This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No [818232 — GEORISK]
3/ Geographical coverage

Main countries: France, Germany, Switzerland, Turkey, Poland, Hungary, Greece

Key countries in Europe: Denmark, The Netherlands, Croatia, Belgium, Slovenia, Serbia

Key third countries: Mexico, Kenya, Chile, Canada

Further replication in Africa and Latin America
Geothermal resources in Europe
Overview

Some key figures

• 130 Geothermal electricity plant, with sustained deployment driven by the Turkish Market

• The EU passes the 2 GWth threshold for geothermal heating systems (DH,…)

• More than 2 million geothermal heat pumps in Europe at the end of 2020
Location of existing and planned geothermal district heating and cooling
How to deliver this project for #Geothermal decade

With de-risking schemes
**RISK ASSESSMENT**

1) Context and Identification of potential risks (BRGM)
Geothermal Risks register, a workshop organised in each country > Done

2) Risk Assessment (GEC-CO)
Geothermal Risk Matrix > Done

3) Tools to assess the risks (BRGM)
GEOriskREPORT: Online tool for developers > Online
## Category Filters

### Categories
- External hazards
- Risks due to uncertainties in the external context
- Risks due to internal deficiencies
- Risks due to subsurface uncertainties
- Technical issues
- Environment risks

### Phases
- Identification / Exploration
- Drilling / Testing
- Exploitation / Development
- Post-closure

### FILTERS

<table>
<thead>
<tr>
<th>Category</th>
<th>Id</th>
<th>Phases</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-1</td>
<td></td>
<td>✔</td>
<td>Flow rate lower than expected (reservoir)</td>
</tr>
<tr>
<td>D-2</td>
<td></td>
<td>✔</td>
<td>Flow rate degrades over time</td>
</tr>
<tr>
<td>D-3</td>
<td></td>
<td>✔</td>
<td>Temperature lower than expected (reservoir)</td>
</tr>
<tr>
<td>D-4</td>
<td></td>
<td>✔</td>
<td>Temperature degrades too quickly</td>
</tr>
<tr>
<td>D-5</td>
<td></td>
<td>✔</td>
<td>Pressure lower/higher than expected</td>
</tr>
<tr>
<td>D-6</td>
<td></td>
<td>✔</td>
<td>Pressure is changing during the operation in an unexpected way</td>
</tr>
<tr>
<td>D-7</td>
<td></td>
<td>✔ ✔</td>
<td>Fluid chemistry, gas content / physical properties are different from expected</td>
</tr>
<tr>
<td>D-8</td>
<td></td>
<td>✔</td>
<td>Fluid chemistry, gas content / physical properties change</td>
</tr>
<tr>
<td>D-9</td>
<td></td>
<td>✔</td>
<td>Target formation is missing in the well</td>
</tr>
<tr>
<td>D-10</td>
<td></td>
<td>✔</td>
<td>Target formation has no/insufficient fluid for commercial production</td>
</tr>
<tr>
<td>D-11</td>
<td></td>
<td>✔</td>
<td>Geological lithology or stratigraphy is different than expected</td>
</tr>
<tr>
<td>D-12</td>
<td></td>
<td>✔ ✔</td>
<td>Excessive scaling in the geothermal loop</td>
</tr>
<tr>
<td>D-13</td>
<td></td>
<td>✔ ✔</td>
<td>Excessive corrosion in the geothermal loop</td>
</tr>
<tr>
<td>D-14</td>
<td></td>
<td>✔</td>
<td>Particle production (&quot;sanding&quot;)</td>
</tr>
<tr>
<td>D-15</td>
<td></td>
<td>✔</td>
<td>Hydraulic connectivity between wells is insufficient for commercial use</td>
</tr>
<tr>
<td>D-16</td>
<td></td>
<td>✔ ✔</td>
<td>Re-injection of the fluid is more difficult than expected</td>
</tr>
<tr>
<td>D-17</td>
<td></td>
<td>✔</td>
<td>Degradation of the reservoir (structure, properties, deteriorating whole-scale further commercial utilization)</td>
</tr>
</tbody>
</table>
RISK MITIGATION TOOLS

1) Existing and innovative financial tools: public and private (GEODEEP) comparison of the Risk Mitigation Systems > Published

2) Framework conditions for establishment a new insurance scheme (SFOE) > published as a Key deliverable

3) Conditions for a transition in the insurance schemes, according to market maturity (GEC-CO) > published

4) Helpdesk for establishing an insurance scheme (EGEC)
   - For public authorities > published
Level of risk and market maturity

Risk Mitigation Schemes

I. Grants
II. Repayable grants
III. Convertible grants
IV. Public insurance scheme
V. Public-Private Partnership
VI. Private risk Insurance

Commercial readiness index

Technological readiness level
Risk Mitigation Schemes

I. Grants
II. Repayable grants
III. Convertible grants
IV. Public insurance scheme
V. Public-Private Partnership
VI. Private risk Insurance
**WP 4: ESTABLISH sustainable RISK MITIGATION SCHEMES IN TARGET COUNTRIES**

Hungary-Poland-Greece  
France-Germany-Switzerland-Turkey

1) Create relationship with decision makers (IGSMiE PAN) (10-24) > ongoing

2) Support establishment of insurance scheme in target countries (CRES) (months 10-20) > ongoing

3) Assess its establishment, adopt corrective measures (Geoex) (months 18-24) > ongoing

A 10 years operation simulation of the financial model

To achieve the average annual increase referred to in paragraph 1, first subparagraph, Member States may implement one or more of the following measures:

