

6.4.2016, Brussels

**Past: TP Geoelec
Review on activities
(Vision, SRA, Roadmap)**

Burkhard Sanner

European Geothermal Energy Council, Brussels



Timeline to the first TP Geoelec

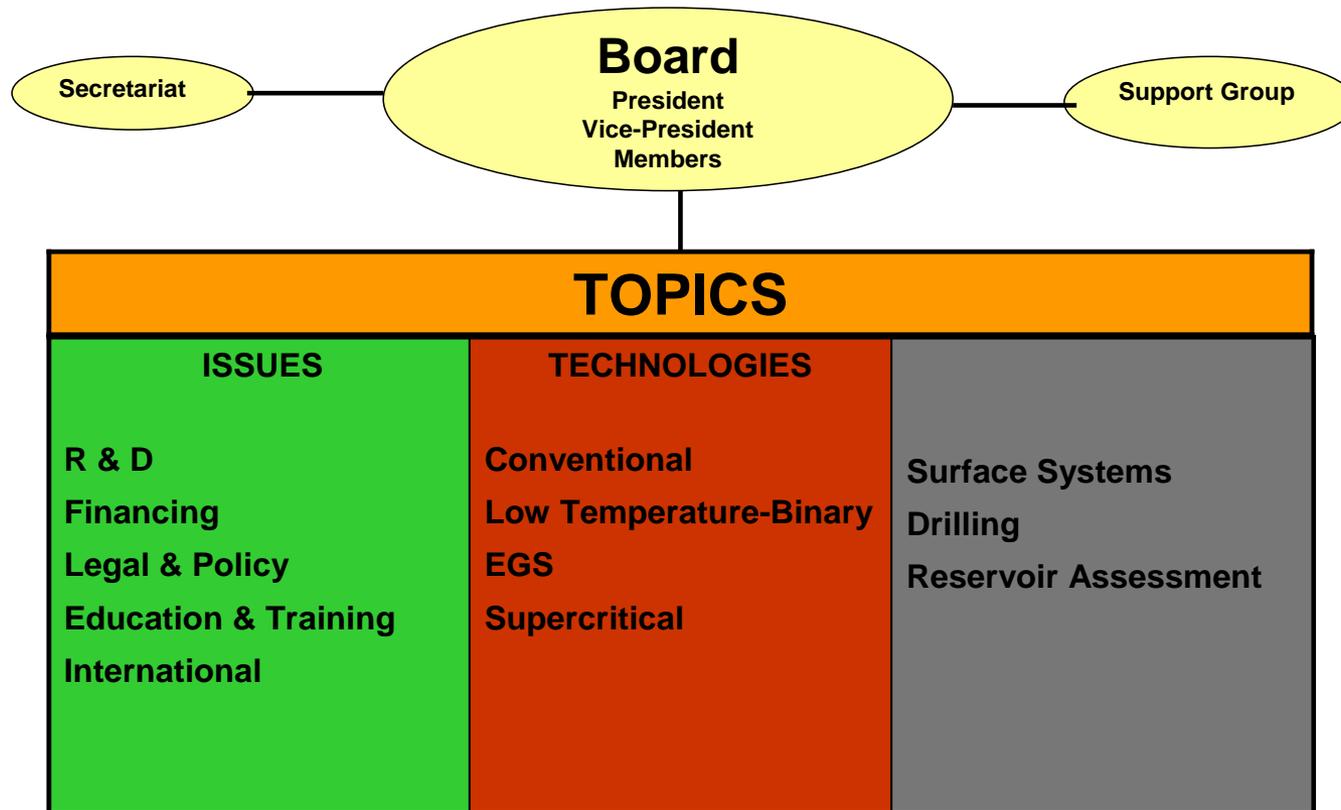
- 24.11.2006: EGEC organized a *Workshop 'Towards a Technology Platform for geothermal energy'*
- Low interest of geothermal industry to have own ETP (DH...)
 - Decision to collaborate with other ETPs
- 9.3.2007: EU Summit on climate: 20-20-20 by 2020
- June 2007: First geothermal proposals for the SET-Plan
- At the end, no reference to geothermal energy!
- September 2008: EGEC launched the process to produce an own Research Agenda
- November 2008: ESTTP becomes RHC-Platform, endorsed by the EC
- January 2009: Publication of the Geothermal Research Agenda and consultation to create a geothermal panel in RHC-PI.
- 26.6.2009: Kick-off meeting Geothermal Panel of the RHC-PI
- 4.9.2009: EGEC AGM > Members decide creation TP Geoelec

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Timeline to the first TP Geoelec

2.12.2009: Kick-off meeting TP Geoelec, Munich



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Timeline to the first TP Geoelec

2.12.2009: Kick-off meeting TP Geoelec, Munich

24.3.2010: 2nd meeting TP Geoelec, Brussels

Work on EGS definition:

Option A) Enhanced Geothermal Systems (EGS) are geothermal reservoirs that require some form of stimulation to develop the permeability necessary for the circulation of hot water and the recovery of heat for electric power generation.

