

ENGINE Workshop

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Geothermal Energy for heating in Europe - status and roadmap to 2020 -

Presented by

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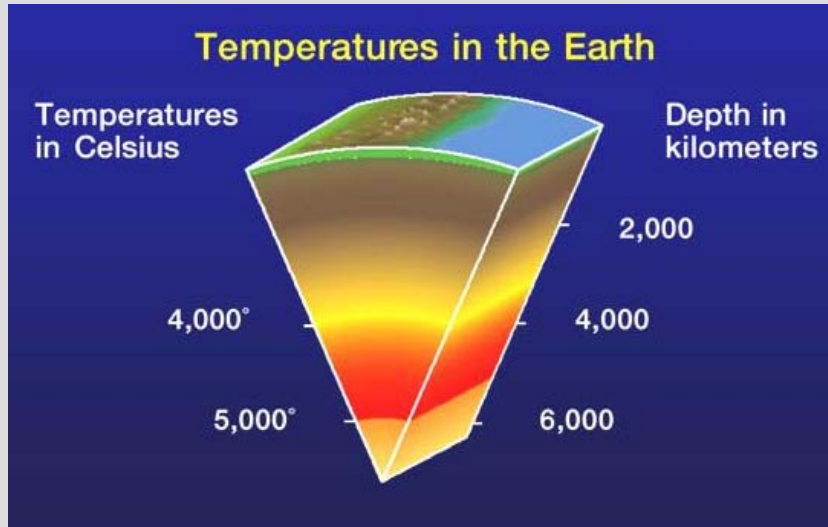
Not all Renewable Energy comes from the sun...



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Not all Renewable Energy comes from the sun...



Graph from Geothermal Education Office, California



...as the earth continuously is releasing about 40 Mio MW of heat from its interior!

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Renewable Energy Policy in Europe

On Jan. 10, 2007, the European Commission released an “energy package”, including a renewable energy roadmap.

A target of 20 % reduction of CO₂ by 2020 is set; renewable energies are just one of the tools to reach that.

At the spring meeting of the European Council on March 9, 2007, the heads of state agreed on that target for CO₂-reduction, and in addition on a target for a share of renewable energy sources within the whole energy sector of the European Union (electricity, heat/cold, transport) of 20 % by the year 2020.

Renewable Energy Policy in Europe

. For these reasons, taking into

consideration different individual circumstances, starting points and potentials, it endorses the following targets:

- = a binding target of a 20% share of renewable energies in overall EU energy consumption by 2020;

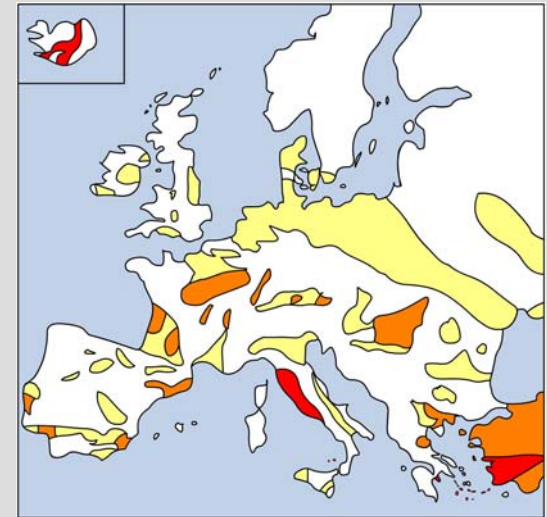
Currently the European Commission prepares a plan on how to divide this renewable energy share over the individual member states (to be expected in autumn 2007).

In this respect a new directive is under preparation to foster renewable energies in all the sectors, and by that eventually replacing the existing directives on RES for electricity and on biofuels around the years 2009-2010.

The situation of Geothermal Energy in Europe

The situation is very different in the various countries and geothermal technologies, according to natural resources and political issues.

