

**SET  
PLAN**  
Conference  
2015

Research, innovation  
and competitiveness  
for the Energy Union

## **GEOHERMAL HEATING AND COOLING**

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Vice-President of EGEC

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### **SESSION 6**

Being the world leader in developing the next generation  
of renewable energy technologies  
Tuesday 22 September 2015

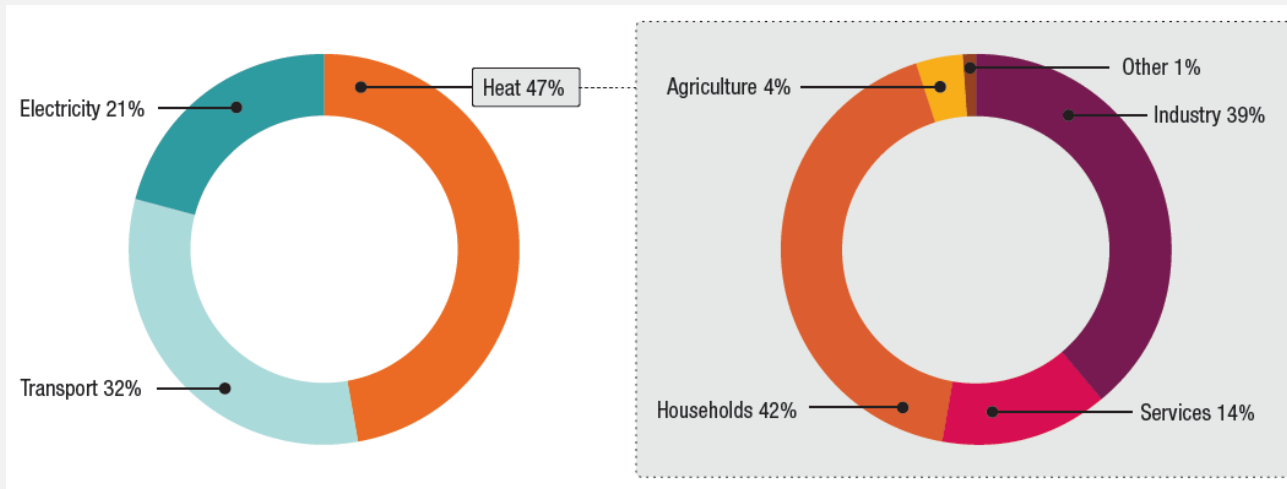
## OUTLINE

- INTRODUCTION
- GEOTHERMAL ENERGY
  - FROM EXPLORATION TO DEVELOPMENT: AN INTEGRATED APPROACH
  - GEOTHERMAL TECHNOLOGIES
- INDUSTRIAL COMPETITIVENESS
- TECHNOLOGICAL CHALLENGES
- NEXT GENERATION GEOTHERMAL TECHNOLOGIES
- RESEARCH, DEVELOPMENT AND INNOVATION
- R&D FINANCING NEEDS FOR GEOTHERMAL

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## GEOHERMAL HEATING - HEAT DEMAND

Why is heating so important - and where is it required ?



Graph from RHC-Platform - SRIA, 2013 (values for 2010)