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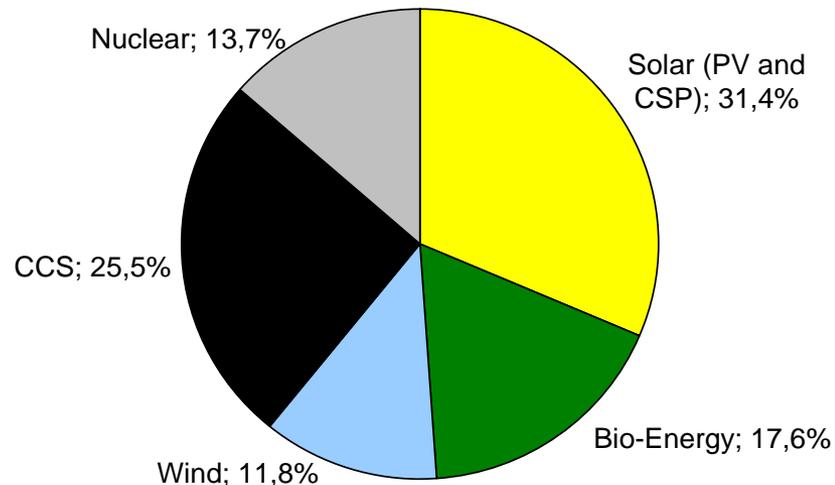


Timeline to the first TP Geoelec

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SET-Plan funding (as in March 2010)



and:

- improved grids,
- smart cities

No geothermal!

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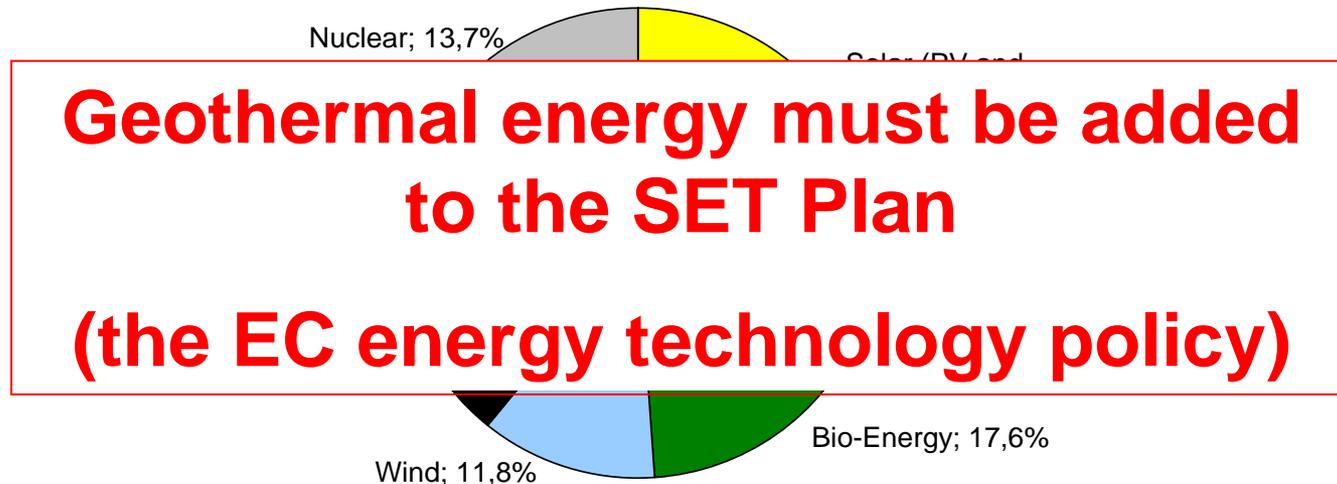


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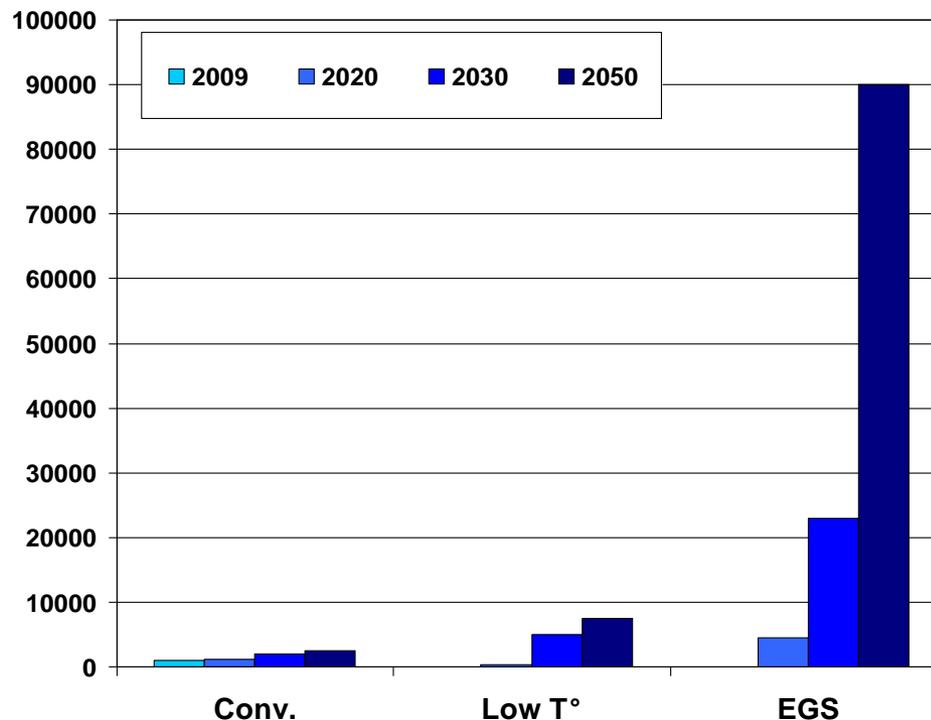
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Timeline to the first TP Geoelec

