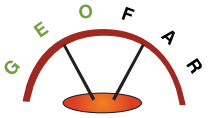
Financial instruments as support for the exploitation of geothermal energy

GEOFAR

GEOTHERMAL FINANCE AND AWARENESS IN EUROPEAN REGIONS



GEOTHERMAL FINANCE
AND AWARENESS
IN EUROPEAN REGIONS

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Abstract

Many European countries have a significant geothermal potential. Some technologies for exploitation of deep geothermal energy are mature. However this potential appears to be not sufficiently exploited. This could be partly explained by a lack of information among decision makers and investors and by the fact that geothermal energy projects are facing non–technical barriers. The GEOFAR project (Geothermal Finance and Awareness in European Regions), carried out within the framework of EU's "Intelligent Energy Europe" (IEE) programme, aims to analyze these non technical difficulties and barriers which hinder the initial stages of geothermal energy projects. GEOFAR aims particularly to focus on the financial barriers and on deep geothermal energy (for direct use of geothermal resources, heat production, electricity production or cogeneration).

The overall objective of GEOFAR is to develop and to propose appropriate and innovative financing and funding schemes. It is therefore necessary to analyse the existing systems: what kind of financial instruments are offered to support deep geothermal energy in Europe and how pertinent they are. The consortium of the project[1] focuses this analyse on ten target countries: Spain, Portugal, Germany, France, Greece, Bulgaria, Slovakia and Hungary, Iceland and Italy.

The report "Financial instruments as support for the exploitation of the geothermal energy" is gathering short descriptions of the main and most significant instruments. More detailed information about each instrument can be found on Fact Sheets that are uploaded on the GEOFAR website accessible under www.geofar.eu.

Bank facilities dedicated to geothermal energy projects are appearing uncommon. However, governmental incentives, as tax reduction, guaranteed feed-in tariffs and grants, are quite common in the target countries. Actually, there is a broad variety of application and systems varying extremely from one country to another. Guaranteed feed-in tariffs are the only instruments offered in all countries and this instrument appears extremely important in ensuring the economic viability of an electricity project. On the whole, all these instruments are a way to increase the profitability, by offsetting the high up-front costs and pay back period of the project, so as to attract investors.
The main barrier identified at this step of the project is the difficulty to obtain finance for the early stage of a geothermal project: a geothermal resource has not been proven until the first well is drilled, thus requiring spending money with a high level of risk.

The main outcome of this analysis shows that it is extremely difficult to find instruments that provide a funding for projects in early stages. Only projects which have proven their economic viability are financed through financial institutions. Public grants are the only instruments proposed to complement equity capital or to finance exploration phases. Geological risk insurance mechanisms, that insure the presence and the quality of the resource, is a way to overcome this important barrier, but these are only offered in a few countries (France, Germany and Bulgaria through the GeoFund international mechanisms).

Finally, this report highlights the heterogeneity of financial instruments currently existing in the target countries and above all, the difficult adaptation of these financial instruments to geothermal projects specificities.

1 This questionnaire, with the guideline for analysis of financial instruments, can be found on the GEOFAR Website www.geofar.eu

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Introduction

Deep geothermal energy is a clean, renewable and viable energy source. Needs of energy in surface, whatever for heating, cooling or the need for electricity are present and yet geothermal resources are not enough exploited in a way to cover these needs.

Deep geothermal energy has a high potential of development in the European countries and the context of climate change concern is the occasion to boost investments. Beyond presence and quality of the resource, the two main points hindering investments could be mentioned there: Existing non technical barriers and a lack of awareness among decision makers.

The GEOFAR project (Geothermal Financial and Awareness in Europeans Regions) launched by the Intelligent Energy – Europe II programme aims to work on non technical barriers and to find solutions to overcome them. The main focus is set on financial barriers that hinder initial stages in the development of a geothermal project. One of the more significant objectives of the project is to develop and propose appropriate financing and funding schemes suitable to boost the development and investment in geothermal energy projects.

This report focuses on financial instruments for deep geothermal energy investments i.e. for utilisation of geothermal energy to produce electricity or for direct use (heating cooling or combined heat and power).

A consortium of European partners from Germany, France, Greece, Spain and Portugal works on this problem since September 2008. This report aims to present the first step of this work which consists in analysing the different financial instruments existing in ten different countries as well as on European and international level. In deed, the first step to develop a new set of financing and funding instruments is to understand what the gaps of the existing financial instruments are. The aim of this report is to present and describe the financial instruments existing in the target countries. The target countries focused on and studied are Germany, France, Spain, Portugal, Greece, Slovakia, Hungary, Bulgaria, Iceland and Italia.

The objective of this report is to give an overview of existing instruments at a given period, to understand what the best practices in a given country are and what could be a good and viable instrument.

Methodology

GEOFAR

In a first step a list of instruments was developed across all analysed countries that cope with supporting investments in deep geothermal energy projects. The objective was not to look just for instruments dedicated specifically on geothermal energy but to open the scope on financial instruments dedicated to renewable energy sources including geothermal, environment friendly projects or even infrastructure projects. The focus of the analysis was set on laws and funding mechanisms from public and semi public organisations. Traditional ways of financing projects, i.e. traditional loans from banks are not under the scope of this report.

Each partner of the project worked on one or two targets countries.

Participant name	Country	Country analysed	Logo
Erlangen AG Technologie Scouting & Marketing	Germany	Germany, Bulgaria and Iceland	ERLANGEN AG
BRGM	France	France and Italy	brgm
Energo Group S.A.	Greece	International	energo GROUP
Institute of Energy for South-East Europe	Greece	Bulgaria	IENE
Institute of Geology and Mineral Exploration	Greece	Greece and Slovakia	
Spanish Geological and Mineral Institute	Spain	Spain	Instituto Geológico y Minero de España
Rödl & Partner GmbH	Germany	Hungary	Rödl & Partner
ARENA	Portugal	Portugal	

Figure 1 **Partner and target countries participating in the GEOFAR project**

The analysed instruments shall cover public and semi public financing schemes, supporting different project stages (early stage geological research, pre-feasibility studies, feasibility studies, drilling of exploration wells,

drilling of development wells and power plant construction, operating and maintenance staff, etc.) and all kinds of different applications of deep geothermal energy (heating, cooling, electricity production, cogeneration …) as well as different level of management (national, regional, European,..).

Then, each viable instrument has been described and analyzed. To facilitate the homogeneity between the instruments and to create a "data base" of Fact Sheets, a guideline for analysis was elaborated. The aim was also to provide a quality standard for analysis of each country and for each instrument. The main objective given in the Guideline was to focus on the key aspects of the instruments, which are

- the type of funding scheme,
- the project scope,
- the project phase,
- the amount of funding,
- eligibility and management

but also to give more precisions concerning, among others, detailed criteria of eligibility or administrative procedures, that could be qualified as "practical in formation".

To go further in the analysis, the partners got in contact with national and European financial institutions and investors via phone interviews or personal meetings. The objectives of these interviews were to learn from experiences and to have a reality check in the domain. This was also a good opportunity to discuss about the financial barriers and how the already existing instruments can be competitive in front of those. For these interviews a questionnaire[2] was also established which gathered aspects to be discussed with financing institutes. The main themes that should be discussed were: Awareness, Projects & Financing and Risk Assessment.

This report aims to present the synthesis (key points) of all instruments existing in the target countries and to provide a clear overview on the target country specific opportunities for support of geothermal energy projects to the target group. For each single instrument, a fact sheet is available to be downloaded on the official project website www.geofar.eu. The fact sheets show the main characteristics of the instruments like: detailed conditions, administrative procedure and previous beneficiary of the instruments.

Remark: *Information about the non target countries Iceland and Italy was added because of the strong exploitation of deep geothermal energy resources existing there and the interest of the consortium on the impact of the existing financial instruments on this exploitation.*

Context

Renewable and geothermal energy

Growing concerns about climate change and awareness about environmental problems lead to the implementation of actions favourable to the new and renewable energies (long-lasting energies) for reduction of the greenhouse effect gas in particular. Political decisions have been taken at several levels:

- At International level, the Kyoto protocol was the first event that compels industrialised nations which ratified the protocol to reduce greenhouse gas emissions. The total target relative to 1990 is a 5.2% reduction.

- At European level, the European Council fixed in 2007 the triple target for 2020 (20 % reduction of green-

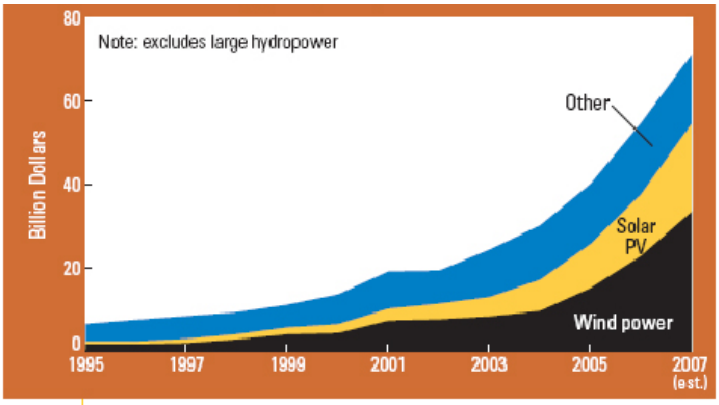
2 This questionnaire, with the guideline for analysis of financial instruments, can be found on the GEOFAR Website www.geofar.eu

house gas emissions, 20 % share of renewable energies in overall EU energy consumption and 20% saving of the European Union's energy consumption).

- At national level[3], European countries have more or less established a general framework and imposed concrete actions. This is also true for the regional level.

Renewable energies are just one way to reduce greenhouses gas emissions. Adding to that other non negligible advantages (they could lead to procure an energy independency and supply security, they are indigenous and independent from oil prices, etc.), they are expected to be one important part of the action.

The interest on renewable energy keeps growing: Regarding the investment in renewable energy this fact becomes visible. During the last decade the annual investments in renewable energy was multiplied by nine like you can see in Figure 2. Also the installation of IRENA (International Renewable Energy Agency) in 2009 with the aim to promote renewable energy worldwide shows the growing worldwide acceptance and importance of the renewable energy.



The oil price increased steadily during the last decade and reached its peak in summer 2008. The political and public discussion across Europe strongly promoted the use of renewable and raised awareness of the dependency on fossil energy sources and of the advantages of renewable energy. Even though the oil price is currently decreasing, the International Agency for Energy already forecasted rising energy prices, when the financial crisis will be overcome and the economy will gain momentum again.

Figure 2 **Annual Investment in new renewable energy capacity, 1995-2007 (Source: REN21)**

Due to its independence from climatic conditions, geothermal energy, for heat or electricity production, can be used 24 hours a day and 7 days a week with an overall price of production remaining relatively constant. In Europe, deep geothermal energy has a high potential. In the report "Green Investing, towards a clean Energy In-

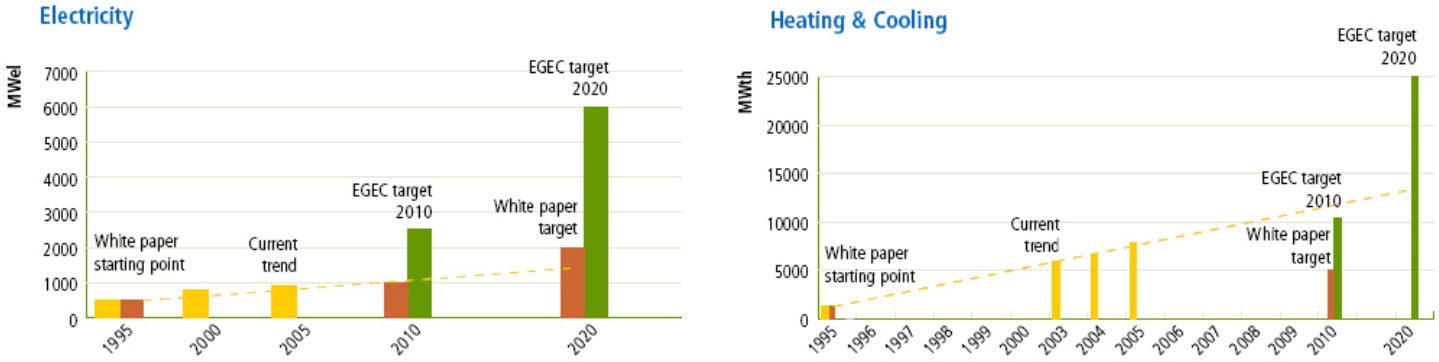


Figure 3 **European targets for geothermal energy (Source: EGEC (2008))**

3 This level will be particularly described in the report "Non-technical barriers and the respective situation of the geothermal energy sector in selected countries – Report" GEOFAR is currently drafting. The report will be ready for download on the project website www.geofar.eu during 2009

frastructure", from the World Economic Forum, geothermal is explicitly quoted as one of the eight key renewable energy sectors, due to its predictable "base-load power" as mentioned in the report. In this context, geothermal energy is totally legitimated to contribute to a new energy mix.

