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Renewable heating (and cooling) An outlook to the nearer future and a view on Gas

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- EREF Representing Director -

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About EREF

- Federation of national associations from the EU Member States, working in the sector of energy produced from renewable sources
- Representing more than 50,000 MW of installed power capacity and a growing capacity in other sectors
- Voice of independent producers of energy from renewable sources
- Member of EREC (European Renewable Energy Council)

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A short word on the co-operation renewables and gas



Renewable and Gas – Friends or Foes?



- Not an easy question?
 - In short and mid term: friends
 - fossil gas to provide both base load and peaking power during transition to renewable energy
 - Long-run: natural gas may become more expensive and supply crises (Ukraine) may occur more often
 - With improved and smart grid and increase of short-, medium and long-term storage of energy fossil gas will be phased out
 - Already around the middle of this century?! (predictions by Ernest Moniz, President Obama's head of the Energy Department)
 - For the Massachusetts Institute for Technology: fossil gas is foe when it comes to fracking:
 - "While treating gas as a 'bridge' to a low-carbon future, it is crucial not to allow the greater ease of the near-term task erode efforts to prepare a landing at the other end of the bridge"

Renewable and Gas – Friends or Foes?



- Renewables and gas in Europe:
 - Both gas and renewables have an interest to call for strong CO2 emission policies and strong CO2 reduction targets:
 - Risk for Europe is that cheap coal, not gas, could dominate the market and carbon emissions keep on rising
 - BUT: Gas is expensive in Europe (unlike US)
 - In particular as carbon emission certificates are too cheap
 - Plus: Supply crises as with Ukraine may raise the price
 - Plus: gas and renewables may differ in some points
 - Renewables call for strong national and EU binding minimum targets for renewables, efficiency and CO2 reduction after 2020
 - Some in gas may only favor strong CO2 reduction targets

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A brief history of renewable heating and cooling in Europe





The 20-20-20 Targets and renewable heating and cooling

- In 2007, EU committed to reach ambitious targets:
 - At least **20% less greenhouse** gas emissions
 - At least **20% renewable energy** in final consumption
 - At least **20% increased energy efficiency**
- To reach those targets:
 - **New Renewable Energy Directive 2009/28/EC**
 - First time “energy” – not only electricity
 - **Reformed Emission Trading System**
 - No particular focus on renewable energy, but reduction of greenhouse gas gets awarded
 - **Energy Efficiency Directive 2012/27/EC**
 - No particular focus on renewable energy, but generally to increase efficiency in heating and cooling
- **THUS: Renewable energy is omnipresent in the EU’s energy policy!**



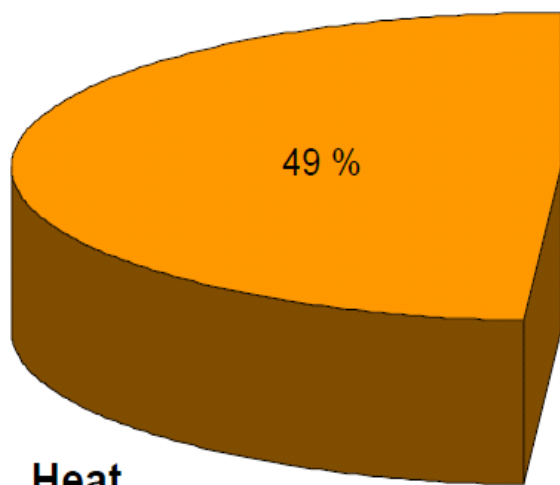
The Renewable Energy Directive 2009/28/EG

- Binding overall EU target of at least 20% renewable energy in final consumption
 - Translated into binding national targets for each Member State according to their respective potentials
 - BUT: Renewable heating and cooling = part of the overall renewable energy target = no separate target
 - Unlike the separate target for biofuels (at least 10% in 2020 for the transport sector)
- AND: Member States enjoy discretion on how they achieve their target
 - Directive suggests (non-exhaustive)
 - Use of support mechanisms
 - Use of certain flexibility mechanisms based on cooperation

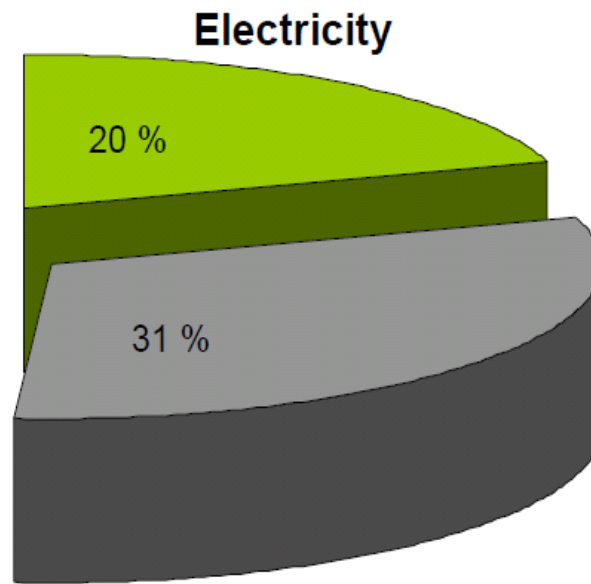
In 2006, a share of 49 % of the final energy consumption in EU 27 was in the form of heat.

