A report on private stakeholders' engagement

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Deep GEOTHERMAL IWG
SUPPORT UNIT

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Contents

Introduction

This report on private stakeholders' engagement is an update and final version of the report D4.1 on a mapping of the private stakeholders potentially active in RD&I on geothermal.

The specific geothermal Implementation plan (IP) from the Implementation Working Group of the SET plan is now executed for achieving the ambition set for geothermal.

To ensure the adequate execution of the IP, a task is dedicated to coordinate private funds and focusing them on the Implementation Plan's R&I and non-technical priorities.
This deliverable aims at producing an assessment of the private stakeholders engagment in RD&I on geothermal.
This report is done in the frame of a general task to analyse private financing of geothermal research and innovation. This task started with a mapping of the private stakeholders potentially active in RD&I on geothermal. The annual reporting on execution of the IP by companies (D4.3/4.4/4.5) presented the results of the private engagement.

Co-funding from private companies in European projects

Presentation of the actors already active as partners in R&I co-funded European projects. These include private industrial actors and public authorities or research institutions (e.g. universities):

Innovation Fund

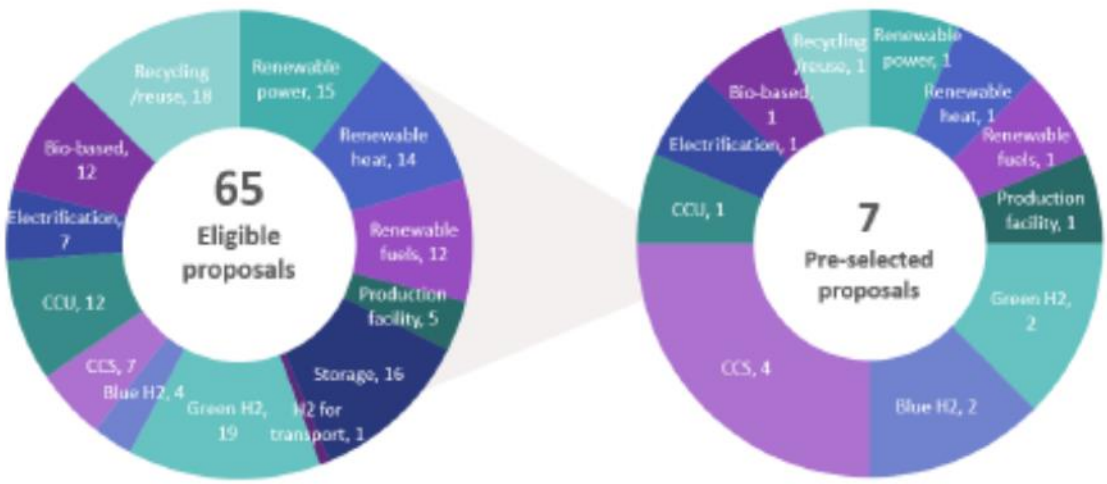
Innovation Fund:

- Large scale ie >7,5€mio: 1st call (7 projects awarded/311 applied but 65 eligible at 2nd stage) and 2nd call for large scale with a deadline on 3 March 2022

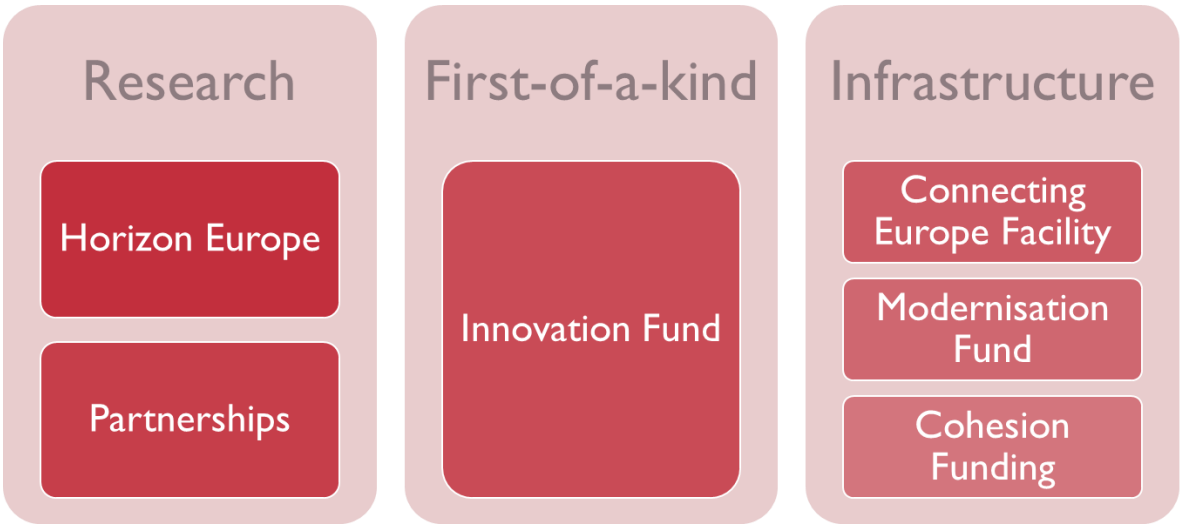
- Small scale projects: 1st call (32 projects awarded/232 applications), 2nd call in summer 2022