Yet, concerning electricity production, regarding all European countries the number of geothermal plants has a high potential that should be increase in the European Union: binary plant technology is getting sprawled, and the new technologies are promising. Let us just quote the Enhanced Geothermal Systems or low temperature production…

To set a framework for geothermal energy projects an advanced energy policy is necessary to boost development of geothermal energy provided that concrete incentives and measures are taken.

Targets for the development of geothermal energy are set and hopefully will be increased. The EGEC (European Geothermal Energy Council) currently requests fixed high-set targets for the development of geothermal energy in the European Brussels Declaration highlighted in figure 3.

Concerning electricity production, regarding all European countries the number of geothermal plants has a high potential that should be increase in the European Union: binary plant technology is getting sprawled, and the new technologies are promising. Let us just quote the Enhanced Geothermal Systems or low temperature production

Now projects have to be launched and investors to be attracted.

Geothermal energy projects

Making generalities on geothermal project (costs, time schedule) is difficult: Power generation and heating production are clearly two different technologies. Additionally the characteristics of the project will depend on the location, capacity expected from the plant, natural conditions, needs in surface, etc. Anyway, some considerations could be drawn.

Quality and quantity of the geothermal resources are the key and necessary conditions for a successful geothermal project. This is a key point in the financing scheme that will be detailed further.

In comparison to other renewable energy technologies, geothermal energy projects have high up-front costs (mainly due to the costs of exploration, like seismic investigations, reprocessing and finally drilling wells) and low operational costs. These operational costs vary to a great extend from one project to another (size, quality of the geothermal fluids, etc.) but are predictable in comparison with power plant on the basis of traditional energy sources which are submitted to the market hazard.

This report will focus on investment costs. The two charts below aim to present cumulative cost during the different phases of a geothermal project and the associated risk. By risk is meant the probability of failure of the project. The first graph refers to a power plant (Organic Rankine Cycle) installation with about 4 MWel and drillings of about 2,750m depth and the second one would refer to a doublet in the Paris Basin for district heating. Both don't include creation of a new network.
Time periods are given as indicative ones: they can vary from project to project, depending mainly on permitting and administrative issues.

During the exploration and pre-feasibility phase, the risk is high while the costs are already significant as e.g. seismic data has to be purchased or seismic investigations have to be conducted. One of the largest obstacles for investment in deep geothermal systems is that the presence and quality of the resource is not proven until the

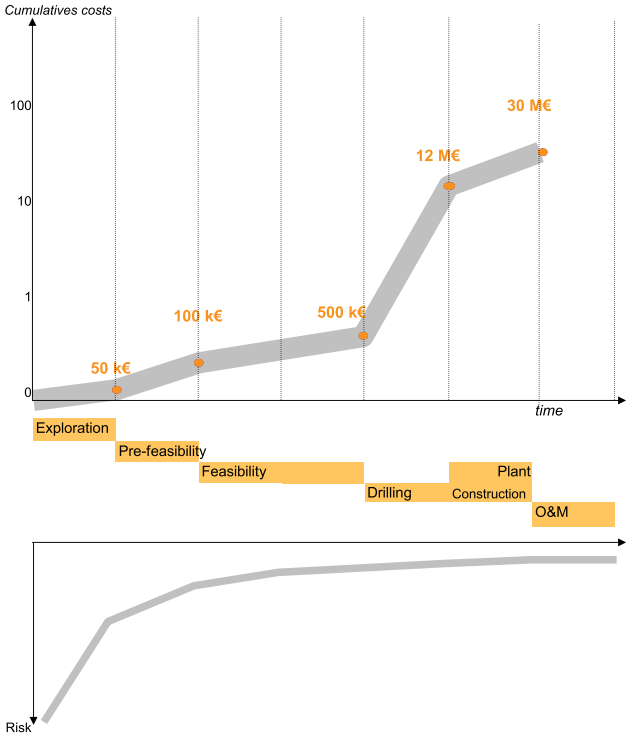


Figure 4 **Power plant (ORC) installation in Germany (Source: R&P)**

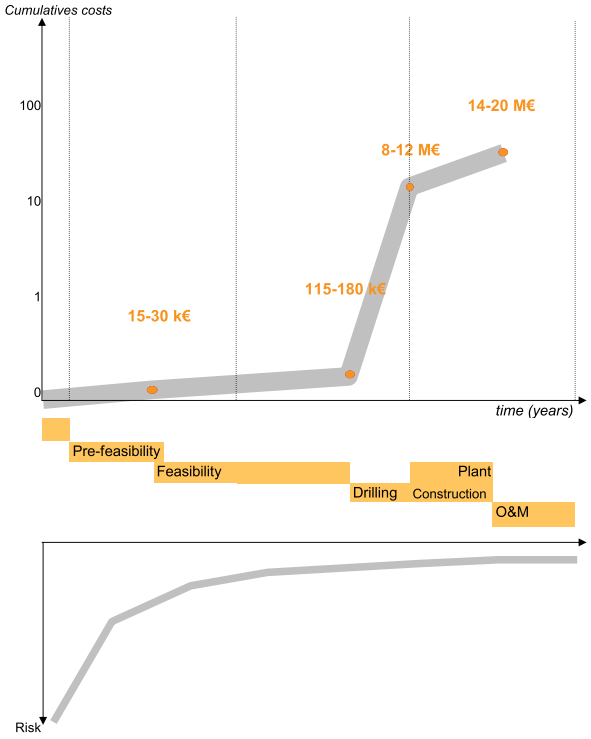


Figure 5 **Doublet for district heating in Paris Basin (Source: CFG Services)**

first exploration well is drilled. In consequence, only if the couple flow rate and temperature fulfills the expectations of the investor (e. g. profitability) it can be determined if the project achieves its objectives. At the moment of successful drilling, the risk decrease and reaches a reasonable level. But funding has to be attracted in the most risky phase of the project under uncertain framework conditions. This is a crucial point for each geothermal project and probably the biggest barrier in project implementation GEOFAR tries to find solutions for.

Remark: *This risk also implies that Financial Institutions have knowledge about geothermal energy. Raising the awareness among decision makers and financial institutions is also an objective of the GEOFAR project.*
Remark: The assumable risk is not so high in some well known regions, like the Paris Basin concerning France, where more than 60 wells were drilled and the geology of the Basin is well known. This is also why time and so costs of exploration are low (not mentioned in this graph).

The network for district heating can significantly increase the cost of investment. For example, again in Paris, in a high density quarter, the costs for of the network can reach 15 to 20 million euros. Some countries, like Eastern European countries could benefit from that because of the large number of existing networks. This could also facilitate the development of geothermal energy projects in combination with district heating networks that currently are supplied by non renewable energy.

Financing geothermal energy projects

The consideration of profitability is a key point for an investor. The operating plants create revenue from sales of electricity or heat or selling both or sometimes for selling of by-products. Multiple- utilization has to be considered already at the beginning of the project because it creates news possibilities for revenues during the operating phase.

Each project has many stakeholders: Consumers, suppliers, developers, governments, operators, financial institutions. They all contribute to the defining of the economical and financial terms of the project and all of them have multiple interests. The Financial institution will focus its attention on the viability and the risks of the project and will expect the debt repayment (usually named in the ratio dscr (debt service cover ratio)), unless the investor will focus its attention on the return on equity of the project. All theses considerations have to be taken into account to assess the viability of the project.

Thus, it was pertaining under the project GEOFAR to discuss with these different stakeholders. For this report, a focus was set on Financial Institutions and Governments that could propose instruments for investors.
Considerations about investment costs and risks underline that the financing of the exploration and (pre)feasibility studies are an important barrier: Unsuccessful drilling is an important risk that has to be taken and to be paid. Drilling costs are consequent and can represent a non negligible part of the overall project costs. But, they have to be financed. Though the risk has to be and is worth to be assumed. Financial institutions argue that for traditional financing the risk is too high to lend at this early stage of the project. They will wait with providing loans to the geothermal projects until the existence and the quality of the resource has been proven. Therefore equity from own resources or grants from public bodies could cover these expenditures. Private equity investors will expect a high rate of return at these first stages of the project due to the risk their investment still faces. Finally, classic project finance schemes can be used at a very late project phase.

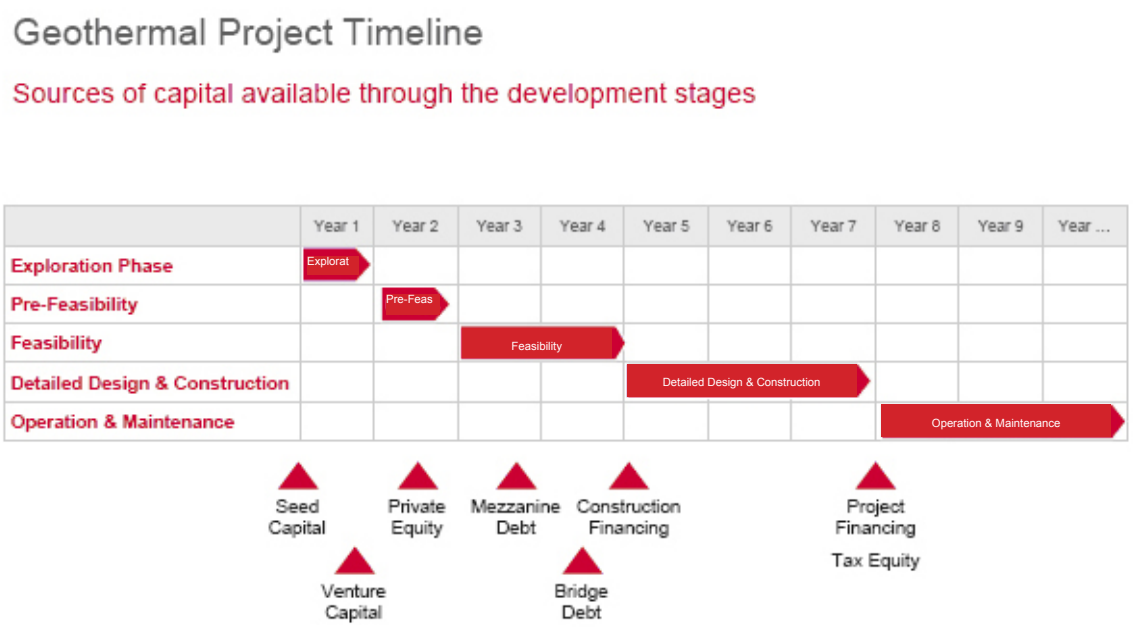


Figure 6 **Classical geothermal project timeline and financing options (Source: Glitnir, adapted)**

Grants can reduce the amount of investments and feed-in tariffs regulated by law increase and fix revenues during the operational phase. Therefore a combination between financing scheme and incentives can be a key point for the economic success of projects and has to be analysed. Proposals of funding schemes (equity, loan, subsidies, grants, etc.) for geothermal energy for each target country, at national and international level, are presented in this report and analysed to see how they are facing this particularity of geothermal projects. A special focus is set on the geological risk insurance mechanisms that guarantee the presence and the quality of the resources. This could be a key aspect to overcome the difficulties.

Renewables and the Financial Crisis

Currently (2009) the world is facing a global financial crisis that affects all financial institutions. This will definitely lead to a modification in the way of thinking of the financial institutions. Having a closer look at this crisis it is realistic to fear that this crisis will reduce opportunities to invest in renewable energy. But the European policy makers have already reacted on the crisis and certain measures on European level have been taken to maintain the sustainable green investment environment in Europe:

- The new directive on the promotion of the use of energy from renewable sources (Renewable Energy Directive) adopted by the European Commission commits EU members to fulfil their objectives. This will push further renewable energy projects throughout Europe, mainly regarding cooling and heating. In 2009, the Member States will have to develop their Renewable Action Plans. This will establish a framework that could push up public and private investors.

