

## NORWAY

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## INTRODUCTION AND BACKGROUND

As an energy nation, Norway is in a unique energy situation compared to most other countries. A highly developed industrial country, Norway produces 10 times as much energy products as it consumes. Almost 95% of the energy produced is oil and gas for worldwide consumption—particularly the European market. In addition to fossil energy, Norway has a production capacity for electricity from hydropower comparable to the domestic consumption and a large magazine capacity.

Although other renewable energy production is still very low, a large share of wind power has been installed and put into production over the past few years, yielding a new 2014 record of 2.2 TWh. This figure is more than double the production since the last HIA report. Another 3.4 TWh gas-fired power is produced annually in Norway. Due to the high share of hydro power, the actual production varies from year to year, and the variations can be as high as 30–35TWh. With a number of cables to Sweden, Denmark, and the Netherlands, Norway is exporting surplus energy in wet years and importing energy in dry years. Over the past decade Norway experienced more precipitation than normal, resulting in an energy surplus and low electricity prices.

Norwegian energy consumption is about 60% based on renewable energy when transportation is included. As a consequence of the renewable energy certificate system with Sweden, and with a newly set Norwegian target of 67%, the rate is expected to increase. In the period 2012–2020 the certificate system will contribute 28 TWh, of which 10 TWh is already built, most of it in Sweden. The Norwegian Wind Association expects another 7 TWh of wind power in Norway in 2020. New production and distribution capacities are sustaining Norway's ambition to be a net exporter and to provide energy storage to the European energy grid.

## UPDATE ON MEMBER'S ENERGY FRAMEWORK

### UPDATE ON RELEVANT POLICIES

The National Climate Agreement from 2013 and the National Transport Plan 2014–2023 call for future growth in passenger transport in major urban areas through more public transport, biking and walking.

Norway has negotiated with the EU and has decided to match a European Union goal of cutting greenhouse gas emissions at least 40 percent below 1990 levels by 2030 under a new government plan. Norway's target will be part of a U.N. deal, due to be agreed in the COP meeting in December 2015 in Paris.

### UPDATE OVERVIEW ON RELEVANT PROGRAM

There is no specific hydrogen related R&D program in Norway. The Research Council launched the new Energy R&D program ENERGIX at the beginning of 2013. Hydrogen is one part of this program, which also covers renewable energy production, energy efficiency, energy system, energy use, other environmental friendly fuels for transport, etc.

## VITAL STATISTICS

### Non-EU Member state

#### Population

5,165,802

#### Territory

323,802 km<sup>2</sup>

#### Capital

Oslo

#### GDP/capita

613,366 NOK

#### Average Annual GDP Growth

10.7% (2014)

#### Primary Energy Structure (2013)\*

#### Primary energy production [TWh]

#### Total production

#### Production by carrier:

2,264

Coal: 14.5

Fuel wood 16

Crude oil 842

Gasoline, liquid gas 55

Natural Gas 1,113

LPG 93

Hydropower 129

Wind power 2.2

District heating 5.3

#### Electricity balance [TWh]

Hydropower 129

Thermal power 3.4

Windpower 2.2

Import 10.1

Export 15.1

\*Wind power statistics from 2014



In the beginning of 2015, there was a portfolio of 11 research and innovation projects being funded from the ENERGIX-program. These are lead topics such as PEM fuel cells, proton conductors, electrolysers and systems. In addition, the ENERGIX-programme is giving additional funding for Norwegian participants in the FCH JU in Brussels. Norwegian companies, research institutes and universities have developed strong capabilities in test, demonstration and infrastructure build-up of HFC technologies based on support from the program. The budget for hydrogen activities has been reduced somewhat the last few years, partly due to the support to FCH JU projects.

Norwegian R&D institutions participate in the EU's Joint Undertaking, FCH JU. Due to lower funding in the FCH JU compared to the framework program, the Research Council has supported Norwegian institutes' participation approved FCH JU projects through the ENERGIX program. The extra funding from ENERGIX has been given to secure the same financial situation provided in the framework program.

### FUNDING FOR DEPLOYMENT AND COMMERCIALISATION OF RENEWABLE TRANSPORT SOLUTIONS

Norway has the fastest growing battery electric vehicle fleet in the world per capita. In April 2015, Norway surpassed the 50,000 vehicle sales mark. This happened to a large extent thanks to very favourable incentives for zero emission vehicles such as: free parking spaces in city centres; free passage on toll roads and ferries; access to public transport lanes; a 90% exemption from taxation on purchase of a BEV; a 90% discount on annual road fee, etc. With the high numbers sold and the exponential growth rate, the government has announced that a revision of vehicle and road taxation will be implemented in the coming years. FCEVs have benefited from these incentives for a few years. There are ongoing negotiations for prolonging the FCEV exemption, while BEVs will experience a gradual phase-out for its attractive benefits.

