

## 1. EXECUTIVE SUMMARY AND KEY RECOMMENDATIONS

### EXECUTIVE SUMMARY

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Norway has a unique twin role as a major oil and gas producer and is a strong global advocate of climate change mitigation. As the third-largest exporter of energy in the world, after Russia and Saudi Arabia, Norway contributes to the energy security of consuming countries. At the same time, as Norwegians highly value environmental sustainability, the country is taking climate policy very seriously.

Norway has set itself an ambitious target to reduce global greenhouse gas emissions by 30% of Norwegian 1990 levels by 2020, and to become carbon-neutral by 2050. Meeting the 2020 target will be challenging, because both the country's electricity supply and energy use in buildings are already essentially carbon-free. Norway is determined and, with its large petroleum revenue, well placed to invest in developing new solutions for a low-carbon future.

### OIL AND GAS

Oil and natural gas production is the largest sector in the Norwegian economy and will continue to generate significant wealth for the country as well as benefits for other countries. As a reliable and transparent supplier, Norway improves the energy security of a large number of IEA member countries. It has a consistent and predictable regulatory framework for exploration and production, and it manages both its petroleum resources and revenue in a transparent and competent manner. The IEA acknowledges Norway's contribution to global energy security and regards its petroleum resource and revenue management as commendable and a model for other countries to follow.

The IEA *World Energy Outlook 2010* contains three scenarios for global energy supply to 2035. In all three, oil and natural gas use is expected to increase beyond 2020 and, in the absence of strong new measures to limit CO<sub>2</sub> emissions, up to 2035. Against this background of rising demand for oil and gas, the IEA welcomes the Norwegian government's efforts to encourage increases in production and recovery. It urges the government to continue to do so by opening new acreage for exploration and by offering additional favourable fiscal and regulatory incentives, when appropriate. In this context, the IEA also welcomes the treaty between Norway and Russia which settles the maritime delimitation between the two countries in the Barents Sea and Arctic Ocean.

Environmental considerations are well integrated in the government policy on the management of petroleum resources, and the IEA encourages the government to continue to develop innovative acreage management approaches in an environmentally sound manner to stimulate exploration and production in both frontier and mature areas.

While oil production is expected to continue to decline, gas production is set to increase, leading to larger exports. Investments in transportation capacity are needed to avoid bottlenecks for the new gas from the Norwegian Sea and to allow Norway to maintain its

position as a major gas supplier to Europe. The IEA encourages the government to continue to facilitate investments in gas pipelines in light of the continuous need for securing regularity and integrity in the gas transport system.

## REGIONAL ELECTRICITY MARKET

Norway deserves to be commended for the continued reliable and efficient performance of the electricity sector over the past few years. The country forms part of the regional Nordic wholesale market which is widely regarded as the model for effective cross-border market integration. Together with its Nordic neighbours, Norway is dedicated to developing the market further.

The prospects of regional integration of European electricity markets and anticipated renewable energy developments put Norway, with its large hydropower capacity, in a favourable strategic position. Many countries bordering on the North Sea and therefore close to Norway, including Germany, the United Kingdom and the Netherlands, plan to significantly increase their wind power capacity to meet their EU 2020 targets, in total by tens of gigawatts. To a smaller extent, Sweden and Norway will also be adding more wind power capacity.

Hydropower and natural gas are the most suitable technologies for backing up variable wind power generation. Norway has significant hydropower reservoir capacity and Statnett, the Norwegian transmission system operator, is planning for several new cross-border interconnections which will strengthen integration between the Nordic market and the rest of Europe. The IEA encourages Norway to use its hydropower capacity, the largest in Europe after Russia, to balance variations in demand and supply in the expanding regional market. This would increase flexibility and efficiency in the integrating regional electricity market and, therefore, enhance European electricity security.

Increased interconnections would also improve electricity security in Norway, because the almost complete dominance of hydropower in the generating mix exposes the country to supply constraints in times of low hydropower availability. Another relatively easy way to improve security of electricity supply, given Norway's natural gas production, would be to build gas-fired power plants. However, the government does not permit new gas-fired plants without carbon capture and storage (CCS) technology. This effectively rules out the gas option until CCS becomes more competitive.

Against the long-term need to decarbonise the power sector worldwide, it is perfectly understandable for Norway to avoid building more unabated carbon-intensive power capacity, but from the medium-term regional perspective, the matter looks different. In times of low hydropower availability in the Nordic market area, power is often imported from the region's coal-fired plants to meet demand in Norway. As a result, more CO<sub>2</sub> is emitted than would be necessary. The regulation also limits the use of natural gas as backup for wind power. Combined-cycle gas turbine plants would help reduce the carbon intensity of power generation, because under the EU Emissions Trading Scheme (EU-ETS), of which Norway is part, they would help push power plants with higher CO<sub>2</sub> emissions per kilowatt-hour gradually out of operation. The government should consider temporarily allowing the construction of gas-fired plants without CCS, but with readiness to install CCS, so as to enable to meet electricity demand in the Nordic market and in the EU-ETS area with lower total CO<sub>2</sub> emissions, and to help ensure security of supply.

