

Chapter RESOURCE ACCESS AND DEVELOPMENT

Webinar consultation 24/05/2019



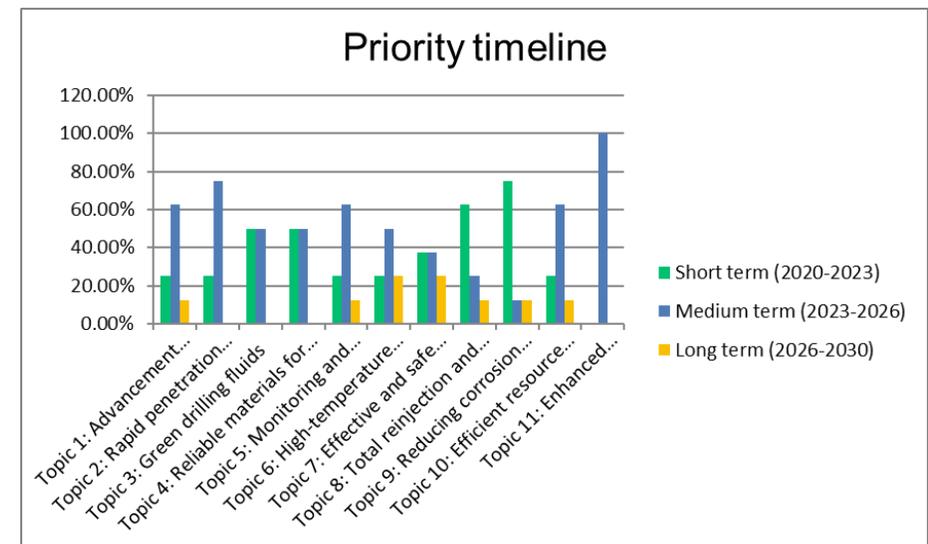
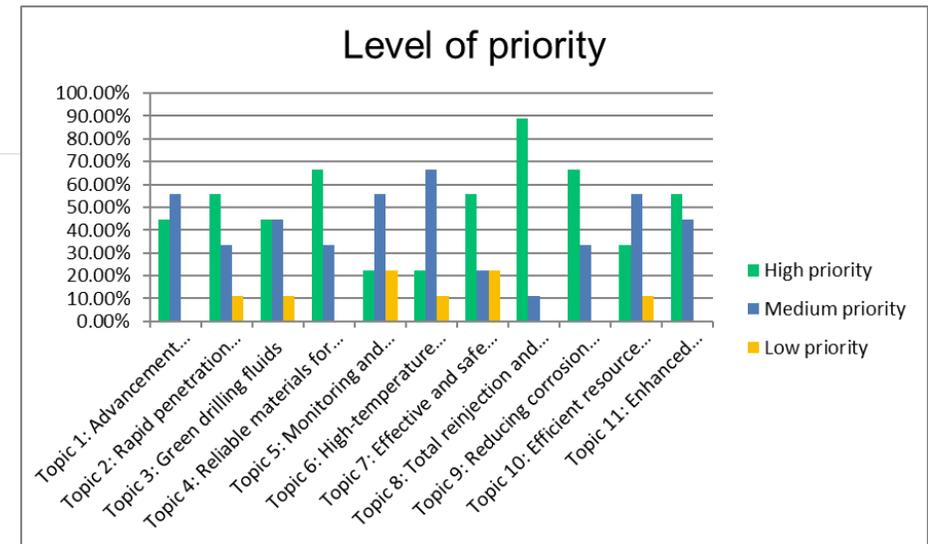
ETIP-DG