High enthalpy resources – in Italy, Greece, etc., for power, heat and other



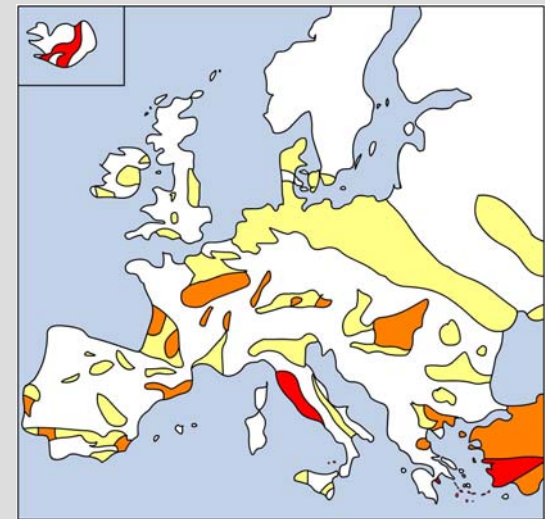
Main basins and geothermal resources in Europe

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Deep geothermal energy mainly in basins (France, Germany, Poland, Italy, Hungary, etc.) for district heating, power, agriculture



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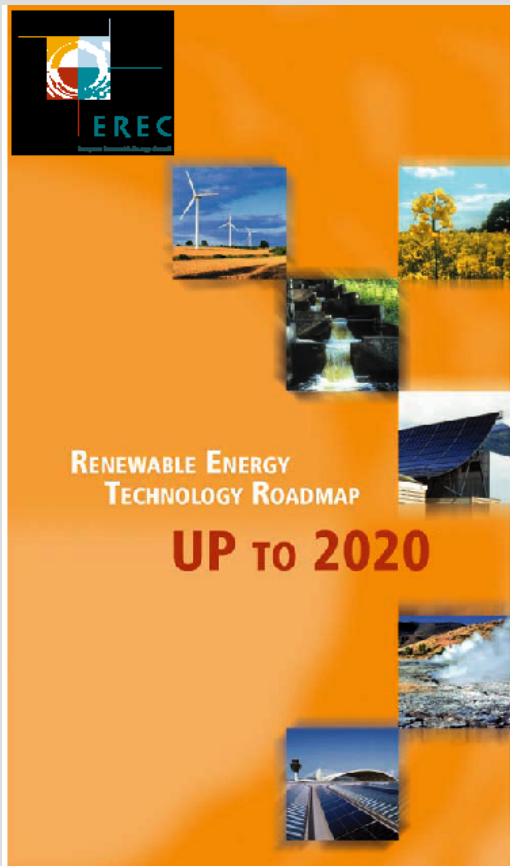
High enthalpy resources – in Italy, Greece, etc., for power, heat and other applications

Deep geothermal energy mainly in basins (France, Germany, Poland, Italy, Hungary, etc.) for district heating, power, agriculture

Shallow geothermal energy – geothermal heat pumps everywhere

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RENEWABLE ENERGY TECHNOLOGY ROADMAP

city Installed Capacity Projections

4 STA	Annual growth rate 2000-2004	PROJECTION 2010	Annual growth rate 2004-2010	PROJECTION	Annual growth rate 2010-2020
GW	26.3	80 GW	15.6	180 GW	8.5
GW	3.7	113 GW	0.8	120 GW	0.6
iW _P	47.8	8 GW _P ³	45.0	52 GW _P ³	20.6
iW _e	8.6	25 GW _e	11.2	50 GW _e	7.2
GW	2.4	1 GW	7.2	2 GW	7.2

Generation Projections

TYPE OF ENERGY	2000 Eurostat	2004 Eurostat	AGR 2000-2004	Projection 2010	AGR2004-2010	projection 2020	AGR 2010-2020
Biomass for heat	44.7 Mtoe	48.4 Mtoe	2.0%	65 Mtoe	5.0%	105 Mtoe	4.9%
Solar thermal	0.38 Mtoe	0.68 Mtoe	15.6%	2 Mtoe	19.7%	12 Mtoe	19.6%
Geothermal	0.66 Mtoe	1.5 Mtoe	22.8%	4 Mtoe	17.7%	8 Mtoe	7.2%

From EREC roadmap 2007

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Table 5: Renewable Electricity Installed Capacity Projections