- 2.12.2009: Kick-off meeting TP Geoelec, Munich
24.3.2010: 2nd meeting TP Geoelec, Brussels
11.6.2010: 3rd meeting TP Geoelec, Pisa

Geothermal Electric Power in EU - 2050



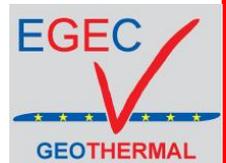
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Timeline to the first TP Geoelec

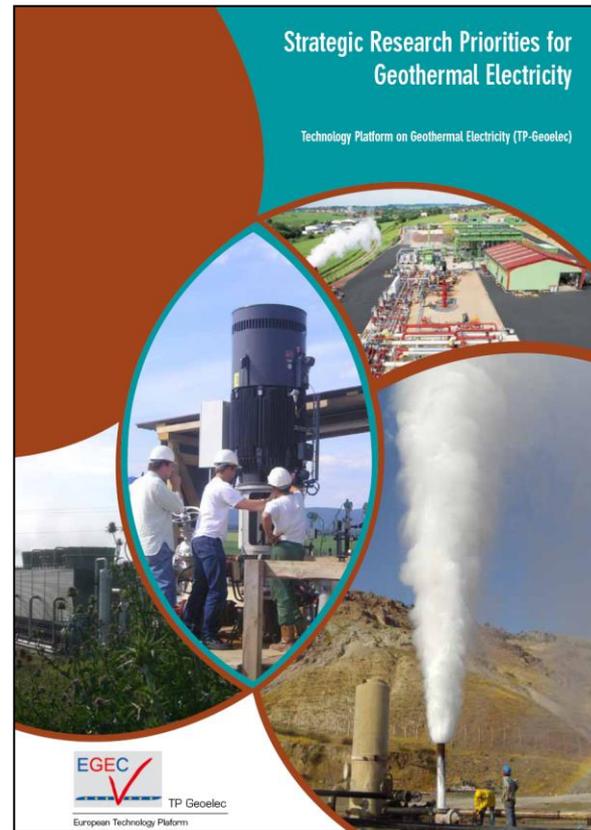
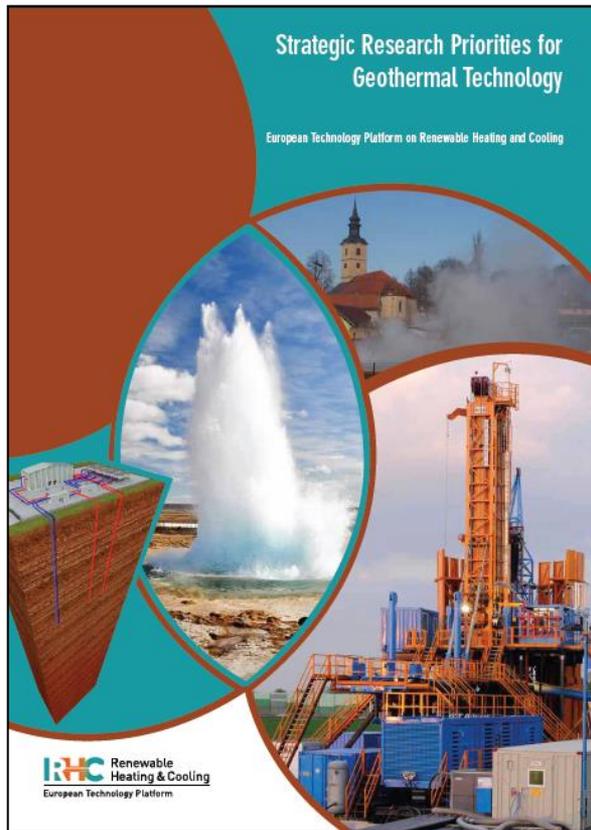
- 2.12.2009: Kick-off meeting TP Geoelec, Munich
- 24.3.2010: 2nd meeting TP Geoelec, Brussels
- 11.6.2010: 3rd meeting TP Geoelec, Pisa
- 14.9.2010: 4th meeting TP Geoelec, Brussels
- During 2011: work on Strategic Research Agenda, both in Geothermal Panel of RHC-Platform and TP Geoelec