European Technology & Innovation
Platform on **Deep Geothermal**

www.etip-dg.eu

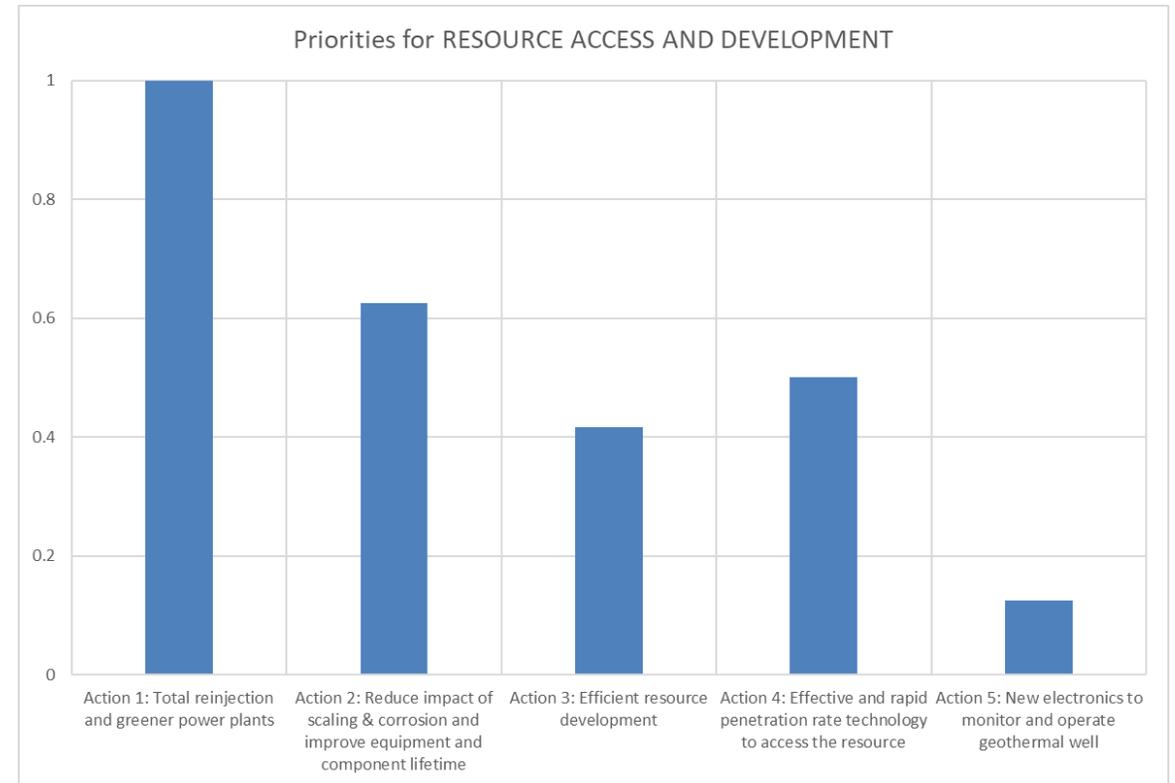
Steering Committee assessment

- Topic 1: Advancement towards robot drilling technologies
- Topic 2: Rapid penetration rate technologies
- Topic 3: Green drilling fluids
- Topic 4: Reliable materials for casing and cementing
- Topic 5: Monitoring and logging while drilling (incl. 'looking ahead' of the bit)
- Topic 6: High-temperature electronics for geothermal wells
- Topic 7: Effective and safe technologies for enhancing energy extraction
- Topic 8: Total reinjection and greener power plants
- Topic 9: Reducing corrosion and scaling and optimising equipment and component lifetime
- Topic 10: Efficient resource development
- Topic 11: Enhanced production pumps



Steering Committee assessment – grouping of the topics

- Topic 8 -> Action 1: Total reinjection and greener power plants
- Topic 4 & 9 & 3 -> Action 2: Reduce impact of scaling & corrosion and improve equipment and component lifetime
- Topic 7, 10 & 11 -> Action 3: Efficient resource development
- Topic 1 & 2 -> Action 4: Effective and rapid penetration rate technology to access the resource
- Topic 6 -> Action 5: New electronics to monitor and operate geothermal well



Action 1: Total reinjection and greener power plants

- Objectives

- Development of reliable, safe and cost-efficient technologies to improve the environmental performance of geothermal power systems over their entire lifecycle. This objective can be reached by reinjection of the geothermal fluid including non-condensable gasses (NCGs) or by development of technology for the capture, sustainable use or abatement NCGs through:
 - The development of coupled well-reservoir multiphase flow models to understand and predict the chemical and physical behavior of geothermal fluids and geo-mechanical behavior of reservoir rocks
 - The development of technology for the capture, sustainable use, abatement or reinjection of NCGs (from TRL4 to 7 now to TRL 7 to 9 by 2023 and market uptake by 2026)

Action 1: Total reinjection and greener power plants

- Targets
 - Reduction of geothermal emissions by xx% in 2026
- Priority: high
- Timeline: short
- Scope
 - Technology development including lab testing and demonstration in relevant environments in the period 2020 – 2023
 - Demonstration in at least 3 geothermal areas by 2026

Action 2: Reduce impact of scaling & corrosion and improve equipment and component lifetime