    - 1 awarded on geothermal for 4,5 €mio: CCGeo: Closed Carbon Geothermal Energy

Figure 2.2. Technological Pathways for eligible and pre-selected proposals



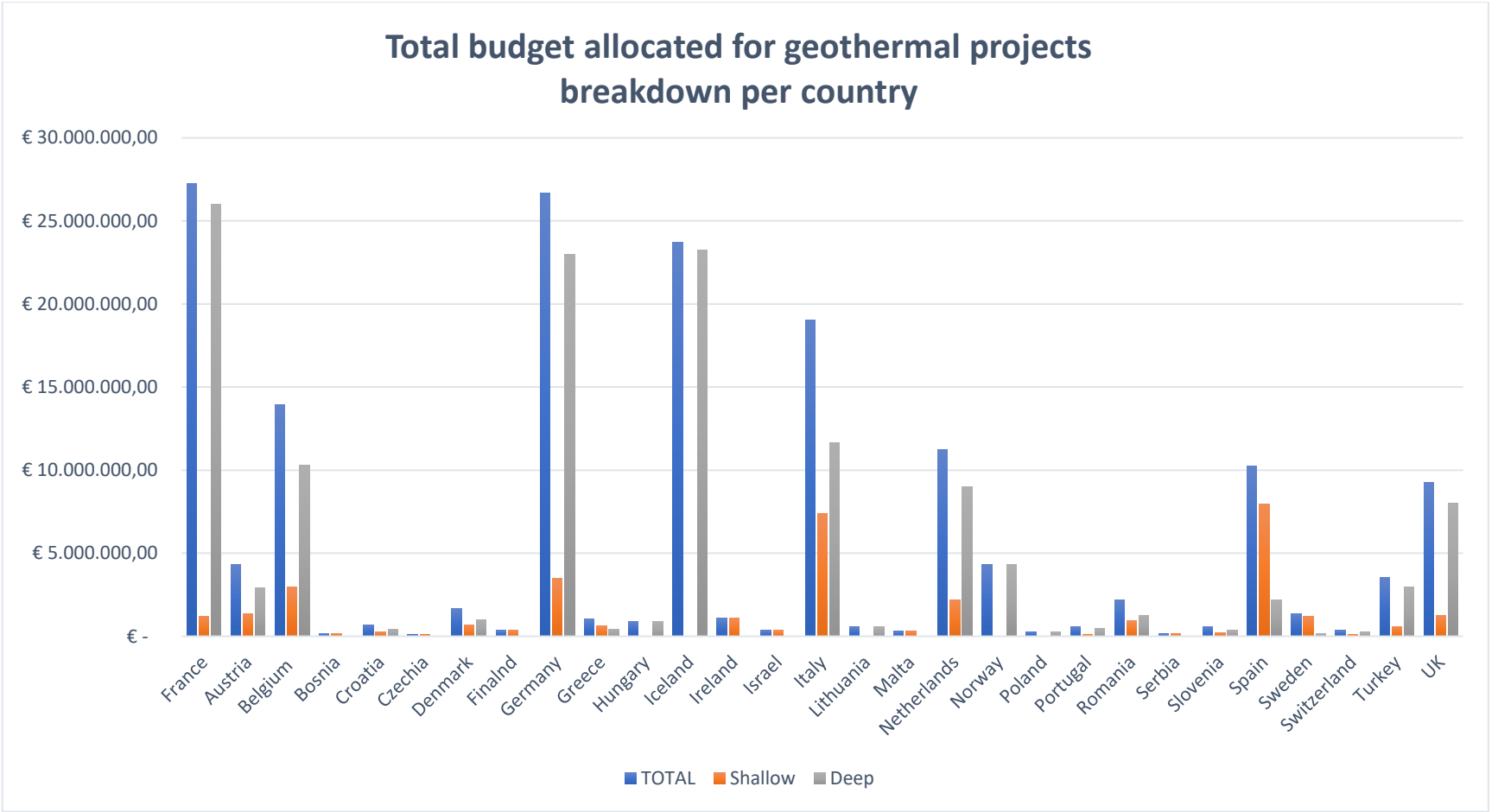
Innovation Fund complementarities



Horizon 2020 programme

During the full period of the programme 2014-2020, the total costs of the geothermal projects supported by H2020 amounted to € 349.853.379,98. The EU contribution was for € 248.755.453,82.
The private co-funding of these European projects amounted € 101.097.926,16.
For the period of the analysis 2019-2021, the total costs of the projects was € 54.364.462,50, and the EU contribution for an amount of € 52.063.699,65. The private co-funding of the European projects during this 3 years period amounted € 2.300.762,85.

The geographical coverage is the following:


Total budget allocated for geothermal projects breakdown per country
€ 30.000.000,00
€ 25.000.000,00
€ 20.000.000,00
€ 15.000.000,00
€ 10.000.000,00
€ 5.000.000,00
€ -
France
Austria
Belgium
Bosnia
Croatia
Czechia
Denmark
Finalnd
Germany
Greece
Hungary
Iceland
Ireland
Israel
Italy
Lithuania
Malta
Netherlands
Norway
Poland
Portugal
Romania
Serbia
Slovenia
Spain
Sweden
Switzerland
Turkey
UK
TOTAL
Shallow
Deep

Details are presented in the table below.

Year (call)	ID	Acronym	Full Name	From	To	Total cost	EU Contrib	Coord. In	Programme	Call for proposal	Topic	Funding Scheme	Deadline Model	Other Projects funded in the call	Website
2019	851816	GEOPRO	Accurate Geofluid Properties as key to Geothermal Process Optimisation	01/11/2019	31/10/2022	€ 4.898.982,50	€ 4.898.982,50	United Kingdom	3.3.2	H2020-LC-SC3-2019-RES-TwoStages	LC-SC3-RES-14-2019 - Optimising manufacturing and system operation	RIA - Research and Innovation action	two stages	4	https://cordis.europa.eu/project/id/851816