TYPE OF ENERGY	2000 EUROSTAT	2004 EUROSTAT	Annual growth rate 2000-2004	PROJECTION 2010	Annual growth rate 2004-2010	PROJECTION	Annual growth rate 2010-2020
1. Wind	13.2 GW	33.6 GW	26.3	80 GW	15.6	180 GW	8.5
2. Hydro	93 GW	107.5 GW	3.7	113 GW	0.8	120 GW	0.6
3. PV	0.18 GW _p	0.86 GW _p	47.8	8 GW _p ³	45.0	52 GW _p ³	20.6
4. Biomass	9.5 GW _e	13.1 GW _e	8.6	25 GW _e	11.2	50 GW _e	7.2
5. Geothermal	0.6 GW	0.66 GW	2.4	1 GW	7.2	2 GW	7.2

Table 7: Renewable Heat Generation Projections

TYPE OF ENERGY	2000 Eurostat	2004 Eurostat	AGR 2000-2004	Projection 2010	AGR 2004-2010	projection 2020	AGR 2010-2020
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From EREC roadmap 2007

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To ensure sustained growth of the market, with the necessary development of industry, drilling capacity, skilled workforce, etc., Geothermal Energy needs clear targets in the two sectors:

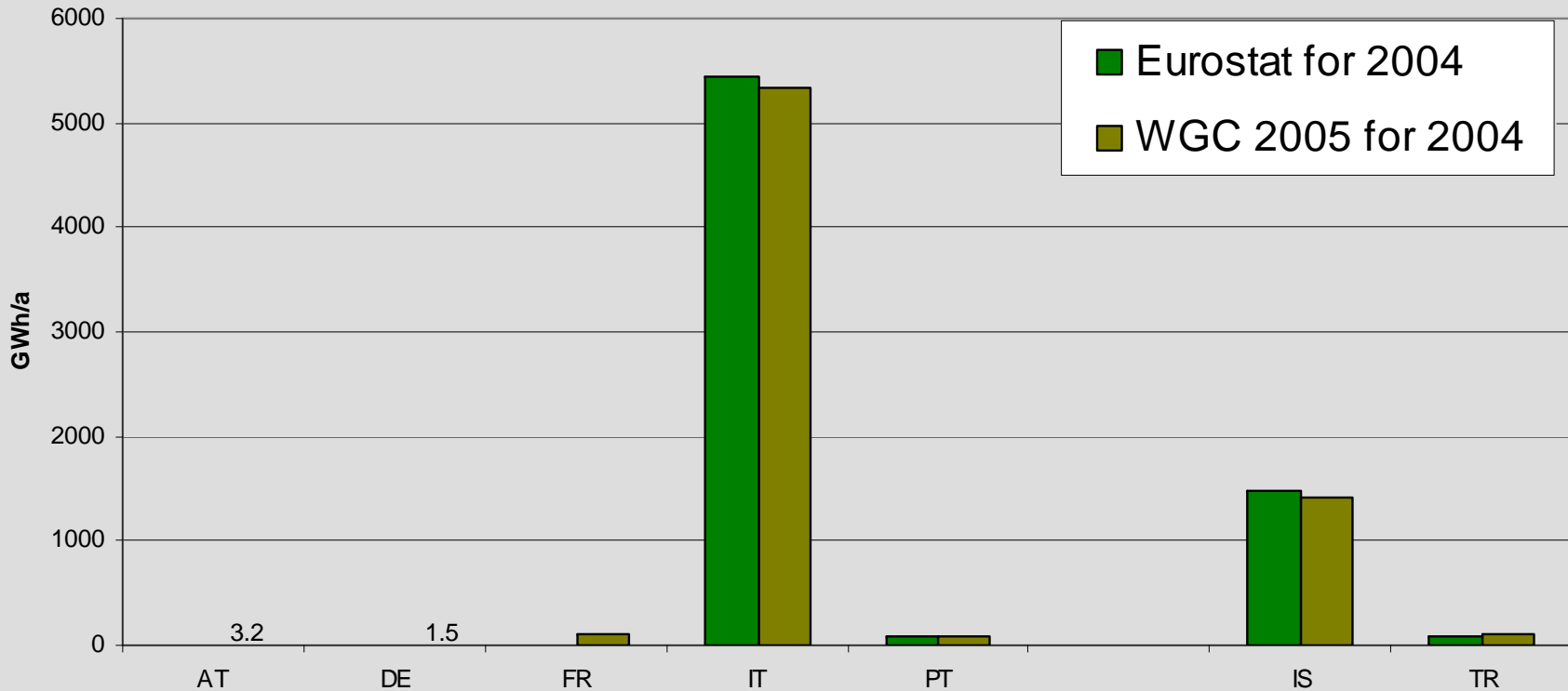
- Electric Power Production**
- Heating and Cooling**
- (Transport only through storage of electrical energy)