Heat accounted for:

**86 % of the final energy consumption in households,
76 % in commerce, services and agriculture, and
55 % in industry.**

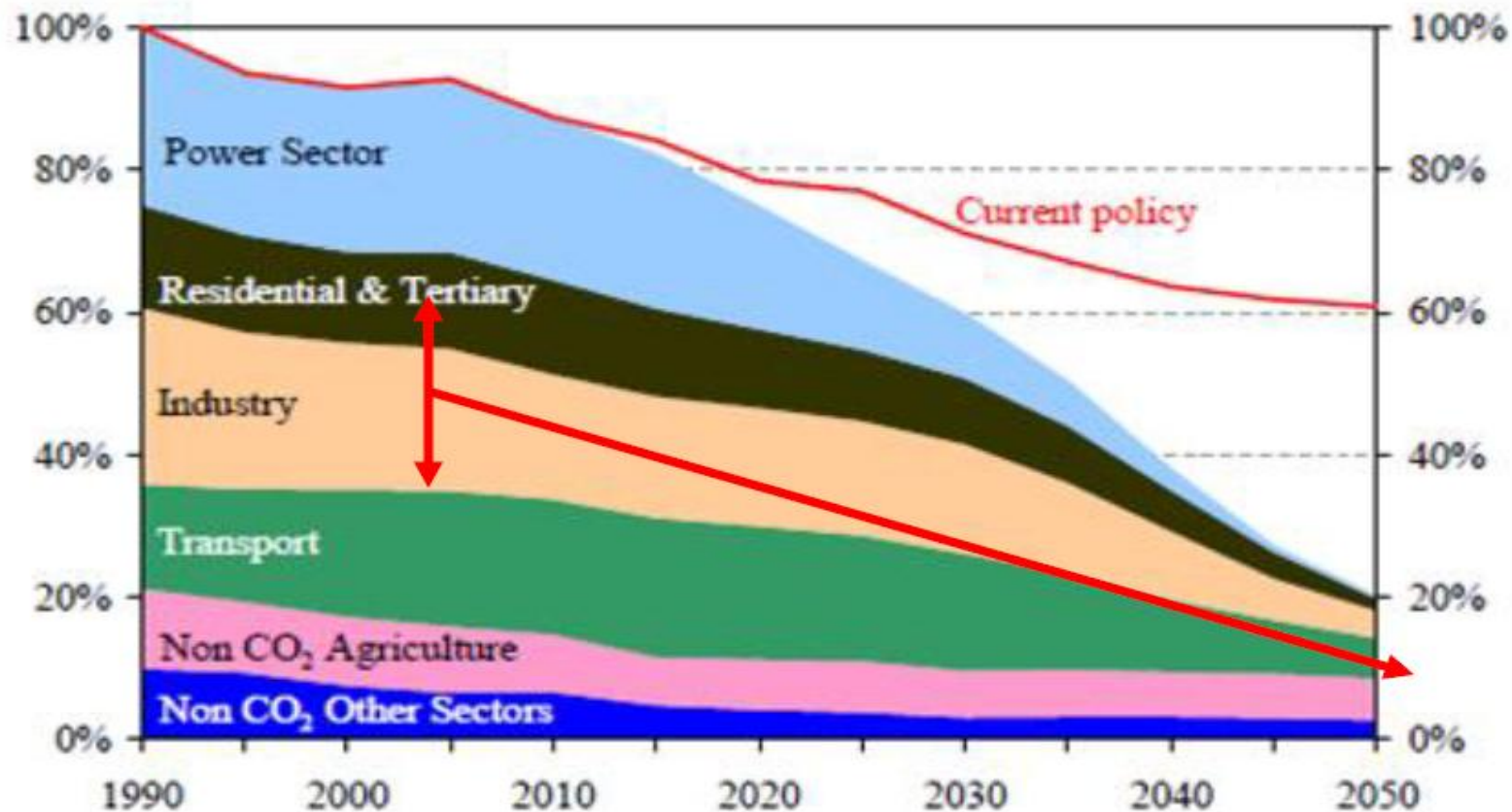


Heat



Transport

Figure 1: EU GHG emissions towards an 80% domestic reduction (100% = 1990)



