Activities in Norway to reduce high GWP emissions

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1. BACKGROUND AND OBJECTIVE

In Norway emissions of fluorinated gases account for around 5% of the total emissions of greenhouse gases. Emission levels have been more than halved since the early 1990 – mainly due to measures in primary aluminium production. There is still room for improvement in most sectors, and the increasing use of HFCs as substitutes for ozone-depleting substances represent an additional challenge.

The Norwegian energy sector is characterized by a large oil- and gas sector and a complete dominance of hydropower for electricity production. Inland greenhouse gas emitting industry is dominated by production of light metals, alloys, oil refining and petrochemical industry. Emissions of climate gases from the private sector are mainly related to transport, while direct heating from fossil fuels is relatively rare.

Industry, including the oil- and gas sector, has been identified as the main sector in which considerable emission reductions can be achieved in a cost-effective way. Some of the large emissions here are related to the use of high GWP gases in the aluminium-/magnesium industry, and the electric utilities sector is also considered important due to the relatively large amount of gas held in this equipment. By close co-operation with the industry the Norwegian government wants to implement a framework of measures that implies considerable reductions in emissions, while maintaining the competitiveness.

For political reasons and due to the characteristics of the national emissions, effective measures are harder to implement in the private and commercial sector. Most commodities used by this sector are imported, and current measures are focusing on taxation according to gas and possible ban on certain applications. All measures in this area have to be in accordance with the European Economic Agreement between Norway and the EU.

In Norway pollution from industry and products is regulated by The Pollution Control Act, which is enforced by the Norwegian Pollution Control Authority. Traditionally industry has been regulated on a factory by factory basis, taking both general legislation and local environmental concerns into account. Chemicals in products have been regulated according to product standards.

For climate gases a more flexible approach is needed. The environmental government needs to cooperate closely with other governmental institutions, industry, the commercial sector and NGOs to find the "basket" of measures that represent the best trade-off between environmental benefits and other interests.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
SF_6	2,19	2,07	0,69	0,72	0,85	0,58	0,54	0,55	0,69	0,84	0,89
From Magnesium	2,14	2,02	0,56	0,52	0,55	0,42	0,45	0,44	0,58	0,72	
From Aluminium			0,07	0,14	0,24	0,09	0,02				
From GIS etc.	0,05	0,05	0,05	0,06	0,06	0,07	0,11	0,11	0,11	0,11	
PFK	3,03	2,52	2,02	1,98	1,71	1,56	1,44	1,38	1,27	1,12	0,90
HFK	0,00	0,00	0,00	0,00	0,01	0,03	0,05	0,09	0,13	0,18	0,23
Total fluorinated gases	**5,22**	**4,59**	**2,71**	**2,70**	**2,57**	**2,16**	**2,04**	**2,01**	**2,09**	**2,14**	**2,02**
Total all greenhouse gases	52,0	49,5	47,9	49,9	51,8	51,6	54,8	55,0	55,3	56,0	55,3

Table 1. Emissions of fluorinated gases in Norway (Mtonnes CO_2-equivalents)

2. PRIMARY ALUMINIUM PRODUCTION

With a yearly production of around 1 Mtonnes primary aluminium, Norway is on of the large aluminium producing nations worldwide. All electricity for the electrolysis is hydroelectric, so CO_2-emissions are exclusively from the consumption of anodes. Consequently other greenhouse gases, mainly PFCs from anode effects have been the main focus for reductions.

In 1990 the emissions of PFC from the aluminium industry was 3,03 Mtonnes CO_2-equivalents, or 5,8% of total national emissions of greenhouse gases. In addition CO_2 from the sector (mainly from the production of anodes) accounted for 3% of national totals. As a consequence of this the sector was identified as a key emission source in the development of a national climate policy.

In 1997 a voluntary agreement was signed between The Ministry of Environment and the industry represented by the 7 aluminium plants. The agreement comprises targets for total emissions of greenhouse gases measured in relation to production. The basis is the emissions in 1990 (5,5 tonnes CO_2-eq./t Al) and the target is a 50% reduction in 2000 and a further 5% reduction by 2005.

Yearly following up of the agreement shows that the commitment was fulfilled for the year 2000, and that the emissions in 2001 were somewhat higher, but still below the target. The main measures in the industry are optimalisation of processes (minimizing anode effects) and a long term shift in technology from soederberg to prebaked.

In the future emissions from this sector will probably be included in a system on tradeable emission quotas (se chapter 6).