Increasing consumer participation can provide an important source of flexibility in power systems. As a short-term measure, demand-side bidding in the balancing market is a best practice that other countries should consider. Over the long term, probably the most economical way to meet incremental demand is through the “negawatts” achieved by saving energy, but a considerable challenge for policy makers is to find effective ways to promote them in a country of generally low power prices and a very high level of per-capita use. Taxation, investment subsidies and regulation are among the options.

With its ample hydropower capacity, Norway could also help its neighbours to move towards a low-carbon future. The government should encourage further integration of the Nordic electricity market, both internally and with other market areas, to improve overall efficiency, flexibility and security of power supply. To this end, the government should facilitate increasing cross-border interconnections and demand-side measures.

## CARBON NEUTRALITY

Norway has devoted considerable attention to environmental sustainability, and climate change mitigation enjoys broad popular and political support. Norway’s global responsibility is manifested in the decision to assume a national emissions reduction target that goes beyond the country’s target under the Kyoto Protocol (-9% vs. +1% from 1990 to 2008-2012). Regarding the post-2012 period, Norway has pledged to cut global greenhouse gas emissions by the equivalent of 30% of its 1990 emissions by 2020. Norway has also declared its ambition to become carbon-neutral (taking into account its contribution to emissions reductions abroad) by 2050 and, if a sufficient number of countries take on major obligations, to bring this target forward to 2030. With its strong commitment to global climate change mitigation, Norway has set a fine example to other countries.

In many ways, Norway already is a lower-carbon economy than most others by virtue of the historical predominance of hydropower. Widespread use of electricity, also for heating, means that energy use in buildings is already essentially decarbonised. The challenge is that only oil and gas production, manufacturing and transport have large potential for further cuts in energy-related greenhouse gas emissions. Norway should continue to consider further measures to internalise the costs of CO<sub>2</sub> emissions from these sectors.

Since the Parliament’s 2008 Climate Agreement, public spending on climate change mitigation has increased substantially. Public funding for research, development and deployment (RD&D) of clean energy more than tripled from 2007 to 2009. In per-capita terms, public funding for all energy RD&D is the third-highest among the IEA member countries. Investment support for promoting energy efficiency and renewable energy through Enova, the government agency, was increased by NOK 1.2 billion (USD 191 million, EUR 137 million) from 2008 to 2009, in line with IEA’s calls for green stimulus packages. Norway deserves applause for this intensified focus on climate change mitigation.

The IEA’s view is that a global energy technology revolution is needed to meet climate change and energy security challenges. Norway’s intensified focus on RD&D therefore is very welcome. The country is already showing global leadership as one of the front-runners in carbon capture and storage. It hosts two of the world’s five large-scale CCS projects, and the government is strongly committed to significant support of further CCS technology development, demonstration and widespread deployment. Recent Norwegian RD&D efforts have also produced the world’s first floating wind turbine, Hywind.

Long-term improvements in energy efficiency in buildings are guaranteed by the strict building code, introduced in 2007. The country has also set the passive house standard as the target level for the building code by 2020 and is working towards this goal in multi-stakeholder partnerships. In the transport sector, Norway's incentives for the uptake of electric vehicles are strong by international comparison; they include exemptions from toll road charges and various taxes, free access to public parkings and funding for infrastructure developments. The government is also planning to substantially increase public transport and the use of rail in freight transport.

Progress has been made also in the renewable energy sector. Norway has recently adopted an offshore wind strategy and is now taking steps to utilise the significant potential in the sector, amounting to tens of terawatt-hour (TWh) per year. The country also has untapped hydropower potential in tens of TWh and is likely to develop it under the green certificates market with Sweden, to be launched in January 2012. More detailed plans for renewable energy will be developed after agreeing on the terms for adopting the EU 2009 Directive on Renewable Energy in Norway and in the European Economic Area (EEA).

Measures to promote energy efficiency and renewable energy have to be particularly well targeted, because they will not necessarily contribute to carbon neutrality. This is because measures often target electricity generation or use, but electricity supply is already practically carbon-free. The government should also be careful to avoid any possible negative impacts from increases in renewable electricity supply on the incentives to use electricity more efficiently. Commendably, in its support policies and climate strategy, Norway is using cost-effectiveness as a key criterion (NOK/kWh, NOK/tonne of CO<sub>2</sub> avoided) for prioritising across measures. As mitigation efforts at home will likely be more expensive than purchasing emission credits from abroad, the government should also remain open to such purchases, as implied by the global nature of the carbon neutrality goal. To clarify the way forward, the government should develop a roadmap towards the objective of carbon neutrality. Once adopted, it should ideally begin to implement the roadmap without delay.

## KEY RECOMMENDATIONS

*The government of Norway should:*

- Stimulate further increases in petroleum production from safe and environmentally sustainable operations and continue to consider further measures to internalise the costs of CO<sub>2</sub> emissions from the sector.*
- Promote further integration of the Nordic electricity market, both internally and with other market areas, to improve overall efficiency, flexibility and security of power supply; facilitate increasing cross-border interconnections and demand-side measures to this end.*
- Develop and implement a roadmap towards the objective of carbon neutrality.*