(a) physical incorporation of renewable energy or waste heat and cold in the energy sources and fuels supplied for heating and cooling;
(b) installation of highly efficient renewable heating and cooling systems in buildings, or use of renewable energy or waste heat and cold in industrial heating and cooling processes;
(c) measures covered by tradable certificates proving compliance with the obligation laid down in paragraph 1, first subparagraph, through support to installation measures under point (b) of this paragraph, carried out by another economic operator such as an independent renewable technology installer or an energy service company providing renewable installation services;
(d) capacity building for national and local authorities to plan and implement renewable projects and infrastructures;
(e) creation of risk mitigation frameworks to reduce the cost of capital for renewable heat and cooling projects;
(f) promotion of heat purchase agreements for corporate and collective small consumers;
(g) planned replacement schemes of fossil heating systems or fossil phase-out schemes with milestones;
(h) renewable heat planning, encompassing cooling requirements at local and regional level;
(i) other policy measures, with an equivalent effect, including fiscal measures, support schemes or other financial incentives.
GeoRisk Project, Premises

<table>
<thead>
<tr>
<th>Premises</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suppositions</td>
</tr>
<tr>
<td>Insurance premium, % of the contracted cost</td>
</tr>
<tr>
<td>Risk cover, % of the contracted cost</td>
</tr>
<tr>
<td>Estimated success rate, % successful/unsuccessful cases</td>
</tr>
<tr>
<td>Costs</td>
</tr>
<tr>
<td>Total overhead costs, thousand €/year</td>
</tr>
<tr>
<td>Expert cost, thousand €/year</td>
</tr>
<tr>
<td>Risk covered (payment), thousand €/year</td>
</tr>
<tr>
<td>Project insured cost, thousand €/year</td>
</tr>
<tr>
<td>Insured cost of one average project, thousand €/year</td>
</tr>
<tr>
<td>Risk cover of one average project, thousand €/year</td>
</tr>
<tr>
<td>Insurance premium of one average project, thousand €/year</td>
</tr>
<tr>
<td>Scheme launching amount, thousand €</td>
</tr>
</tbody>
</table>

### 10 year simulation tool

<table>
<thead>
<tr>
<th>Sheet No.</th>
<th>Title</th>
<th>Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Table of contents</td>
<td>Objective of the whole symulation: Calculating of the 10 years cash-flow of the RMS, with estimating realistic projects, scheme operation and costs. Proving that the scheme is sustainable.</td>
</tr>
<tr>
<td>2</td>
<td>Premises</td>
<td>Collecting of realistic premises of the Scheme.</td>
</tr>
<tr>
<td>3</td>
<td>Operating chart</td>
<td>Illustrate the Risk Mitigation Scheme</td>
</tr>
<tr>
<td>4</td>
<td>Description of the Projects</td>
<td>Presentation of the Projects included into the Scheme.</td>
</tr>
<tr>
<td>5</td>
<td>10 years operating description</td>
<td>Description of the events of the projects as well as of the cash flow in every quarter</td>
</tr>
<tr>
<td>6</td>
<td>10 years cash-flow</td>
<td>Table and graphs of the cash-flow of the Scheme in the following 10 years.</td>
</tr>
</tbody>
</table>
A 10 years operation simulation of the financial model

Operating simulation: analyses and further calculations in the three focus countries

Ten years operating simulation of the planned Hungarian Geothermal Risk Mitigation Scheme

10 years cash-flow

Total Assets at the end of year, €

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Assets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>10.735.000</td>
</tr>
<tr>
<td>Year 2</td>
<td>9.100.000</td>
</tr>
<tr>
<td>Year 3</td>
<td>9.745.000</td>
</tr>
<tr>
<td>Year 4</td>
<td>10.390.000</td>
</tr>
<tr>
<td>Year 5</td>
<td>8.710.000</td>
</tr>
<tr>
<td>Year 6</td>
<td>9.355.000</td>
</tr>
<tr>
<td>Year 7</td>
<td>10.000.000</td>
</tr>
<tr>
<td>Year 8</td>
<td>8.320.000</td>
</tr>
<tr>
<td>Year 9</td>
<td>8.965.000</td>
</tr>
<tr>
<td>Year 10</td>
<td>9.610.000</td>
</tr>
</tbody>
</table>
A 10 years operation simulation of the financial model

Premium, Risk Cover and Success Rate analysis with the Hungarian premises

10 years cash-flow

Year 1
Year 2
Year 3
Year 4
Year 5
Year 6
Year 7
Year 8
Year 9
Year 10

10 years cash-flow

Premium
10%
Premium
8%
Premium
6%

10 years cash-flow

Risk Cover 75%
Risk Cover 80%
Risk Cover 60%
Risk Cover 50%

10 years cash-flow

Success Rate 90%
WP 5: REPLICATION AND PROMOTION IN EUROPE & GLOBALLY

- Countries to target in WP5 are
  - in Europe (Denmark, Netherlands, Belgium, Croatia, Serbia, Slovenia)
  - and outside (Chile, Kenya, Canada & Mexico).

- A regional, Pannonian Basin geo-risk insurance scheme is to be evaluated in WP5

> ongoing
WP 5: REPLICATION AND PROMOTION IN EUROPE & GLOBALLY

Adapt tools, set framework conditions (GEODEEP) > ongoing

Create liaison with decision makers and international & national stakeholders, present tools (CRES)
one-to-one interviews, webinars, > ongoing

3) Capacity building (TBK)
Organise one workshop in each third countries > ongoing
WP 5: COMMUNICATION

Publications: Reports, Brochures.
Website
Media campaign
Events
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