Industrial heat is a large share of the heat sector, with huge growth potential

## GEOTHERMAL - THE HEAT OF THE EARTH

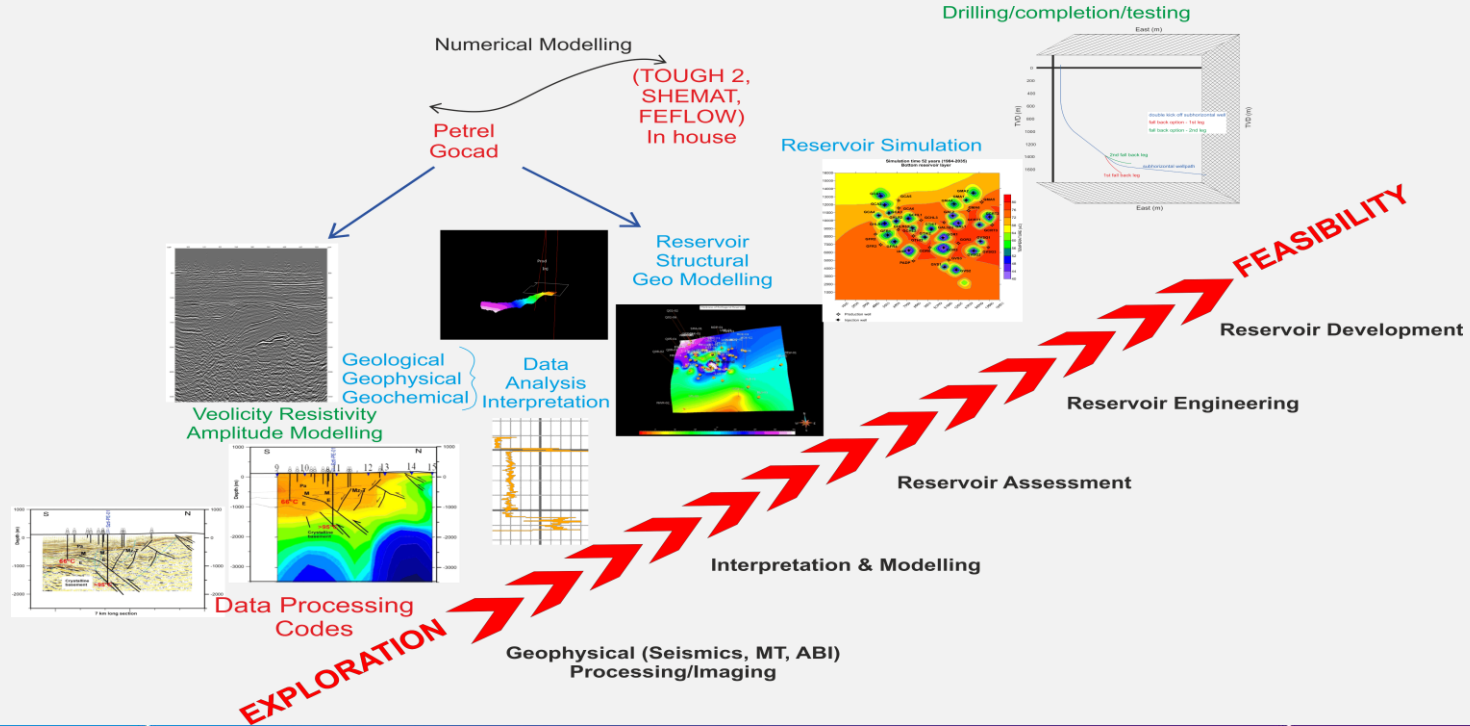
And the earth can show it is hot !

Geothermal manifestations  
in Tuscany, Italy

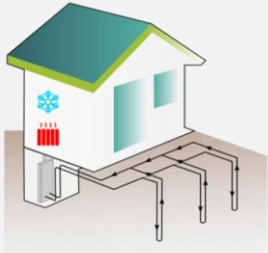


Thermometer in geothermal circuit  
of Szentes DH plant, Hungary

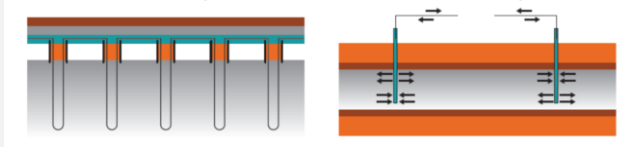
# FROM EXPLORATION TO DEVELOPMENT: AN INTEGRATED APPROACH