Source: EGEC

RES SECTOR SHARE IN FINAL SECTORAL ENERGY CONSUMPTION

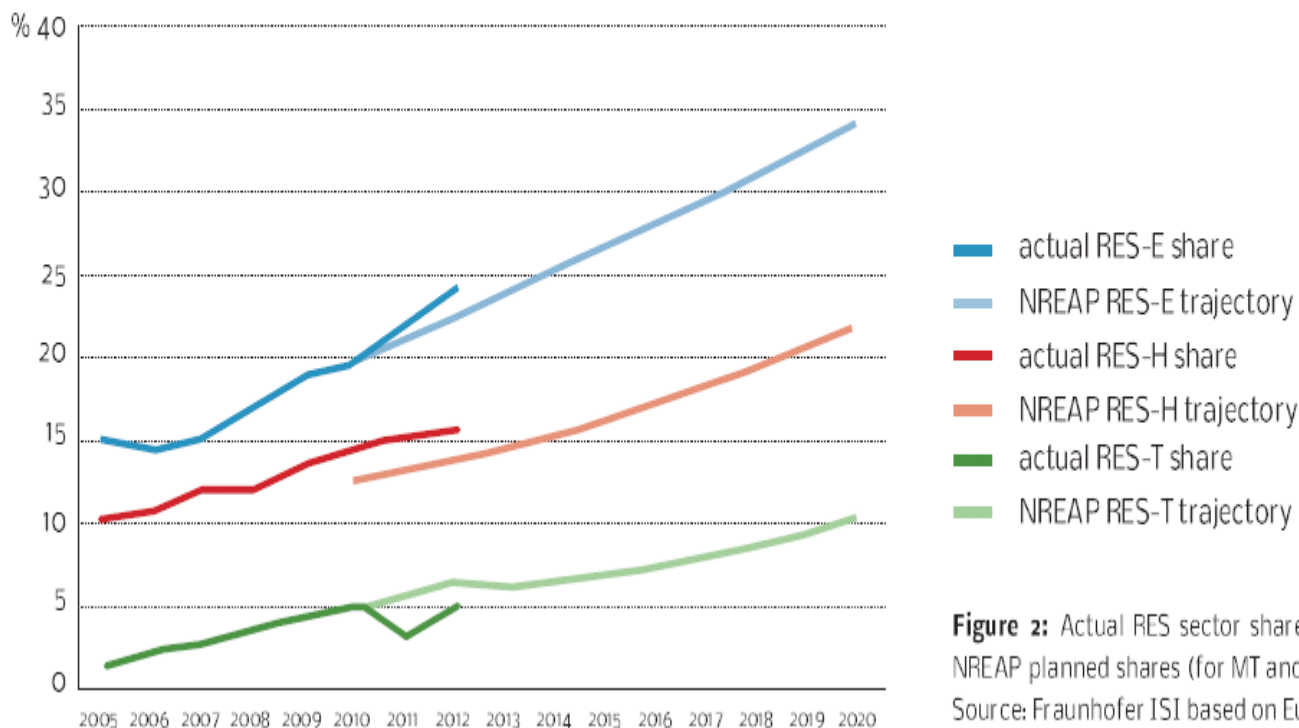


Figure 2: Actual RES sector shares in the EU-28 from 2005-2012 and NREAP planned shares (for MT and LV the actual shares are estimated).
Source: Fraunhofer ISI based on Eurostat and NREAPs.

ACTUAL VERSUS PLANNED RES-H&C SHARES

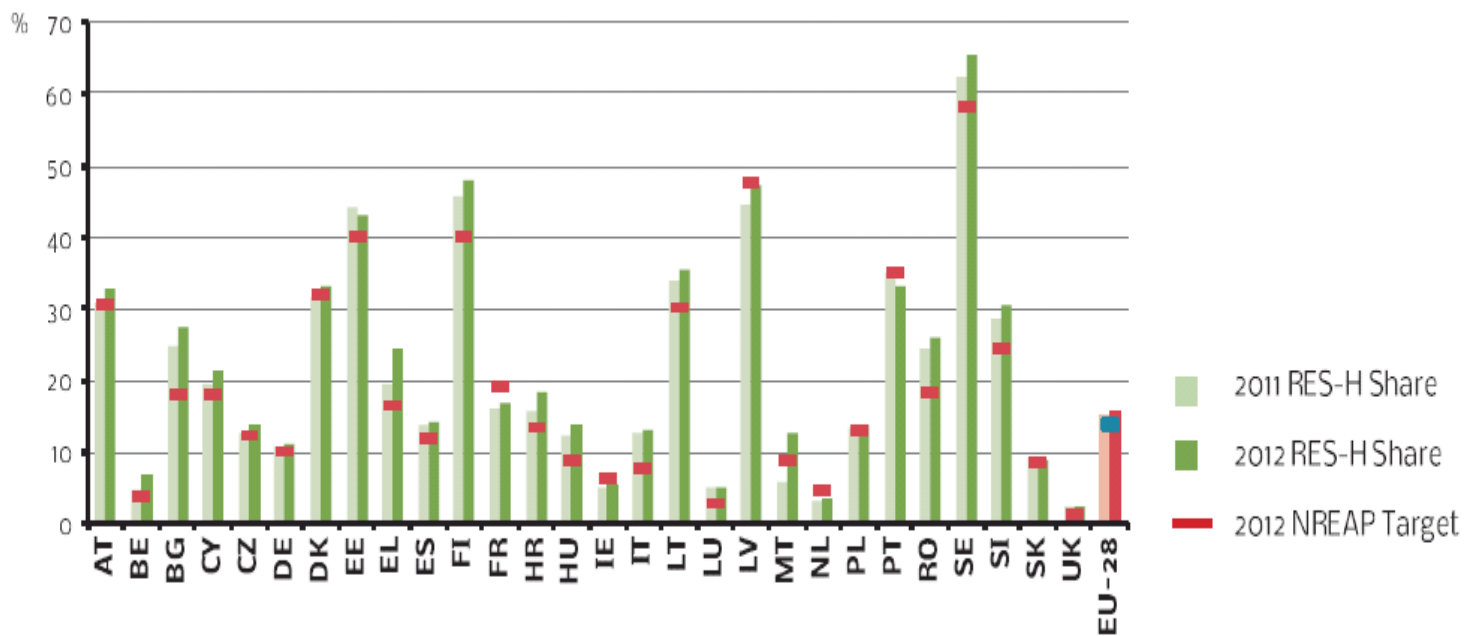


Figure 6: RES-H&C shares vs. NREAP target shares (Eurostat actual share 2012 is tentative for LV. Progress Report share has been used for MT).

Source: Fraunhofer ISI based on Eurostat, NREAPs, and Progress Reports.



Implementation in the Member States: Slow progress in renewable heating and cooling...

- Main problems:
 - Administrative procedures are complicated
 - Planning laws may stand in the way of construction of renewable energy plants
 - E.g. geothermal, but also biogas...
 - Member States do not follow their National Renewable Energy Action Plans under Directive 2009/28/EC
- But in particular:
 - Insufficient awareness of the variety of technologies and renewable resources to be used for renewable heating and cooling and their potential – even in the shorter term!

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Renewable heating and cooling – various options