- Some national recovery plans push renewable as they can be creator of jobs and a possible way to relaunch the economy. In deed, the development of renewable energy in a given territory, supported with appropriate financial and administrative support instruments, could bring benefit effects in economical and social terms. The European Recovery Plan could also be a possible way to develop renewable and so geothermal energy.

Focus on the European Recovery Plan
The European Commission will respond to the current economic situation, claiming a co-ordinated approach between Member States and the EU. Especially emphasis will be set on innovation and greening of EU investments. The EC discusses a mix of : - Public expenditure - Guarantees and loan subsidies - Financial incentives - Lower taxes - Temporary VAT reductions The EERP sets out a comprehensive programme to direct actions to smart investment (investing in energy efficiency, investing in clean technology, investing in infrastructure). Projects in the field of heat production, district heating, electricity production and cogeneration could be eligible.

The crisis will probably lead to the creation of new financial funding incentives or instruments, like the European Recovery Plan. A co-existence with existing funding instruments but also the disappearing of some existing instruments, described in this report, are thinkable. For the European geothermal sector additional funding possibilities would be a chance to further increase the existing set of geothermal plants and consequently enlarge the contribution of geothermal projects to the heat and power generation market.

European and International Financial Instruments

At European and International level several instruments for supporting investments in renewable energy projects, including geothermal, are established. These instruments tackle with different project phases. In the following section you can find a short description on the set of those financial instruments.

European Financial Instruments

All European financial Instruments follow the European Union economic main policy objectives:

- Cohesion and convergence promotes developing regions within the EU and is key to the integration objectives of the Union
- Support of small and medium sized enterprises (SMEs) is of central importance for the EU's economy and employment
- Innovation supports the goal of establishing a competitive, innovative and knowledge-based European economy.
- Promoting sustainable, competitive and secure energy sources.
- Support of human capital, notably health and education.

In this context, instruments have been launched whereof Geothermal Finance can benefit from.

Research and Development: The European Union promotes Research and Development, in particularly in the field of renewable energy over the FP7-Energy programme to foster the development of new technologies in the renewable energy, including geothermal energy.

RESEARCH – FP7-ENERGY		
All EU Member States and Associated countries and non-EU member states, assuming minimum EU participation	Managed by …	European Commission – DG Energy and Transport and DG Research
	at European level	
	Project Scope…	All kinds of cooperative research projects in the field of geothermal energy
	Funding Scheme …	Grant
	Project Phase…	Early stage of the project
Who can apply …	Research institutions, research driven SMEs and individual researchers in consortia meeting minimum cooperation requirements.	
Scope of funding …	Between 50% and 100% of the project costs, depending on the type of project and status of the beneficiary and its role. Projects must secure co-funding from other sources.	
Short additional description	For the electricity generation project, research and development should aim to develop enabling technologies for the exploitation of high-temperature resources, and to prove the feasibility and sustainability of EGS technology in representative EU sites.	

European Investment Bank and European Investment Fund

About EIB: Created as the long-term lending bank of the European Union, the European Investment Bank can play a key role in the investments, and particularly concerning environmental projects The EIB raises substantial volumes of funds on the capital markets and lent it on favourable terms to projects furthering EU policy objectives. For geothermal energy projects it offers loans and venture capital.

European Investment Bank and European Investment Fund		
Mainly, 27 European countries	Managed by …	European Investment Bank and European Investment Fund
	at European level	
	Project Scope…	Deep-seated geothermal energy provided they contribute to the EU economic policy objectives
	Funding Scheme …	Loans (EIB), Venture Capital (EIF)
	Project Phase…	Early stage of the project
Who can apply …	All kind of project promoters with a well-developed business plan	
Scope of funding ...	Normally 50%, possibly 75% of project cost. Minimum project size for direct loan is 25 million euros (total project cost).Smaller projects are served through project aggregation through an intermediary. Distinction is made between (I) Mature and (ii) Research, Development and Innovation project.	
Short additional description	Loans are granted to viable capital spending programs or projects in both the public and the private sector. Counterparties range from large corporations to municipalities and small and medium-sized enterprises. Requests for venture capital should be addressed directly to an intermediary. EIF makes investments in venture capital funds that support SMEs, particularly early-stage and tech-orientated enterprises. Technical Assistance and guarantees are also proposed	

Interview with EIB: Energo Group held an exploratory meeting with officials of the European Investment Bank at the EIB head office in Luxembourg on 20th February 2009. EIB stressed the need to get informed at the earliest possible moment of geothermal projects that may be seeking financing through the renewable energy sources financing programme of the bank. EIB already has some experience with geothermal projects. It is interested in projects with a high-quality geothermal resource that can remain viable in the long run without subsidies. EIB stressed that it sees geothermal energy as a mature technology which however for the time of its existence cannot deliver the projected increased efficiencies of other emerging technologies such as photovoltaic, solar, offshore wind power, tidal and bio fuels. Nevertheless, it sees a significant role for geothermal energy and a need to support suitable and suitably-prepared projects.
Communication with the EIB will continue for the duration of the GEOFAR project. Further meetings with the EIB will be held in 6 months' and 12 months' time to discuss specific projects that will have come through the GEOFAR pipeline. For such meetings being effective, project proposals have to be sufficiently elaborated well ahead of the meetings.

Currently EIB does not fund projects in early stages, but only projects which have proven their economic viability, i.e. exploitation. If GEOFAR is able to identify projects with significant technical advances over existing geothermal technology, then EIB could, possibly, be persuaded to consider those geothermal projects as emerging technologies. Emerging technologies with scale potential may, in this case, receive support in the shape of forward pricing of their prospective efficiency gains.

Remark: *As a consequence of the European Recovery Plan the EIB will significantly increase its financing of climate change, energy security and infrastructure investments by up to € 6 bn per year, while also accelerating the implementation of the two innovative financial instruments jointly developed with the Commission, i.e. the Risk Sharing Finance Facility to support R&D and the Loan Guarantee Instrument for TEN-T projects to stimulate greater participation of the private sector.*

EBRD Renewable Development Initiative:

About EBRD: The EBRD is the largest single investor in the region and mobilises significant foreign direct investments beyond its own financing. It invests mainly in private enterprises, usually together with commercial partners. For financing renewable energy projects the EBRD has set up the Renewable Development Initiative.

EBRD Renewable Development Initiative		
Albania, Armenia, Azerbaijan, Belarus, Bosnia/Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, FYR Macedonia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Montenegro, Moldova, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan. 29 countries located throughout Central and Eastern Europe and the former Soviet Union.	Managed by …	EBRD
	at **regional** level	
	Project Scope…	Deep-seated geothermal energy
		Must compete on financial criteria with other renewable energy projects
	Funding Scheme …	Projects from €5 million - €250 million: loans, equity minority positions with a clear exit strategy, guarantees, investment funds / smaller projects: Loans, equity, leasing, technical assistance, all through qualified financial intermediaries.
	Project Phase…	Early stage of the project
Who can apply …	Only commercial companies or an intermediary authorised to act for them	
Scope of funding ...	**For large projects** (€5 million - €250 million): minimum €5 - 15 million loan size (in exceptional cases the loan can be smaller). The EBRD funds up to 35% of the total project cost for a Greenfield project or 35% of the long-term capitalisation of an established company. **For smaller projects:** Investments range generally between EUR 500,000 and EUR 6 million; equity share target range is 25-30% but up to 49% is possible.	

Short remark: *As a consequence of the European Recovery Plan the EBRD will more than double its efforts for energy efficiency, climate change mitigation and financing for municipalities and other infrastructure services. This could lead through the mobilisation of private sector financing to € 5 bn investments.*

JASPERS, JEREMIE and JESSICA: The European Commission has launched these three initiatives to enhance the support for start-ups and micro-enterprises, through technical assistance, grants, as well as non-grant instruments such as loans, equity, venture capital or guarantees, and highlights the added value of undertaking these actions in cooperation with the EIB group. Support is given to activities in selected or all EU member states. Geothermal energy projects can be the beneficiaries of the support over the country specific activities.

JASPERS - Joint Assistance in Supporting Projects in European Regions		
Principally the new Member States and acceding countries of the EU. EU regions covered by the new Convergence Objective for the period 2007-2013 in all EU Member States that will choose to participate.	Managed by …	European Commission – DG Regional Policy, European Investment Bank (EIB) and the European Bank for Reconstruction and Development (EBRD)
	at European level	
	Project Scope…	Deep-seated geothermal energy
		Large projects supported by the EU funds (costing more than €25 million for environment projects). In the smaller countries, JASPERS will concentrate on the largest projects. Must compete with other energy and non-energy projects in the same urban area on the basis of financial criteria
	Funding Scheme …	Free Technical assistance to the beneficiary Member States
	Project Phase…	Early Stage of the project
Who can apply …	Public authorities (ministries) in Member States Geothermal energy firms with projects to propose should apply to public authorities in Member States.	
Scope of funding ...	Cost of Technical Assistance/No per-project prior limitation on the resources committed to technical assistance under JASPERS on the part of European agencies. Limitations exist on the total financial resources and their allocation per Member State for the projects that ultimately are qualified.	
Short additional description	The main objective of JASPERS is to assist the Member States in the complex task of preparing quality projects so that they can be approved more quickly for EU support by the services of the Commission. JASPERS will provide comprehensive assistance for all stages of the project cycle from the initial identification of a project to the Commission decision to grant assistance.	

JEREMIE-Joint European Resources for Micro to Medium Enterprises		
Regions in all EU Member States	Managed by …	European Commission – DG Regional Policy, European Investment Bank (EIB) and the European Investment Fund (EIF)
	at National level	
	Project Scope…	Deep-seated geothermal energy
		Must compete with other energy and non-energy projects in the same urban area on the basis of financial criteria
	Funding Scheme …	Holding fund to provide financial intermediary with equity, loans or guarantees, as well as technical assistance as appropriate.
	Project Phase…	Early stage of the project
Who can apply …	Micro, small or medium-sized enterprises (through a financial intermediary)	
Scope of funding ...	Micro to medium enterprises with projects to fund will receive support through JEREMIE-accredited financial intermediary. The JEREMIE-accredited financial intermediaries will be responsible for making funds available on competitive terms. No per-project prior limitation on the part of European agencies, except on the total financial resources and their allocation per region (regional policy managing agency).	
Short additional description	Holding fund to be managed by financial intermediary, such as venture or seed capital fund, start-ups, technology or technology transfer fund, guarantee or mutual guarantee fund, loan fund, micro credit provider, etc. Regional policy managing authorities (i.e. public entities) in Member States that wish to join the JEREMIE framework, decide to allocate resources from the programme to a holding fund. The holding fund may be a suitable qualified financial institution at national level.	

JESSICA Joint European Support for Sustainable Investment in City Areas		
Urban areas in all EU Member States that will choose to participate	Managed by …	European Commission – DG Regional Policy, European Investment Bank (EIB) and the Council of Europe Development Bank (CEB)
	at Regional level	
	Project Scope…	Heating & Cooling
		Different forms of investments supplying energy via networks to a defined geographical area.
	Funding Scheme …	Equity and loan participation in Urban development funds and in Holding funds to hold portfolios of Urban development funds
	Project Phase…	Early stage
Who can apply	Project promoters could be public, municipal or private sector enterprises, or joint enterprises involving these actors in any possible combination of them.	
Scope of funding	No per-project prior limitation on the part of European agencies, except on the total financial resources and their allocation per urban area. Geothermal projects must compete with other energy and non-energy projects in the same urban area on the basis of financial criteria	
Short additional description	Regional policy managing authorities (i.e. public entities) in Member States deciding to use the JESSICA framework will launch one or more calls to express interest, addressed to Urban development funds. Urban development funds will select and support PPPs and other urban projects, providing them loans, equity or guarantees, but not grants. It would be possible for a given project to be supported partly by the non-grant urban development funds, and partly by public grants (including from operational programmes). Other private banks or investors may also participate.	

Pre-Accession Assistance: The European Commission also developed instruments for EU candidate's countries or potential candidate countries in the Western Balkans by the Instrument for Pre-Accession Assistance (IPA) – Energy Efficiency Finance Facility.

