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EGEC Deep Geothermal Market Report

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SUMMARY/ABSTRACT

The geothermal industry experienced significant growth in 2010, and the total installed electric capacity in Europe now amounts to around 1.6 GW_e, producing some 10.9 TW_eh of electric power every year. There are 59 geothermal power plants in Europe, with 47 of these located in EU Member States, namely in Italy where there are 35 plants; meaning an EU installed capacity of ca. 0.9 GW_e. According to the 75 planned projects (a geothermal plant typically needs 5 years to become operational), additional capacity will grow from 1.6 GW_e installed in 2011 to 2.6 GWe in 2015, with this major increase linked to the rapid growth of the Turkish and Icelandic markets. In addition, 99 projects are currently being explored, representing a capacity of around 0.75 GW_e.

After 20 years of slower paced development, the geothermal district heating (GeoDH) market has seen a renewal of momentum in the last 2 years. Currently, there are 212 GeoDH systems in operation in Europe, with a total installed capacity of about 4.7 GW_{th}. The heating and cooling sector represents 50% of the final energy demand in Europe, and geothermal is more and more attractive as a competitive renewable heating source, as there is a dual need to decarbonize this sector, while ensuring the provision of heating at an affordable price for consumers. The 'hot' GeoDH markets in Europe are in France (Paris, and renewed activity in the Aquitaine basin), Germany (Munich) and Hungary, but it is important to always underline that GeoDH systems can be installed in all European countries. In recent times, there have been new entrants to the market: The Netherlands, Spain (Madrid), UK (Newcastle) etc. By 2020, nearly all states in Europe will have GeoDH.

INTRODUCTION

After almost a decade of only small capacity development in the geothermal electricity market, in recent years there has been resurgence in interest in geothermal power development. Numerous projects have been launched throughout Europe, with new capacity coming on line in Iceland and Turkey in particular. Geothermal energy is firmly on course to become a decisive factor in the European energy mix.

However, it must be noted that progress in recent years varied widely, differing significantly from country to country. Such variations can be attributed to several factors, to be grouped in two clusters:

- Resources: In relation to resource side factors, the most important is the geological potential; high enthalpy resources can sustain significantly larger new capacities on the short term, while new power plants or CHP plants in hydro geothermal settings are generally much smaller, and EGS power plants still need time to become an economically viable alternative for other geological conditions.
- Non-technical issues: As regards to non-technical factors, the different national regulations and incentive schemes have an effect, in addition to varying availability of financing facilities, insurance etc.

For geothermal district heating, there is a similar context, with a further complication which has been slowing market development. While delivery of electricity generated from geothermal power in Europe is rarely a problem due to the well developed and readily available electric grid, the delivery of heat to consumers is always linked to a dedicated heating network. Therefore, there has been an interesting development in places where resource and demand overlap, and where district heating either exists already or can be set up economically, due to a sufficiently dense demand.

1 GEOTHERMAL ELECTRICITY

The development of geothermal power is compiled on a world-wide basis every five years at the World Geothermal Congresses (WGC). It should be noted that due to the early preparation of country update reports, WGC data typically refer to the year before the congress, or even two years before. So the data from WGC 2010 concern mainly the year 2009. Figure 1 shows a graph of installed electric power capacity prepared from the European subset of the WGC 2010 data.

In autumn 2011 EGEC compiled its first Deep Geothermal Market report [EGEC, 2011]. The equivalent subset to the WGC 2010 figure is given in Figure 2; values mainly are taken from contacts with the plant operators, and they reflect a more current situation, which explains some differences in numbers.

