represent a global benchmark in energy and environmental efficiency with significantly better performance than current global levels. Hydro has announced the investment in a 50/50 JV in Qatar for a 570 000 t/yr aluminium smelter with the power delivered from a new combined cycle gas turbine (CCGT) power plant.

Physical risks:

Aluminium

Our operations are located so that the likelihood of extreme weather events potentially impacting our operations is limited. All major sites and operations have been through local risk assessments where also issues like extreme weather events have been included. Part-owned Alpart (alumina refinery) at Jamaica has been influenced by hurricanes in the Caribbean. In 2005, the hurricane Katrina affected some of our operations in the southern US.

Oil and Energy

Extreme weather conditions have had only minor effect on our operations. Offshore installations on the Norwegian continental shelf are already designed for extreme weather situations, and Hydro has more than 30 years of experiences in these rough waters. Typical actions in other parts of the world would be temporarily evacuation of staff and close down production during the most extreme situations, as we did during the hurricane season in the Gulf of Mexico in 2005.

Design criteria for production facilities will be updated to take into account changing climatic conditions.

Other risks (consumer demand):

Individual EU member states, like Belgium and Denmark, have introduced steps to reduce waste and packaging waste. Belgium will from 1 July 2007 introduce an eco-tax on plastic bags, plastic cutlery and on plastic and aluminium household foil. Denmark has introduced a packaging law with a tax based on energy intensity. This law is to the disfavour of aluminium.

- **Opportunities:** *What commercial opportunities does climate change present to your company for both existing and new products and services?*

Aluminium

Aluminium, with its properties that include lightweight and ease of recycling, represents a growing opportunity in an increasingly carbon-constrained world with an expected growth rate of 4.5% p.a. A characteristic of aluminium used in transport (in a lifecycle perspective) is that the energy savings in use more than outweighs the energy needed for its production.

Our strategy is therefore to support the increased use of aluminium by

- Developing innovative applications in transportation, packaging systems and energy efficient building systems.
- Establishing infrastructures and systems for aluminium recycling of process scrap and post consumer scrap.

Oil and Energy

Also in our Oil and Gas business opportunities will arise including new low-carbon technologies, carbon capture and storage (CCS), and the development of renewable energy for supply to our customers.

We are upgrading our hydropower stations and are looking into possibilities for increased hydropower production from small waterfalls. We have also invested in technologies for the utilization of wind and wave energy.

In the longer term, we see hydrogen as the energy carrier which, in combination with electricity and heat supply, can eliminate CO₂ emissions arising at the end user of energy. We have a long history in manufacture of electrolyzers for hydrogen production and participate in several projects and programmes to promote hydrogen as a future energy carrier.

At Utsira, a small island on the west coast of Norway, we have demonstrated the world's first energy system combining wind energy and hydrogen as storage medium. The hydrogen works as the source for electricity production during periods of little or no wind. Hydro has extended the original two years demonstration period for another two years, ending spring 2008.

- *Strategy: Please detail the objectives and targets of the strategies you have undertaken or are planning to take to manage these risks and opportunities. Please include adaptation to physical risks.*

Aluminium

Hydro entered into voluntary agreements with the Norwegian and the German authorities on the reduction of greenhouse gas emissions from aluminium production. The Norwegian agreement was signed in 1997, and we committed ourselves to a 55% reduction in specific emissions of climate gases (baseline 1990) by 2005. We achieved this target well ahead of schedule. In Germany the agreement was signed in 1997 and the objective was a 50 % reduction in specific perfluorcarbon (PFC) emissions (baseline 1990) by 2005. Our German smelters also achieved this target well ahead of schedule. The reductions have been linked to investments in technology, improving the efficiency of the operations. These investments are in the order of NOK 200 million. The total emission reduction, as a consequence of the Norwegian agreement, has been 1 million tonnes CO₂e.

Hydro is now a part of an agreement covering all of the process industry in Norway, members of the industry association Norsk Industri (Federation of Norwegian Industries) under which the industry will reduce its total CO₂ emissions by 20 percent compared to 1990 within 2007.

Since 2000 Hydro has closed down the Söderberg plant in Sunndal and invested close to one billion USD (NOK 6 billion) in new, efficient technology and capacity there. This has resulted in reduced greenhouse gas emissions per tonne aluminium produced. Hydro has also closed its Söderberg potline in Høyanger and will be closing the Söderberg lines in Årdal during the first half of this year. The only remaining Söderberg potline still in operation in the Hydro production system is the line at Karmøy, scheduled to close at the end of 2009.

Hydro implemented an environmental Key Performance Indicator tool in our aluminium business area in 2006, where climate gas emissions and energy efficiency are included. Each site uses this tool to track performance and set annual improvement targets.

