



Leadership in renewables

Geothermal Energy: the impact of EU R&D funding

Bioenergy | Biofuels | **Geothermal** | Hydropower | Ocean | Solar PV | Solar thermal | Wind

OBJECTIVES

A comprehensive study of geothermal energy research and development (R&D) support within the EU over the past 20 years

1
Identify the impacts of EU R&D support of the geothermal energy sector

2
Understand how the geothermal energy sector has developed

METHODOLOGY

EFFECTIVE DATA COLLECTION ACTIVITIES USING A RANGE OF METHODS

DATA FROM EXISTING DATABASES

STAKEHOLDER QUESTIONNAIRE

CASE STUDIES

EXPERT INTERVIEWS

LITERATURE REVIEW

KEY FIGURES: FUNDING OF R&D

EU Framework Programmes funding

37
geothermal energy projects funded through the Framework Programmes (FP5-Horizon 2020)

€90 m
EU funding through the Framework Programmes (FP5-Horizon 2020) for geothermal technologies

40 %
of funding to enhanced geothermal systems, making it the most funded R&D topic

Member State funding

€40 m
R&D budget grew from an average of €5 m per year (pre 2000) to an average of €40 m per year (2011 onwards)

Top 4
1. Germany
2. France
3. Italy
4. Netherlands

86 %
of geothermal energy R&D funding is from the Top 4 Member States

International funding

The EU region ranks among the top regions in terms of geothermal R&D funding, with budgets comparable to those for the USA

IMPACT ON KNOWLEDGE GENERATION

Patents

EU share of global patents reduced from 35 % in 2000 to 10 % in 2014

The number of EU patents filed grew from less than 40 per year in the early 2000s to more than 100 per year between 2007 and 2010.

From 2011 onwards, EU patents average 60 per year

Publications

36 % of global publications between 1995 and 2017 had EU authors, compared with US authors (20 %) and Chinese authors (10 %)

EU Framework Programmes funded top publishing organisations and many projects that delivered publications

Additional impacts

EU Framework Programme funding provided the foundation for pan-European R&D in the sector by establishing innovation networks and a common innovation agenda

EU Framework Programme funding helped to improve the appraisal of geothermal systems and enabled high-risk high-reward geothermal projects, contributing to the economics and wider applicability of geothermal systems

IMPACT ON SECTOR DEVELOPMENT

3 500 MW

installed capacity for heat generation in 2016, growing from 1 500 MW in 1995

Heat generation

800 MW

installed capacity for electricity generation in 2016, growing from 500 MW in 1995

Electricity generation

€250 million+

average exports per year (2011-2015) to the rest of the world

Exports

€1 billion

EU geothermal energy sector turnover in 2016

Turnover

8 600

people employed in EU geothermal energy sector in 2016

Jobs

Mixed picture on costs. Technology development reduces costs, but application at less optimal locations leads to higher costs

Geothermal cost

0.21 %

gross final electricity consumption from geothermal energy in 2016

EU electricity

0.15 %

gross final heat consumption from geothermal energy in 2016

EU heat

EXAMPLES OF IMPACT FROM R&D PROJECTS

IMAGE Integrated Methods for Advanced Geothermal Exploration

- 20 novel methods and techniques validated in industry
- Example: Algorithm developed that enabled a €200 000 saving per geothermal project
- Further testing and implementation with industry partners underway

DESCRAMBLE Drilling in dEep, Super-Critical AMBient of continental Europe

- Evaluating existing equipment in supercritical conditions – testing at a depth of 2.9 km in a temperature of between 507 °C and 517 °C
- A first-of-a-kind pressure/temperature (P&T) logging tool
- Developing simulation software for geothermal reservoirs to better predict the production scenarios of projects operating in supercritical environments