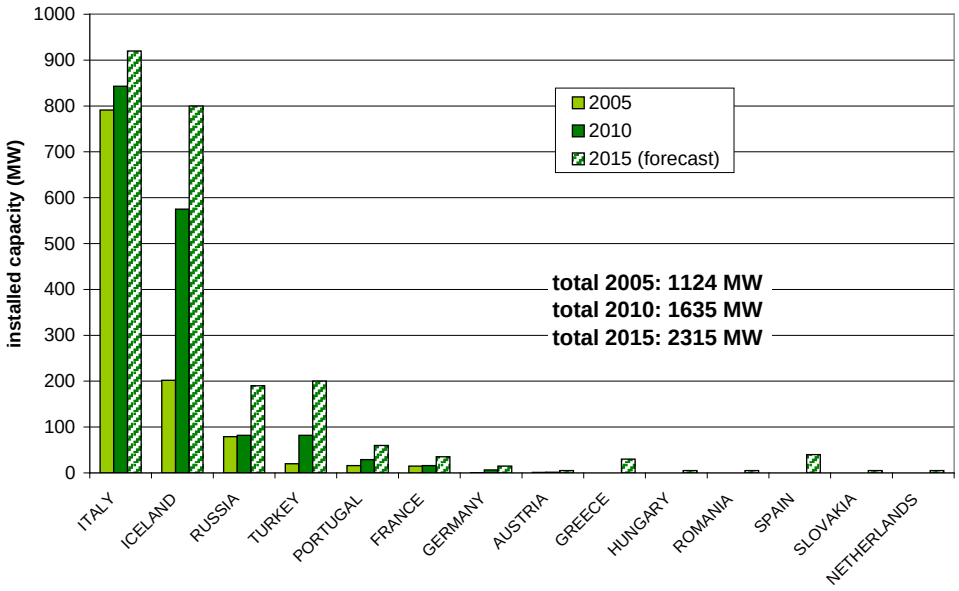

Figure 1: Installed capacity of geothermal power in Europe, after WGC data (mainly from [Bertani, 2010])

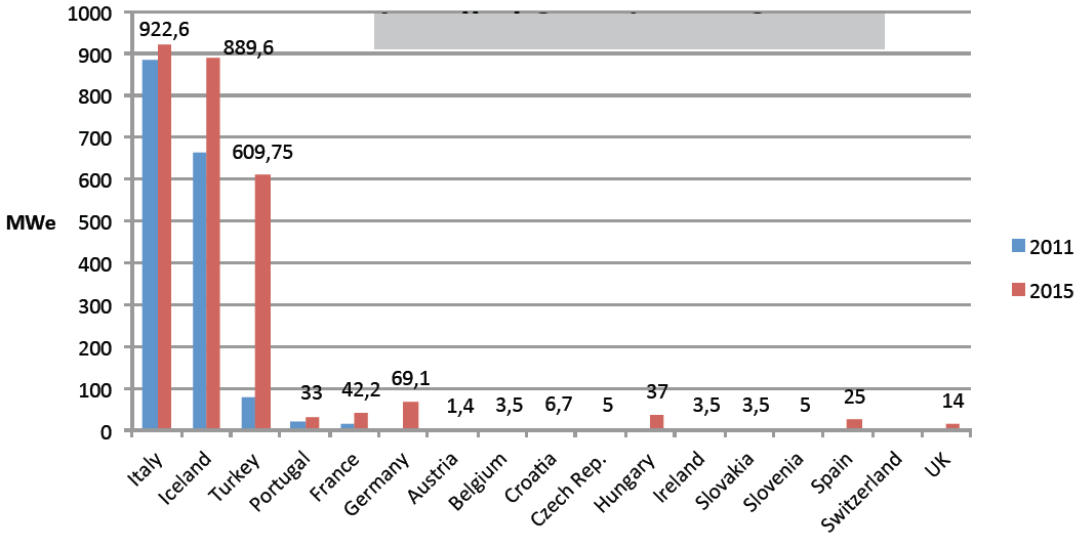

Figure 2: Installed capacity of geothermal power in Europe in 2011 and forecast to 2015, after EGEC market report [EGEC, 2011])

Summing up all the individual power plants, geothermal energy in Europe today can deliver slightly more then 1.6 GW_e of electric power (figure 3): data from WGC 2010 and from the EGEC market report are quite consistent here (despite not counting Russia in the EGEC report, as the Russian power plants in the far East belong more to the circum-pacific area than to Europe). Concerning the expectations for 2015, by counting the capacity of plants under construction, the numbers in the EGEC market report are higher, in particular due to higher expectations now in Iceland and Turkey.