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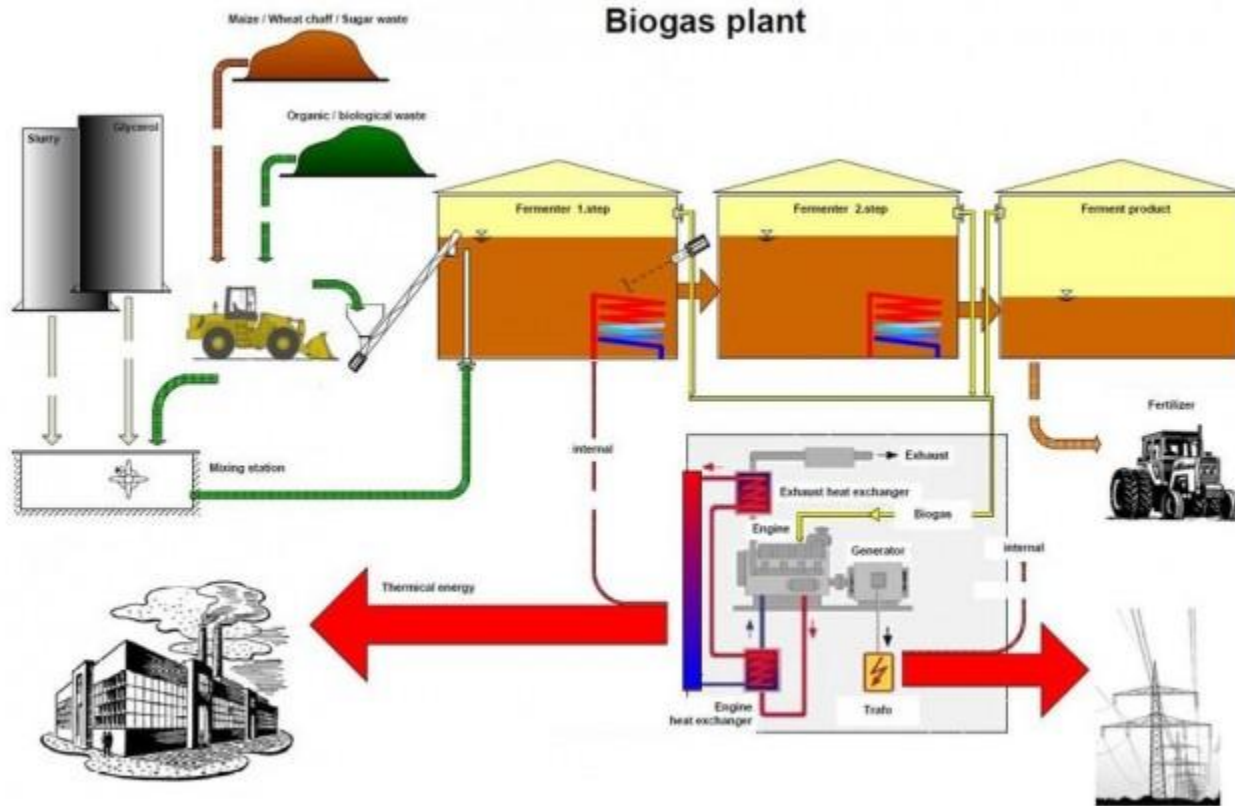
| | Biomass | Geothermal | Solar Thermal | Heat Pump |
|-------------|--|--|--|--|
| Industry | High temperature 251°C to 400°C |  |  | |
| Tertiary | Medium temperature 96°C to 250°C |  |  |  |
| | Low temperature 0°C to 95°C |  |  |  |
| residential | | | | |

Different RES H&C can provide heat at low and medium temperature levels. Biomass can provide heat above 250° , while further R&D can enable solar thermal collectors and deep geothermal technology to cover high temperature heat demand.

Source: EREC



Renewable heating and cooling – Biogas



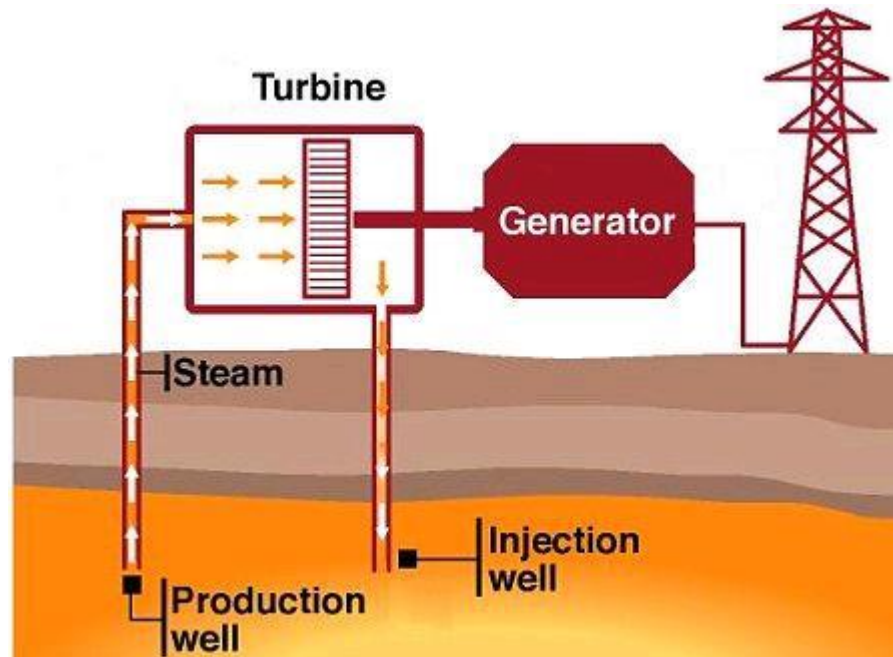


Renewable heating and cooling – Biogas

- In 2011, the heat supply from biogas in the European Union was at 201.6 ktoe
 - More than half of the complete European biogas energy production is of German origin. In 2011, total European production was around 10.1 Mtoe.
 - From 2010 to 2011, the increase of total energy production from biogas in European countries, excluding Germany, was approximately 19.3 per cent.
 - Around 56.7 per cent of the plants in Europe produced biogas from agricultural waste, with landfills at 31.3 per cent, and wastewater treatment plants at 12 per cent of total biogas production in the EU.
 - Following Germany, after 2010 the largest biogas producers in Europe were the United Kingdom, Italy, France and the Netherlands. Very dynamic growth was evident in Germany and the Czech Republic, as well as in Greece, Latvia and Lithuania.