Instrument for Pre-Accession Assistance (IPA) – Energy Efficiency Finance Facility		
Pre-Accession European States Albania, Bosnia and Herzegovina, Croatia, Montenegro, Serbia including Kosovo1, Turkey, and the former Yugoslav Republic of Macedonia	Managed by	European Commission – DG ENLARGEMENT Implementing Authorities are the EIB, EBRD and the CEB in co-operation with KfW under joint management with the European Commission.
	at European and national level	
	Project Scope	Investments on the energy demand side contributing to the energy performance of buildings and industry sector as described in the Directive on energy end-use efficiency and projects related to renewable energy generation
	Funding Scheme	Credit facility plus investment incentive for end-beneficiaries, credit facility plus administration fee for financial intermediaries.
	Project Phase	Early Stage
Who can apply	– Eligible Financial Intermediaries are banks or leasing companies locally registered, licensed, or incorporated entities, including subsidiaries of EU banks and EU leasing companies, in the beneficiary countries and operating in the beneficiary countries.– Eligible end-borrowers are private entities;- residents organized in collectives of individuals, such as housing associations; Public entities like Municipalities and their associations.	
Scope of funding	Investment incentive granted to end-beneficiary is 25% of total project cost payable upon repayment of the loan. Fixed maximum, €5 millions for each end-beneficiary, €20 millions for each financial intermediary.	
Short additional description	Financial intermediaries are selected on the basis of their capacity, financial strength, branch networks and regional presence, and their interest to participate in and promote the Facility and its objectives.	

Structural Funds and **Cohesion Funds** are funds allocated by the European Union for two related purposes: support of the poorer regions of Europe and support of integrating European infrastructure. Current programs run from 1 January 2007 to 31 December 2013, with 277 bn Euro budget for Structural Funds, and 70 bn Euro for the Cohesion Fund.

Renewable energy and energy efficiency projects realized on local level can be some of the best options to use the funds effectively. To draw down EU Structural Funds each Member State must submit a National Development Plan to the European Commission, setting out its investment priorities for EU Structural Funds. This plan forms the basis of negotiations between the Member State Government and the European Commission relating to the allocations of EU funding.

The maximum contribution of the funds to a project depends on the type of project and where it takes place. Basically each project needs co-financing. So beside EU funds also national funds are needed.

Cohesion Fund

The Cohesion Fund is a structural instrument that helps Member States to reduce economic and social disparities and to stabilize their economies since 1994. Energy efficiency and renewable energy are funded sectors. A Member State, which is eligible for Cohesion Funds has a per capita gross national product (GNP), measured in purchasing power parities, of less than 90 % of the Community average and has a program leading to the fulfillment of the conditions of economic convergence as set out in Article 104c of the Treaty establishing the European Community.

Structural Funds

The mission of structural funds is to fix the striking disparities between the EU Member States and regions. The European Regional Development Fund (ERDF), one of the two structural funds dedicated to renewable, will finance measures in the two objectives supporting designated areas and regions. These are as follows:

- Development and structural adjustment of regions whose development is lagging behind
- Economic and social conversion of areas facing structural difficulties

Funding of:

- Direct aid to investments in companies (in particular SMEs) to create sustainable jobs;
- Infrastructures linked notably to research and innovation, telecommunications, environment, energy and transport;
- Financial instruments (capital risk funds, local development funds, etc.) to support regional and local development and to foster cooperation between towns and regions;
- Technical assistance measures

Cohesion policy was also put forward through the European Economic Recovery Plan for Europe. The European Commission announced recently (march 2009) that it intends to invest €105 billion in green projects (€4.8 billion for renewable energies) under the EU's cohesion policy. A certain amount especially for renewable energy is provided. The detailed amount for the GEOFAR target countries are mentioned in the Figure 7. The respective Operational Programme has to be checked to learn about modalities of use for geothermal energy.

Germany	226,110,262	Portugal	104,650,199
France	365,435,057	Hungary	202,892,004
Spain	164,357,038	Bulgaria	66,491,830
Greece	292,840,000	Slovakia	90,252,216

Figure 7 Cohesion policy investment for renewable energy (€), 2007-2013

Remark: *The European Union Greenhouse Gas Emission Trading Scheme (EU ETS), cap-and-trade system for carbon dioxide emissions in the European Union, based on Directive 2003/87/EC can cover geothermal energy projects. This system works with the implementation of National Allocation Plans in European countries introducing allowances for some sectors and individual installation.*
It will not be further analysed in this report, in so far as they more indirectly finance geothermal energy projects.

International Financial instruments

At international level some financial instruments have been installed investors in European geothermal energy projects can benefit from in selected countries. Especially the instrument GeoFund will be taken into account in order to analyse who Eastern European countries can benefit from this instrument.

GeoFund (Geothermal Energy Development Program): The Geothermal Energy Development Program aims at systematically promoting the use of geothermal energy in the Europe and Central Asia region by removing barriers to the development of geothermal energy, leading to greater diversification in energy use and an increase in demand for and the supply of geothermal energy projects. The GeoFund is funded by the Global Environment Facility (GEF) Trust Fund.

GeoFund (Geothermal Energy Development Program)		
Europe and Central Asia GeoFund eligible countries: Albania, Armenia, Azerbaijan, Belarus, Bosnia-Herzegovina, Bulgaria, Croatia, Georgia, Kazakhstan, Kirgizstan, Macedonia, Moldova, Montenegro, Romania, Russia, Serbia, Ukraine, Tajikistan, Turkey, Turkmenistan, and Uzbekistan.	Managed by …	World Bank
	at international level	
	Funding Scheme …	Projects can be supported by the Technical Assistance Window, the Geological Risk Insurance Window and the Direct Investment Funding Window: GEOFAR offers technical assistance, partly risk insurance, straight grants, contingent grants
	Project Scope…	Deep-seated geothermal energy
		The GEOFUND support offers comprises: - Providing technical assistance and capacity building to transfer know-how and to establish a geothermal data base and capacities to develop and implement geothermal energy projects; - Supporting capital investments in geothermal energy development projects; - Supporting reforms in policies, and the legal, regulatory and institutional framework of the energy market
	Project Phase…	Early stage and drilling
Who can apply …	For policy and institutional reforms supported under the TA Window governments and other public institutions (i.e. municipalities, government agencies) can apply. For projects to be financed utilities (private or public), investors, banks, etc. can apply.	
Scope of funding ...	A total amount of 25 Mio US$ is eligible in GeoFund for geothermal energy projects. The projects can apply in different windows: - TA-Window: 7 Mio US$ - DIF-Window:8 Mio US$ (contingent grants, low cost loans or, in limited cases, grant financing, direct grants to support part of the investment cost for exploration) - GRI-Window: 10 Mio US$ (grant on geological risk events during the exploration phase	
Short additional description	The World Bank-GEF Geothermal Energy Development Program (GeoFund) is a region-wide multi-country facility of up to US$25 million	

National Instruments

Germany

Germany offers a broad set of financial instruments for geothermal projects which are described in the following.

Renewable Energy Sources Act (EEG): The **EEG** regulates the priority connection of facilities for energy production out of renewable energy sources to the grids for the common supply with electricity and regulates the feed-in tariffs. Every plant operator that operates a plant producing energy out of renewable energy sources (i.e. geothermal) can benefit from these tariffs. The electricity from geothermal energy is reimbursed

- The reimbursement for electricity increases by 4.0 c€/kWh for a plant that started running before 1 January 2016.
- The reimbursement for electricity generated in combination with heat use increases by **3.0** c€/kWh (heat-use bonus) for the first 10 megawatts of output if at least one fifth of the available heat capacity is decoupled.
- The reimbursement for electricity that is generated by the use of petro-thermal techniques increases by **4.0** c€/kWh (technology bonus) for the first 10 megawatts of output.

Act on the Promotion of Renewable Energies in the Heat Sector (EEWärmeG): The Act sets clear rules for owners of newly constructed buildings that must cover a share of the thermal energy demand with renewable energies. Instead of investing directly into renewable energies the owner also fulfils his obligation to use renewable energies by alternative measures such as covering the thermal energy demand directly from a local or district heating net if a substantial share of the heat comes from renewable energies. This sets new possibilities also to heat networks supplied by heat out of geothermal energy sources.

Market Incentive Programme: Based on the “Directive for the funding of actions for use of renewable energy sources in the heat market” from 20th February 2009 several financial instruments for deep geothermal projects have been developed by the BMU (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety). The instruments comprise funding for drillings, risk mitigation in drilling stages, plant design and construction as well as heat networks. The KfW (Kreditanstalt für Wiederaufbau – Banking Group) offers loans in combination with redemption grants. The main instrument is the “Programme to Promote Renewable Energies”.

Programme to Promote Renewable Energies		
Germany	Managed by	KfW Bankengruppe
	at national level	
	Project Scope	Focus on heat production
	Funding Scheme	Low interest loan with redemption grant for renewable energy projects.
	Project Phase	Drilling of development wells (heat generation), power plant design (heat generation) and construction, Infrastructure (heat networks)

Who can apply	- Municipalities, legally dependent municipally-owned enterprises, special - purpose associations - Small and medium sized enterprises (SME) - Large enterprises in cases of special funding eligibility - Enterprises which are to a majority share owned by municipalities which fall below the SME-criteria - Private individuals and private foundations that use the produced energy solely to meet their own needs
Scope of funding	The financing share is up to 100% of the eligible net investment costs. A maximum loan amount of usually EUR 10 million per project can be granted by the KfW. Redemption grants amount to: - a maximum of 2 Mio € for plant funding, - a maximum of 5 Mio € for drilling cost funding (for one doublet) - a maximum of 2.5 Mio € for additional expenses for deep drilling (for one doublet) - a maximum of 1.5 Mio € for heat networks.
Short additional description	The programme is divided in two parts, the part “standard” (loan) and the part “premium” (loan with redemption grant). For huge operations in deep geothermal the programme part “premium” is applicable.

Research: For demonstration projects a demonstration programme has been set by the Federal Ministry of Environment (BMU) in order to support projects with demonstration character that influence existing or planned operations.

BMU-Environmental Innovation Programme		
	Managed by …	KfW Bankengruppe
	at national level	
	Project Scope…	Heating & Electricity & Cogeneration
	Funding Scheme …	Bullet loan with interest subsidy (KfW) and in special cases investment subsidy
	Project Phase…	Demonstration projects
Who can apply …	National and international private companies, mainly public sector dominated companies, municipalities, municipality associations; owner operated municipal enterprises, administration unions and county administrations.	
Scope of funding	For the bullet loan with interest subsidies the amount of financial support can be up to 70 % of the fundable costs without a limit. An investment subsidy for up to 30% of the fundable costs can be applied for in exceptional cases.	
Short additional description	This loan with interest subsidy will be provided to operations/projects that are based on a technology that either has not been used yet or if a known technology is subject to a procedural combination.	

Investment support programmes for public bodies: The KfW offers several types of loan with fixed interest rate for financing public energy (infrastructure) projects, i.e. over the programme KfW Investitionskredit Kommunen, KfW Investitionskredit Kommunen – flexibel, KfW Kommunal Investieren. Each public body has to check if loans from these programmes can be requested and combined with other financial instruments for planned deep geothermal projects.

France

The new French energy policy is boosted by the "Grenelle de l'environnement". This Round Table, gathering civilian and public service representatives, was launched in order to define the key points of the French government policy on ecological and sustainable development issues for the coming years. Results of the discussion are implemented in concrete laws and actions. These define new financial schemes to boost investment in renewable energy, and consequently, for geothermal energy and are completing the fiscal incentives system.

Governmental Incentives: The French Government introduced incentives for renewable energy projects:

- To boost electricity production from renewable, the law compels the French electricity grid operator to buy electricity from renewable at a fixed price. The so called **feed-in tariffs** have been increased since 2006. For geothermal power production with contracts signed since this date, the tariff is fixed at 12 c€/kWh (a bonus between 0 and 3 c€/kWh kWh can be added if produced heat is also used) for Metropolitan plants (supposed to be binary cycles) and at 10 c€/kWh for plants located overseas (with the same bonus). These values are for the year 2006 and are actualised each year following the inflation.

- To decrease price of renewable energy, the French government reduced the VAT rate for district heating with renewable sources of production. The reduced VAT rate applies for renewable heating, including geothermal energy for the two parts (connection and energy) of the final user contracts. VAT rate of the energy consumption decreases from 19.6 % to 5.5 % if an average of more than 60% (50% by the end of 2009) of the energy comes from renewable energy sources.

Grants: French Environment and Energy Management Agency (ADEME) offers special grants for geothermal energy, at national level but overall at regional level (assisted in some regions by the Regional Council). These grants are financing feasibility studies and investments to geothermal projects.