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Geothermal Strategic Research Agenda(s)

26.4.2012: Conference of the RHC Platform in Copenhagen, Presentation of the SRAs



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Geothermal Strategic Research Agenda(s)

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RHC

4. DEEP GEOTHERMAL.....	
4.1 INTRODUCTION.....	
4.1.1 DEVELOPMENT OBJECTIVES.....	
4.1.2 RESOURCE ENVIRONMENTS.....	
4.1.3 SCOPE OF DEEP GEOTHERMAL APPLICATION.....	
4.2 RESOURCE ASSESSMENT.....	
4.2.1 INTRODUCTION.....	
4.2.2 CREATION OF A EUROPEAN GEOTHERMAL DATA BASE.....	
4.2.3 EXPLORATION TECHNOLOGIES FOR SUBSURFACE IMAGING.....	
4.2.4 MODELLING TOOLS FOR RESOURCE ASSESSMENT AND RESERVOIR PERFORMANCE EVALUATION.....	
4.2.5 EXPLORATION RISK ASSESSMENT AND MITIGATION.....	
4.3 DEEP DRILLING.....	
4.3.1 NOVEL DRILLING CONCEPTS.....	
4.3.2 CURRENT DRILLING TECHNOLOGY.....	
4.3.3 IMPROVED DRILLING TECHNOLOGY.....	
4.3.4 OPTIMISATION OF ECONOMICS.....	
4.4 PRODUCTION TECHNOLOGIES.....	
4.4.1 MATERIAL DEFINITION, WELL DESIGN AND COMPLETION.....	
4.4.2 WELL STIMULATION, FORMATION DAMAGE.....	
4.4.3 CORROSION AND SCALING.....	
4.4.4 DOWNHOLE INSTRUMENTATION, MONITORING AND LOGGING.....	
4.4.5 PUMP TECHNOLOGY.....	
4.4.6 PRODUCTION MANAGEMENT AND RETROFITTING.....	
4.5 SURFACE SYSTEMS FOR DIRECT HEAT USES AND CHP.....	
4.5.1 POWER CYCLES, CHP.....	
4.5.2 DISTRICT HEATING, DIRECT USES, CASCADING AND STORAGE.....	
4.5.3 ABSORPTION COOLING.....	
4.6 ENHANCED GEOTHERMAL SYSTEMS (EGS).....	
4.6.1 OVERVIEW.....	
4.6.2 EGS ENVIRONMENTS.....	
4.6.3 HARD ROCK DRILLING TECHNOLOGY AND WELL COMPLETION.....	
4.6.4 FRACTURE IDENTIFICATION, RESERVOIR STIMULATION, SEISMICITY.....	
4.6.5 LOGGING/TESTING/MONITORING, RESERVOIR MODELLING.....	
4.6.6 SUSTAINABILITY, ROCK/WATER INTERACTIONS.....	
4.6.7 EGS, FURTHER ISSUES AND SUMMARY.....	
4.7 SUMMARY: DEEP GEOTHERMAL.....	

Geoelec

1. A EUROPEAN VISION FOR GEOTHERMAL ELECTRICITY.....	
1.1 INTRODUCTION.....	
1.2 TODAY.....	
1.2.1 WHAT IS GEOTHERMAL ELECTRICITY PRODUCTION?.....	
1.2.2 EUROPEAN GEOTHERMAL INDUSTRY STAKEHOLDERS.....	
1.3 TO 2020: LAYING THE FOUNDATIONS OF A EUROPEAN GEOTHERMAL INDUSTRY.....	
1.4 TO 2030: MAKING EGS A COMPETITIVE SOURCE OF ELECTRICITY.....	
1.5 BEYOND 2030: POWERING EUROPE AND THE WORLD FROM GEOTHERMAL.....	
2. STRATEGIC RESEARCH AGENDA FOR GEOTHERMAL POWER GENERATION TECHNOLOGY.....	
2.1 INTRODUCTION.....	
2.2 TECHNOLOGY STATE OF THE ART.....	
2.3 TECHNOLOGY DEVELOPMENT OBJECTIVES.....	
2.4 RESEARCH PRIORITIES.....	
2.5 ROADMAP FOR 2020/2030 BEYOND.....	
3. REFERENCE: GEOTHERMAL ELECTRICITY.....	