Renewable heating and cooling – Geothermal



Source: RE UK

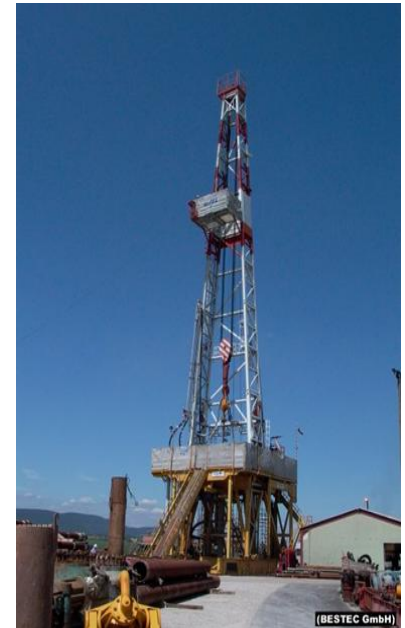
Renewable heating and cooling – Geothermal



Modern geothermal power plants in Larderello, Italy



Bad Blumau (Austria)

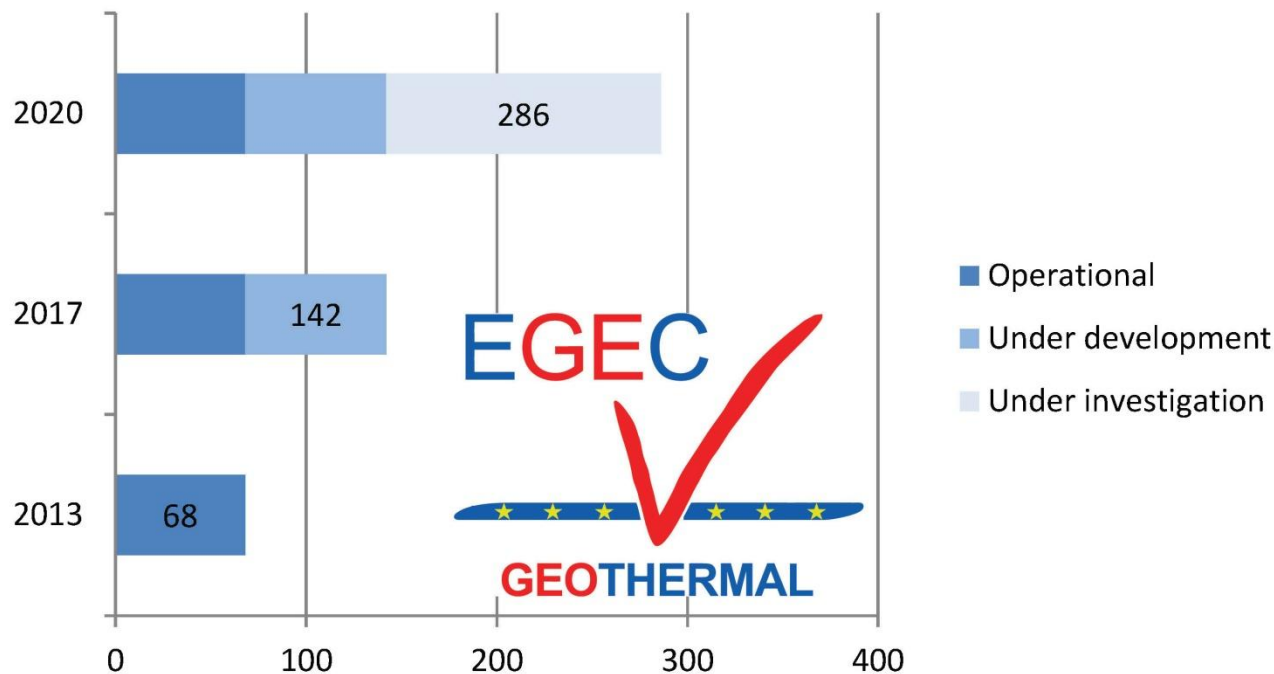


Drilling rig at the European R&D site Soultz-sous-Forêts (F)



Renewable heating and cooling – Geothermal

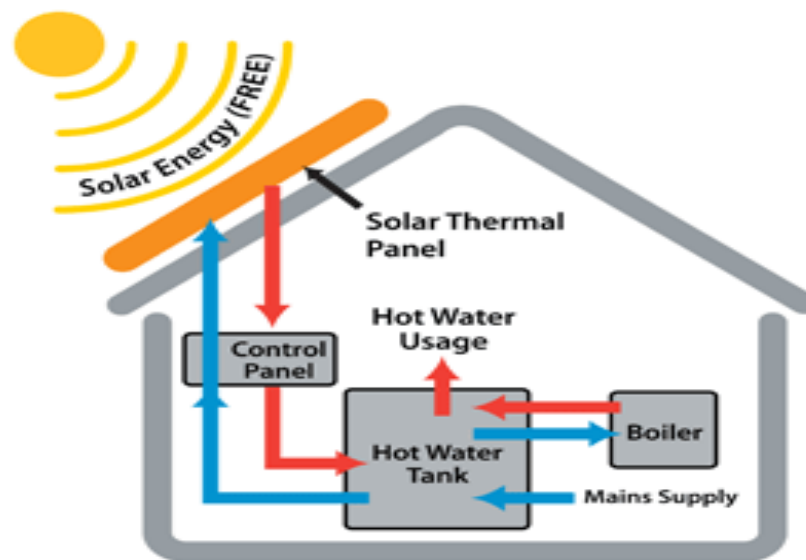
Number of Geothermal Power Plants In Europe