2019	851917	GeoHex	Advanced material for cost-efficient and enhanced heat exchange performance for geothermal application	01/11/2019	31/10/2022	€ 4.989.401,25	€ 4.989.401,25	United Kingdom	3.3.2	H2020-LC-SC3-2019-RES-TwoStages	LC-SC3-RES-1-2019-2020 - Developing the next generation of renewable energy technologies	RIA - Research and Innovation action	two stages	4	https://cordis.europa.eu/project/id/851917
2019	857830	CROWDTHERMAL	Community-based development schemes	01/09/2019	31/08/2022	€ 2.305.801,25	€ 2.305.801,25	Belgium	3.3.2 // 3.3.7 // 3.3.3	H2020-LC-SC3-2019-RES-	LC-SC3-RES-28-2018-	CSA - Coordination and	one stage	13	https://cordis.europa.eu/project/id/857830

			for geothermal energy							IA-CSA	2019-2020 - Market Uptake support	support action			
2019	815319	Geo-Drill	Development of novel and cost-effective drilling technology for Geothermal Systems	01/04/2019	30/09/2022	€ 4.996.400,00	€ 4.996.400,00	United Kingdom	3.3.2	H2020-LC-SC3-2018-RES-TwoStages	LC-SC3-RES-11-2018 - Developing solutions to reduce the cost and increase performance of renewable technologies	RIA - Research and Innovation action	two stages	16	https://cordis.europa.eu/project/id/815319
2019	815301	RE-COGNITION	REnewable COGeneration and storage techNologies IntegraTIon for energy autONomous buildings	01/04/2019	31/03/2022	€ 4.990.000,00	€ 4.990.000,00	Italy	3.3.2	H2020-LC-SC3-2018-RES-TwoStages	LC-SC3-RES-4-2018 - Renewable energy system integrated at the building scale	RIA - Research and Innovation action	two stages	16	https://cordis.europa.eu/project/id/815301
2019	814865	RES4BUILD	Renewables for clean energy buildings in a	01/05/2019	30/04/2023	€ 4.999.702,50	€ 4.999.702,50	Germany	3.3.2	H2020-LC-SC3-2018-RES-	LC-SC3-RES-4-2018 - Renewable	RIA - Research and Innovation action	two stages	16	https://cordis.europa.eu/project/id/814865

