

Geothermal technology workshop 08/09/2016

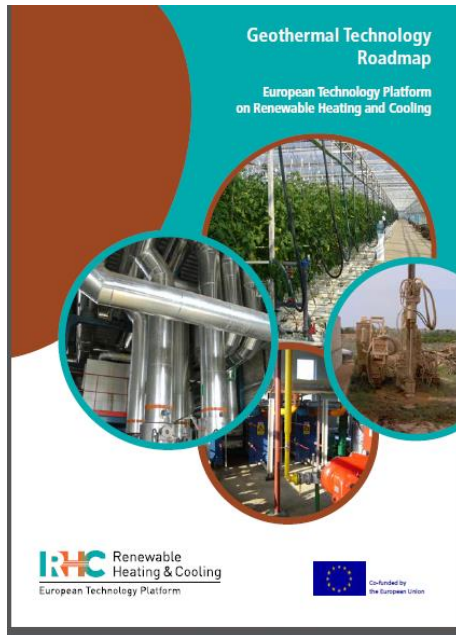
Agenda

- Feedback from ongoing Geothermal R&D projects
- Issue paper on geothermal, Declaration of Intent on deep geothermal– SET Plan
- New ETIP on smart networks (SNET)
- Working groups structure: definition and composition – selection of the WG leader
- Next activities

RHC-tender: Feedback from ongoing Geothermal R&D projects

- Deliverable 1.1- First report on the status of the implementation of the five Roadmaps
- Status of Implementation of the Geothermal Technology Roadmap (EGEC)
- The projects which are the focus of the analysis should start from 2012 and already provide main results in 2016.
- The geographical coverage is EU-28+Iceland, Israel, Norway, Switzerland, Turkey). Both EU and national-funded projects should be the focus of our analysis.

RHC-tender: Feedback from ongoing Geothermal R&D projects



Subsection	R&D programme area acronym	R&D programme area title	Indicative budget*	Classification & TRL's
DEEP GEOTHERMAL RESOURCES	GEO D 1	Create a European Geothermal resource database.	25 mln Euro	Development TRL 5-6
	GEO D 2	Exploration technologies (geochemical and geophysical exploration campaigns), characterisation and assessment of geothermal reservoirs	40 mln Euro	Research TRL 3-4
	GEO D 3	European campaign of slimholes: new technologies & drilling campaign	10 mln Euro	Development TRL 6
	Total		75 mln Euro	
DEEP GEOTHERMAL DRILLING	GEO D 4	Improve current drilling technologies	20 mln Euro	Development TRL 5
	GEO D 5	Develop novel drilling technologies by 2020: in laboratories (by 2015), on site (by 2017), on a demonstration plant (by 2020)	15+25+40 = 80 mln Euro	Research TRL 3
	GEO D 6	New drilling concept: horizontal, multi-wells, closed loop systems	15 mln Euro	Research

R&I priority: DEEP GEOTHERMAL- DEEP GEOTHERMAL RESOURCES- *Create a European Geothermal resource database (GEO D 1)*

Specific KPI	Value of the KPI at the date of submission of deliverable D1.1	Statements and figures supporting the value provided
<p>Improved exploration of geothermal resources and creation of a European geothermal resource database. In the future, not a single project should need to be abandoned after the decision to go ahead with drilling:</p> <p>Decrease geological risk to 2020 by 25% (expressed by reduced number of abandoned projects due to low temperature or flow).</p>	<p>Fully Available when database published</p> <p>National databases allow to decrease risk in operated field by around 10 %.</p> <p>This gives good indication that the 2020 target could be achieved.</p>	<p>Database ongoing</p> <p>ERANET-geothermal</p> <p>Eurogeosurveys initiative</p> <p>IRENA: global atlas</p> <p>GEODH GIS map</p> <p>GEOELEC GIS map</p> <p>Several national initiatives</p>

R&I priority: DEEP GEOTHERMAL- DEEP GEOTHERMAL RESOURCES- Exploration technologies (geochemical and geophysical exploration campaigns), characterisation and assessment of geothermal reservoirs (GEO D 2)		
Specific KPI	Value of the KPI at the date of submission of deliverable D1.1	Statements and figures supporting the value provided
<p>Improved exploration of geothermal resources and creation of a European geothermal resource database. In the future, not a single project should need to be abandoned after the decision to go ahead with drilling:</p> <p>Reduction of exploration cost by at least 25% in 2020, and 50% in the longer term.</p>	<p>Major results from 2017 with IMAGE final results</p> <p>Need assessment of all ongoing R&D projects in exploration</p>	<p>More than 27 R&D projects (VIGOR, GEAGAM, GEORG...)</p>