- Objectives

- Development of effective and environmentally benign measures to control scaling and corrosion (TRL 6 – 8 by 2023, TRL 9 by 2026)
- Development of save and environmentally benign measures to remove scaling (TRL 6 – 7 by 2023, TRL 8 – 9 by 2026)
- Development of materials that are resistant to corrosion and/or have anti-scaling properties. Such materials can help to reduce operational costs and downtime and to increase the lifetime of components such as submersible pumps and tubing (TRL 5 – 7 by 2023, TRL 8 – 9 by 2026)
- Developing materials, including casing couplings and cements, to improve overall heat transfer and to guarantee integrity and resistance to fatigue over the well's lifetime under the challenging conditions encountered in geothermal applications (TRL 5 – 6 by 2023, TRL 7 – 8 by 2026, TRL 8 – 9 by 2030)
- Development of eco-friendly drilling fluids that are stable under high temperature – high pressure conditions and that effectively protect drilling equipment against corrosion (TRL 4 – 5 by 2023, TRL 6 – 7 by 2026, TRL 8 – 9 by 2030)

Action 2: Reduce impact of scaling & corrosion and improve equipment and component lifetime

- Targets
 - Reduce O&M costs per MWh produced with xx% in 2030 by:
 - Reduced downtime of geothermal plants due to scaling or corrosion, equipment replacement or cleaning
 - Increased lifetime of components and equipment
 - Improve environmental performance and mitigate unsolicited side effects
- Priority: moderate to high
- Timeline: short to medium
- Scope
 - technology development and demonstration

Action 3: Efficient resource development

- Objectives

- The development of effective and safe technologies for enhancing energy extraction from low permeability rock (TRL 5 – 6 by 2023, TRL 7 – 8 by 2026, TRL 9 by 2030)
- Increase the ability to predict the thermal, flow and operational behavior of geothermal reservoir, well field and steam network in order to enhance the capacity to control and predict the management efficiency of a geothermal power plant. This asks for the development and testing of thermodynamic models coupled to the flow of steam as well as model to evaluate flow of mass and heat in geothermal wells and reservoirs
- Development of second generation geothermal pumps with prolonged lifetime under aggressive fluid conditions or of alternative lifting technologies (TRL 6 – 7 by 2023, TRL 8 – 9 by 2026)

Action 3: Efficient resource development

- Targets
 - Improve energy yield through improved hydraulic connection to the reservoir, increased reservoir performance and enhanced O&M procedures by 20% in 2026 and 30% in 2030
 - Increase the lifetime of geothermal pumps for geothermal resources up to 140°C to at least 5 years in 2026 and at least 10 years in 2030
 - Lift the operational window of pumps / lifting technologies to 200°C – 80 l/s – 1000 m lift by 2026 and 250°C – xx l/s – xx m lift in 2030
 - Extend the lifetime of plants
- Priority: moderate
- Timeline: short to medium
- Scope
 - Research on mass and thermal flow modelling (2020 – 2026)
 - Technology development, testing and validation (2020 – 2026)
 - At least 3 demonstration projects of enhanced heat extraction from low permeability by 2030

Action 4: Effective and rapid penetration rate technology to access the resource

- Objectives
 - Development of proven or new rock destruction mechanisms into highly efficient and versatile rock destruction processes for geothermal applications
 - Elaboration of protocols and tools ensure wellbore stability and to avoid lost-in-hole accidents
- Targets: Achieve cost reduction in resource access by:
 - Reducing the time needed to complete a well by 25% in 2026 and 50% in 2030
 - Reducing delays due to wellbore stability issues by xx% 2026 and xx% in 2030
 - Reducing costs due to lost-in-hole accidents by xx% 2026 and xx% in 2030
- Priority: moderate
- Timeline: medium
- Scope
 - Technology development and demonstration
 - knowledge exchange among geothermal operators / drillers as well as between the geothermal industry, oil & gas and the mining industry (2020 – 2030)

Action 5: New electronics to monitor and operate geothermal well

- Objectives
 - Develop electronics and sensors to be used in high-temperature geothermal wells during drilling operations. This will lead to better control of the drilling process reducing the risk of wellbore stability and to lost-in-hole accidents
 - Development of data communication technologies that allow fast and reliable data transfer under high-temperature conditions
- Targets
 - Development of electronics and sensors that can withstand temperatures of 350°C in 2030
 - Development of data communication technologies that can withstand temperature up to 350°C in 2030
- Priority: low
- Timeline: medium to long
- Scope
 - Technology development and demonstration
 - This action is related to action 4 and asks for collaboration with the ICT industry (see D5.3: External stakeholders, common RD&I needs and complementary actions)



The sole responsibility of this publication lies with the author. The European Union is not responsible for any use that may be made of the information contained therein.
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No [773392 — DG ETIP]