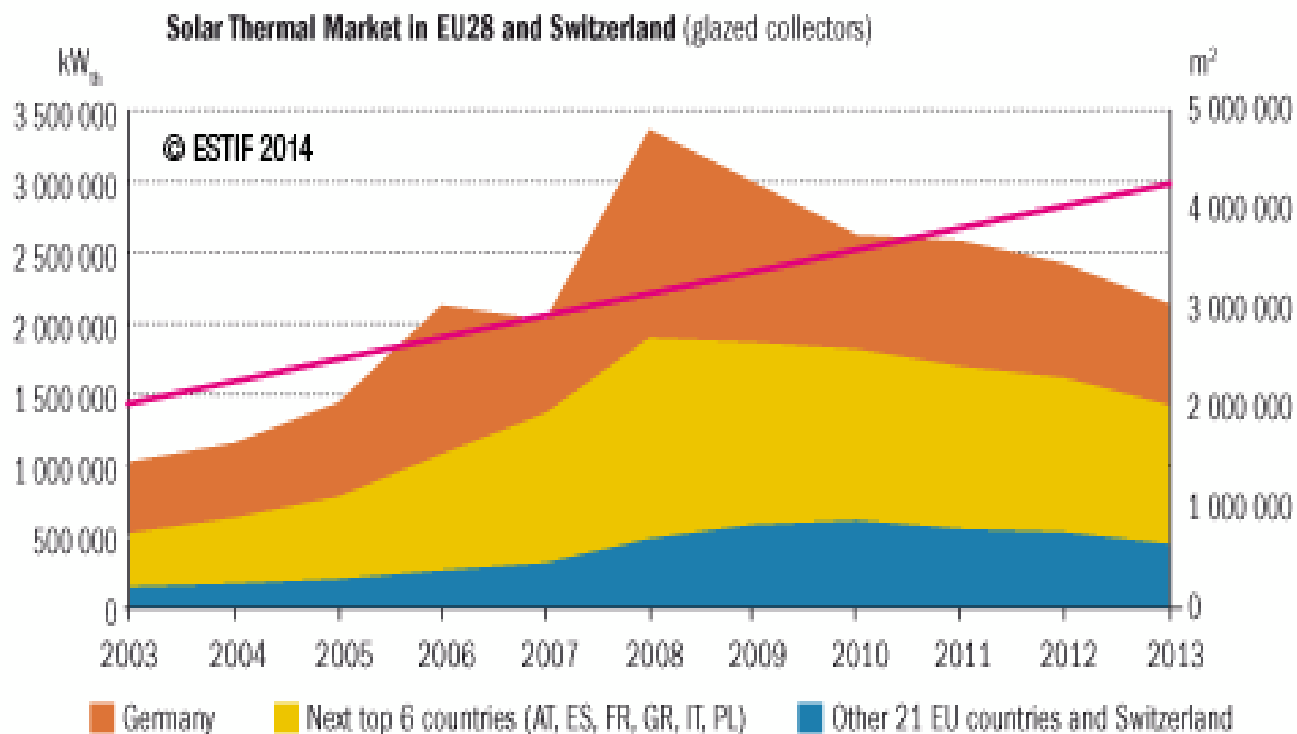
Renewable heating and cooling – Solar heating

- Key applications for solar technologies are those that require low temperature heat such as domestic water heating, space heating, pool heating, drying process and certain industrial processes.
- In most applications solar combi-systems are used, generating energy for hot water and space heating.





Renewable heating and cooling – solar heating



More options for more efficiency

- District heating
- According to Art. 14 Energy Efficiency Directive 2012/27/EC
 - Member States have to “Take adequate measures for efficient district heating and cooling infrastructure to be developed and/or to accommodate the development of high-efficiency cogeneration and the use of heating and cooling from waste heat and renewable energy sources, where the comprehensive assessment identifies a potential whose benefits exceed the costs for the application of high efficiency cogeneration and efficient district heating and cooling.”
- Way to increase overall efficiency of the heat supply
 - E.g. solar district heating combinations
 - Heat plants combined with solar thermal energy plants
 - CHP plants combined with solar energy plants
 - One major approach to increase the overall energy efficiency in urban areas, either by refurbishment of existing systems or by the introduction of new systems in existing or new building establishments.



More options for more efficiency

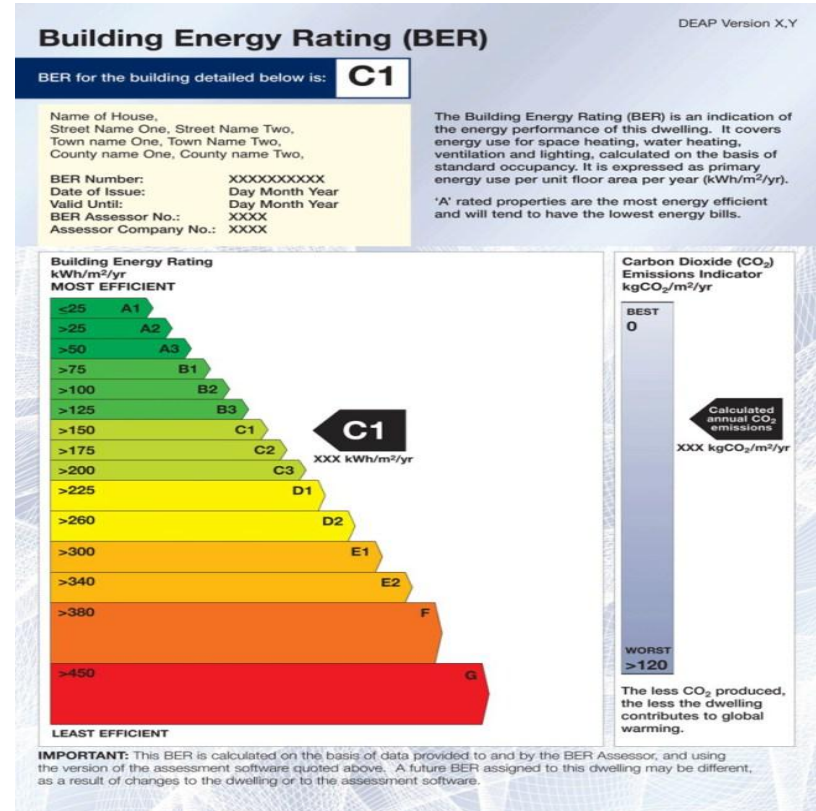
- **Power to Gas – an innovative system solution for the energy turnaround.**
 - The idea behind Power to Gas is to convert renewable electricity to hydrogen or methane, and store it in the gas infrastructure, and then to use it in a variety of consumption areas.
 - Hydrogen and methane from renewable electricity can be used equally in mobility, industrial, heat supply and electricity generation applications. That makes Power to Gas a multi-system solution, which supports the integration of renewable energy into the energy system and also contributes to reaching the ambitious goals of reducing emissions of greenhouse gases and the sustainability goals in all areas of consumption.
 - As an electricity storage method, Power to Gas can also contribute to compensating the increasing fluctuations in electricity generation from wind and solar energy, and facilitate long-term use of electricity which could not be integrated directly into the electricity grid at times of particularly high renewable generation.
 - Thus, Power to Gas makes the change from an electricity turnaround to an energy turnaround possible.