R&I priority: DEEP GEOTHERMAL- DEEP GEOTHERMAL RESOURCES-

European campaign for slimholes: new technologies & drilling campaign (GEO D 3)

Specific KPI	Value of the KPI at the date of submission of deliverable D1.1	Statements and figures supporting the value provided
<p>Improved exploration of geothermal resources and creation of a European geothermal resource database. In the future, not a single project should need to be abandoned after the decision to go ahead with drilling:</p> <p>Reduction of exploration cost by at least 25% in 2020, and 50% in the longer term.</p> <p>Decrease geological risk to 2020 by 25% (expressed by reduced number of abandoned projects due to low temperature or flow).</p>	<p><i>Still to be confirmed as no drilling campaign has been launched</i></p> <p>Slimeholes done in 2015 = < 10 incl. Turkey, and 1-2 in Italy</p> <p>Interest of drilling campaign comes from other sectors</p>	

R&I priority: DEEP GEOTHERMAL- DEEP GEOTHERMAL DRILLING - *Improve current drilling technologies (GEO D 4)*

Specific KPI	Value of the KPI at the date of submission of deliverable D1.1	Statements and figures supporting the value provided
<p>Reduce cost for drilling and underground installations by at least 25% compared to the situation today</p>	<p>Current (?) Market conditions helps costs reduction</p> <p>Improve current technology ready in 2-3 years: thermodrill, descramble</p> <p>Development: example erdwerk</p> <p>Drilling cost reduce by 15-20%</p>	<ul style="list-style-type: none"> - ETH Zuerich (Spallation drilling), - Fraunhofer Institute (Laser Jet drilling) - University Dresden (Electro-Pulse drilling): Development and testing of an electric pulse method drill head for deep geothermal (EIV) - HH300 geothermal drilling facility - DIRT Drilling with fiber reinforced composite material - ThermoDrill - Fast track innovative drilling system for deep geothermal challenges in Europe - DESCRAMBLE - Drilling in supercritical geothermal condition - InnoDrill - Technology platform for research-based innovations in deep geothermal drilling - STRADA energy - DeepEGS

STRATEGIC TARGETS

Agreed strategic targets in deep geothermal energy

1. → Improve the overall conversion efficiency, including bottoming cycle, of geothermal installations at different thermo-dynamical conditions by 10% in 2030 and 20% in 2050;
2. → Increase reservoir performance¹⁴ resulting in power demand of reservoir pumps to below 10% of gross energy generation and in sustainable yield predicted for at least 30 years by 2030;
3. → Reduce the exploration costs by 25% in 2025, and by 50% in 2050 compared to 2015 average costs;
4. → Reduce production costs of geothermal energy (including from unconventional resources, EGS, and/or from hybrid solutions which couple geothermal with other renewable energy sources) below 10 €/kWh_e for electricity and 5 €/kWh_{th} for heat by 2025¹⁵;
5. → Reduce the unit cost of drilling (€/MWh) by 15% in 2020, 30% in 2030 and by 50% in 2050 compared to 2015;
6. → Demonstrate the technical and economic feasibility of responding to commands from a grid operator, at any time, to increase or decrease output ramp up and down from 60% to 110% of nominal power.

¹⁴ Reservoir performance includes underground heat storage.

¹⁵ Costs have to be confirmed establishing at least 5 plants in different geological situations, of which at least one with large capacity (20 MW_e or, if for direct use only, 40 MW_{th}).

STRATEGIC TARGETS

- *Transparent and harmonized methods and instruments for technical and financial risk management.*
In early exploratory stages a framework insurance policy would mitigate the exploration risks and acts as a stimulus until, after the initial high level risk be mastered, developers carry out exploration/development issues under their own responsibility and resources.
- *Increasing social acceptability and mitigation of unsolicited side effects (induced seismicity, emissions to the environment).*
Unsolicited side effects in reservoir, including induced seismicity, and plant management must be mitigated to address social concerns and increase social acceptability of geothermal installations. New technologies should be developed to improve the environmental performance of high-temperature geothermal power generation systems, avoiding the release of steam and potentially hazardous chemical compounds into the atmosphere from the cooling tower, as well as non-condensable gases (NCGs) like carbon dioxide. In particular the feasibility of closed-loop reinjection of liquid and NCGs for gas-reach resources should be demonstrated.