The targets have to be complemented by suitable instruments in order to ensure the necessary framework within the EU member states:

- Economic viability (dependable, transparent, creating the “level playing field”)**
- Legal and administrative security (firm right for use of a resource, clear licensing rules, suitable environmental regulations)**
- Flanking measures like training, awareness raising, and, not least, increased support of R&D**

In Electric Power Production, installed capacity currently is in high-enthalpy areas



Annual geothermal power production

In Electric Power Production, installed capacity currently is in high-enthalpy areas



Italy (Travale-Radicondoli)

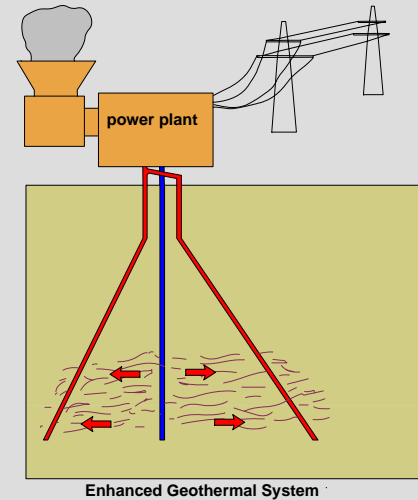
Iceland (Krafla)

Portugal (Ribeira Grande, Azores)



In Electric Power Production, countries like Austria and Germany show what can be achieved with smart measures like feed in tariff.

- ORC-plants on low-temperature reservoirs ($\sim 100\text{ }^{\circ}\text{C}$)
- Development of other binary plants (Kalina)
- R&D and demonstration in EGS



Austria (Altheim)
 Austria (Bad Blumau)
 Germany (Neustadt-Glewe)

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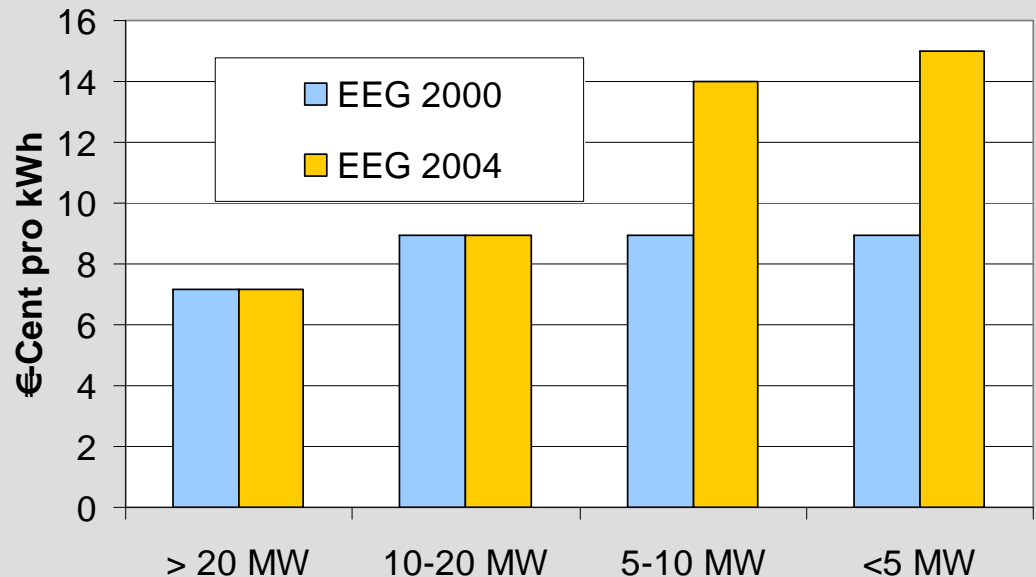


In Electric Power Production, countries like Austria and Germany show what can be achieved with smart measures like feed in tariff.