### THE END OF TRANSNOVA AND THE TRANSITION TO ENOVA

The last 15 some years, the state-governed public body Enova SF has provided funding for bringing new renewable energy technology to the market. With their main focus on environmentally friendly production and consumption of energy, the agency has prioritized the stationary sector. As a large Norwegian public agency, Enova had a 2014 budget of 3.1 bn NOK (approx. US\$385 million) for co-financing of projects investing renewable energy and energy efficiency measures.

In 2009, to address the growing emission challenges in the transport sector, the Government established a new public support agency—Transnova—through the Ministry of Transport. Transnova provided funding for demonstration and trialling of new transport technologies. With allocations from the Government given on a yearly basis, Transnova had 2014 budget of 90 million NOK (US\$11.2 million).

For the past five years, Transnova has contributed to the development and demonstration of a broad range of projects with different energy carriers for the transport sector. After five years of program operation, an evaluation highlighted obvious advantages of merging this funding scheme with the public support schemes for the stationary sector. This finding led to the national Government decision to merge Transnova into the much larger stationary agency Enova in 2015. At the time of writing (April 2015), Enova is under way to develop a new transport incentive and support scheme.





## PROGRAMS, PROJECTS, INITIATIVES IN BRIEF

### ESTABLISHMENT OF THE NEW HRS OPERATING COMPANY HYOP

From the foundation of the HyNor Project and through regional initiatives and projects, Norway currently (as of year-end 2014) has a network of six refuelling stations, where one is dedicated for bus refuelling (350 bar).

The HyNor project has acted as an overarching national institution, but infrastructure development has had a stronger regional focus around the Oslo region during the last few years. Statoil, which owned a few of the HyNor stations opened from 2007, decided to phase out all renewable energy activities starting in 2011. As the HRS infrastructure was affected by this decision, a regional initiative decided to establish a new HRS operator company; in May 2012 HYOP was created. HYOP secured an agreement transferring the ownership of stations from Statoil, as well as the H2Moves station located in Oslo. An operating agreement for the new Hynor Lillestrøm station was made that same year. At the moment, HYOP operates 5 stations.



### REGIONAL HYDROGEN COMMITMENT IN OSLO AND AKERSHUS

Since 2014, the H2Moves Scandinavia project brought 17 FCEVs to the Oslo region, 10 Mercedes F-CELL, 5 Think City Electric FC and 2 Hyundai ix35 FCEVs. Acting as an important part of the Scandinavian Hydrogen Highway Partnership, and in cooperation with Swedish and Danish partners, the three-year Interreg Next Move project also contributed to 13 additional publicly owned Hyundai ix35 FCEVs to the ÖKS-region in 2013 and 2014. Local regional actors have contributed as early fleet users, making the technology more well-known and visible to the public while providing extensive touring and test drive opportunities to residents. In Norway (picture above), four of the cars were delivered to the municipalities of Skedsmo and Oslo, in the region of Akershus and the Romerike Waste Recycling Agency (ROAF).

The HyNor Oslo Bus initiative evolved into the CHIC project—Clean Hydrogen in European Cities, supported by FCH JU. Since 2012, five EU cities have procured and tested a fleet of a total 26 fuel cell buses, five of which are operational in the Oslo region. The project will last until the end of 2016, but planning is underway for a continuation and ramp-up plan for a larger FC bus fleet in the Oslo region (see below). The project shows a steady growth of bus operation reliability, where the VanHool buses are functioning very well with good feedback from drivers and passengers. Air Liquide provided the refuelling station at Rosenholm in Oppegård, Akershus—which is the largest in Norway to date.



The Hynor Lillestrøm HRS opened in Lillestrøm in 2012. It also functions as a national test centre for demonstration of new HFC technology. The companies ZEG Power and Hystorsys are testing hydrogen production from reforming of locally produced biogas as well as metal hydride storage, in collaboration with the Institute for Energy Technology.