In addition large scale demonstration and deployment to prove innovative concepts and their integration in the energy system are needed to make technologies available for the market.

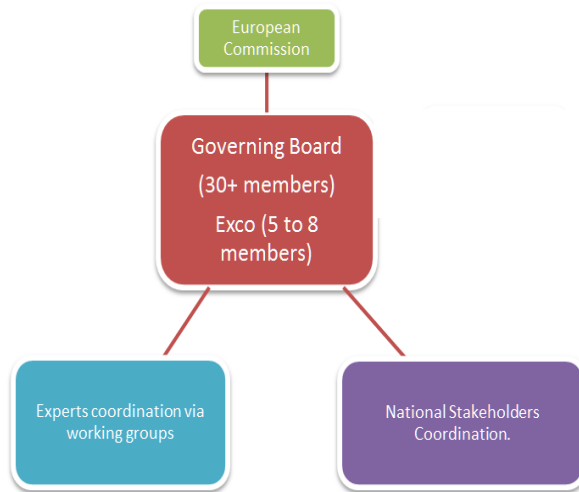
STRATEGIC TARGETS

Next steps

The stakeholders agree to develop within 6 months a detailed implementation plan for the delivery of these targets, determine joint and/or coordinated actions, identify the ways in which the EU and national research and innovation programs could most usefully contribute, identify the contributions of the private sector, research organizations, and universities, identify all issues of a technological, socio-economic, regulatory or other nature that may be of relevance in achieving the targets, and report regularly on the progress with the purpose to monitor the realisation of the targets and take rectifying action where and whenever necessary.

The stakeholders intend to use the European Technology and Innovation Platform on Deep Geothermal energy as the main vehicle for discussing and agreeing on the implementation plan.

New ETIP on smart networks (SNET)



Stakeholder group	Number of seats	Associations
TSOs	4	ENTSO-E
DSOs	4	CEDEC, EDSO, Eurelectric, GEODE
National representatives	3	SET-Plan Steering Committee
Research & Academia	3	EERA - EUREC - EUA - EPUE
Storage (technology and services providers)	3	EASE - Eurobat - HEA
Consumers (aggregated and not aggregated)	3	ANEC - BEUC - SEDC
Thermal Generation (flexible)	3	COGEN Europe - EPPSA - ETN - EUGINE - EUTURBINE
ICT technology & network providers	3	Digital Europe - ESMIG - ETNO - EUTC
Non ICT - Manufacturers equipment suppliers	3	Europacable, Orgalime, T&D Europe
Renewable Energy Sources ETIPs	3	EGEC - Ocean - PV - RES H&C - Wind
Interface to Other Energy Carriers (Heat, Transport, Gas, ...)	3	EGVIA - EHA - ENTSO-G - ERTRAC - Euro Heat and Power - EUROGAS
Regulators*	1	ACER - CEER

TOTAL	36
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*Participation on ad-hoc basis

Working groups structure

- definition
- composition
- selection of the WG leader

EGEC Secretariat	Executive Committee				Support Groups, EERA, ERANET, other ETIPs etc.
	Steering Committee				
Working Groups					
Subsurface		Surface		Horizontal	
Exploration	Deep Drilling	Production technologies	Surface	Non Technical	
<ul style="list-style-type: none"> •Hydrothermal: medium and high T° •EGS •Supercritical •Understanding Geological processes •Exploration methods •Reservoir characterization •Resource assessment 	<ul style="list-style-type: none"> •Improvement •Novel technologies •Drilling concept •Need for materials •Cost reduction key driver •Dedicated Well designs/techniques for exploration, reservoir development 	<ul style="list-style-type: none"> •Reservoir •Materials •Sustainable Reservoir development •Stimulation /induced seismicity •Scaling & corrosion •Reservoir monitoring and optimization 	<ul style="list-style-type: none"> •Power conversion •CHP •Zero emissions •Grid Flexibility •Hybrid (other source) 	<ul style="list-style-type: none"> •Legal & Policy •Education & Training •Public acceptance, •Risk management •Finance •Competitiveness •System integration 	

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- *EXPLORATION*
[3]
- *DEEP DRILLING*
[4] [5]
- *PRODUCTION TECHNOLOGY*
[1] [2] [4] [6]
- *SURFACE*
[1] [2] [4] [6]
- *NON TECHNICAL*

Next activities

- Meetings:
 - During EGC2016 in Strasbourg ?
 - AGM 2016 with SC election: november 2016 ?

- Actions:
 - Update roadmap
 - Prepare H2020 WP 2018-2016-2020