Economic basis given in Germany through EEG, revised August 2004

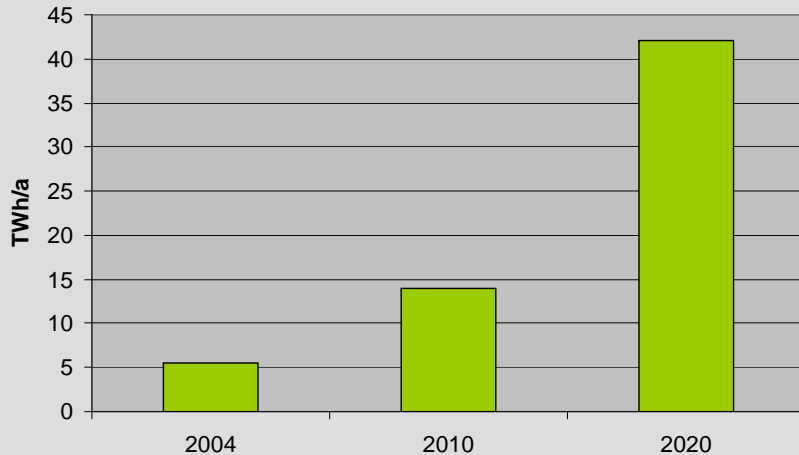
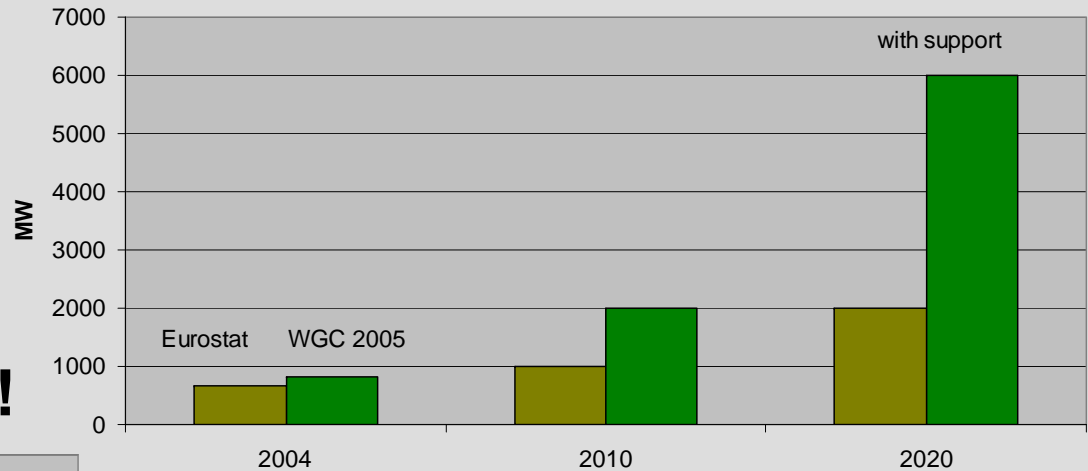
Main activity in the Rhine Graben and in the Munich area (Molasse basin)

Unterhaching to go to the grid in summer 2007, as the first larger plant

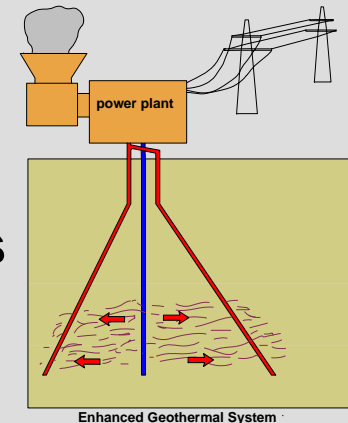


In Electric Power Production, in 2020 a total installed capacity of minimum 2 GW electric power can be expected within the EU, with up to 6 GW if support measures are taken

– for a production of 42 TWh annually!