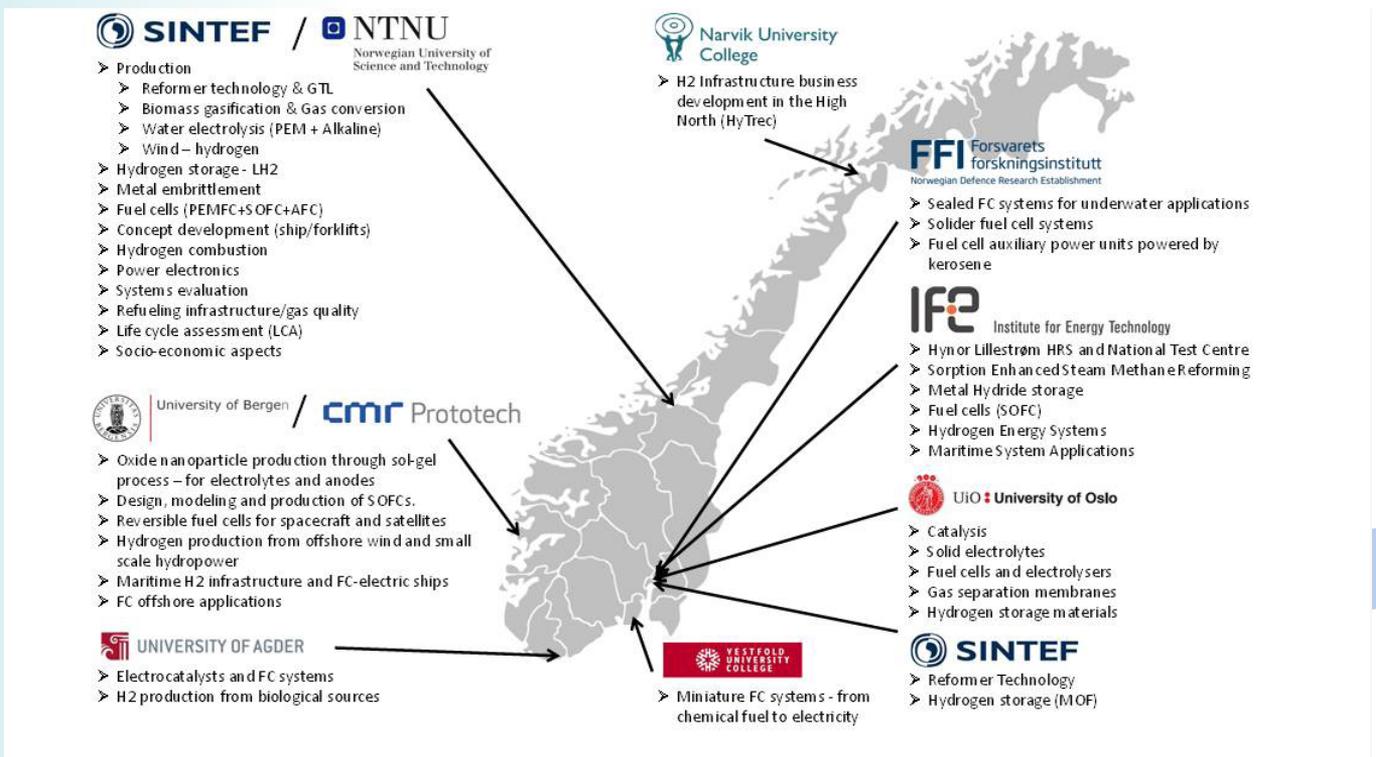
Akershus County Council and the City of Oslo have for many years had ambitious climate and energy policies. With Akershus in the lead, they co-developed and approved a new Regional Hydrogen Strategy in 2014, which aims for a significant growth of HRS and fleet development for the coming years, with a set of incentives and policies for public-private coordination towards 2025. The strategy aims for at least 350 FCEVs and 30 buses in the region by 2018 and 10,000 cars and 100 buses by 2025. In October



2014, Akershus CC released an Action Plan which covers investments and policies for 2015-2016 (approx. €6.5 Mill. ). The City of Oslo is currently finalizing the process with an overall Climate and Energy Strategy, where transport sector policy will be of highest priority. For further reading, please see [www.oreec.no/hydrogen](http://www.oreec.no/hydrogen).

**R&D PROJECTS NATIONWIDE**

Norwegian R&D institutions have long traditions of participating in international collaborative research projects, particularly within the European FCH JU programme. With the new 2<sup>nd</sup> Joint Undertaking period under Horizon 2020 and together with industrial actors, Norwegian R&D institutions are already getting involved in a broad range of new projects.



**REFERENCES**

**MEMBER WEBSITE**

[www.rcn.no](http://www.rcn.no)

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