The International Aluminium Institute, where Hydro is a member, launched a sustainability initiative: “Aluminium for future generations” in 2003. It is a global undertaking that contains, among several elements, a range of voluntary objectives. Voluntary Objective 1 is an 80 percent reduction in perfluorcarbon (PFC) greenhouse gas emissions per tonne of aluminium produced for the industry as a whole by 2010 compared with 1990. This is done by sharing best practice in the industry and an active transfer of measurement methodology to new participating countries, e.g. China and Russia.

Oil and energy

We expect key performance indicators to be established from 2008 for each offshore installation on energy efficiency (e.g. energy per produced oil equivalent, o.e.). We are also evaluation whether to establish reduction targets on greenhouse gas emissions. The Norwegian Continental Shelf has, however, reached a mature stage, and the extraction of oil and gas now results in increased greenhouse gas emissions per extracted amount.

Since the early 1990s, Norway has levied a tax on CO₂ emissions from offshore oil and gas production on the Norwegian Continental Shelf – ranging from EUR 35 – 50/tonne CO₂. Consequently, CO₂ emissions from our operations in Norway are substantially lower than the OGP's (The International Organization of Oil and Gas Producers) recorded world average.

- ***Reduction targets:*** *What are your emissions reduction targets and time frames to achieve them? What renewable energy and energy efficiency activities are you undertaking to manage your emissions? (This question not required if answering Section B.)*

2. Greenhouse Gas Emissions Accounting

Methodology: Please provide the following information on your company's emissions measurements:

- *The accounting year used to report GHG emissions.*
The data given below are valid for 2006.
- *The methodology by which emissions are calculated.*
Emissions are calculated according to WBCSD GHG Protocol
- *Whether the information provided has been externally verified or audited.*
Scope 1 emissions have been verified.
- *An explanation for any significant variations in emissions from year to year, e.g. due to major acquisitions, divestments, introduction of new technologies, etc.*

- **Scope 1 and 2 of GHG Protocol:** Direct and Indirect GHG emissions and electricity consumption. Please complete the table below for tonnes CO₂e emitted and electricity consumption:

	Globally	Annex B Countries
Scope 1 activity tonnes CO ₂ e emitted	8 791 834 tonnes CO ₂ e	7 564 773 tonnes CO ₂ e
Scope 2 activity tonnes CO ₂ e emitted	5 193 057 tonnes CO ₂ e	5 193 044 tonnes CO ₂ e

MWh of purchased electricity: (please refer to www.cdproject.net for details)

Percentage of purchased MWh from renewables:
(please refer to www.cdproject.net for details)

- **Scope 3 of GHG Protocol:** Other Indirect GHG emissions. Where feasible please provide estimates for the following categories of emissions:
 - *Use/disposal of company's products and services.*
 - *Your supply chain.*
 - *External distribution/logistics.*
 - *Employee business travel.*

Aluminium

Our aluminium business calculates emissions according to WBCSD GHG Protocol and follows the IAI (International Aluminium Institute) framework for reporting GHG emissions tier 2.

Hydro produces a variety of aluminium products with varying CO₂ emissions associated with their use. Use of aluminium in transport (cars, airplanes etc.) reduces the CO₂

emissions significantly over time compared to steel. Studies performed by the International Aluminium Institute (IAI) indicate 6-8% fuel savings for every 10% reduction in weight (aluminium parts are in general 40-50% lighter than steel parts). These studies have concluded that substituting steel with 1 kg aluminium in car has the potential to eliminate 20 kg CO₂ over the life of an average vehicle. With Hydro's power mix the emissions related to the production of 1 kg of aluminium is less than half of this.

Hydro has also developed an energy efficient concept for building facades, called TEMotion™, that reduces energy consumption in buildings significantly (please refer to http://www.hydro.com/library/attachments/en/investor_relations/financial_reports/pdf_annual_report_2005/annual_review_2005_en.pdf, page 47 for more details).
http://www.wicona.com/en/aluminium_excellence/sustainability/temotion/index.html

The major CO₂ emissions in the aluminium supply chain are related to the production of electricity for our smelters. Electricity is produced from a variety of sources, with associated CO₂ emissions varying from 0 (hydro power) to 1 tonne CO₂/MWh (coal power). The average CO₂ emissions from the electricity used by Hydro is approximately 0,2 tonne CO₂/MWh. Total emissions from this production amount to approximately 6 million tonnes CO₂ each year.

Hydro has developed an Environmental Ranking of alumina where type of fuel, thus CO₂ emission is an important factor. This system is used to push our suppliers to improve their HSE activities and systems. This Environmental ranking is updated every second year, recently done for the total year of 2006.