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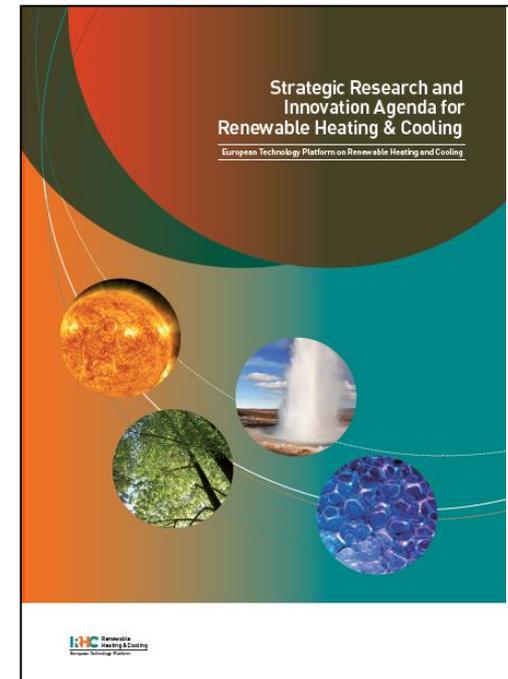


RHC Strategic Research and Innovation Agenda

22.4.2013: Conference of the RHC Platform in Dublin,
Presentation of the joint SRIA for

RHC

- **Renewable Heating & Cooling:** Vision, Opportunities and Challenges
- **RHC Applications and R&D&D Priorities** by demand types:
 - Residential Buildings
 - Non-Residential Buildings
 - Industrial Processes
 - District Heating and Cooling
- **Enabling technologies** (ICT and Materials)
- **Research capacities** and **non-technological issues**
- Outlook on the **Implementation Roadmap** (budget and funding)

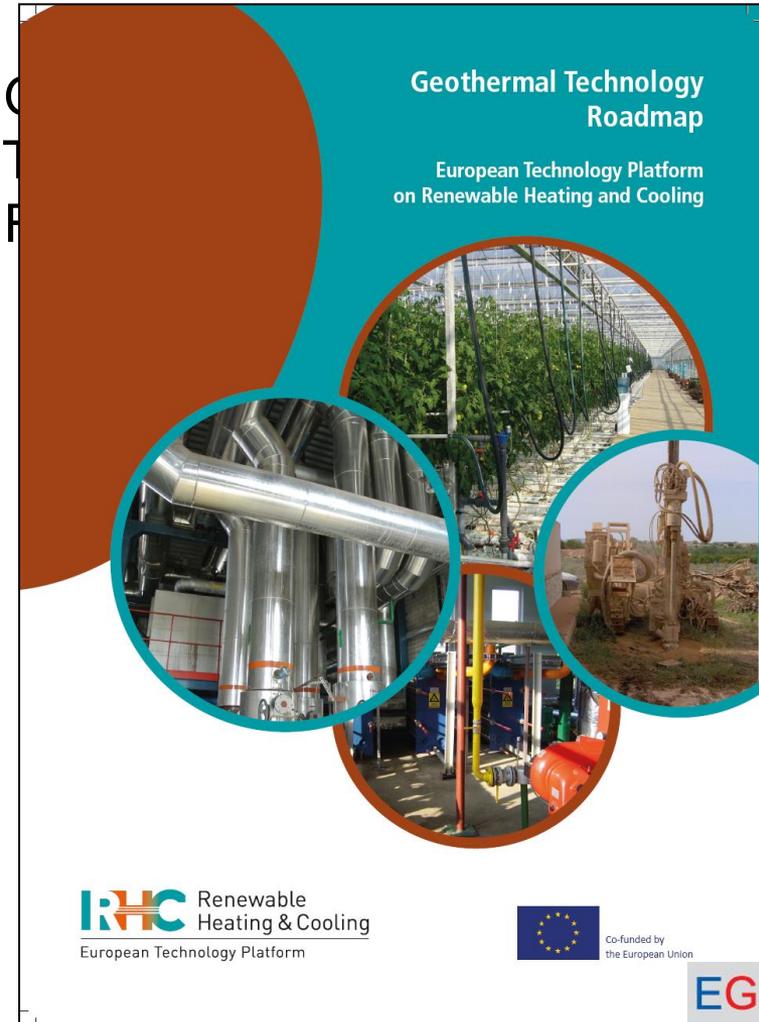


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Geothermal Technology Roadmap