ADEME Grants for feasibility studies		
France	Managed by …	ADEME
	at national and regional level	
	Project Scope…	Heating & Electricity & Cogeneration
	Funding Scheme …	Grants
	Project Phase…	Feasibilities Studies
Who can apply …	Public and private operators can apply	
Scope Funding …	Feasibility studies for geothermal projects can be granted up to 50% of the cost of the study, limited to 300,000 € for deep geothermal energy. A specific grant can be added for a consultant assisting the project owner (30% of the sum, limited to 100,000 €).	
Short additional description	Grants are not systematically given, that is to say that they are evaluated and the sum given depends on the project files.	

Consequences of the "Grenelle de l'environnement", French Ministry and ADEME are launching a fund dedicated to renewable energy producing heat ("Heat Fund"). This should become a performing instrument to launch investment in renewable heat production giving grants for investment and of the depending on the production.

Fond Chaleur (Heat Fund)		
France	Managed by …	Ministry of Ecology, Energy, Sustainable development and Land settlement (MEEDDAT), French Environment and Energy Management Agency (ADEME) and Ministry of Agriculture and Fishing (MAP).
	at regional level	
	Funding Scheme …	Grants
	Project Scope…	Heat Production
	Project Phase…	Investment
Who can apply …	Private or public operators can apply to this fund.	
Scope of funding …	The rate of the grant is calculated this way: the amount should provide that the heat is sold at least 5% cheaper than it is by using fossil energy (gas being usually the reference). All projects will be studied case by case. It is necessary to be insured through the geological risk insurance to obtain these subsidies.	
Short additional description	For the period 2009-2011 are dedicated 960 Millions € to this Fund (for all renewable) by the French Finance law for 2009-2011. It has been designed to reach gradually 800 million €/year. This Fund also considers a specific system for the district heating network.	

Participating on equity capital: Some financial institutions invested and could invest in geothermal energy, like the Caisse des Dépôts. Caisse des Dépôts is a public financial institution that performs public-interest missions on behalf of France's central, regional and local governments. It is only investing in equity capital and mainly in semi-public companies ("Sociétés d'Economie Mixte" under French law) dealing with heat production for district heating. Other private institutions are also ready to lend money to geothermal energy projects, but no specific instruments for geothermal energy are proposed. Let's mention that some private funds have been created for renewable energy, like Eurofideme 2, from Natixis Environnement & Infrastructures or Demeter & Partners.

Carbon Finance: The July 13th 2005 French Energy Law (Loi POPE (Orientation de la Politique Energétique)) follows the Kyoto Protocol and specifies the French energy policy. Among measures fixed by this law, White certificates (or energy savings certificates) are introduced as quota systems for producers, suppliers or distributors of electricity, gas and oil (named "obliged"). They complete the National Allocation Plan for CO2 quotas (from the European Union Emissions Trading Scheme) that only concerns urban heat production up to 20 MW. The support, for this EU ETS, is given as carbon credits called emission reduction units (ERU) for the quantity of greenhouse gas emissions avoided during the period 2008-2012. The investor may either sell these credits in the market, or, if he is subject to the European Union Emissions Trading Scheme, he may use them for his own requirement. The penalty for "obliged" is fixed to 2c€/kWh. The maximum that "eligible" can obtain is so less than 2c€/kWh (negotiated). Standardised projects are encouraged,"Renewable Heat Production for district heating" and "Extension of renewable district heating" are eligible by default. It's not possible to combine Energy Saving Certificates with the Heat Fund. Each potential investor will have to determine which instruments fit best for the project.

Remark : *It could also be underlined there that some income tax reduction can be obtained for developer that invests in French overseas department, but modalities and eligibility conditions are too complex to be explained in this report (reference Text: Code Général des Impôts art 199 undecies B").*

Greece

Governmental Incentives: The law for the promotion of Renewable Energy Sources (law 3468/2006) sets feed-in tariffs for electricity production from geothermal energy. In the interconnected electric system, the selling price of electricity is 7.3 c€/kWh and in the non – interconnected island system it is 8.46 c€/kWh. Both tariffs are under change during 2009.

Remark: *A modification of geothermal law of Greece (law 3175/2003) should provide provisions for the financing of geothermal projects (heating and cooling using geothermal water, geothermal heat pumps). Later on it will be possible with simple Common Ministerial Decisions (Ministry of Economy and Ministry of Development) to set the detailed financing instruments such as grants, tax reductions (incl. VAT), favorable financing, etc. for geothermal applications and use.*

At the moment, the main instrument that can be used (except FIT) is:
Law for incentives for the private investments for economic development and regional converge:
The 3299/2004, "Law for incentives for the private investments for economic development and regional converge" is the main financial instrument for the development of geothermal energy in all uses.

"Incentives for private investments for economic development and regional convergence"	
Geographical Scope …	Greece and other countries where Greek small or medium (SME) companies invest.
Managed by …	Ministry of National Economy and Finance and Ministry of Development
at National level	
Project Scope…	Heating & Electricity & Cogeneration
	Business activities related to geothermal energy which fall under the provisions of Incentives Law are specified in the law.
Who can apply …	Private enterprises

Based on this law the government gives support to investment plans under the following forms:

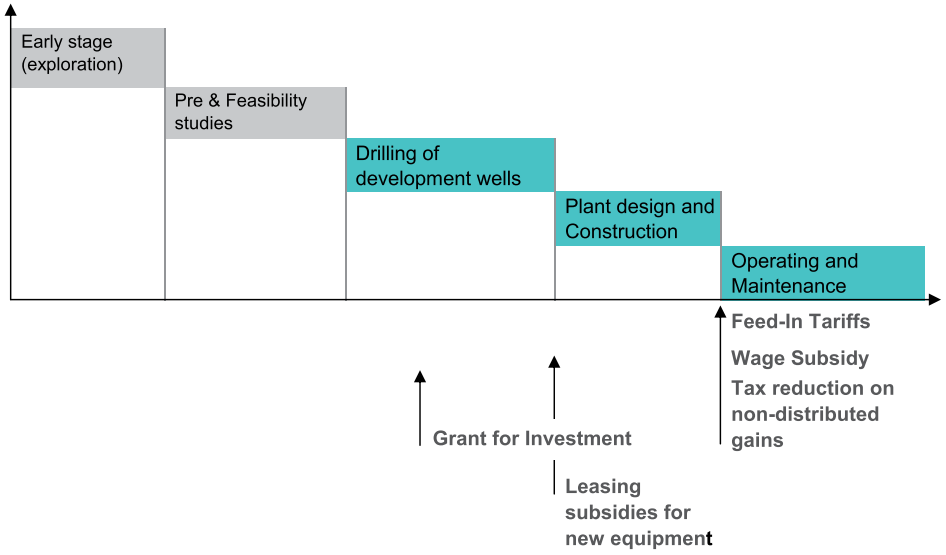


Figure 8 **"Incentives for private investments for economic development and regional convergence" in Greece**

Funding Scheme	Grants for Investment	Leasing Subsidy	Tax reduction (exemption) on non-distributed gains	Wage subsidy
Project Phase	Design and construction of the plant	Investment to new mechanical and other equipment and to buy this equipment.	Operating and maintenance	Operating and maintenance
Scope of funding	The amount of financial support is calculated on the basis of the geographical region and the investment cost. The maximum percentage of the grants in combination with other financial supports should not exceed 55% of the total investment cost.	The amount of financial support is calculated on the basis of the geographical region and the investment cost. The percentage of the investor's own participation in investments which are included in the cash grants and/or leasing subsidies system cannot be less than 25% of the subsidized expenses.	For the investment plans, the tax allowances are offered according to zone and category and vary from 50% to 100%.	The amount of this financial support is calculated on the basis of the geographical region and the investment cost. Wage subsidy for employment created varies from 10% to 40%. Additional grants can be given to very small companies.
Short additional description	This financial support is offered under the terms and conditions set out in the Investment Incentives Law.	Leasing subsidy covers part of the payable instalments by the State relating to a lease which has been entered into for the use of new mechanical and other equipment.	The allowance is effective for the first ten (10) years of operation. It is created through a tax exempted reserve. Concerning investments which are included in the tax exemption at least 25% of the cost should be covered by the financial participation of the investor, either by own funds or loan, provided that no state subsidy accompanies this part.	Employment positions relative to the investment are considered new employment positions which are created for the assistance of the investment within the first three years of its completion and start of productive operation.

Portugal

Governmental Incentives: The Portuguese government introduced a simplified scheme with application on renewable energy for electricity production.

The main instrument of promotion is the payment of a guaranteed feed-in tariff with a purchase obligation, which is calculated by a formula, based on various factors like system output and capacity. The payment is guaranteed for 15 years.

A reduced VAT (12%) is applied for acquisition of new equipments, such as machines and other equipments designed for renewable energy.

New equipments are also deductible for tax (irs) in 30 % with a limit of € 796 of the overall value. New equipments for renewable energy production, equipments for electrical and thermal energy production (co-generation) from micro turbines, with maximum power of 100 kW, consuming natural gas, including additional equipments indispensable to its own operation are included.

Grants through Regional Program: The main incentives in Portugal are grants coming from the regional institutions. The fund, not only dedicated to geothermal energy projects, is the same for all regions, but the conditions of allocation varies from one region to another. Globally:

- Public and private organisations can apply to this fund.
- They are mainly dedicated to pilot projects, and most particularly public projects or recognized public interest projects.
- Grants can cover up to 85% of the total amount of the project costs for heat, electricity or cogeneration production.

Regional Programme	Managed by ..
Programa Operacional de Valorização do Potencial Económico e Coesão Territorial da R.A. da Madeira (INTERVIR+)	Instituto de Desenvolvimento Regional (IDR)
Programa Operacional Regional de Lisboa 2007 - 2013	Comissão de Coordenação e Desenvolvimento Regional de Lisboa e Vale do Tejo
Programa Operacional Regional de Alentejo 2007 - 2013	Comissão de Coordenação e Desenvolvimento Regional do Alentejo
Programa Operacional Regional de Algarve 2007 - 2013	Comissão de Coordenação e Desenvolvimento Regional do Algarve
Programa Operacional do Centro 2007 - 2013	Comissão de Coordenação e Desenvolvimento Regional do Centro
Programa Operacional do Norte 2007 - 2013	Comissão de Coordenação e Desenvolvimento Regional do Norte
Proconvergência – Programa Operacional dos Açores para a Convergência	Direcção Regional do Planeamento e Fundos Estruturais

Spain

Currently two main instruments are running that aim at fostering geothermal energy development. These two instruments are the IDAE financing instrument and the price regulation.

IDAE financing instruments		
Spain	Managed by …	IDAE (Institute for Diversification and Saving of Energy)
	at national level	
	Project Scope…	Heating & Cooling & Electricity
	Funding Scheme …	Various systems: loan, participation in projects…
	Project Phase…	Feasibility studies and investment
Who can apply …	Public and private investors can apply	
Scope of funding	Depends on the negotiation	

For electricity production: The operator of electricity generated with geothermal energy can be supported with a feed in tariffs or a bonus depending on the geothermal power plant capacity:

Capacity of the Power Plant		
<50 MW	50<P<100 MW	>100 MW
Guaranteed feed-in tariff or Bonus paid on top of the price derived on the free market	Bonus for the electricity produced	No eligible

General characteristics:
Tariffs: 90% TMR (variation of reference tariffs from this year and the next year) for the first 20 years
80% TMR for the rest
Bonus: 40% TMR
Incentives: 10% TMR

Regulated tariffs: for the first 20 years 6.8900 c€/kWh; 6.5100 c€/kWh for the rest.

Reference bonus: for the first 20 years 3.8444 c€/kWh; 3.0600 c€/kWh for the rest
The reference bonus can be considered as a special bonus dedicated for each project that negotiates it during the first 15 years of exploitation

Within the last Renewable Energy Plans, geothermal energy was not considered. But as currently new possibilities of geothermal exploration are developed in Spain, the new Renewable Energy Plan will take geothermal energy into account as one of the most interesting energy sources for the near future into account.

Research: The Ministry of Science and Innovation proposes three different instruments for R&D projects that could be used for geothermal energy projects (innovative or pilot project) developed by public and private organizations. The instruments launch as soon as the feasibility studies begin.

-The National R&D&I Plan can offer subsidy and/or loan with special interest that can support up to 50% of the project depending on the body without maximum amount of support.

- Cooperation among the enterprises and the scientific and technological bodies for projects with high contribution of new technologies and the development of new process (minimum of 2 M€ during 2009) can be supported with grants for Unique Strategic Projects in the field of energy.