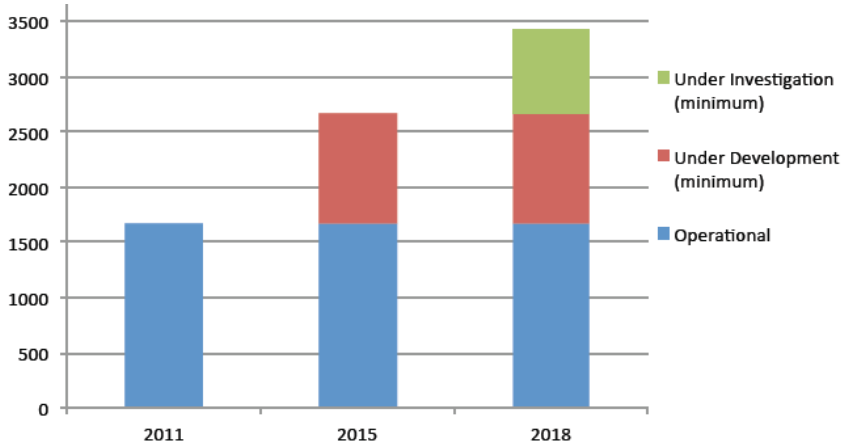

Figure 3: Summary of installed capacity of geothermal power in Europe in 2011 and forecasts to 2015 and 2018, after EGEC market report [EGEC, 2011])

Within the European Union, the development of renewable energy use is somehow regulated within Directive 2009/28/EC of the European Commission, Council and Parliament. The goal is to achieve an overall share of 20 % of final energy from renewable sources within the total final energy consumption of the EU, with the individual, mandatory shares to be achieved by the member states laid down in Annex I of the Directive. Each member state had to deliver a National Renewable Energy Action Plan (NREAP) to explain how the state wants to achieve this target, and to give an itinerary towards 2020 for the individual sources. Figure 4 summarises the values given for geothermal power in those NREAPs that consider geothermal power at all (10 of 27 countries); the differences both in absolute numbers (Italy leads by far) and in the shape of the curve (cf. Greece) are substantial.

