

European Technology

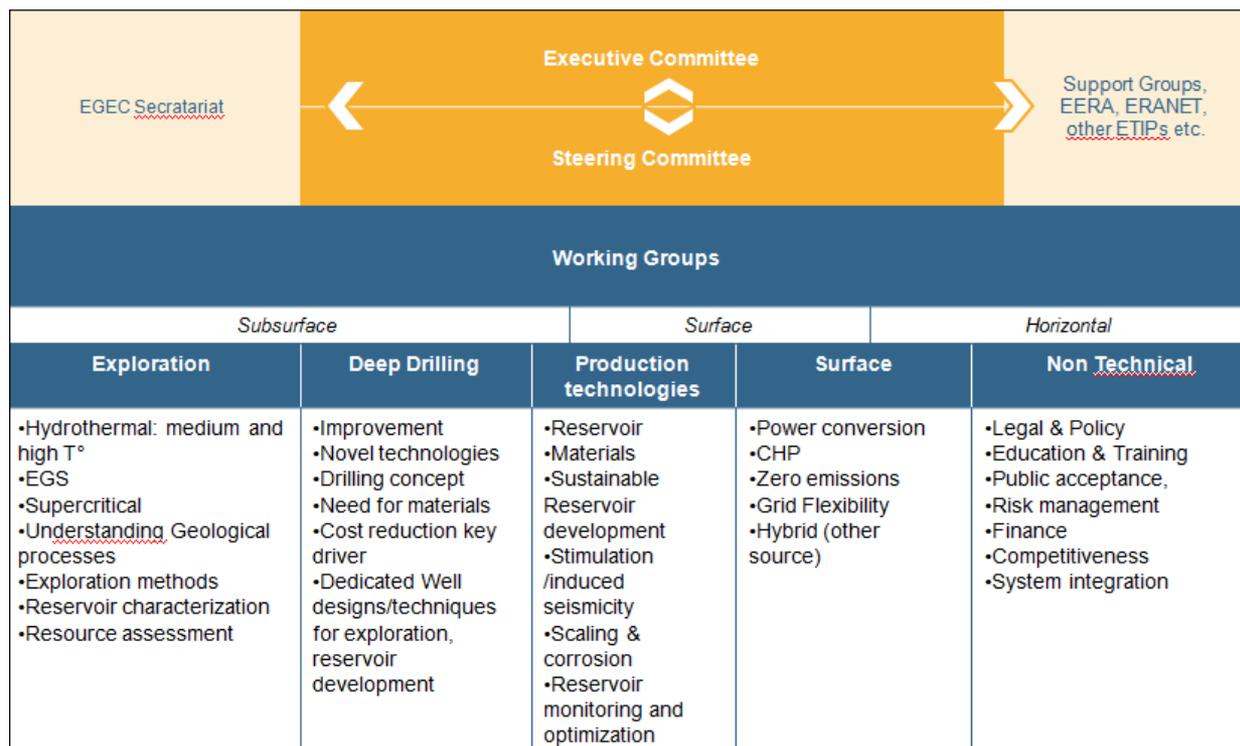
Deep Geothermal

& Innovation Platform

Report from the WGs

Exploration

Terms of Reference



Working Group Exploration - strategic targets

1. Increase reservoir performance 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.
2. Improve the overall conversion efficiency, including bottoming cycle, of geothermal installations at different thermodynamic conditions by 10% in 2030 and 20% in 2050;
3. 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 €/ct/kWhe for electricity and 5 €/ct/kWhth for heat by 2025
4. Reduce the exploration costs by 25% in 2025, and by 50% in 2050 compared to 2015;
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% - 110% of nominal power.

Working Group Exploration - strategic targets to EC

- **A1.1 Enhanced exploration methods for deep geothermal reservoirs**
- **A2.6 Resource potential, data and technical risk management tools**
- A3.1 Innovative Risk mitigation financial tools

TWG – fiche exploration

| Description of Research and Innovation Activity | | DG TWG |
|--|---|--|
| Title: Exploration techniques (including resource prediction and exploratory drilling) | | F.6 |
| Targets: DOI 3, 4 | Monitoring mechanism: | |
| <p>Description: (D) Applying innovative exploration techniques, optimizing existing technologies and adapting methods for the geothermal application to reduce exploration costs by reducing costs of the technique or replacing traditional (and expensive) state-of-the art technologies at least partly (e.g. reducing the area of a 3D seismic survey by applying other exploration techniques). (EGEC2) Exploration technologies (geochemical and geophysical exploration campaigns), <u>characterisation</u> and assessment of geothermal reservoirs (EGEC3) European campaign of data acquisition: new technologies & drilling campaign (EGEC5) Develop novel drilling technologies by 2020: in laboratories (by2015), on site (by 2017), on a demonstration plant (by 2020)</p> | | |
| TRL at start: 3-4 | TRL at end: 4-5 | |
| Total budget required: 130 M€? (40 ongoing EGEC2) | | |
| Expected deliverables: | Timeline: | |
| | | |
| Party/Parties | Implementation Instruments | Indicative financing contribution |
| ETIP, EGEC, D, CH, NL, IT?, EERA | LC-SC3-RES-11-2018: Developing solution to reduce the cost and increase performance of renewable technologies (8-10 M€) | |

exploration

- **Magmatic**
 - Conventional
 - Supercritical
 - offshore
- **basement/Sedimentary**
 - Shallow: Storage
 - Conventional (oil & gas reservoir depth)
 - Ultra-deep (> 4km)

A1 – Developing the next generation of deep geothermal electricity and heating/cooling technologies

| | | |
|-------------|----|---|
| Exploration | 1 | Development of method to estimate near critical temperature prior to drilling. |
| | 2 | Development of method for offshore geothermal exploration including knowledge transfer from Oil and Gas industry. |
| | 3 | Post exploration data fusion |
| | 4 | Fracture characterization based on time-lapse electric potential data |
| | 5 | Assessment of ultra-deep geothermal resources & Improvement of exploration techniques for ultra-deep reservoirs |
| | 6 | reducing pre-drill mining risk for ultra-deep geothermal systems |
| | 7 | Data organization and new and more integrated geothermal potential computation and maps, also taking into account economic, environmental and social aspects /risk management |
| | 8 | Enhanced geophysical numerical inversion methods |
| | 9 | Revisited integrated geothermometer method |
| | 10 | Gather worldwide knowledge on geothermal analogous sites / Big-data analytics |
| | 11 | Enhanced resource assessment from time-lapse analysis in producing fields and existing wells |
| | 12 | outcrop analogues for integrated geothermal exploration of geothermal systems |
| | | |

A2 – Close-to-market demonstration of competitive deep geothermal electricity and heating/cooling

| | | |
|-------------|----|--|
| Exploration | 52 | Deep water flow's identification & prediction by non-destructive methods in exploration & exploitation |
| | 53 | Technologies development of temperature distributed measures |
| | 54 | resource potential and risk management tools |