Oil and energy

Hydro's oil and gas activities emit approximately 1.9 million tonnes CO₂e per year (based on equity) due to the use of oil and gas at our offshore installations on the Norwegian continental shelf. Whilst minor amounts are used as feedstock for plastics production, the bulk of the produced oil and gas is used as fuel in various forms. A rough estimate indicates that approximately 80 million tonnes CO₂ emissions result from the use of the oil and gas produced by Hydro. This equals almost 90 % of the CO₂ emissions connected to the commercial oil and gas life cycle.

Hydro exports approximately 130.000 boe natural gas to Europe each year. This gas is mainly used for power generation. This power partly substitutes coal based power, and partly it contributes to increased power capacity. When natural gas replaces coal as fuel, CO₂-emissions are approximately halved from 800-1000 kg CO₂/MWh to 350-400 kg CO₂/MWh.

3. Additional Greenhouse Gas Emissions Accounting

Using the methodology as set out in 2(a), please state your Scope 1 and 2 emissions as follows:

- **Countries:** For each country in which you have operations, where available.

(Please refer to www.cdproject.net for details)

- **Facilities:** For facilities covered by the EU Emissions Trading Scheme (EU ETS). Please also include the number of allowances you were issued under the applicable National Allocation Plans.

Primary aluminium production is not covered by the EU ETS. However, a few of our facilities fall under the scheme because they are classified as “combustion installation” according to the Annex 1 of the EU ETS.

This applies to:

<u>Plant</u>	<u>Installation</u>	<u>Allowance (tonnes CO2)</u>
Grevenbroich, Germany	central heat station	53,310
AluNorf, Germany (50%)	central heat station	56,712
Rafnes, Norway (50%)	VCM/chlorine production	88,653
Noretyl, Norway	ethylene cracker	249,487
Sture , Norway	oil terminal	89,765
Stenungsund, Sweden	VCM/chlorine production	19,502

- **EU ETS impact:** What has been the impact on your profitability of the EU Emissions Trading Scheme?

In December 2004 Hydro announced a major write-down of book value of our German primary aluminium plants, partly due to increasing energy costs, also driven by carbon cost. In June 2005 we announced that “increasing power prices in Europe forces Hydro to restructure its German primary aluminium plants”. This included the closure of our fully owned plant in Stade, and that we recommended closure of our part owned plant in Hamburg. Hamburg closed at the end of 2005 and was in 2006 sold to a German company. Stade closed at the end of 2006 after a successful business development program to secure new jobs for many of the employees.

4. Greenhouse Gas Emissions Management

- **Reduction programmes:** *What emission reduction programs does your company have in place? Please include any reduction programs related to your operations, energy consumption, supply chain and product use/disposal.*
 - *What is the baseline year for the emissions reduction program?*
 - *What are the emissions reduction targets and over what period do those targets extend?*
 - *What investment has been/will be required to achieve the targets and over what time period?*
 - *What emissions reductions and associated costs or savings have been achieved to date as a result of the program?*
 - *What renewable energy and energy efficiency activities are you undertaking to manage your emissions?*

Aluminium

Please refer to question 1 regarding our environmental KPI and voluntary commitments. .

Emissions from operations

The aluminium industry globally, and Hydro in its operations in Norway, Germany and Australia, have achieved significant reduction in the GHG emissions. Today, the dominating production technology for the primary production of aluminium is the prebake electrolysis technology. This technology has been optimised and refined for many years in order to minimise emissions, including greenhouse gas emissions. Norsk Hydro's prebake technology is today regarded as the best available technology (BAT) in the aluminium industry regarding emissions.

There is presently no proven, alternative technology available, although substantial research is being done. In the longer term new aluminium smelters may be designed to operate without carbon anodes or to capture and potentially store the CO₂, given a CCS infrastructure. Hydro's technology organizations in Årdal and Porsgrunn, Norway, and Neuss, Germany, with 110 employees, are highly dedicated to the effort of developing new technologies, including environmental solutions.

Business opportunities

Norsk Hydro is working continuously to reduce energy consumption in all production processes of the aluminium value chain. These efforts include technology solutions for heat recovery in primary production and the introduction of regenerative burners in our cast houses and downstream processes.

The new smelter technology developed by Hydro is seen as an important business opportunity, as it makes Hydro an attractive business partner. This has been demonstrated in examples like Slovalco (Slovakia) and in Qatalum, a 50/50 joint venture between Qatar Petroleum and Hydro.