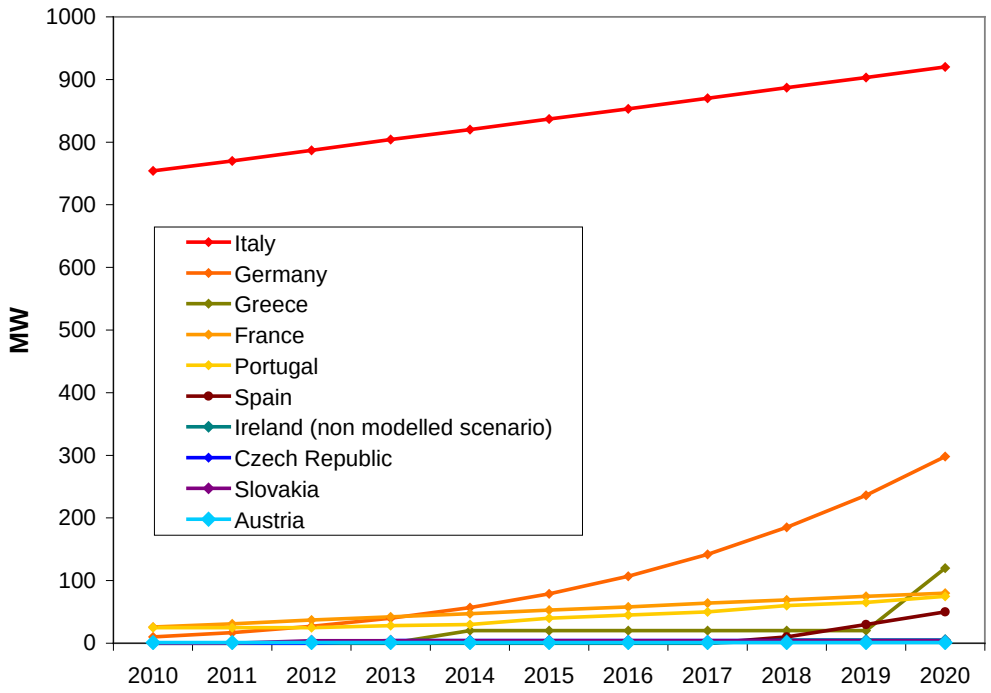

Figure 4: Development paths for installed capacity of geothermal power in EU member states, as to the NREAPs published in 2010

2 GEOTHERMAL HEAT (DEEP)

Again, the World Geothermal Congresses (WGC) provide a very good overview of the global market every five years. In figure 5 the installed thermal capacity is shown for the different EU member states and for some non-EU-countries in Europe. It is obvious that the lion´s share of geothermal heat within EU is delivered from shallow geothermal installations, with the highest amount of deep geothermal heat in Italy, and the largest variation of deep geothermal applications in Hungary. Outside EU, geothermal district heating is predominant in Iceland (the highest number world-wide!) and Turkey, while Norway and Switzerland use a considerable amount of shallow geothermal heat.