- Private companies in cooperation with public bodies, universities, research centres can be supported with grants by the CENIT program for big R&D Program.

The decision on one of those instruments depends on the call for proposals (objectives, scope...) and on the specific project.

Bulgaria

The Bulgarian Government installed incentives to foster investment in geothermal projects. The measures taken are:

- Reduction of customs duties for imported items
- Free utilization of existing wells
- Reduction of Value Added Tax (VAT) by 2%
- Reduction of income tax by 3%
- Negotiable reductions in other taxes which apply

Besides these incentives, financial instruments exist that offer financial support to investors in geothermal energy projects.

Feed-In tariffs: Implementation of the "Ordinance on Setting and Applying Prices and Rates of Electric Energy" from the law on renewable and alternative energy sources states that energy generated from renewable energy sources will be given preferential pricing, but moreover, transmission and distribution entities will be required to purchase all renewable energy produced at a fixed rate. The incentives consist also in a mandatory connection of RES power producers power to the electrical grid, a preferential price for the sale of RES energy and a securing preferential treatment for producers of RES power.

Investment promotion: To strengthen investments in energy projects including geothermal projects the Bulgarian Ministry of Economy and Energy has passed a law on the promotion of investments to strengthen the domestic energy market.

Law on Promotion of Investments		
Bulgaria	Managed by …	Ministry of Economy and Energy, Republic of Bulgaria
	at national level	
	Project Scope…	Heating & Electricity & Cogeneration
	Funding Scheme …	Subsidy
	Project Phase…	Drilling of development wells
Who can apply …	Private Investors	
Scope of funding ...	60% of the investment	
Short additional description	At least 40% of the investment costs must be financed by private equity or third party loans	

The EBRD together with Bulgarian banks has developed the Bulgarian Energy Efficiency and Renewable Energy Credit Line (BEERECL):

Bulgarian Energy Efficiency and Renewable Energy Credit Line (BEERECL)		
Bulgaria	Managed by …	DAI Europe in co-operation with EnCon Services and ESBI as Independent Energy Expert
	at national level	
	Project Scope…	Co-generation (industrial projects) and Geothermal projects in general
		Industrial energy efficiency projects owned by private sector companies.
	Funding Scheme …	Loan with incentive grant
	Project Phase…	Drilling of development wells
Who can apply …	Private operators	
Scope of funding ...	There is a limit on the amount of the loan principal, on which the grant can be received. This limit differs among the Participating Banks and varies from €150,000 to 2million. In addition, project sponsors receive an incentive grant upon project completion. This grant offers: - 15% of the disbursed loan principal for industrial energy efficiency projects - 20% of the disbursed loan principal for small renewable projects	
Short additional description	The company, applying for financing under the BEERECL should have at least 51% private ownership	

Hungary

The main support for geothermal energy is the Environmental and Energy Operational Program (KEOP) which is one of the 6 Operative Programs of the 2007-2013 New Hungarian Development Plan and mainly funded by the structural and the cohesion funds of the European Union:

Environmental and Energy Operational Program (KEOP)			
Hungary	Managed by …	National Development Agency	
	at national level		
	Project Scope…	Heating & Electricity & Cogeneration	
		The produced energy has to be used to meet the needs of the local populations, institutions and manufacturers.	
	Funding Scheme …	Grants, credits, guarantee instruments, subject to operating calls for application.	
	Project Phase…	Subject to operating calls for application.	
Who can apply …	Public and private organizations can apply.		
Scope of funding	Total budget for renewable energies of 253 million Euro. The subsidies range extremely from operating calls.		
Short additional description	Applications are running in two year periods, a new one was scheduled for March 2009.		

Governmental Incentives: The Act No. LXXXVI 2007 regulates the feed-in tariffs for renewable energies. Geothermal energy is included. Tariffs vary according to time of day and technology and are adapted on a yearly basis taking the inflation rate into account.

Slovakia

Government incentives: The Slovak Government launched several instruments to promote renewable energy:

Feed-in tariffs: Feed-in tariffs have been installed to support electricity generation. To benefit from this purchase obligation, the capacity of the power plant should be higher than 5 MW. If the plant operator receives an investment grant by the state or by the EU, the amount of payment decreases. Decree of RONI of 28th July 2008 No 2/2008 sets the price regulation in electricity sector which is for geothermal energy set to 5 900 Sk/MWh (corresponds to 19.584 c€/kWh as of 1st January 2009). This price is fixed for the next 12 years following the operation start. However, if the installation (or refurbishment) of the geothermal equipment was supported by the Government or by the EU Funds, the fixed price is reduced in compliance with the following table:

Government or EU fund support	
As the share of the acquisition costs [%]	Fixed price reduction by [%]
Up to 30	4
Up to 40	8
Up to 50	12
Over 50	16

Note: Currently there is a "Bill on RES support" awaiting the approval in the Slovak Parliament, expected validity as of January 1st 2010. In the Bill the reduction of fixed price is defined by the different method; one suggests the reduction of the guaranteed period of fixed price validity.

Tax reduction: In Slovakia, electricity is subject to a consumption tax except if it is produced by renewable energy. Geothermal energy benefits from the exemption of tax on the consumption of renewable-energy-source electricity. The amount of tax is calculated on the basis of the amount of electricity tariffs.

Geothermal plant operators can obtain subsidies through the European Structural Fund according to calls for applications that are proposed.

Operational Programme Competitiveness and Economic Growth		
The "convergence objective area" of the Slovak Republic covers certain regions in Central, Eastern and Western Slovakia	Managed by …	The grant is provided by the Ministry of Economy. Slovak Innovation and Energy Agency acts as an administrator of the support.
	at national level	
	Project Scope…	Electricity production and production of heat for space heating and hot water.
	Funding Scheme …	Subsidy
	Project Phase…	Investment Phase
Who can apply …	For small and medium-sized private enterprises	
Scope of funding …	The subsidy ranges from 20 k€ to 200 k€ for small projects and from 60k€ to 5m€ for larger projects. It shall not exceed 40% of the eligible cost of the project for the Bratislava region, or 50% of the eligible project costs for other regions of Slovakia. For information, a geothermal project (Geothermal energy exploitation in Bardonov) was supported by the sum approx. 3.9 million €.	
Short additional description	Funds are part of the fund allocated by the European Regional Development Fund (ERDF), Subsidies allocated through calls for application	

Measure of the priority line "Energy" of the programme	Indicated support total [EUR]
2.1 – Increasing energy efficiency on the demand and supply side and progressive technologies in the energy sector Scheme supporting sustainable development (de minimis support scheme)	23,2 million
2.1 - Increasing energy efficiency on the demand and supply side and progressive technologies in the energy sector Scheme of State support for the increased energy efficiency on the demand and supply side and progressive technologies in the energy sector by direct help	83 million

Iceland

The National Energy Fund was established by merging the former Electricity Fund and the Geothermal Fund in 1967 and is now the main instrument for supporting geothermal energy projects.

National Energy Fund	
Managed by …	National Energy Authority
at national level	
Funding Scheme …	Loan
Project Scope…	Heating
	exploration of geothermal heat (Heat production, District heating), exploitation of energy resources, economical energy utilization and exploitation of domestic energy resources
Project Phase…	Exploration
Who can apply …	Private and public operators of geothermal plants (just Icelandic institutions as it is ruled by law that just Icelandic legal persons may own the claim for producing geothermal energy)
Scope of funding …	National Energy Fund loan will at maximum be 60% of the Fund-approved costs. The interest rate on National Energy Fund loans is 6%.
Funding Scheme …	Grant
Project Scope…	Heating & Electricity & Cogeneration
	Exploitation of energy resources and economical energy utilization.
Project Phase…	Exploration
Who can apply …	Private and public operators of geothermal plants (just Icelandic institutions as it is ruled by law that just Icelandic legal persons may own the claim for producing geothermal energy)
Scope of funding …	National Energy Fund grant shall not exceed 50 % of the estimated costs of the individual project.
Funding Scheme …	Venture loan
Project Scope…	Heating & Electricity & Cogeneration
	design or construction of original instruments and equipment for research on and exploitation of energy resources
Project Phase…	Exploration
Who can apply …	Private and public operators of geothermal plants (just Icelandic institutions as it is ruled by law that just Icelandic legal persons may own the claim for producing geothermal energy)

Remark: *Glitnir, Iceland Bank, proposed a hybrid mezzanine financing vehicle to hinder the barriers of financing, under the name of Resource Verification Loan, witch gives fund to the project at the early stage of the project.*

Italy

Geothermal resources in Italy are mainly used for electricity production. Electricity generated from geothermal energy sources is mainly promoted through a quota system. This system obliges all producers and importers of electricity to generate a certain quota of renewable-energy-sourced electricity. If this is not possible, producers and importers have to purchase a certain amount of green certificates. All those businesses importing or producing more than 100 GWh of electricity are obliged to satisfy the national quota.

Quota System (Certificati Verdi)		
Italy	Managed by …	GME (Gestore del Mercato Elettrico)
	at national level	
	Project Scope…	Electricity production & Cogeneration
	Funding Scheme …	Green Certificates
	Project Phase…	Operating & Maintenance
Who can apply …	Public & Private operators that are obliged to generate a quota of renewable electricity	
Scope of funding	The amount of quota depends on the obligation period. For example, Plants that have been operative since 2008 receive a number of certificates which equals their net production multiplied with 0.9.	

As a consequence, the value of the kWh generated from renewable is the sum of the base price of the energy plus the market value of the Green Certificates (the latter is limited to the first eight years of plant operation). In the year 2007, this mechanism led to an average market price of 1.3 € c€/kWh for the Green Certificates, to be added to the average price for the sale of electricity, which was around 7 c€/kWh

As an alternative, small plants and expensive technologies can make use of various kinds of price regulation, which might be more cost-efficient than participation in the certificate system. The price regulation provides mechanisms like a feed-in tariff. Feed-in tariffs are dedicated to promote small systems. Systems generating less than 1MW can choose feed-in tariffs. The payment depends on the profitability of the system, for geothermal energy, the amount is set at 20 c€/kWh and the guarantee period is fixed to 15 years.

For heat production and for utilization in district heating plants, there is a contribution in form of a tax credit for investors. These grant represents about 21 €/kW for capital costs and 0,0258 €/kWh on yearly production operation.

Synthesis

Comparisons

Considering the ten European countries analysed in this report, we can first assume that they all have developed instruments for both heat and electricity production but there is a great non homogeneity concerning financial instruments for geothermal energy.

Guaranteed feed-in tariffs is the only instrument which can be found in all target countries (except Ireland). And yet, although everybody agrees that the principle is efficient, systems vary extremely from one country to another regarding amount, length of time or whether the tariff is paid for the gross or net (reduced by the self consumption) electricity production.

In the effort to combat climate change, the increased deployment of renewable energy sources is regarded by many as critical. One major obstacle to this adoption is the retail price of electricity generated from renewable sources (including geothermal), which is typically higher than the retail price of electricity generated from fossil fuels. A feed-in tariff is a revenue-neutral way of making the installation of geothermal energy more appealing. The electricity that is generated out of geothermal energy is bought by the utility at legally secured tariffs and furthermore the utility is obliged to purchase the electricity produced.

Lenders are interested in long-term sustainable projects with high profitability. (That could differ from some private funds wanting to have high profitability in a short term). The feed-in tariffs are a long-term guarantee as the contract is signed for a given period at a fixed price. This secure source of income should increase the profitability of the project and should be high enough to ensure profitability. The feed-in tariffs are already taken into account at the early stage of the project but act at a very late stage. The feed-in tariff is a strong incentive to promote electricity from renewable energy. A range of tariffs are given for the GEOFAR target countries in the Figure 9 (the tariffs vary depending on the size of the power plant). Usually the tariffs are independent of the time of the day, except in Hungary where the tariff is higher at peak demand times. The guarantee period should be long enough to make this instrument totally viable. As shown on Figure 9 this period is different in all the analysed countries.
Although principles are largely accepted and recognised as an efficient incentive, systems and tariffs vary significantly from country to country making them more or less performing.