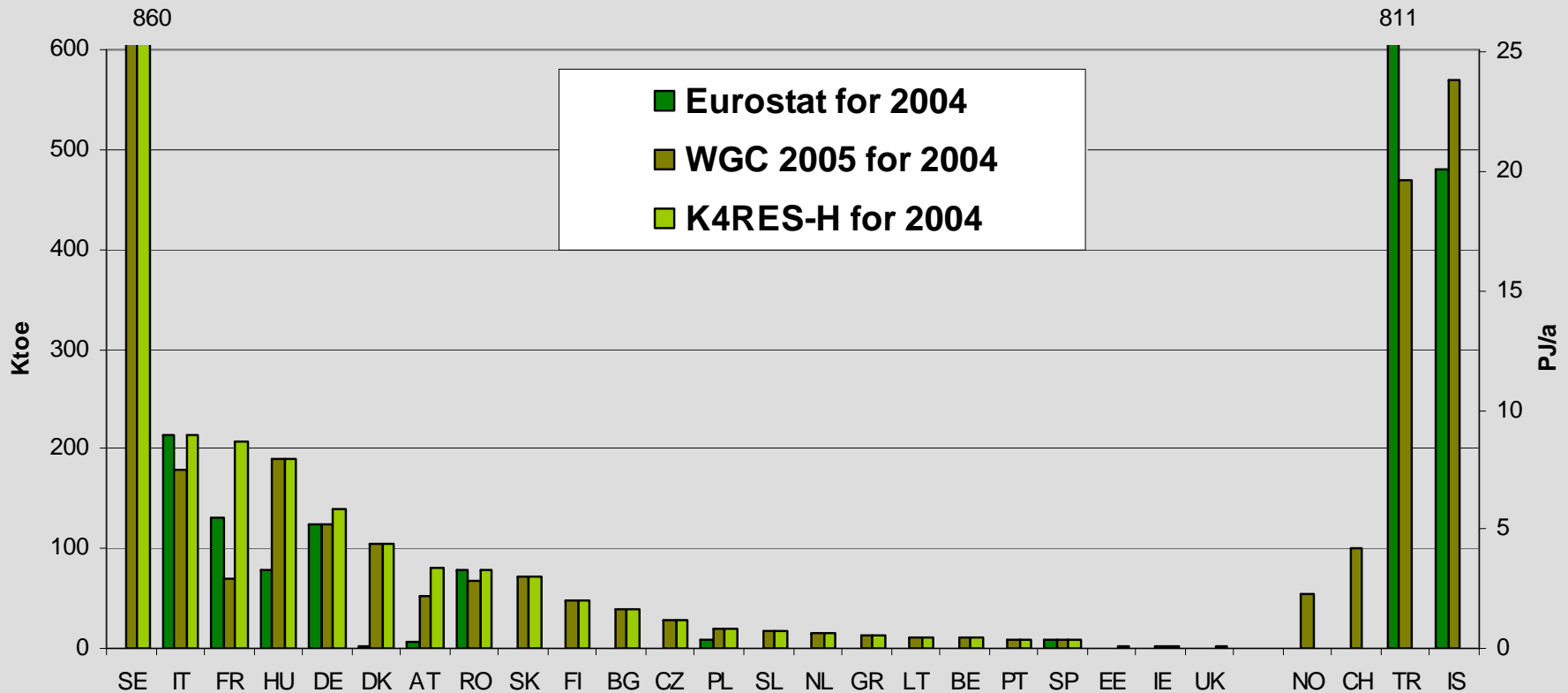
For the high numbers, we need success of EGS technology!



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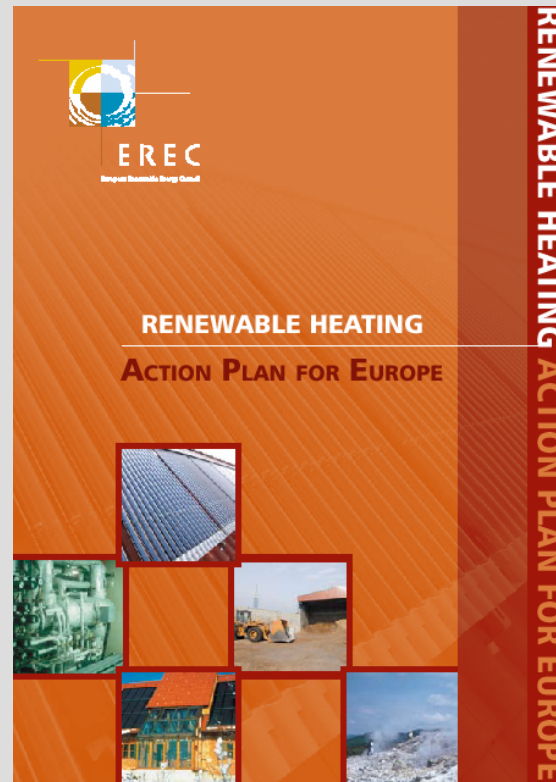
In Heating and Cooling, the current geothermal heat production shows, that not the potential, but the support and uptake control the development