More efficiency in general



- Building sector has the largest energy-savings potentials
 - Accounts for about 40% of the overall primary energy use...
- Major legislative initiatives at European level, such as the Energy Performance of Buildings Directive (EPBD).
- Many households nowadays integrate one or other renewable energy installation to secure their energy supply





Hot Water

WITHOUT FIRE
WITHOUT COST
WITHOUT INCONVENIENCE

A Climax Solar Water Heater

Set on or set into (flush with) your roof will give you the luxury of hot water without the discomfort of manipulating a stove and heating the interior of your house.

Over 2,000 in use in this locality. Any user will tell you that the heater has more than paid for its cost, and once known is indispensable.

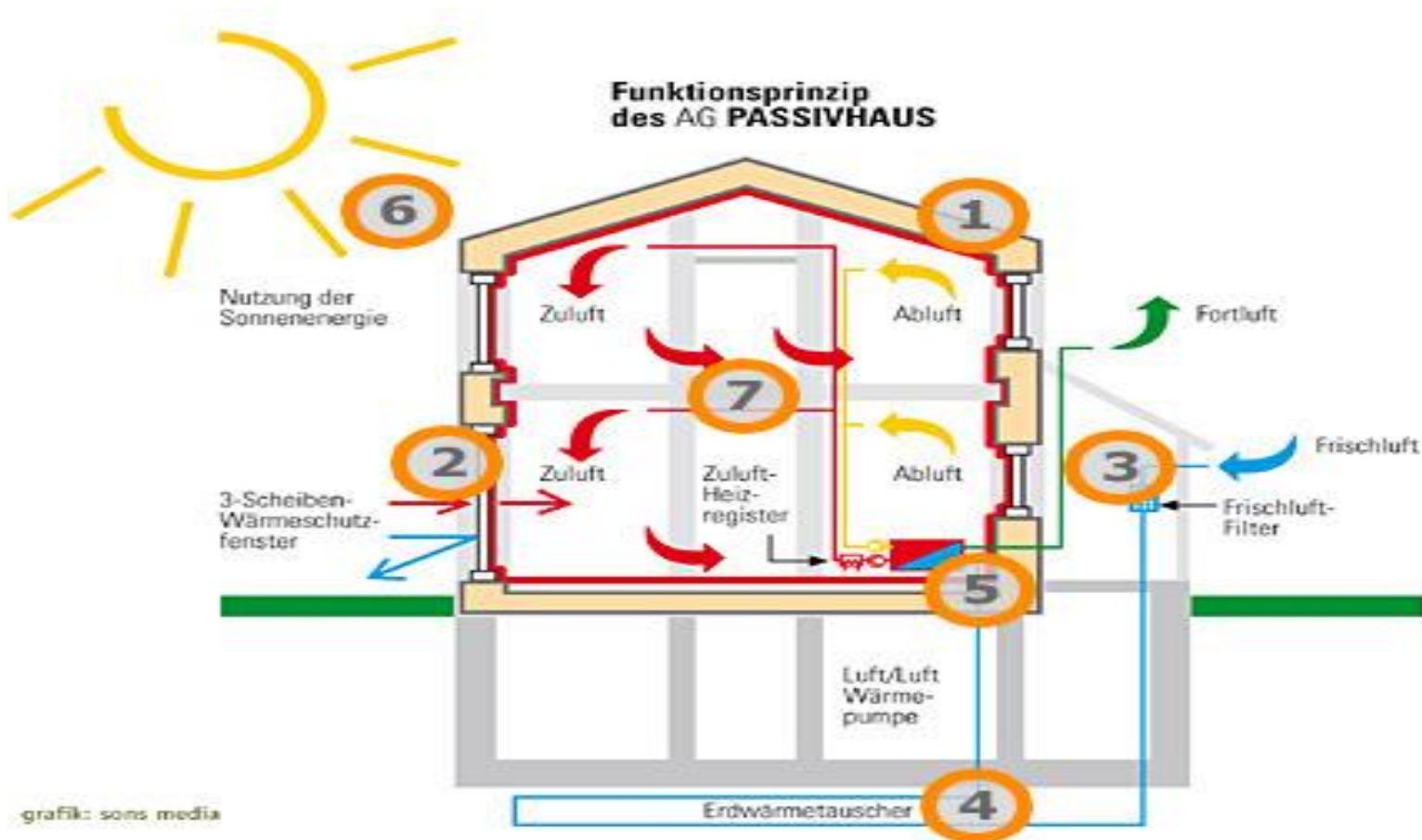
Phone Brown 171

SOLAR MOTOR CO.

238-239 Bradbury Bldg. Los Angeles

DEPARTMENT "B"

More efficiency in general – ideas for the future...