Target Country	Year of creation	Guarantee Period (year)
Germany	1980	27
Italy	1992	15
Spain	1994	20
Greece Mainland	1994	10 to 20
Greece Island	1994	10 to 20
Portugal	1999	12
France Mainland	2001	15
France Overseas	2001	15
Hungary	2003	Varies, max. period of amortization
Slovakia	2007	1 (renewable)

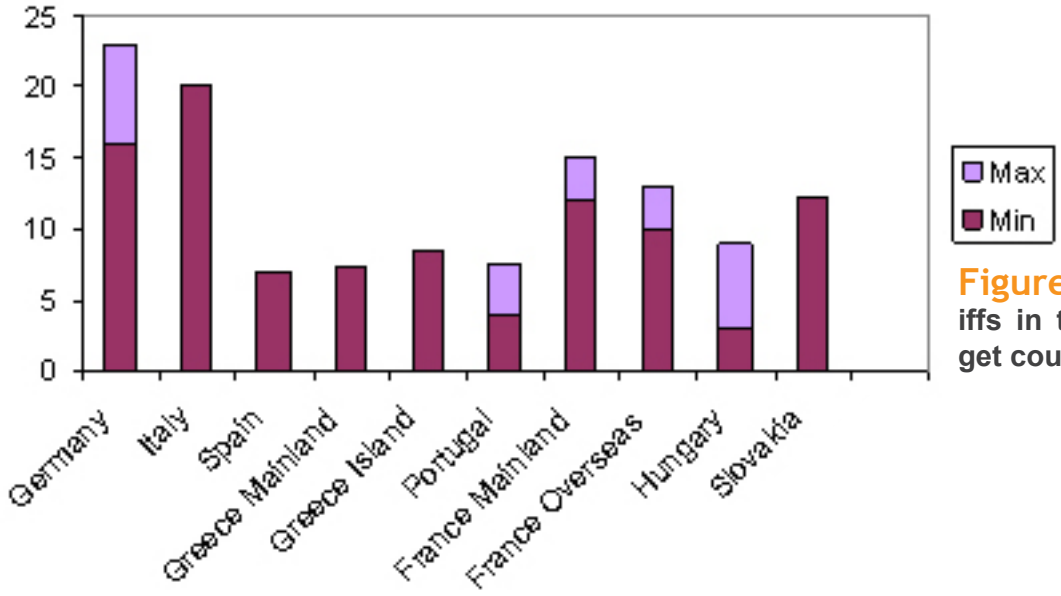


Figure 9 **Feed-in tariffs in the GEOFAR target countries**

So do the Italian feed-in tariffs included there but they are mainly dedicated to small production (less than 1MW). In deed the system implemented in Italy is a quota system with tradable certificates. Spain proposes also an alternative to guaranteed feed-in tariffs in form of bonuses paid on top of market prices.

In a large majority, feed-in tariffs range depending on technology and tariffs for geothermal energy are in most cases lower than for other renewable energy sources.

The feed-in tariffs are limited on electricity production. This instrument doesn't exist for heat production. Heat production has no long-term guarantee that production will be sold to a fixed rate.

Tax reductions are also quite common as governmental incentives and are concerning both electricity production and heat production. But in this case again systems vary from country to country. They are not allocated to the same item of price as specified in the table below.

	Country	Name / Analysis	Beneficiaries	Project Scope	Project phase when the instrument tackle
VAT Reduction	France	VAT Reduction on selling heat price	Public & Private	Heat Production (District Heating)	O&M
	Bulgaria	VAT Reduction	Public & Private		O&M
	Portugal	VAT Reduction for new equipment	Public & Private	Electricity production	Pant design & Construction
Tax Exemption	Greece	Tax exemption on non distributed gains	Private	Heating & Electricity & Cogeneration	O&M
	Slovakia	Exemption from consumption tax	Public & Private	Electricity production	O&M
Other Tax Reduction	Bulgaria	Income Tax Reduction	Public & Private		O&M
	Italy	Credit tax reduction	Public & Private	Heat Production (District Heating)	Drilling wells and during O&M

Figure 10 **Tax reductions in the GEOFAR target countries**

These two instruments are under special conditions systematically granted in different countries, as other instruments have to be negotiated. An influence of government market regulation is non negligible and as we have already mentioned, there is absolutely no homogeneity at European level. Finally, let us underline the importance of political support that is pathbreaking to promote development of energy systems.

Grants are also quite common to boost investment. Subsidies are offered at national level, but mainly at regional level. Subsidies cover mainly the investment phase, for drilling of development wells but also the purchase of equipment for the central production and can cover 30% or 40% of the investment.

Subsidies can also be granted directly proportional to the real production. This happens for example in France or in Italy (tax credit).

Some countries are specially dedicating their instruments to private operators, like Greece ("Incentives for private Investment") or Bulgaria (with its "Law on promotion on Investment"), or to Small and Medium Sizes enterprises (like Slovakia, with its "Operational Programme Competitiveness and Economic Growth").

France offers special subsidies for feasibility studies that are a first step to financing exploration phase meanwhile the Portuguese regional programs are more oriented to the development of pilot project.

Grants can also be included in global acting **bank facilities** where projects are submitted to calls for application and underlie a strict selection. Financing schemes are adapted and negotiated subjected to the project submitted. This occurs mainly for European financial instruments or for calls for application in Hungary or Slovakia (for which funds are provided mainly by the European Structural Funds).

This is also the case for European instruments that - deeper analysed - are more global: they offer not only instruments to finance launched geothermal projects but can also include technical assistance.

Special **bank facilities** with low interest loans are rarely existent in the target countries, except in Germany and in Iceland.

The European Union allocates funds **for research and pilot projects**. Some countries also dedicated money to promote research and development of new demonstration projects, geothermal energy can benefit from. Classical instruments are subsidies like i.e. in Germany the Ministry for Environment creates bank facilities as bullet loans with subsidized interest rates.

At European level and at national level, these instruments should permit to launch new technologies, for example to develop EGS Systems that will enable to produce electricity production where resources are less favourable.

Public subsidies are the only way to finance the exploration phase. Funds dedicated to research and demonstration programs could be another way but nothing systematic can be found on European level. In deed, banks are afraid of the high risk. The high risk is the key aspect and makes the financing of geothermal energy projects difficult. Venture loans are offered in Iceland and by the European Investment Found. Subsidized Geological **Risk Guarantee Systems** are offered in France, in Germany and by the GeoFund, as **Insurance Mechanism.** These are instruments that provide solutions to overcome the financial risk barrier.

Remark: *The financial instruments for financing district heating network were not specially analyzed in this report, but some countries mentioned that subsidies can be offered for development of district heating network (like in Germany, France, ..). This point could be important to promote development of geothermal solution.*

GEOFAR Countries									Comments
Financial Instruments									
Equity capital									
- Owner	X	X	X	X	X	X	X	X	In general available but should be attracted
- Funds									Funds dedicated to renewable are available, but not necessary adapted to geothermal energy projects.
- Venture Capital									Usually everywhere available or negotiable but possibly not attracted yet by geothermal energy projects
Loans (Foreign capital)									
Bank loans	X	X	X	X	X	X	X	X	In general available, but not at the early stage of the project
Subsidized loans									
- loan with low interest	X								
- zero interest loan / interest free loan									
- fixed rate loan									For long term loan
- bullet loan	X								With grace period
- loan with redemption grant	X						X		For Bulgaria by EU programs
Direct subvention									
State subsidies									
- grants		X		X	X		X		
- reduced VAT		X			X		X		
- feed-in tariffs	X	X	X	X	X	X	X	X	
- other tax reduction or exemption				X		X	X		
EU subsidies		X				X	X	X	Mainly by structural funds
Other subsidies		X			X				France/Portugal : Regional grants (depending on the regions)
- loan with redemption grant	X						X		For Bulgaria, by EU programs
Risk management instrument									
Geological Risk insurance	X	X					X		Private insurance solutions as realized in Germany are also available abroad.

Insurance Mechanism

Issue

Insurance mechanisms are not financial instruments in the common sense as they are not a way to obtain money to explore or to increase the profitability of the project. But, they are a key point to boost investment in geothermal energy. They are only dedicated to geothermal energy and taking its specificity into account.

As there is a gap in available financing instruments that correlates to the highest risk period of project development phases (early stage of the project when the resource is not proved), each investor has to face a disproportionate share of project risk compared to other renewable energy investments. The investor must have access to adequate capital to move a geothermal project into the later stages of development, and he must be willing to put that capital at significant risk. This pairing of risk and money gap multiplies the risk of geothermal projects. Getting a loan for the investment is difficult as most banks will not lend money to high-risk projects. Mitigating the risk is necessary to realise the investment.
Such geological uncertainties are specific to the geothermal activities and traditional insurance policies do not offer any specific solutions for this type of risk in view of its very nature. A risk-sharing instrument helps to overcome this hindering barrier in order to foster investments in geothermal energy projects.

Specific financial guarantees designed to cover project investors against the geological uncertainties specific to this activity could secure the financing of a project

Currently, only a few European countries provide such a risk-sharing system for geothermal projects. These are France, the oldest one and Germany. Let us mention that Switzerland also has one. At international level, GeoFund provides also a partial insurance system for GeoFund member countries whereof Eastern European countries like i.e. Bulgaria can benefit from. Furthermore there are private enterprise insurance solutions available which have to be negotiated on an individual basis and include high insurance premiums. For example, private insurance solutions are also proposed in Germany that can be available abroad.

National System

France

The development of geothermal energy in France was encouraged by the implementation of a global scheme involving financial guarantees designed to cover project investors against the geological uncertainties specific to this activity:

- The risk during the drilling phase of not obtaining geothermal resource matching the flow rate and temperature requirements enabling to assure the profitability of the planned operation (risk called “Short Term risk”),
- And the risk of seeing this resource, when it exists and is exploited, lessening or disappearing before the amortization of the equipments as well as the risk of damage affecting the wells, the material and the equipment of the geothermal loop during the exploitation period (risk called “Long Term risk”).

Risk Insurance		
France	Managed by …	SAF Environnement
	at national level	
	Project Scope…	"Deep" drilling wells
	Funding Scheme …	Insurance system to cover the geological risk Short Term and Long term, partly financed by public funding.
	Project Phase…	Early Stage for the short-term procedure and during O&M for the long term procedure
Who can apply …	Public or semi-public investors (local communities, subsidized housing organisations, hospitals and joint investment companies) or private operators	
Short additional description	The financing system to cover the geological risk is based on two complementary mechanisms: - A short-term procedure, based on the socialisation of risks, which guarantees the results (of the first well, with an insurance rate based on the cost of the drilling. - A long term Risk insurance is used for securing long term profitable exploitation. Duration of the insurance contracts is 20 years. The insurance rate is a fixed yearly amount.	
Scope of funding …	For STR, and in case of total failure (quantity and quality of the resource), the fund can cover up to 90% of the total cost of the first well (depending on the more or less favourable regions). For LTR, in case of damage that leads to the guarantee application, the compensation amount will depend on the consequences of the damage and the measures to remedy it.	
About the manager …	SAF Environnement is a subsidiary of the Caisse des Dépôts et Consignations (majority), and other Public and private financial establishments.	

Germany

To take over the risk of non-discovery the German BMU has developed a risk mitigation instrument focused on geothermal drilling projects. With this instrument the BMU has for the first time offered a public risk mitigation system for deep geothermal projects in Germany.

Fündigkeitsrisiko Tiefengeothermie		
Germany	Managed by …	KfW Bankengruppe
	at national level	
	Project Scope…	Heat production, Electricity production, Combined heat and electricity production
	Funding Scheme …	Loan with indemnification clause (in case of not successful drilling) and redemption grant
	Project Phase…	The instrument is focused on the drilling phase of projects with at least two deep drillings (development drilling and injection drilling) that will be connected to a primarily cycle.
Who can apply	Small and medium-sized private companies, private companies that are majority owned by municipalities, municipalities, local authorities, special-purpose associations, non-commercial investors, large companies can be funded in special cases proving the eligibility of the investment	
Scope of funding	The financing share is up to 80% of the eligible drilling costs including the investments for stimulation measures with a maximum loan of 16 Million € per drilling project (one doublet). The indemnification clause will be discharged after proven and KfW-approved non-discovery to 100% from the liability for the repayment of outstanding loans.	

Short additional description	The loan can be combined with a redemption grant for accrued costs for stimulation. This leads to higher interest rates during drilling.This instrument was installed by the BMU in order to offer a instrument that takes over the main non-technical barrier in geothermal energy projects, the risk of non-discovery.