## GEOHERMAL H&C TECHNOLOGIES



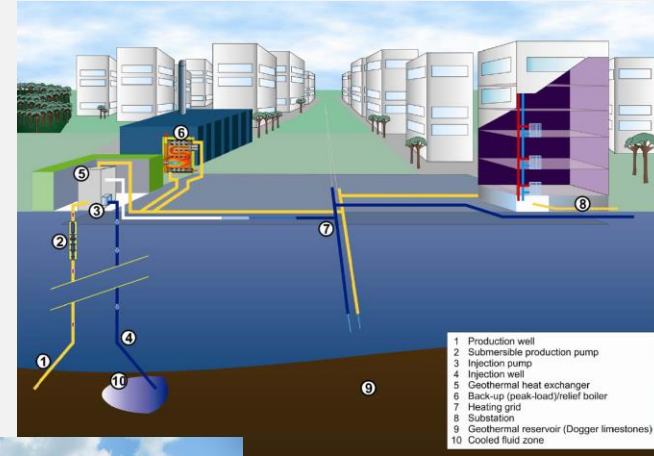
Heat pump



Underground thermal storage



Direct uses: ex. in  
agro-industry



District Heating



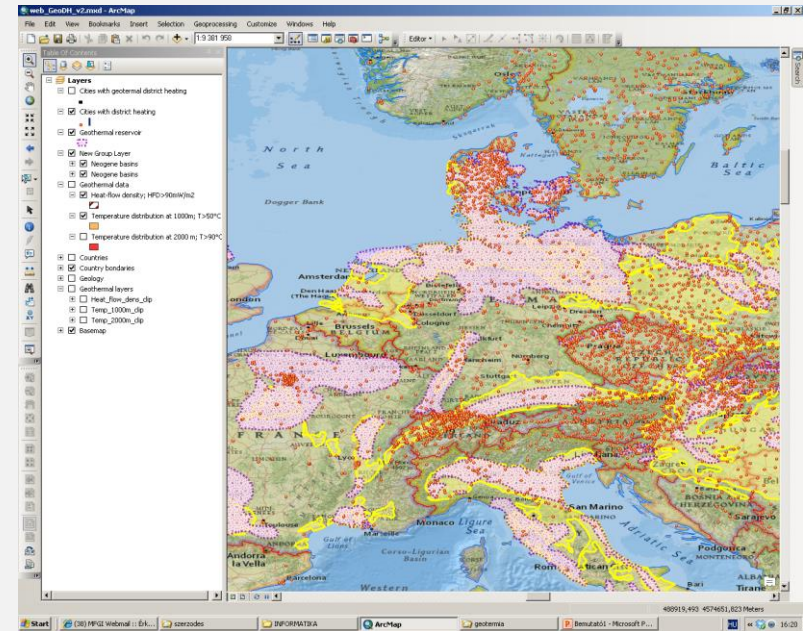
EGS and Cogeneration

## INDUSTRIAL COMPETITIVENESS

- With 1.2 million units of GSHP installed, Europe is the world leader on the shallow geothermal market. It is also leading in innovation such as underground thermal energy storage (UTES). Main competitors are for heat pumps manufacturers in China and the USA.
- With more than 200 geothermal DH systems in operation, Europe is also the global leader for geoDH. Global competition exists mainly for heat exchangers and pipes. Also direct uses of geothermal started in Europe, China is now leading the market due to the large demand there.
- EGS plants are only operation in Europe up to now. Projects are ongoing in the USA and Australia.



## geoDH potential in Europe



## TECHNOLOGICAL CHALLENGES

- Develop innovative solutions for refurbishing existing buildings with systems that are easier to install and more efficient at low temperatures.
- Develop geothermal District Heating systems in dense urban areas with a deployment of EGS.
- Contribute to the decarbonisation of the industry by providing competitive solutions for H&C.



## NEXT GENERATION OF GEOTHERMAL TECHNOLOGIES...TO REMAIN N° 1 IN GEOTHERMAL

- GSHP for retrofiting buildings
- Smart thermal grids with geoDH
- UTES with high temperature storage
- EGS for cogeneration and high temperature process heat

## SMALL THERMAL GRIDS USING GEOTHERMAL ENERGY

Heat and Cold Production in Paris, FR (144 Rue de Rivoli, Paris, Louvre district)

Issue: supply heat and cold to buildings where heated/cooled areas exceed land availability



7000 m<sup>2</sup> (offices + shops)