			future power system							TwoStages	energy system integrated at the building scale				
2019	850626	REFLECT	Redefining geothermal fluid properties at extreme conditions to optimize future geothermal energy extraction	01/01/2020	31/12/2022	€ 4.992.761,25	€ 4.992.761,25	Germany	3.3.2	H2020-LC-SC3-2019-RES-TwoStages	LC-SC3-RES-14-2019 - Optimising manufacturing and system operation	RIA - Research and Innovation action	two stages	4	https://cordis.europa.eu/project/id/850626
2020	851541	REGEN-BY-2	Next REnewable multi-GENeration technology enabled by TWO-phase fluids machines	01/09/2020	31/08/2024	€ 5.419.327,50	€ 4.905.748,75	Italy	3.3.2	H2020-LC-SC3-2019-RES-TwoStages	LC-SC3-RES-1-2019-2020 - Developing the next generation of renewable energy technologies	RIA - Research and Innovation action	two stages	10	https://cordis.europa.eu/project/id/851541
2020	[101006964]	OptiDrill	Optimisation of Geothermal Drilling Operation with	01/01/2021	31/12/2023	€ -	€ 3.985.302,50	Germany	3.3.2	H2020-LC-SC3-2020-RES-RIA	LC-SC3-RES-18-2020 - Advanced	RIA-LS - Research and Innovation action		18	https://cordis.europa.eu/project/id/101006964

			Machine Learning								drilling and well completion techniques for cost reduction in geothermal energy	Lump Sum			
2020	[101006752]	ORCHYD	Novel Drilling Technology Combining Hydro-Jet and Percussion for ROP Improvement in deep geothermal drilling	01/01/2021	31/12/2023	€ -	€ 3.999.945,00	France	3.3.2	H2020-EU.3.3.2. - Low-cost, low-carbon energy supply	LC-SC3-RES-18-2020 - Advanced drilling and well completion techniques for cost reduction in geothermal energy	RIA-LS - Research and Innovation action Lump Sum		18	https://cordis.europa.eu/project/id/101006752
2020	957810	IANOS	IntegrAted SolutioNs for the DecarbOnization and Smartification of Islands	01/10/2020	30/09/2024	€ 8.786.838,75	€ 6.999.654,65	Portugal	3.3.4	H2020-LC-SC3-2020-EC-ES-SCC	LC-SC3-ES-4-2018-2020 - Decarbonising energy systems of geographical Islands	IA - Innovation action	one stage	20	https://cordis.europa.eu/project/id/957810

GEOTHERMICA-funded projects

GEOTHERMICA is a consortium of geothermal energy research & development institutions from 15 European countries and regions and the newly associated in 2019, the U.S. Department of Energy (DOE). GEOTHERMICA's objective is to accelerate the development of geothermal energy globally, by combining financial resources and know-how of its respective partners, as well as expanding the use of clean and renewable low carbon geothermal energy beyond its traditional markets and regions. GEOTHERMICA seeks to explore optimization of geothermal heat and power generation, including innovative integrated and combined systems. To date, GEOTHERMICA has financed in its first call, with the support of the European Commission, eight large Inter-European projects allocating close to EUR 30 million. The USA joined the consortium in 2019 giving GEOTHERMICA the weight to influence and accelerate geothermal energy globally. A second joint call as launched in 2020 and awarded projects are announced in 2022.

For the first call, the total budget of the co-funded projects as € 23.043.591,00, for a public contribution of € 43.788.565,00, and a private contribution of € 20.744.974,00.