Multi national Systems

Geofund, first described in the international financial instruments, also includes a partially Risk Insurance.
The Geological Risk Insurance (GRI) Window with a proposed amount of US$10 million is dedicated to partially insure project promoters/investors against the short-term, up-front geological risk of exploration, and/or the long-term geological risk of facing a deposit with lower-than-estimated temperature, higher than estimated mineralization, or difficult re-injectivity. The Geological Risk Insurance (GRI) will share partially the resource risks of geothermal exploration and reservoir confirmation drilling. A grant is payable on geological risk events during the exploration phase.

Comparisons between the different systems

France, Germany and Bulgaria are covered with a system of risk insurance for geological risks covering the risk of not discover the necessary quantity and quality of the resource in the reservoir (flow rate and temperature). Meanwhile the German system (just launched in 2009) offers loans with indemnification clauses, France and the Geofund system offer grants in case of proven failure. France and the Geofund system also offer a long term guarantee to cover the possible modification in quality and quantity of the resource.

Analysis

The major part of financial instruments is not dedicated to geothermal energy in general. Although geothermal energy and renewable energy have common characteristics (relatively high investment costs concerning specific energy power capacity and low operational costs), instruments are not considering the particularity of geothermal projects: high up-front costs and insecurity concerning the size and output of the energy supply project only after completion of the drillings.

Main barriers to overcome		Financial Instruments that exist actually
High up-front costs		Public Subsidies
		Venture loan
Geological Risk		Subsidized Insurance Mechanism
Long pay back period	High investment costs	Bank Facilities (e.g. subsidized interest loans)
	Low outcomes	Feed-in Tariff for electricity production
		Tax reduction

Figure 11 **Main barriers hindering geothermal energy projects and financing instruments**

This global scheme is though insufficient: First of all, none GEOFAR target country offers the complete scheme of financing and there is always a lack concerning the finance of the exploration phase. If some rare banks are

proposing instruments dedicated to geothermal energy, they usually only tackle after the phase of feasibility studies. In consequence potential projects cannot be identified above all the geological investigations are connected with substantial expenses.

Feed in tariffs are good instruments to perform the profitability of the power generation or combined cycle project and increase economic outcome. The risk therefore is not mitigated; nevertheless the chance for higher profitability attracts even venture capital. If a project is e.g. planned by the public sector (that could be above all the case in matters of district heating) an insurance solution can lower the risk to a level that enables the implementation of the project. In that case, insurance mechanisms seem to be necessary.

These properties should permit to define roughly strengths and weaknesses of instruments in promoting the development of geothermal energy.

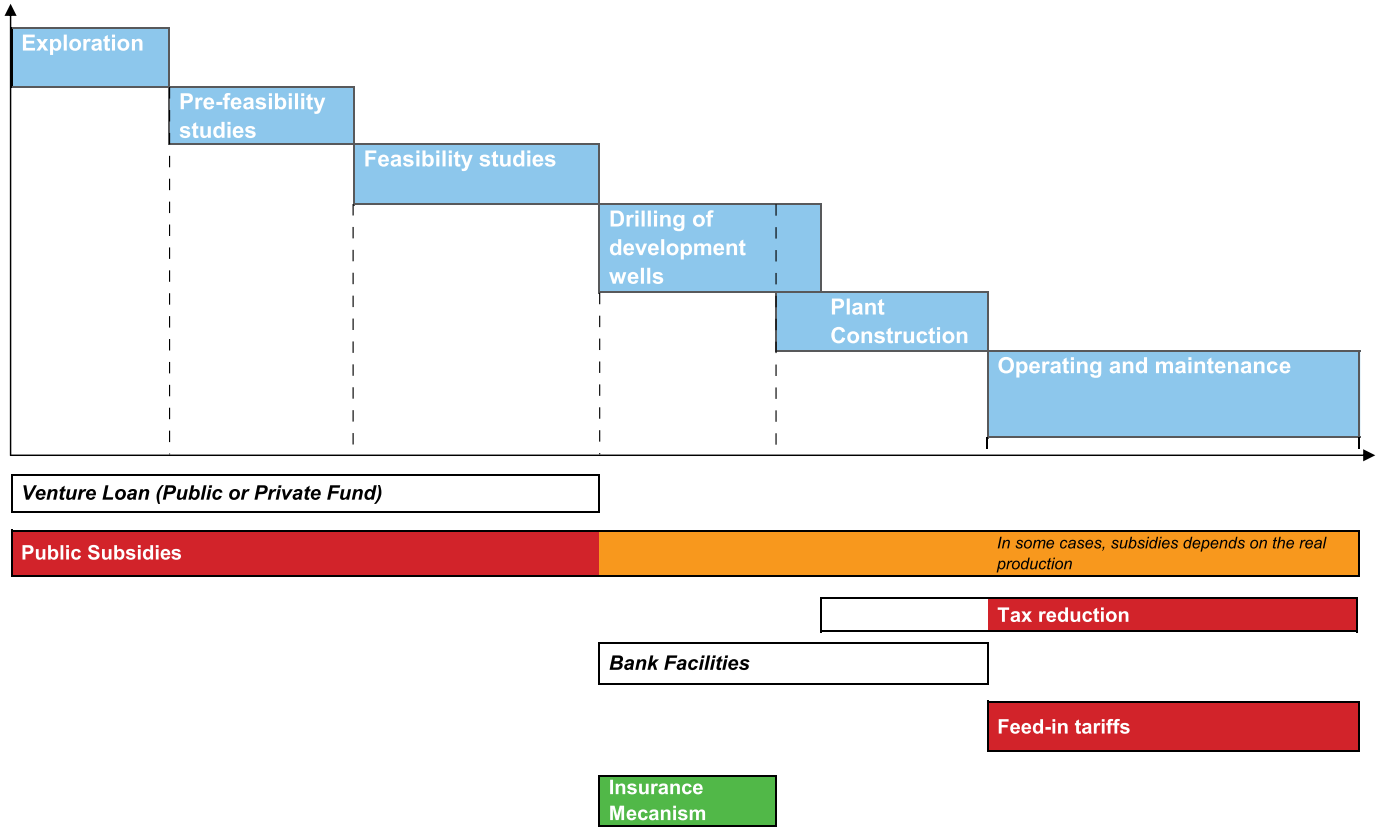


Figure 12 **Geothermal project process scheme and financing instruments**

Instruments offered	Main strengths	Main Weakness
Feed-in Tariffs	Secure income over a long term period	Acts at a very late project stage
Tax reduction	Promote increased capital investment	Affects mainly operational phase when revenues are generated
Grants	Substitute equity	Management of public money
Bank Facilities	Possibility to finance projects with high investment volumes	Difficult to apply in the stage of exploration without insurance mechanism
Tradable certificates/Quota systems	Deals with very few public money	No long term secured and fixed income

Figure 13 **Main strengths and weaknesses of financing instruments**

On the whole, all existing financing instruments are undertaken in partnership with:
- national or local authorities
- national or local financial institutions
- entities that make up a significant financial contribution to the financing of the project.

Those rules have been evolved from experience and are very successful in
- mitigating the risks of moral hazard in the selection and monitoring of projects
- promoting efficiency in decision making
- maximising the economic benefits from investment of taxpayers' money

Additional features of existing financing instruments are:
-no specific focus on leading industrial sectors or champion-firms
-reliance on markets or "quasi-markets" to guide the allocation of financial resources

Those additional features are less desirable when financial markets operate in a relative inefficient way like they do in times of generalised uncertainty. Research in the real options literature shows that market and quasi-market signals are obscured by increased uncertainty by as much as 50%. Given the same product price (including subsidy) and demand information, firms will invest half of the rate that they would normally invest, in case of them perceiving uncertainty. For financial intermediaries, the effect is amplified manifold through leverage. So, the strengths of good times can become weaknesses in bad times. Moreover, policy in abnormal times can lead to faulty logic. With states intervening heavily in the financial system of most countries and committing large amounts of taxpayers' money, one should expect financing decisions to be influenced by a more complex, less predictable and less uniform set of criteria. This should produce efficiency losses and, more important, additional uncertainty.

There are, also, acknowledged weaknesses to the financing instruments made available by international institutions for financing geothermal energy projects, like the superficiality of supervision, monitoring and control of large project portfolios in large institutions.

International institutions could, in former times, count on the expertise of specialised long-term credit institutions in many countries. Those have evolved or been merged into much larger universal and international banks. Project being a part of sectors which are classified as peripheral are not able to attract bank' attention. Venture capital can fill this void, but is, also, dependent on well-functioning financial markets both for loan finance and for the ultimate listing of successful projects.
Inadequate supervision in large banking institutions, which has been traced by researchers, exists mostly due to conflicts of interest. Even with present-day information and telecommunications technology, there are limits to the size of an organisation, beyond which the costs of supervising, monitoring and controlling outweigh the efficiency benefits.

Concerning the aforementioned, in the medium term (the next five years) one should expect a significant realignment of the financing instruments that will be made available by international institutions. It would not be wise to expect the present instruments to stay in action unchanged. There will be pressure on financial resources to be more focused on existing rather than emerging industries and technologies, if only to ease the conversion of resources from uses that will be made redundant in a new world economic environment. The energy industry and, in particular, the geothermal energy industry can position itself to benefit from these forthcoming structural changes.

Conclusion

This report presented the different financial instruments existing in the target countries and those managed at European level. Let us underline that this report presents the given situation at a given time beginning by year 2009. It should be taken into account the actual global situation and the lack of visibility of the financial institutions.

Some common instruments exist across Europe that foster investments in geothermal projects (such as feed-in tariffs), but the lack of harmonisation in instruments is obvious.
Moreover, and despite the broad panel of solution, not all project phases of a geothermal project are covered and its specifications are rarely taken into account.

Geothermal energy features high up-front costs and low operating costs. It can be summarized that grants can support the financing of investments and guaranteed feed-in tariffs ensure the profitably and can increase revenues during the operational phase. The combination between financing scheme and incentives is mainly a key point for successful projects. But, more than high investment costs concerning geothermal projects the main barrier to overcome is the financing of exploration and pre feasibility studies. Geological Risk insurance systems are insufficiently developed in the target countries (only offered in Germany and France) but are necessary to overcome the main barrier in geothermal projects and besides conditions to foster early stage funding mechanisms are insufficiently developed in the target countries.

Developing geothermal financial instruments at the European level that would support geothermal projects in their early stage by financing and by risk-sharing and which would take specificities of geothermal energy projects in consideration could be a solution to foster investments in geothermal energy projects.

A European solution therefore should try to solve two main aspects: the lack of financing for the exploration phase and the risk of an inappropriate quality or quantity of the geothermal resource comparing to the expectations for the project. This solution would have to take into account on one hand the project specific aspects, which have to be fulfilled and on another hand the investment environment of the project.

The GEOFAR project should propose in the next steps appropriate funding schemes and financial Instruments, that could be such a European solution that will cover these aspects.

Some references

- “Geothermal Electricity and Combined heat and Power”, EGEC, 2007
- “The Investor’s Guide to Geothermal Energy, How to capitalize on the heat beneath your feet”, Forseo, 2008.
- “A geothermal Europe –EGEC Brussels Declaration”, EGEC, 2009
- http://res-legal.eu/

Glossary

Adapted from http://vernimmen.net

Fund	With the purchase of fund shares the investor becomes co-owner of the company. The investment is managed by an investment company and open for any kind of investor. The shares are usually sold by financing institutes.
Bullet loan	The payment of the entire principal of the loan (interest can be included) is due at the end of the loan term resp. the loan includes a grace period.
Seed capital	Capital used for financing projects during their start up phase, at very early stage of the project. It is provided by specialised funds, business angels, etc.
Venture capital	Providing of equity or equity equivalents to start-ups and recently established companies.
Mezzanine debt	Highly subordinated debt that fits between subordinated debt and equity. Mezzaniners are repaid only after all other subordinated debt claims have been settled.
Bridge debt	Bridge loans are set up to provide funds until permanent financing is raised (capital increases, bond borrowings or the disposal of a subsidiary) that will be used to repay it. Bridge loans are of short duration, expensive and frequently used for large transactions.
Leverage buy-out (LBO)	Acquisition of all a company’s shares financed largely by the borrowed funds.

List of abbreviations

GEOFAR	Geothermal Finance and Awareness in European Regions
EC	European Comission
EU	European Union
EIB	European Investment Bank
EGEC	European Geothermal Energy Council
FIT	Feed-in Tariffs
SME	Small and Medium Enterprises
VAT	Value Added Tax
EGS	Enhanced Geothermal Systems

GEOTHERMAL FINANCE
AND AWARENESS
IN EUROPEAN REGIONS