March 2014: Release of the



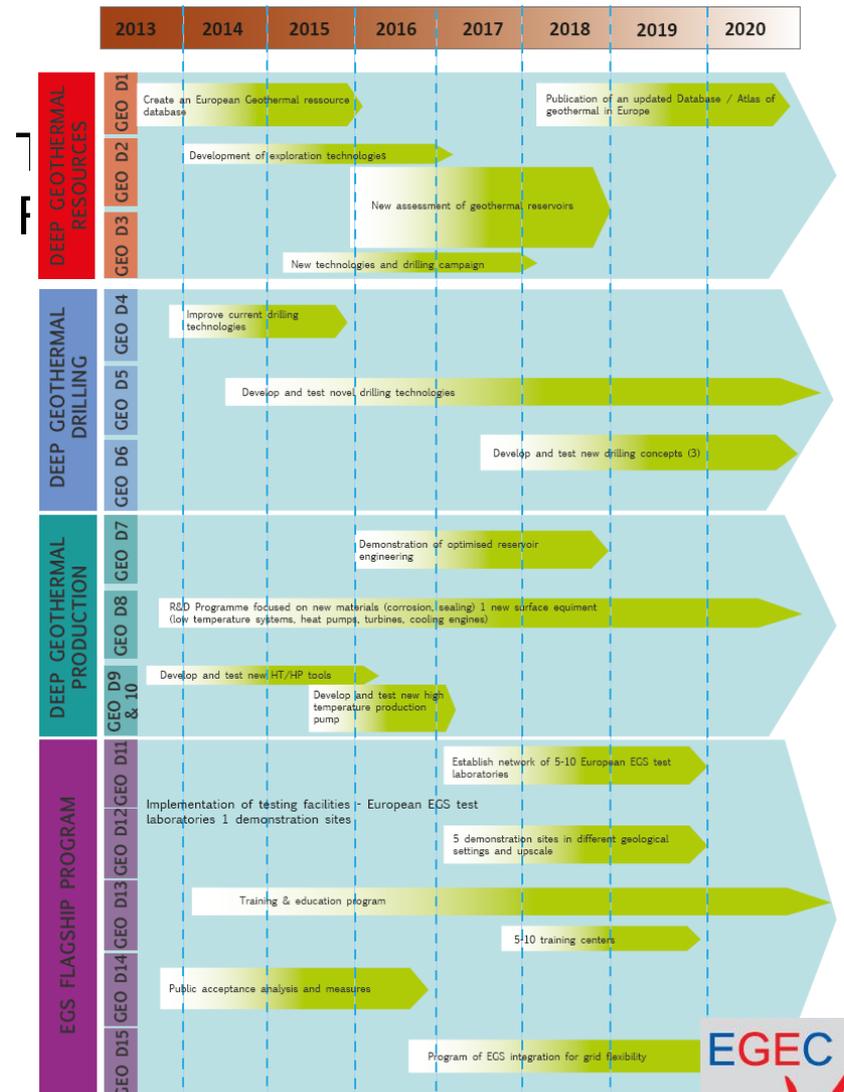
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Geothermal Technology Roadmap

March 2014: Geothermal

Subsection	Indicative budget
DEEP GEOTHERMAL RESOURCES	75 mio €
DEEP GEOTHERMAL DRILLING	115 mio €
DEEP GEOTHERMAL PRODUCTION	80 mio €
EGS FLAGSHIP PROGRAM	337 mio €
	607 mio €



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Geothermal is part of the SET-Plan !

22.9.2015: Geothermal presentation at SET-Plan Conference in Luxembourg, given by Miklos Antics



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From ETP to ETIP

26.1.2016: The RHC-Platform becomes the RHC-ETIP

6.4.2016: Meeting to create a deep geothermal ETIP

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Geothermal Electric Power

A recent EU-project 2011-2013 has compiled the information on geothermal power potential in Europe, in particular for EGS



Coordinated by EGEN
Visualisation of the results
by Web-GIS (done by TNO, NL)