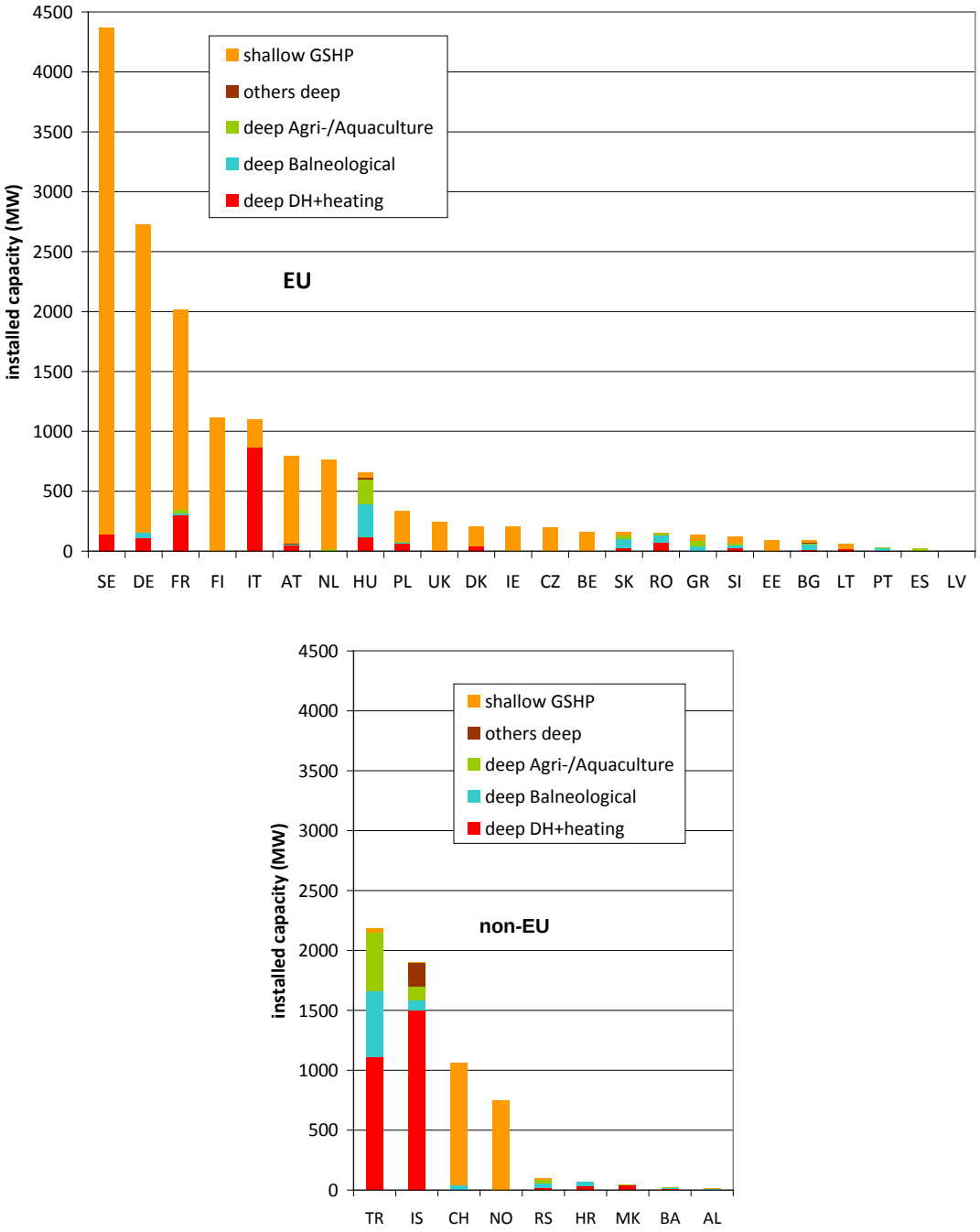

Figure 5: Installed capacity of geothermal heat in Europe, distributed by source (deep/shallow) and application, after WGC data (mainly from [Lund et al., 2010]); EU Member states above, non-EU states below.

In the EGEC market report [EGEC, 2010], the data for 212 geothermal district heating plants are collected, as well as for about 170 plants planned or under construction (figure 6). In particular in France, Germany and Hungary, a considerable number of new plants are expected to become operational within the next years. The development of produced heat as forecasted in the NREAPs is shown in figure 7. Values are given by 14 EU member states, while some others where geothermal district heating plants yet are existing did not provide any clue for the development (e.g. Denmark).