Annual geothermal power production

In Heating and Cooling, action plans have been developed within IEEA-project K4RES-H for solar thermal, biomass and geothermal, to reach ambitious targets by 2020

There is also a joint plan with the summary, from EREC

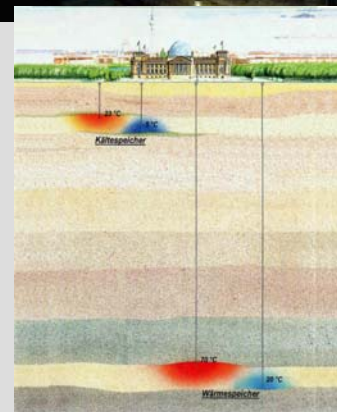


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In Heating and Cooling, support measures on a European scale yet are lacking, to release the potential.

In 2020 heat production of up to 8 Mtoe (335 PJ/a) will be possible, with 4 Mtoe in 2010



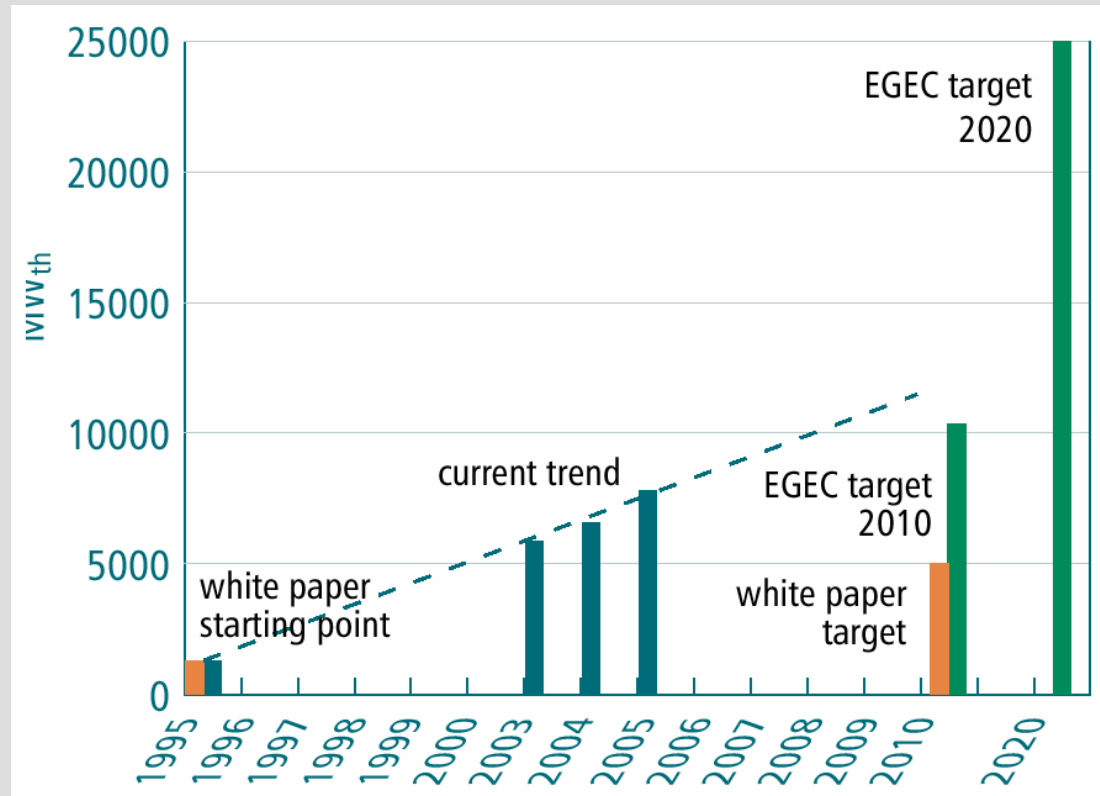
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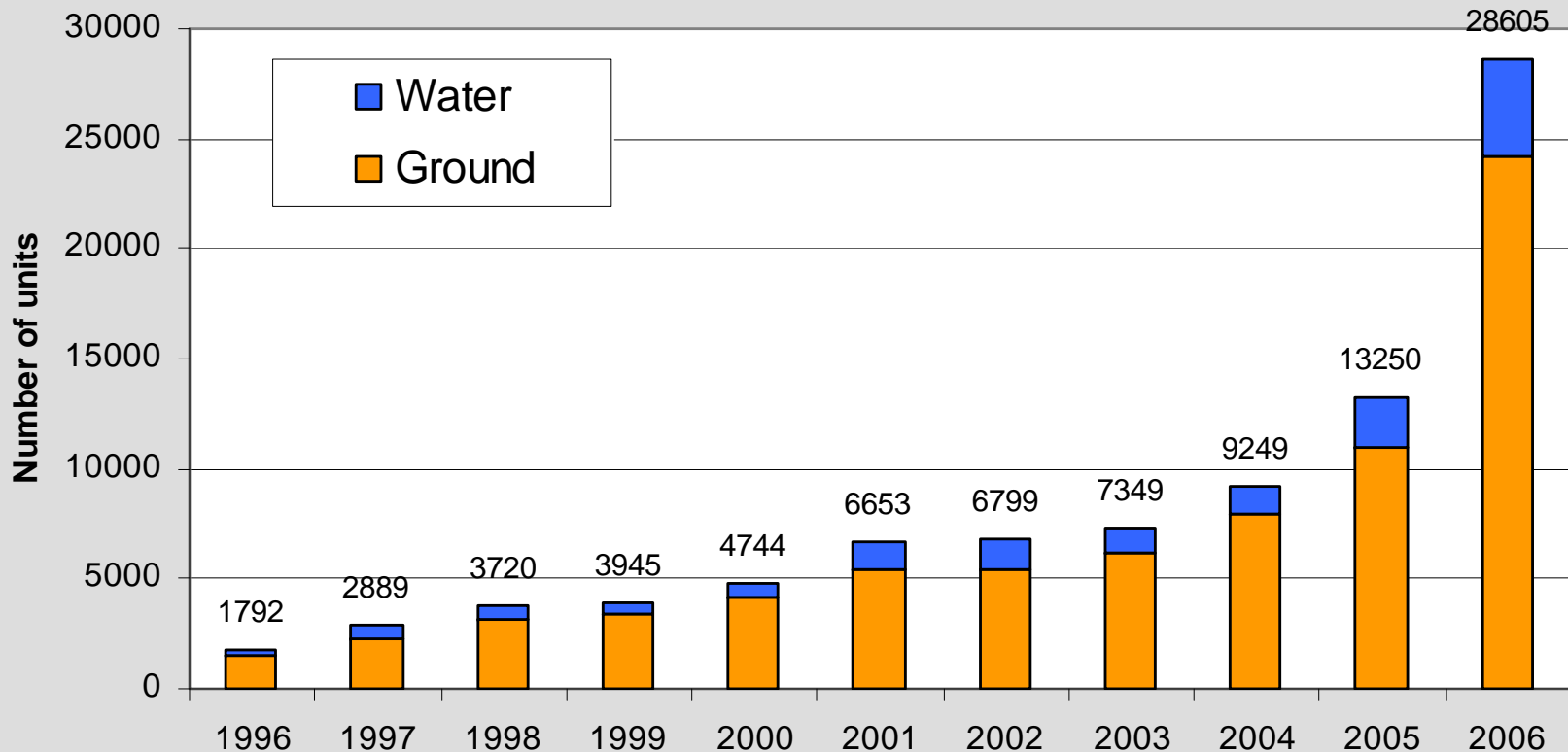
In Heating and Cooling, support measures on a European scale yet are lacking, to release the potential.

In 2020 heat production of up to 8 Mtoe will be possible, with 4 Mtoe in 2010

– and the White Paper target of 2 Mtoe for 2010 has already been exceeded in 2005!



One reason for the success in Heating and Cooling are **Ground Source Heat Pumps**, as the example of **Germany** shows



One reason for the success in Heating and Cooling are Ground Source Heat Pumps, as the example of Germany shows

Problems related with the “boom” in GSHP:

- Lack of drilling capacity
 - Problems with quality of work
 - Licensing procedures need be fast, but without loss in environmental protection!
- => More “non-technical” action like education, training, standards, etc. required**

The EGEC goal for geothermal energy in Europe:

- 42 TWh/year of electric power in 2020
- 8 Mtoe/year (335 PJ/year) of heat in 2020

For further information:

www.egec.org

*Thank you for your
attention!*

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