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Outlook Renewables – a solution for the heating and cooling sector?



| | Renewable Heating and Cooling | Conventional Gas |
|---------------|--|---|
| Advantages | <ul style="list-style-type: none"> - GHG emission neutral - Resources renewable = More efficient than all other fuels - No costs for resources = cheaper than all other fuels | <ul style="list-style-type: none"> - Less GHG emissions compared to other fossil fuels - More efficient than other fossil fuels - (Possibly) Cheaper than other fossil fuels |
| Disadvantages | <ul style="list-style-type: none"> - High up-front costs - Some technologies still under development - Administrative, information and legal barriers hinder fast deployment | <ul style="list-style-type: none"> - Not GHG emission neutral = not fit for total decarbonisation - Potential import dependency and security of supply problems - Susceptible to rising gas prices |
| Conclusion | <ul style="list-style-type: none"> - Long-term solution for decarbonisation of the heating and cooling system in Europe | <ul style="list-style-type: none"> - Short- to medium-term solution for decarbonisation of the heating and cooling system in Europe - “assistance” in the transition to a 100% renewable heating and cooling supply |



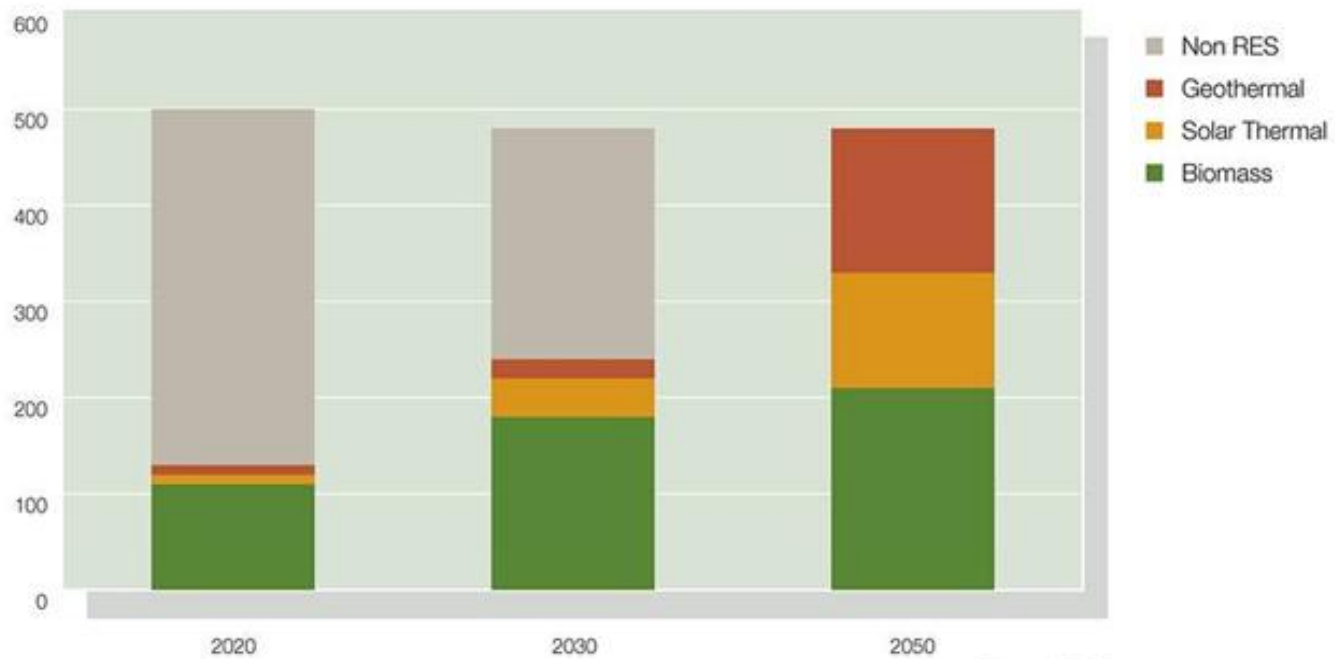
Outlook

- The theoretical and technical potential of renewable energy sources could exceed Europe's total heating and cooling consumption.
 - In **2020** over **25%** of heat consumed in the European Union could be generated with renewable energy technologies.
 - By **2030** renewable heating and cooling technologies could supply **over 50%** of the heat used in Europe.
 - By **2050** biomass could contribute 231 Mtoe, while geothermal could account for 150 Mtoe and solar thermal for 133 Mtoe.
- BUT: It's a challenge!



Outlook

Contribution of Renewable Heating and Cooling Technologies to Heat Consumption (Mtoe)

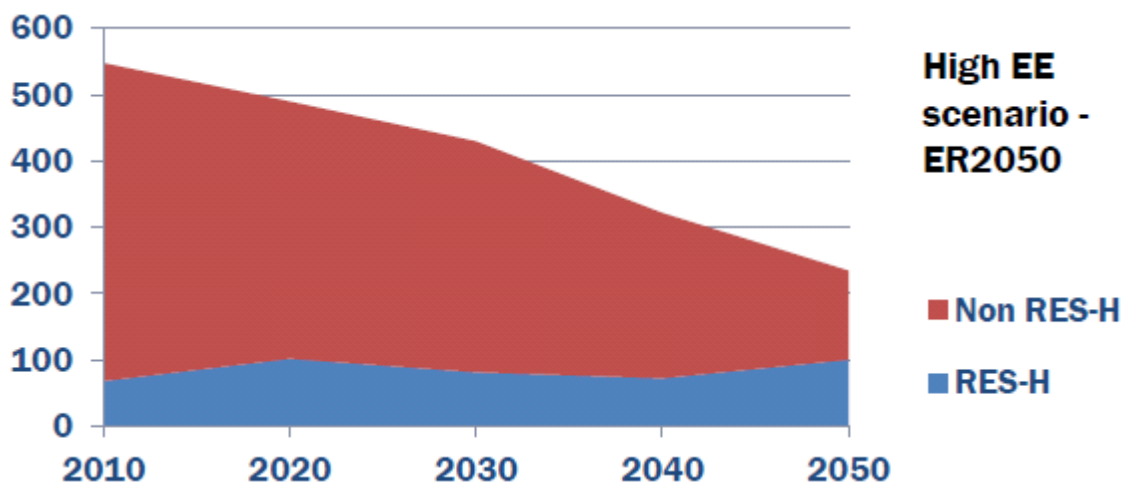


Source: EREC



Outlook

- BUT: the 27% renewables target proposed by the European Commission is insufficient to provide a signal for the renewable heating and cooling sector



- 27% renewables in 2030 = stagnation for renewable heating and cooling
 - From 21% in 2020 to 25% in 2030
- Only a higher target will have a real impact!

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Thank you for your attention!

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