470 kW<sub>th</sub> heating

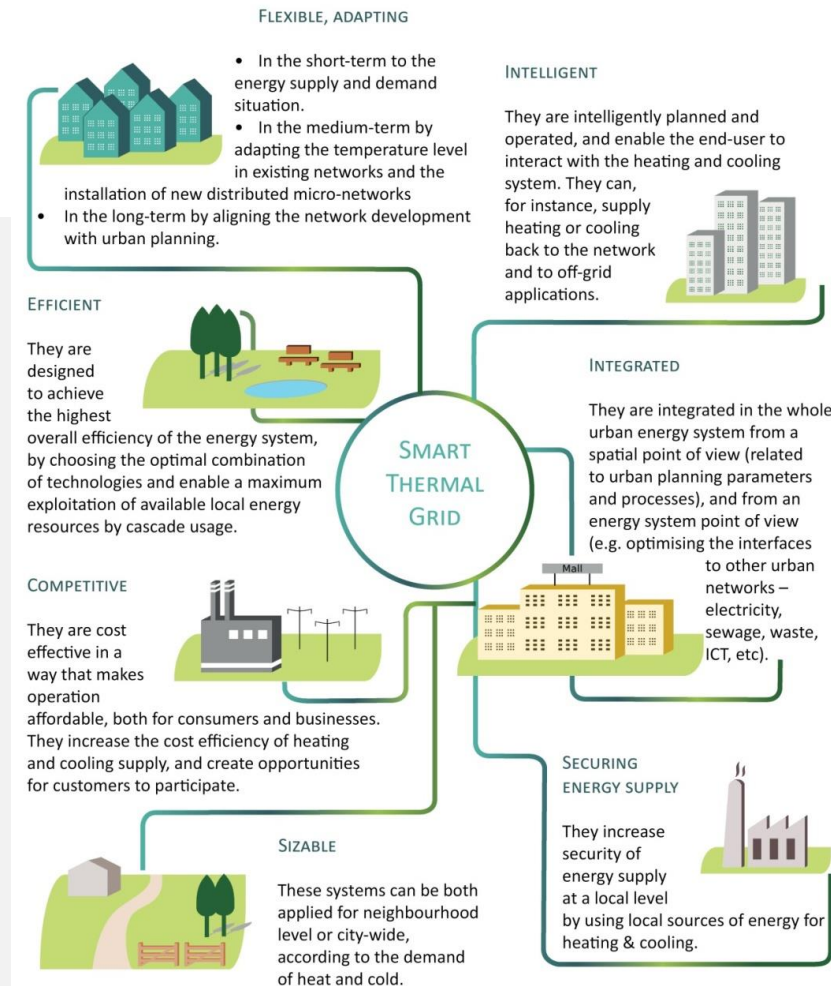
850 kW<sub>th</sub> cooling

Groundwater wells

Balanced consumption, with  
consideration of COPs of the heat pumps

## CHARACTERISTICS OF SMART THERMAL GRIDS

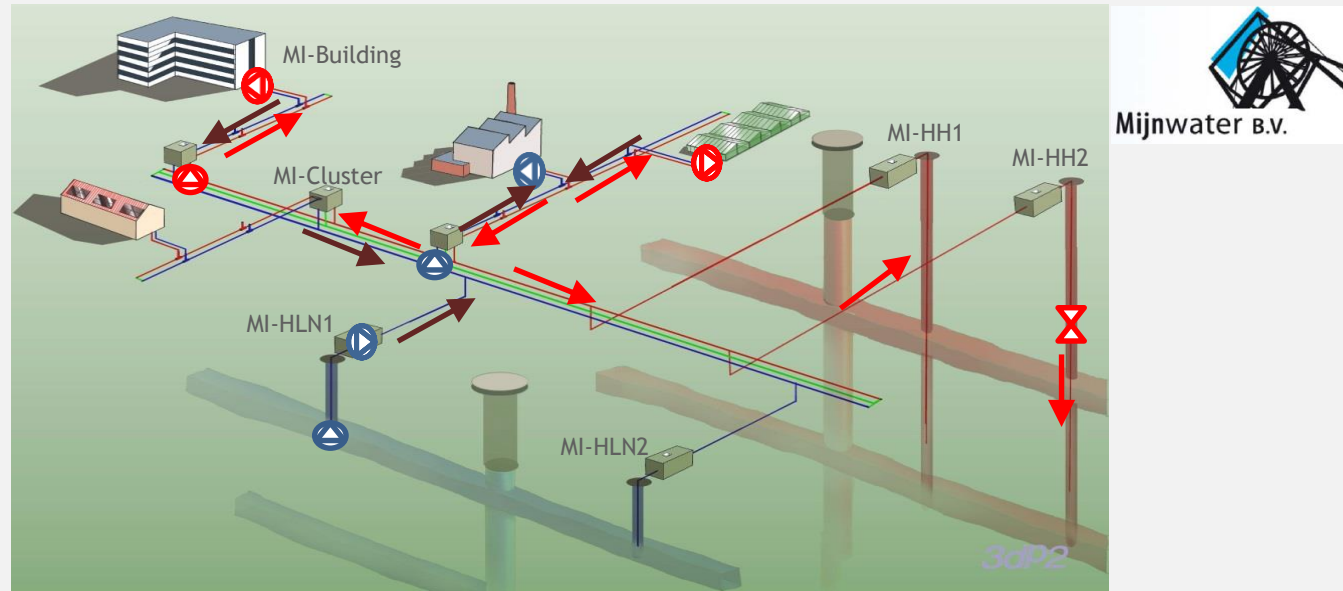
- Flexible and adapting
- Intelligent
- Efficient
- Integrated
- Competitive
- Sizable
- Securing Energy Supply



