IEA GEOTHERMAL

Norway Country Report
2012

IEA Geothermal
Implementing Agreement

National Activities

Chapter 18 of Draft 2012 GIA Annual Report

Norway

Figure 18.3 Ny Ålesund, Svalbard located on 79 ° N.

18.0 Introduction and Overview

Norway is a young nation when it comes to utilisation of geothermal energy. So far there is no electrical production from geothermal resources which are dominated by the deployment of heat pumps which are quite widespread. Norway has no deep geothermal installations in operation, but there are preliminary plans for utilizing deep geothermal energy in a district heating system in mainland Norway, and to replace fossil fuels with geothermal energy in Ny Ålesund, a remote settlement in Artic Svalbard.

There is a strong lobby from academic institutions (universities, research institutes) and industry to promote all aspects of geothermal energy amongst politicians and the public. The umbrella organisation for this lobby is the "Norwegian Centre for Geothermal Energy Research" (CGER) which was established in 2009, and which at the beginning of 2012 had 16 partners from universities, research institutes, and industry. The main argument for establishing geothermal energy in an "oil country" Norway is country´s official energy policy to increase the use of renewable energy resources combined with valuable experience and know-how in off-shore technologies possessed by Norwegian industry and academia which could be readily utilised by the emerging geothermal industry.

18.1 Highlights and Achievements

Norway has organised in May 2012, 27th IEA-GIA ExCo meeting in Oslo. The meeting took place together with all the IEA-GIA Annex meeting at Statoil's offices at Vækerø (see Figure 18.1). In the same week CGER organised one

day seminar (also at Vækerø) which was attended by several IEA-GIA ExCo members with scientific contributions from both Norwegian and foreign guests. The latter were primarily IEA-GIA ExCo members. In connection with these events IFE organised for IEA-GIA one day workshop at Kjeller (HQ of IFE on the outskirts of Oslo) on the topic of corrosion, scale and tracer technology. The workshop consisted of presentations by key members of IFE's scientific staff followed by laboratory visits. All these events which took place within one week were a great success. This included also weather and various social events which took place at the same time.

Figure 18.1 ExCo members attending the meeting at Statoil.

The major geothermal activity in Norway is ground source heat pumps. According to the heat pump organization NOVAP there are about 5000 new geothermal installations per year. More than 90 % of the GSHP systems utilize energy from boreholes in crystalline rocks by use of borehole heat exchangers (BHE). The Norwegian standard system is a 50-350 m deep borehole of 139 mm (115mm) diameter with a single 40 mm U tube installed. Most of the BHEs are kept open without grouting. There is a trend towards deeper BHEs. An installation with a 500 m deep single U tube has successfully been delivering heat for more than two years. Some of the BHE fields established recently have boreholes of 300 m depth. These have been reported in the two previous IEA-GIA annual reports.

Figure 18.2 and Table 18.1 illustrate GSHP development over the past years The yearly variation reflects the prices of electricity where 2003 was a dry year with low hydro power production and 2005 wet year. There is a clear trend with increasing interest in geothermal Ground Source Heat pumps- GSHPs (water/water, air/water heat pumps), but the Norwegian heat pump market is still dominated by air/air heat pumps with number of installations larger by the order of 10 in comparison with GSHPs.

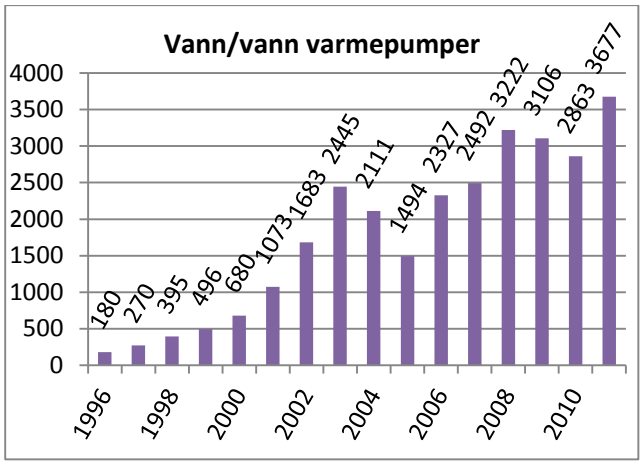

Figure 18.2 Annual installation of *water/water* heat pumps in the period 1996-2011(Statistics for *air/water* heat pumps are similar). The numbers for 2012 were not available when the report was compiled.

Table 18.1 Geothermal energy use in Norway for 2012. (The data is based on gross estimates. na=data not available).

Electricity	
Total Installed Capacity (MW_e)	0
Contribution to National Capacity (%)	0
Total Generation (GWh)	0
Contribution to National Demand (%)	0%
Direct Use	
Total Installed Direct Use (MW_{th})	na
Total Heat Used (PJ/yr) [GWh/yr]	na
Total Installed Capacity for Heat Pumps (MW_{th})	2000

- 3677 water/water heat pumps were sold in Norway in 2011, which gave energy savings 434,4GWh.
- 2914 air/water heat pumps were sold in Norway in 2011 which gave energy savings 183,7GWh.
- The total number of annually registered energy wells is circa 5000.