Soultz-sous-Forêts

www.geoelec.eu

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www.egec.org

Geothermal Electric Power

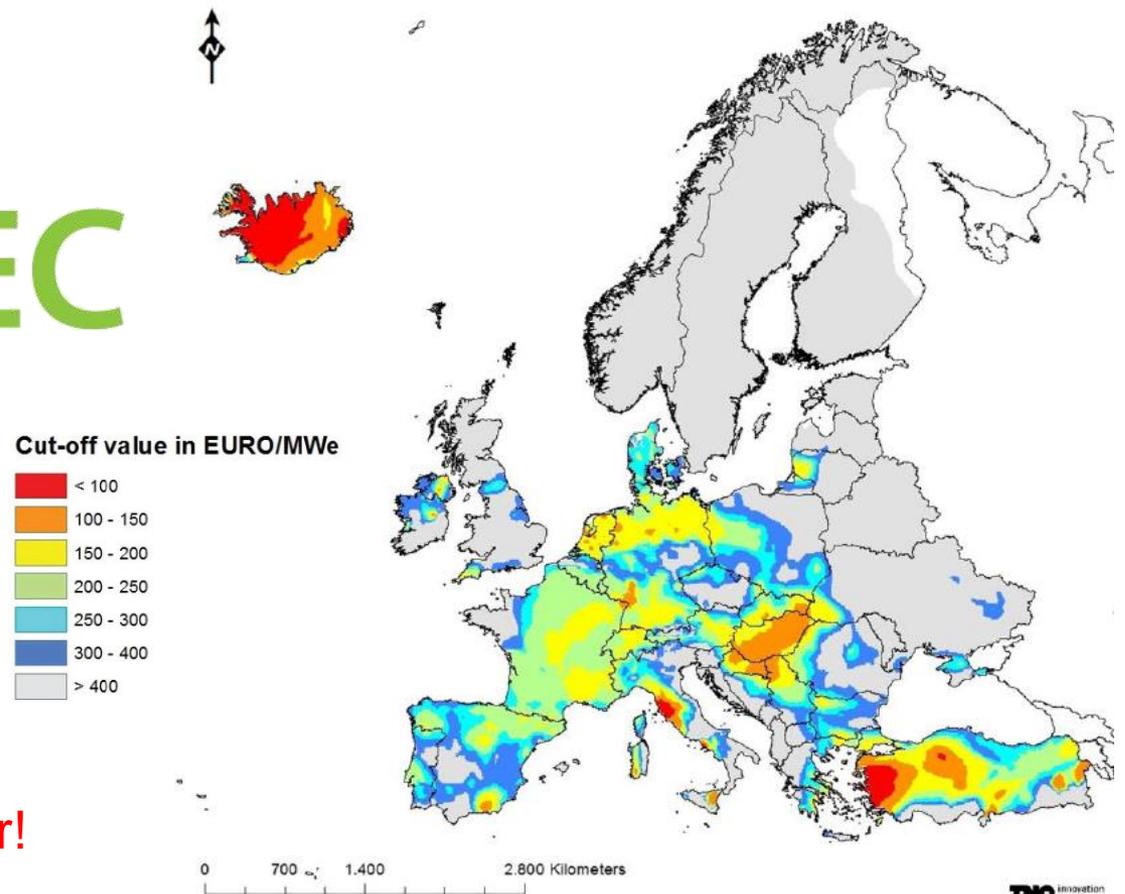
Geoelec results,
as shown in
Web-GIS



Economic potential
of geothermal power
production in Europe
in 2030

**Geothermal Power is
flexible base-load power!**

www.geoelec.eu



TNO Innovation
for life

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Geothermal Electric Power

Geoelec results,
as shown in
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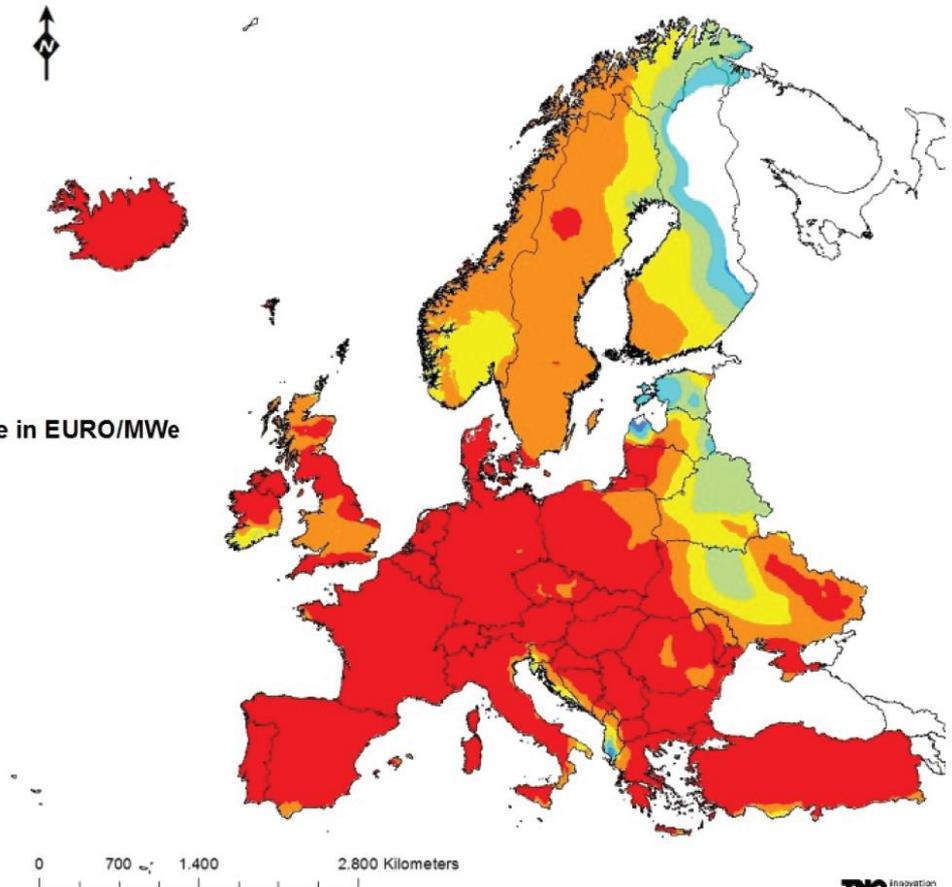