## TOWARDS SMART THERMAL GRIDS OF THE 2ND GENERATION

Example of thermal grid based on mine water

Several development stages towards a smart grid Minewater 2.0



Artist impression Minewater 2.0

Graph: Mijnwater BV

## RESEARCH, DEVELOPMENT AND INNOVATION

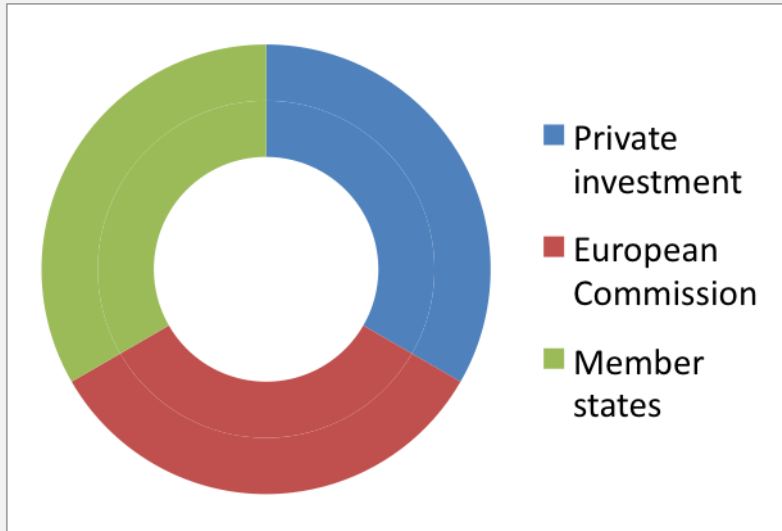
- Renewables for heating and cooling and flexible renewable electricity generation are important components of the future energy system and will contribute to achieving the objectives of the Energy Union. To this end, further R&I is needed, particularly in the following areas:
  - *Market uptake of small-scale renewable heating and cooling installations: Geothermal small-scale systems are already competitive in some markets in Europe. There is the need to remove barriers for a market uptake all over Europe.*
  - *Innovation for allowing the fuel switch in District Heating and for industrial process: The industry and the DH sectors must switch to renewables, some innovations are needed for this transition: low temperature systems, energy efficient devices etc.*

## RESEARCH, DEVELOPMENT AND INNOVATION

- ***Demonstration of flexible RES power plants:*** Some renewables, including geothermal plants, usually run as base load, but new technology such as binary turbines allow them to be flexible in their production. More demonstration plants must be installed in different market contexts.
- ***Research and Development of the next generation of RES technologies such as EGS:*** Breakthrough renewable technologies could be the future game changer for decarbonising the energy system. Enhanced Geothermal Systems (EGS) is a technology already demonstrated but an Action Plan must be launched for increasing its contribution to the electricity mix.
- ***Towards a smart integrated energy system:*** The future energy system should make a strong link between its three sectors: electricity, heating & cooling, transport. Smart energy grids will play an important role in the future smart cities and communities by ensuring a reliable and affordable energy supply to various customers with renewable energy carriers like geothermal energy

## R&D FINANCING NEEDS FOR GEOTHERMAL

### Budget overview to implement the geothermal RESEARCH AGENDA 2014 - 2020



The total amount of R&D money to be spent by industry within 2014-2020:	ca 400 Mio EUR
Horizon 2020 and member states	ca 740 Mio EUR
Total R&D investment needed between 2014 and 2020:	1140 Mio EUR

Public R&D support in form of grants, guarantees, insurance, risk finance (equity)...upfront !

# *Geothermal Energy: renewable-sustainable-proven-achievable-realistic*



## GEOHERMAL HEATING AND COOLING

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Ministère du Développement durable  
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Co-funded by  
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This conference has received funding from the European Union Horizon 2020 research and innovation programme under the grant agreement No 681163