Project				
Acronym	**Description**	**Geothermica financing**	**Total cost**	**Private funding**
CAGE	CAGE is a development and demonstration project of several cost-saving and output-improving installation technologies.	€ 5.834.888,00	€ 13.457.698,00	€ 7.622.810,00
COSEISMIQ	This GEOTHERMICA research, innovation and demonstration project will improve and validate the advanced technologies for monitoring and controlling induced seismicity that have been developed and coded in the past three years.	€ 1.148.958,00	€ 2.479.458,00	€ 1.330.500,00
GECONNECT	GeConnect aims at increasing the reliability of the downhole construction of geothermal wells beyond the state of the art using flexible couplings (patent filed 19th of December 2016, international publication number WO 2017/103950 A1).	€ 868.891,00	€ 1.196.126,00	€ 327.235,00
GEOFOOD	Food production in Europe requires further steps in reducing the carbon footprint. This project showcases the opportunities of direct use of geothermal energy to increase food production in highly productive circular systems.	€ 1.249.204,00	€ 1.749.656,00	€ 500.452,00
GEO-URBAN	The GEO-URBAN project aims to explore the potential for low enthalpy geothermal in urban environments. The project will focus on two target locations – Dublin, Ireland and Vallès, Spain – and will provide a feasibility analysis for the commercial development of deep geothermal resources in these regions.	€ 539.275,00	€ 737.233,00	€ 197.958,00
HEATSTORE	The main objectives of this project are to lower the cost, reducing the risks and to optimize performance of high temperature (~25 to ~90°C)	€ 8.305.268,00	€ 16.265.971,00	€ 7.960.703,00

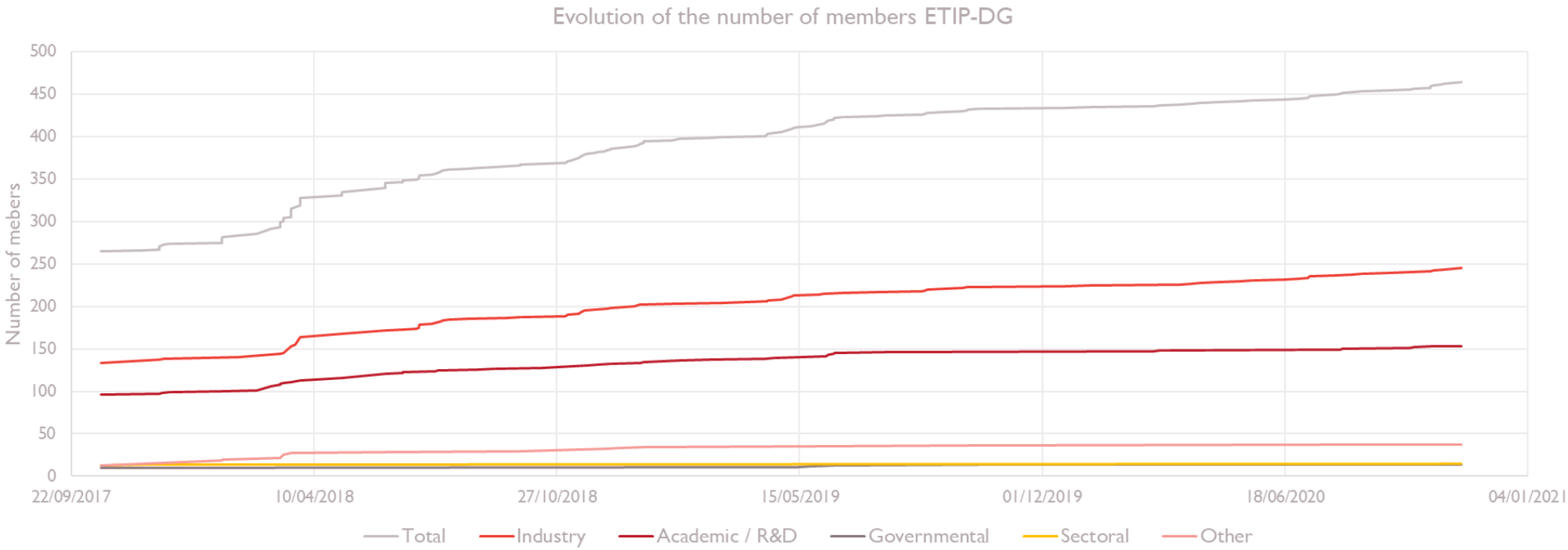
	underground thermal energy storage technologies by demonstrating 6 distinct configurations of heat sources, heat storage, and heat utilization.			
PERFORM	The objective is to improve geothermal plant performance in order to increase energy output and provide economic feasibility to current and future geothermal projects.	€ 2.236.825,00	€ 3.011.717,00	€ 774.892,00
ZoDrEx	ZoDrEx aims at demonstrating drilling, completion and production technologies increasing technical and economic successes of geothermal projects.	€ 2.860.282,00	€ 4.890.706,00	€ 2.030.424,00
TOTAL		**€ 23.043.591,00**	**€ 43.788.565,00**	€ 20.744.974,00