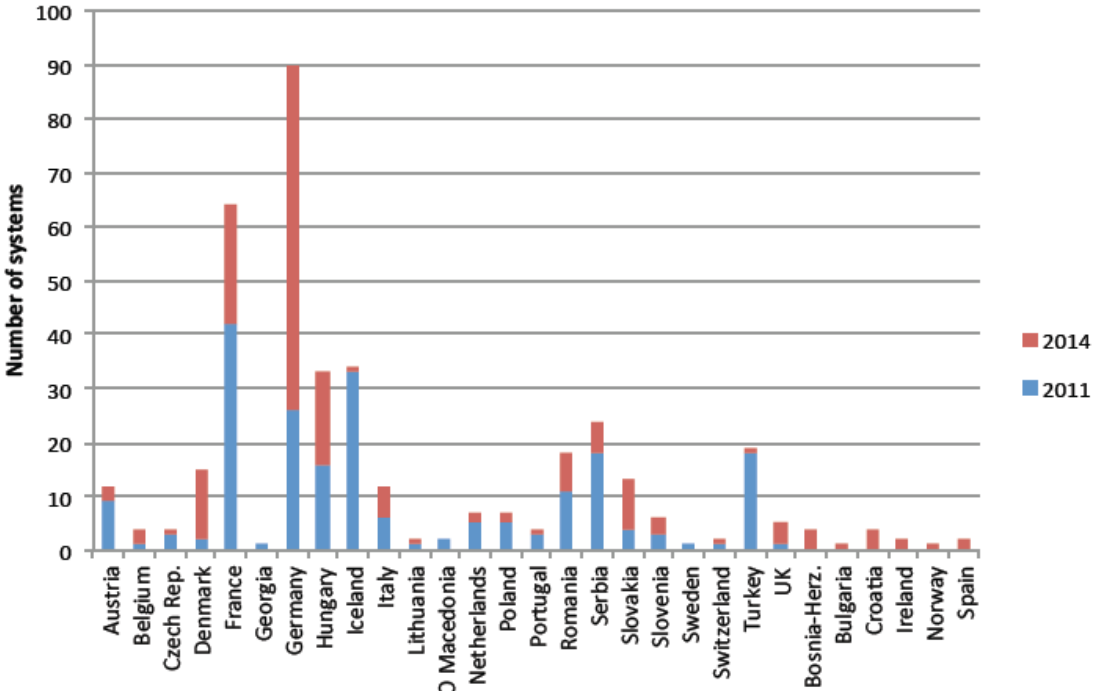

Figure 6: Number of geothermal district heating systems in Europe in 2011 and forecast to 2014, after EGEC market report [EGEC, 2011])

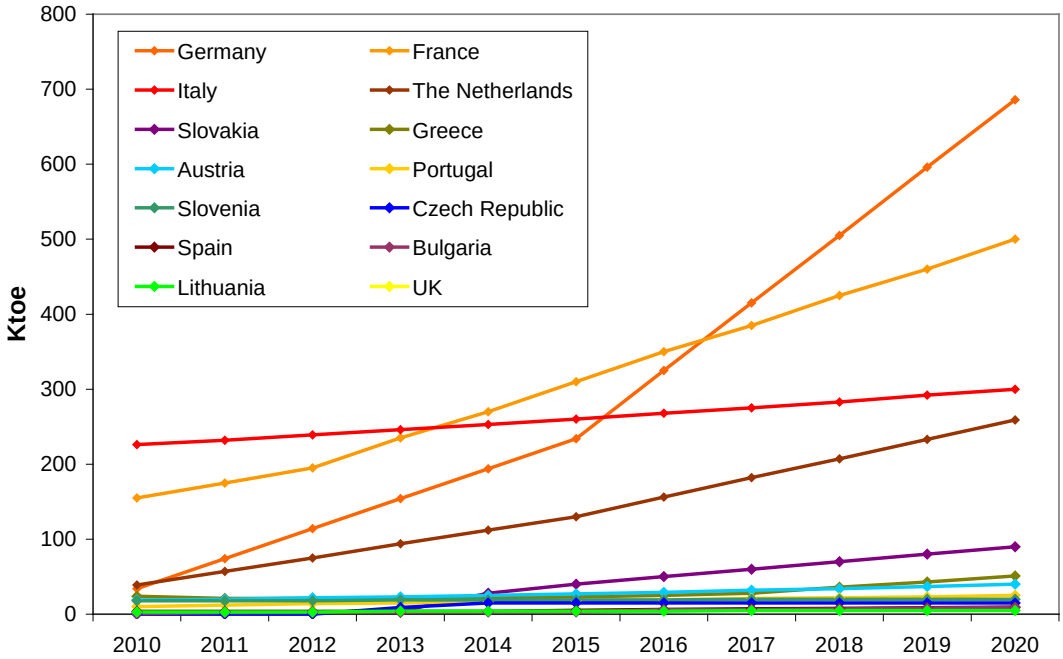

Figure 7: Development paths for produced heat from deep geothermal sources in EU member states, as to the NREAPs published in 2010

For the renewable heat sector, the European Technology Platform for Renewable Heating and Cooling (ETP-RHC) has also elaborated scenarios and a related research agenda for the geothermal sector, through the Geothermal Panel of the platform (see: http://www.rhc-platform.org). The Geothermal Panel had put together scenarios for the development of geothermal heat in the different sub-sectors (figure 8):

- shallow geothermal (mainly geothermal heat pumps)
- deep geothermal direct uses, like district heating
- the heat share from geothermal combined heat and power (CHP)

A vision towards 2050 [ETP-RHC, 2011], based on the sectorial figures from biomass, geothermal and solar thermal, and the additional contributions enabled through cross-cutting technologies like storage, heat pumps, hybrid systems, explained how the total heating and cooling demand within the EU might be covered from renewable sources in the timeframe to 2050 (figure 9).