3. MAGNESIUM INDUSTRY

Up till 2002 Norway had one plant using SF_6 as a cover gas in the production of primary and secondary magnesium. Primary production was, however, closed in 2002 – resulting in an 80% reduction in emissions.

The use of SO_2 as a cover gas has been considered for the remaining secondary production. No decision is made on this issue, but the probable inclusion of SF_6 in the planned system on tradeable emission quotas might make this measure more relevant.

4. SF_6 IN GAS INSULATED SWITCHGEARS (GIS)

Gas Insulated Switchgears (GIS) are commonly used in both high- and medium voltage equipment in the Norwegian electric grid. Especially large installations, typically situated in mountain halls, represent a possible considerable source of SF_6 emissions. Total national emissions of SF_6 from GIS were 2,66 tonnes in year 2000.

Different control options, including the taxation of SF_6, have been considered for curbing these emissions. In mars 2002 the Ministry of Environment and the users of SF_6 settled down on a voluntary agreement on the reduction of emissions. The agreement covers the complete life-cycle of imported or domestically produced equipment.

Users (mainly hydroelectric power producers, grid operators, some large industrial processing plants and one producer of GIS) are legally represented by their business organisations, while the daily management of measures is the responsibility of a nationwide company responsible for the handling of electric waste. From the Government side The Norwegian pollution Control authority will be responsible for the following up of the agreement.

The users commit themselves to reduce the emissions by 13% in 2005 and 30% in 2010 (2000 as baseline year, and an expected 7% increase from 2000 to 2010 in a business-as-usual scenario). They will further develop an already well established system for handling of discarded SF_6-equipment to include administrative tools for keeping track of the gas during the complete lifecycle. This will assist in the following up of the agreement, as well as provide better estimates of national actual emissions (tier 2).

Key measures to fulfil the agreement will be related to information and education. A particular focus will be towards the avoidance of continuous leakages of gas, while widespread substitution of SF6 with other gases or technical solutions only is considered to be realistic in the longer term.

5. EMISSIONS OF HFCs

In a business-as-usual scenario the use of HFCs in Norway is expected to increase from virtually zero in the mid-1990s to 1,5-2% of total emissions of greenhouse gases by 2010. This is due to substitution of ozone-depleting substances, as well as a general increase in the use of heat-exchange systems – particularly air-condition equipment. All HFC gas is imported – either in ready-made equipment or in bulk for refilling of existing equipment.

Several measures, including a voluntary agreement, have been considered to curb the expected growth in emissions. Currently taxation is considered to be the most realistic option.

For gas imported in bulk, a tax according to CO_2-equivalents is being proposed. For administrative purposes gas in products will be taxed according to a classification system based on product type, energy consumption and group of gas (high, medium or low GWP).

The tax is expected to minimize leakages from existing systems, encourage substitution to more environmental friendly cooling agents and limit the use of HFCs as fire extinguisher to the absolutely essential applications. Recycling is encouraged by omitting recycled gas from taxation. An already well established system (originally intended for the collection of CFC and HCFC gases) is expected to handle considerable amounts of HFC gas from discarded equipment. The details regarding this system are being discussed in the parliament at the moment, and a possible inclusion of a tax refund regime is also considered.

6. TRADEABLE EMISSION QUOTAS

In 1991 Norway introduced CO_2-taxes as a step towards a cost-effective policy to limit emissions of greenhouse gases. The highest tax is for road traffic and in the offshore industry. Taxes for industry and heating purposes are according to fuel type and sector. Emissions from industrial processes, cement production and the use of natural gas is omitted, so in total the tax covers only about 47% of total greenhouse gas emissions.

For greenhouse gas emissions from industry, the Government is preparing an emission trading system for the period before the first commitment period under the Kyoto-protocol (2005-2007). This early system, which does not include i.a. agriculture, waste treatment and emissions of HFCs, is expected to be widened in the Kyoto commitment period (2008-12). Ideally the system should apply to all emission sources and gases where practical considerations make this possible – leading to a gradually replacement of taxes and other policy instruments.

It is expected that even the early system will include non-CO_2 emissions from industrial processes. Consequently PFC from aluminium and SF_6 from magnesium will be covered, and the existing voluntary agreement with the aluminium industry will be replaced by the inclusion in the quota system. There are however no plans to include GIS under this system, and for practical reasons it is unlikely that HFC will be included in the foreseeable future.