Potential new private actors to execute the IP

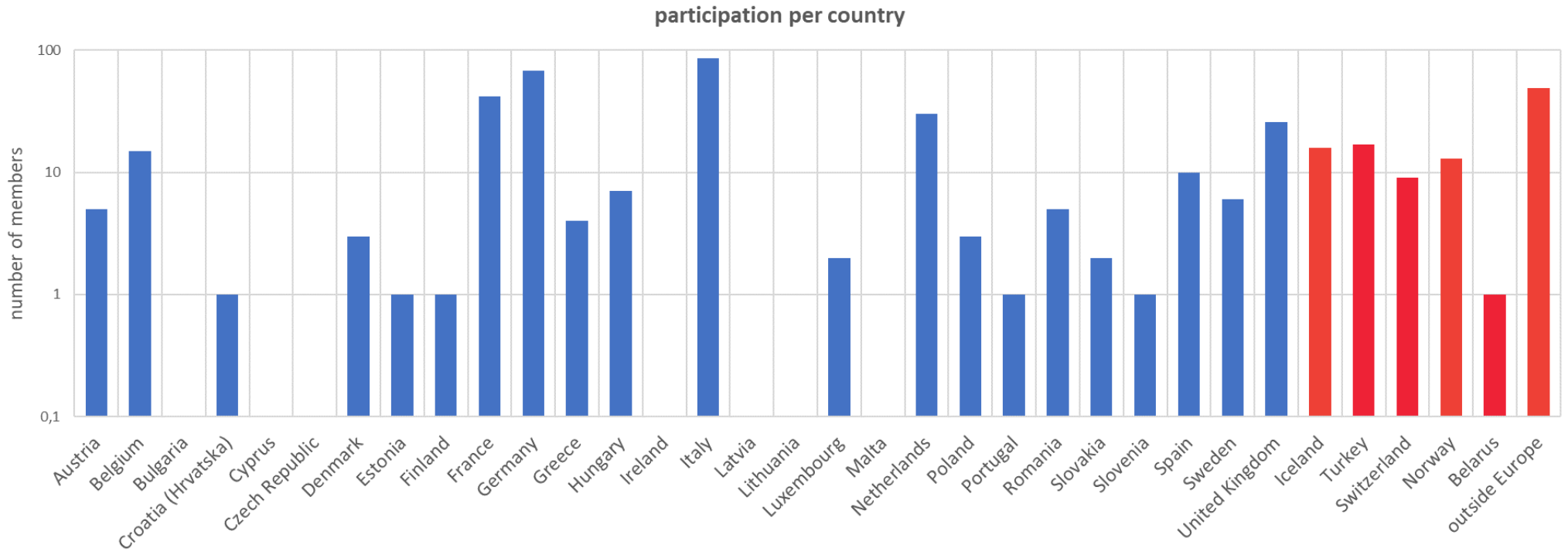
Beyond the actors already involved in projects contributing to the achievement of the SET Plan Deep Geothermal IWP (H2020, Geothermica), it is possible to identify key actors of the private sector that may potentially contribute to these objectives. This can be done from one side by considering the attendance of events such as the European Geothermal Congress, looking at companies involved in such platforms as the RHC ETIP Geothermal Panel and the ETIP Deep Geothermal, or by looking at the membership of organisations such as EGEC whose membership represents actors of the whole geothermal value chain.
From the other side, companies operating in the deep geothermal sector in Europe can be identified along the value chain.

ETIP DG

In 2021, the membership was composed by 292 organisations and 464 individual members.



Graph: Evolution of the number of members for ETIP DG



Graph: ETIP DG membership per country

TOWARDS A GEOTHERMAL STRATEGY

Europe rests on a vast amount of geothermal energy that can provide permanent supplies of renewable heating, cooling, power as well as sustainably sourced lithium and other raw materials, everywhere.

Both the International Energy Agency and ADEME - the French energy agency - found it to be the most cost-effective solution for heating wherever it is used. Yet it remains underdeveloped and often out of sight for EU policy makers. This situation must change now. Especially given the urgent need for a rapid energy transition maximising use of local resources.