Waste heat from the aluminium plants in Årdal and Sunndal is used for local heating purposes. In Årdal the cooling water from the cast houses is used for heating public swimming pools as well as for ground heating of local soccer fields. In Sunndal the local energy company is running heat exchangers in the scrubbers, based on the hot flue gas from the plant. As of today total effect is at 8.5 MW. This can be increased up to 38 MW if there is a market for the heat locally. Sunndal Energi supplies heat to public buildings, residential areas as well as industry. In the future the heat can also be used in fish breeding.

In all Hydro's Norwegian cast houses fuel oil has been replaced by gas as main energy source, thereby saving CO₂-emissions.

Oil and energy

Emissions from operations

Energy management and optimization on offshore installations is expected to yield energy savings of up to 10 %. Examples of such small scale innovations are: improved exhaust gas flow from the turbines, energy utilization in necessary pressure drops from high-pressure wells, enhanced turbine maintenance and the careful appraisal of all pressure reducing elements in the energy consuming system.

The transfer of power from land to reduce CO₂ emissions on offshore installations has been considered. However, converting from gas to electric power generation on existing installations is shown not to be commercially viable. Future field developments, however, will to a large extent be based on transferring production from offshore wells to onshore processing (e.g. Ormen Lange) allowing for replacement of energy from offshore gas turbines by electric power from clean sources onshore.

Hydro's policy is to avoid gas flaring as a permanent solution from own and non-operated assets. For our operations in the North Sea, flaring and venting is reduced to a minimum by integrating solutions from the design stage on. Flaring is also reduced and covered by governmental regulations in our non-op activities in Canada. To enhance the possibility for implementing flaring and venting reductions from our other international activities, Hydro joined the World Bank's Global Gas Flaring Reduction Initiative in 2003. This initiative promotes cooperation between governments and companies on flaring and venting, by encouraging reporting and developing associated gas recovery plans.

Business opportunities

Carbon capture and storage will offer future business opportunities. We are developing technology for CO₂ separation for gas-fired power production and for the production of hydrogen as a CO₂ free energy carrier. Norsk Hydro is also a partner in the Sleipner field on the Norwegian continental shelf where CO₂ is separated from the gas and stored in an underground aquifer. In addition, we participate with other major oil companies in The

Carbon Capture Project (CCP) to study new technologies and refinement of conventional technology for CO₂ separation and storage.

Hydro is contributing to bringing forward more cost efficient solutions by developing CO₂ capture technologies that have potential for 50% cost reductions compared to state-of-the-art technology. Hydro will, given the right incentives from the authorities, actively take part in the implementation of this technology.

We have carried out extensive studies on the use of CO₂ for enhanced oil recovery, but so far this has not proved to be commercially viable for the cases in our portfolio.

Hydro is developing significant positions within wind energy. Several wind projects are in preparation in Norway and abroad, but are awaiting clarification of permits and governmental policies before investment decisions. Onshore wind parks are subject to public acceptance issues regarding visual pollution. Placing wind turbines offshore solves this whilst also taking advantage of the greater wind speeds offshore. Hywind™ is a future-oriented R&D project combining Hydro's offshore oil industry experience with Hydro's competence in wind power. Using just two offshore blocks of the Norwegian Continental Shelf, Hywind™ has the potential to produce an amount of electricity equal to Norway's hydropower production.

Hydro takes an active part in the Clean Urban Transport for Europe (CUTE) Program and the Clean Energy Partnership (CEP) by active involvement in projects in Reykjavik, Hamburg and Berlin. The Hydro-led HyNor™ project - which is building the "Hydrogen Highway" providing hydrogen fuelling stations between the Norwegian cities of Oslo and Stavanger (a distance of 560 kilometers) - also includes establishing one of Norway's first hydrogen fuelling stations at Hydro's site at Herøya. This fuelling station receives hydrogen from Hydro's chlorine plant.

In 2005, Hydro also set up a New Technology Ventures Fund II, totalling NOK 400 million. It supplements the Hydro Ventures Technology Fund I, established in 2001 with a lump sum of NOK 350 million. The intention is to contribute to Hydro maintaining its leading position technologically, both within oil and gas and new forms of energy.

- **Emissions trading:** *What is your company's strategy for trading in the EU Emissions Trading Scheme, CDM/JI projects and other trading systems (e.g. CCX, RGGI, etc), where relevant?*

Hydro supports market-based emission trading systems and the establishment of a price of carbon as one of the necessary instruments to drive emissions reductions. We are active in the EU Emission Trading Scheme mainly for the purpose of compliance trading and risk control. Our installations covered by the EU ETS (please refer to question 3) were in compliance in the second EU ETS reporting period. Most of these installations were short, and were buyers of credit. These installations were allowed to emit 557,429 tonnes CO₂e in 2006. In 2008, the offshore oil and gas sector will be included in the EU ETS. Hydro's offshore installations in Norway emit approx. 1.6 million tonnes CO₂e. The reduction requirements will be covered by CDM and JI credits.