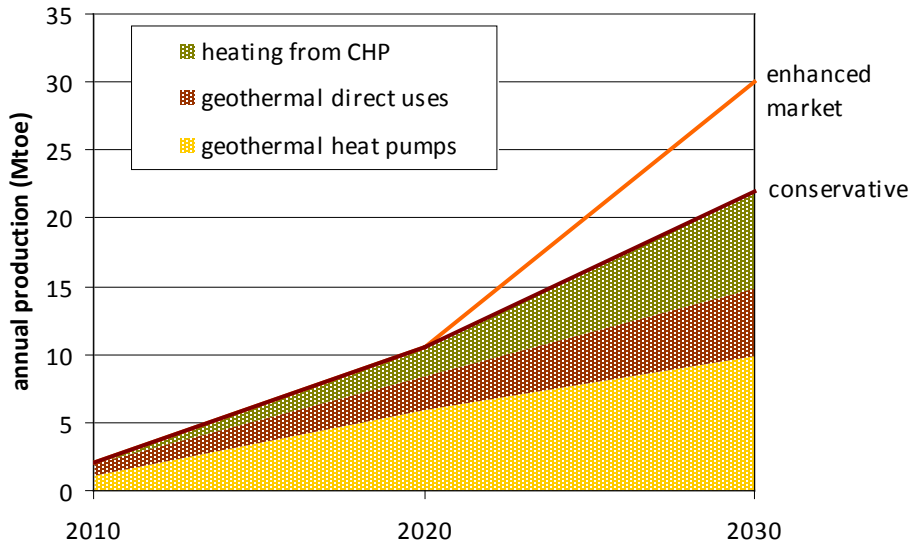

Figure 8: Geothermal heating (and cooling) scenarios 2020 and 2030 [ETP-RHC, 2012]

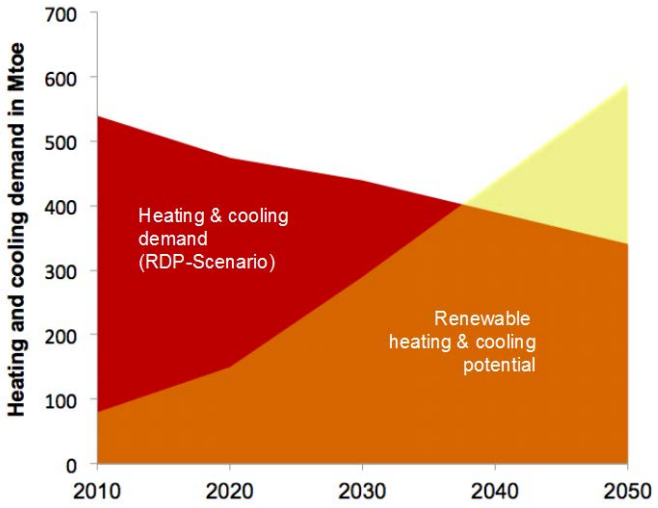

Figure 9: Possible development of renewable heating and cooling towards a full coverage of the demand inside the EU in the timeframe up to 2050 (after data from [ETP-RHC, 2011])

3 REFERENCES

Bertani, Ruggero, 2010: Geothermal Power Generation in the World 2005-2010, Update Report, Proc. WGC 2010, IGA, Bali, paper #0008, 41 p.

EGEC, 2011: Deep Geothermal Market Report 2011, EGEC, Brussels, 42 p.

ETP-RHC, 2011: Common Vision 2020-2030-2050, ETP-RHC/EGEC, Brussels, 48 p., download: http://www.rhc-platform.org/publications/

ETP-RHC, 2012: Strategic Research Priorities for Geothermal Technology, ETP-RHC/EGEC, Brussels, 70 p., download: http://www.rhc-platform.org/publications/

Lund, John; Freeston, Derek; Boyd, Tonya, 2010: Direct Utilization of Geothermal Energy 2010 Worldwide Review, Proc. WGC 2010, IGA, Bali, paper #0007, 23 p.