Therefore, 150 companies call to prepare and issue Europe's strategy on geothermal energy and sustainable raw materials extraction, by 2023. The purpose of the strategy is to unlock geothermal energy's potential as a major renewable energy source across the internal market and neighbouring countries. This should focus on identifying barriers; proposing measures to accelerate deployment; including heating & cooling infrastructure; the effective maintenance of high environmental standards; de- risking of private investments; sustainable mineral extraction and crowding-in financing to frontload a pipeline of projects that can help deliver on the EU's new 2030 climate and energy targets, the REpowerEU plan as well as climate neutrality by 2050.

Acluxega
AFPG
AINER
AltaRock Energy Inc
Anger's Söhne Bohr und Brunnenbauges GmbH
AOTEA
ApE - Agencija za prestrukturiranje energetike, d.o.o.
APPA renovables
Ariki geothermia
ARMINES
Artesia
ARUP
ASC Ltd
Austrian Geothermal Association
Baker Hughes
BRGM
Bundesverband Erdgas, Erdöl und Geoenergie e.V
Bundesverband Geothermie e.V.
CAFA
Calida Aqua d.o.o.
Cardial
CARTIF
Catedra Hunsosa
CausewayGT
CEEC
Celsius Energy
CeraPhi Energy
CGG
Cindrigo Holdings Limited
Clear Sky Partners
Climeon
CNI
Comet
Cornish Lithium
COSVIG
Croatian Geological Survey
Croatian Hydrocarbon Agency
Crowdfunding Hub
CROWDTHERMAL
E.ON
EAPOSYS AG
Eavor Technologies Inc.
ecoFOREST
EIA 21
EnBW
Enel Green Power SpA
Energy lab
Engie
Engie Solutions
EREN
ES-Géothermie
Estonian Geothermal Association
ETIP Deep Geothermal
Euroheat & Power
European Federation Of Geologists
European Geothermal Energy Council
EXERGY
Fangmann Energy Services
Fraunhofer IEG
GA Drilling
Gec-Co Global Engineering & Consulting Company Gmbh
Geodynamics Worldwide GWW
GEOEC
GeoEcoMar
geoENERGIE Konzept GmbH
GEOFIT
Geoframe Energy
GeoLinks
Geolith
Geological Survey of Bosnia & Herzegovina
Geological Survey of Estonia (EESTI)
Geological Survey of Finland (GTK)
Geological Survey of Ireland
Geological Survey of Norway
Geological Survey of Serbia
Geologischer Dienst NRW
GEOLORN
Geomnia
Geoplat
GeoServ
Geoteam
GeotermiKA d.o.o.
Geothermal Association of Ireland
GeoThermal Engineering GmbH
Geothermal Resource Group
Geothermie Nederland
Geothermie Schweiz
GeoTrainet AISBL
GeoVartha
Getech
GEUS
GFZ Helmholtz-Zentrum Potsdam
Greenwell Energy GmbH
Grup de Treball de Geotermia
GTML
Halliburton
HarbourDom
Hungarian Geothermal Association (MGtE)
Iceland Drilling
IF Technology bv
Ilustre Colegio Oficial de Ingenieros Industriales de Galicia
Inco-Drilling
Innargi
Jesder – Geothermal Power Plant
Investors Association
Lithium de France
Lithuanian Geothermal Association
Magma Energy Italia
Malmberg

MS Energy Solutions
Munich RE
New Zealand Geothermal Association
NTU Geothermal Consulting Ltd (40)
Openfield™ Technology
Opportunities & Friends
PCC Renewables
Pfeffer Filtertechnik
Pole-Avenia
Polish Geothermal Society
Quali GEOTHERMIA
Rank
Reelwell
RHC Platform – Geothermal Panel
Romanian GEOEXCHANGE Society
Sacyr
Shell
Simon
Sirus e.s
SMP Energies
Sorgenia SpA
St1
Steam S.r.I.
Storengy Deutschland GmbH
Svenskt Geoenergicentrum
Syndicat des énergies renouvelables
Telur Geothermia et Agua
Teranov Geothermal Energy
Time & Place CONSULTING
TLS Geothermics
Turboden
Unione Geothermica Italiana
Universidad Complutense de Madrdid Geologicas
Vercana
Vito
VS. GEOFORMA
Vulcan Energie Gmbh
WeHeat Systems
Westbay Geosolutions
WIEN ENERGIE
Yeager Energy B.V.
ZeroGeo Energy Limited