Furthermore, Hydro supports the CDM and JI mechanism as cost efficient tools for reaching compliance, as well as instruments for promoting and implementing technologies with less greenhouse gas emissions, especially in developing countries. By now Norsk Hydro has set aside approximately €23 million for investments in credits from JI and CDM projects. In the EU ETS we assume that more than 50 % of our reduction requirements will come from acquiring projects based CDM and JI credits

Hydro has been one of the founding-investors in the World Bank's Prototype Carbon Fund (PCF). The PCF has been the first market-based fund in the world that utilises the CDM and JI mechanisms to acquire credits. Further, Hydro is one of totally 26 participants in the GG-CAP's buyers pool that is run by Natsource.

Aluminium is not a part of the European Union Emission Trading Scheme, even for the period 2008-2012. The aluminium industry is in a dialogue with the EU Commission regarding the period up to 2020. The topic for discussion is that aluminium remains outside the EU ETS, based on a Sectoral Agreement building on the results achieved by the European aluminium industry

- **Emissions intensity:** *Please state which measurement you believe best describes your company's emissions intensity performance? What are your historical and current emissions intensity measurements? What are your targets?*

Hydro believes that emissions measured against production is the best way to describe emission intensity. Please refer to

http://www.hydro.com/en/global_commitment/environment/global_warming/oil_energy/index.html
http://www.hydro.com/en/global_commitment/environment/global_warming/aluminium/index.html
http://www.hydro.com/en/global_commitment/environment/global_warming/polymers/index.html

for details on our emission intensity.

Hydro is a highly diversified company, and corporate targets are not regarded meaningful. Our commitments and voluntary agreements are described under question 1 and 4.

- **Energy costs:** *What are the total costs of your energy consumption e.g. from fossil fuels and electric power? What percentage of your total operating costs does this represent?*

Aluminium:

Electrical power represent close to 30 % of the site operating costs, on a weighted average for the Hydro primary aluminium plants. In addition comes cost of energy for alumina and carbon anode production, which can be calculated to 10-15 % of the site operating costs.

Oil & Energy:

The overriding energy cost in our Oil & Energy business area results from the use of natural gas. This energy cost represents approx. 0.8% of total revenues in this business area.

- **Planning:** *Do you estimate your company's future emissions? If so please provide details of these estimates and summarize the methodology for this. How do you factor the cost of future emissions into capital expenditure planning? Have these considerations made an impact on your investment decisions?*

Hydro estimates future emissions, using methodology in the GHG Protocol as a basis. Due to the confidential nature of future business development, these estimates are confidential.

The formal requirements for all capital expenditure in Hydro, covering both typical investment projects as well as major contracts, shall include sensitivities regarding climate change issues. The corporate directive on Deployment of Capital includes this requirement for all investments above NOK 1 billion, approximately USD 160 million.

All investment proposals must be reviewed by the relevant advisory body, also including direct and indirect GHG emissions. This corporate directive has been in place in its present form since 2003.

5. Climate Change Governance

- **Responsibility:**

- *Which Board Committee or other executive body has overall responsibility for climate change?*
- *What is the mechanism by which the Board or other executive body reviews the company's progress and status regarding climate change?*
- *Individual performance: Do you provide incentive mechanisms for managers with reference to activities relating to climate change strategy, including attainment of GHG targets? If so, please provide details.*

The Executive VP Leadership and Culture is responsible for the climate change issues on the Corporate Management Board. Reporting to the Executive VP, the Senior VP Climate and Environment coordinates the strategic climate issues through a network where the business sectors in Hydro are represented. Three or four times a year the Senior VP Climate and Environment takes part in the CMB on review of Climate Change issues. The Senior VP Climate and Environment also gives input on strategic reviews as well as investment decisions. The Senior VP Climate and Environment is 2 levels from the Corporate Management Board.

Hydro communicates the risks and opportunities from greenhouse gas emissions and climate change in our annual report (see page 109-110 in the Annual Report 2006), and on our web-site (see www.hydro.com/en/global_commitment/environment/global_warming/index.html and sub sites).

- **Individual performance:** *Do you provide incentive mechanisms for managers with reference to activities relating to climate change strategy, including attainment of GHG targets? If so, please provide details.*

Executive officers' compensation is linked to fulfilment of the business plans. Direct or indirect GHG targets are a part of the business plans at sector and business area level where relevant.