Economic potential
of geothermal power
production in Europe
in 2050

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Cut-off value in EURO/MWe



TNO
Innovation
for life



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Geothermal District Heating

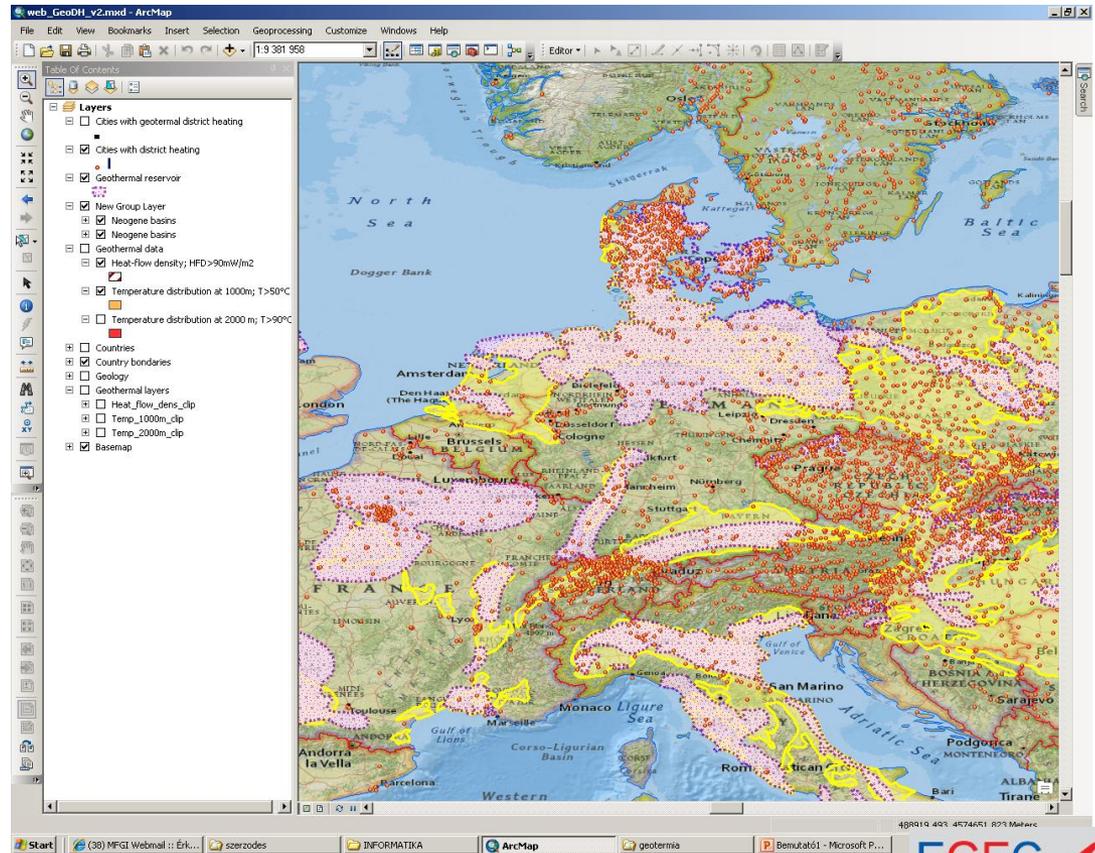
An EU-project 2012-2014 compiled the information on geothermal DH potential in Europe



Coordinated by EGEN
Visualisation of the results by Web-GIS

Matching potential and DH demand

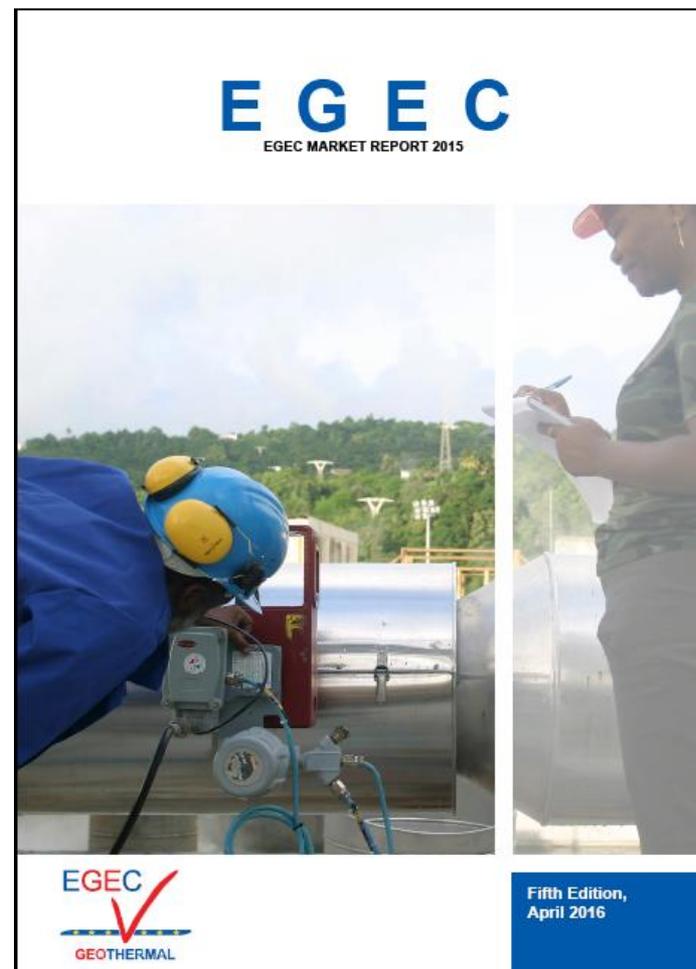
www.geodh.eu



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***Thank you very much
for your attention!***



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