18.2 National Programme

As the third-largest exporter of energy in the world with a domestic electricity supply almost totally dominated by hydropower, Norway is unique with respect to energy resources. Norway has one of the largest share of renewable energy both in its total primary energy supply and in electricity supply. Norway has set itself an ambitious target to reduce global greenhouse gas emissions by 30% relative to 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.

In 2002 Enova SF was established as a public enterprise to promote energy saving and new renewable sources of energy. Enova is funded through an Energy Fund made up partly from an earmarked grid levy and partly from the state budget. Today the Energy Fund is about 25 billion NOK (3.4 billion Euro) and will increase by 10 billion NOK (1.4 billion Euro) within 2013. Funding from Enova has resulted in energy savings of 21 TWh since 2002, (www.Enova.no)

Over the last decade Norway has strengthened its energy R&D efforts and the government funding is almost tripled in this period. A new national collective R&D strategy for the energy sector, ENERGI 21, was launched in 2008 and revised in 2011. The vision of the strategy is to be the leading energy and environment conscious nation in Europe. The implication of the ENERGI 21 document has been dealt with in the previous two country reports, where it pointed out that ENERGI 21 has given deep geothermal energy low priority in its strategic plan which effects government short term and long term funding of geothermal.

In 2008 the Norwegian Parliament adopted the Climate Agreement to increase energy research, development and deployment (RD&D) by 600 million NOK (80million Euro) for CCS and non-fossil based energy systems. Public funding for energy RD&D is among the highest in the world. To develop expertise and promote innovation in targeted energy R&D areas, eight centres for environment–friendly energy research (FME) were established in 2009. Each of the centres receives annual funding of 10-20 million NOK (1.4 - 2.7 million Euro) for eight years. Geothermal energy was not a prioritized area in 2009 but a new Climate Agreement was approved by the Parliament in 2012 with a specific decision to establish a research centre in geothermal energy.

There has been an increase in GSHP particular for larger buildings after a new building code with strict requirements for energy efficiency was introduced in 2007 and revised in 2010. These new energy performance requirements are expected to cut the need for energy for heating purposes by around 25%. The new regulations also specify that, as a main rule, a minimum of 60% of the energy required for heating and hot water in new and refurbished buildings above 500m^2 must be supplied by energy carriers other than electricity and /or fossil fuels. This opens up the possibility that a lot of medium sized GSHP installations will be needed for ubiquitous locations such as school buildings. The building code will be revised in 2015. The target level is the passive house standard or active houses producing energy.

Another new legislation which has contributed to increased interest for GSHPs is the energy labelling scheme. From 2010 this scheme requires buildings to have an energy certificate and an energy consumption label when built, leased or sold. These schemes are assumed to promote increased knowledge and awareness of the energy consumption in buildings.

18.3 Industry Status and Market Development

We refer to IEA-GIA Annual reports from 2010 and 2011 for further details.

18.4 Research, Development and Demonstration/Deployment

We refer to IEA-GIA Annual reports from 2010 and 2011 for further details.

An interesting initiative launched in 2012 is geothermal plan for Ny Ålesund, Svalbard (Chapter Figure; Figure 18.3). Svalbard is an archipelago in the Arctic Ocean, located north of mainland Europe. The Svalbard Treaty of 1920 established full Norwegian sovereignty over Svalbard. Ny Ålesund is a remote settlement on the west coast of Spitsbergen, the main island of Svalbard. Funding is being sought for investigations relating to the replacement of fossil fuel with geothermal energy for this settlement, where research of the artic environment is a main activity. There are lots of uncertainties regarding the geothermal potential and the geology in this region, but there exist hot springs in an area north of Ny Ålesund.

18.5 Geothermal Education

We refer to IEA-GIA Annual reports from 2010 and 2011 for further details.

CGER has continued to run for its members workshops on topics which are relevant to geothermal energy. In November 2012, CGER organized a one day workshop in Bergen with a major session entitled "Downhole measurements and monitoring for geothermal wells". Additional presentations were given by invited guests from Hungary and Slovakia.

18.6 Future Outlook

Shallow geothermal energy (heat pumps) is a wildly used in Norway. However, deep geothermal energy is relatively a new concept for the Norwegian establishment in particular

for public, politicians, funding agencies, press (media), industry and also research organizations.

CGER continues to promote geothermal energy in Norway so it is more well-known and accepted as an important component in the renewable energy mix. In this aspect, CGER will organize in autumn 2013 a major geothermal conference GeoEnergi 2013 which is a follow up of a successful conference GeoEnergi 2011. This 2 day event is aimed at scientists, media and policy makers, and will be addressed by several distinguished international guests including President for International Geothermal Association Professor Roland N. Horne.

CGER has become member of EGEC (European Geothermal Energy Council**)** thus gaining access to valuable network of international geothermal organizations.

CGER makes all its efforts so that the Norwegian government follows the White Paper on "Climate Agreement" from 2012 where geothermal energy has been mentioned specifically as one its priorities.

18.7 References and Websites

IEA Energy Policies of IEA Countries, Norway 2011 Review OECD/IEA (2011)

- www.rcn.no
- www.cger.no
- www.enova.no
- http://www.energi21.no/
- www.novap.no

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