IEA GEOTHERMAL

European Commission Report 2012

IEA Geothermal Implementing Agreement

National Activities

Chapter 9 of Draft 2012 GIA Annual Report

European Commission

9.0 Introduction & Overview

The EU supports geothermal energy through its Framework Programmes for Research and Innovation. The Energy Theme of the current 7th Framework Programme (FP7) publishes annual calls for proposals. Topics concerning geothermal energy, shallow and deep, are included in most of these calls. The current FP7 started in 2007 and ends this year. The next framework programme is "Horizon 2020", due to start in 2014 and to run until 2020.

9.1 Highlights and Achievements

The 2013 energy call (FP7-ENERGY-2013-1) invited geothermal proposals to be submitted in the field of geothermal reservoir characterisation and assessment. The deadline for proposal submission was end of November 2012, and evaluation of the proposals was completed in January 2013. Funding for one geothermal project was specified in the call, and the successful proposal (IMAGE) is now at the negotiation stage.

The European Technology Platform for Renewable Heating and Cooling (RHC-ETP) gathers all main renewable heating sources and stakeholders (biomass, solar thermal and geothermal) and deals with strategic issues for growth, competitiveness and sustainability, including research and innovation. The important objectives of this platform are to elaborate a shared/common vision about the development of the market by 2020 – 2030- 2050 with the preparation of the related Strategic Research Agenda (SRA). This latter will be presented during the 4th European Conference of the RHC-ETP that will be held in Dublin on 22 – 23 April 2013.

9.2 Three EU Projects in 2012

There were three ongoing and three new projects started in 2012.

9.2.1 Ground-Med

Started in January 2009; End date: December 2013; EC funding: 4,548,944 Euros

The Ground-Med project "Advanced ground source heat pump systems for heating and cooling in Mediterranean climate" has developed a new generation of geothermal heat pumps systems, which are being demonstrated and monitored, while heating and cooling 8 buildings in South Europe with a variety of indoor heating/cooling emitters (radiators, fan-coils, air handling units and radiant walls). Its main objective is to maximize the seasonal performance factor in each one of the 8 demonstration sites, which is the ratio of useful energy delivered to the building throughout the year, divided by the electricity consumption at the different system components. The technology developed, which is now under evaluation, includes super heat pump prototypes of different technological options such as single compressor, tandem compressors and inverter compressor, fan-coils of extremely low electricity consumption, a new type of air handling unit using condensing heat, a thermal energy storage unit for cooling, innovative borehole heat exchangers, as well as advanced control methods and algorithms for maximum energy efficiency.

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9.2.2 Geothermal ERA NET

Started in May 2012; End date: April 2016; EC funding: 1,999,955 Euros

The Geothermal ERA-NET cooperation will support geothermal research in Europe and develop greater cooperation between energy agencies and ministries in Europe, facilitating work on common goals. The Consortium represents National and Regional programmes from 9 European countries (Iceland, The Netherlands, France, Switzerland, Germany, Italy, Hungary, Turkey and Slovakia), giving the Geothermal ERA-NET the critical mass required for successful operations.

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9.2.3 GreenHP

Started in December 2012; End date: August 2016; EC funding: 3,499,701 Euros

The goal of the GreenHP project, next generation heat pump for retrofitting buildings, is to investigate and develop a new highly efficient heating system based on high-capacity air/water heat pumps for retrofitting multi-family houses and commercial buildings. This high power heat pump system will use an alternative refrigerant and

will interact with large (renewable) energy systems, like the smart grids in particular, and integrate other renewable energy sources, like photovoltaic and solar thermal, as well as energy storage.

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9.2.4 NextHPG

Started in December 2012; End date: November 2016; EC funding: 2,656,417 Euros

The main objective of NextHPG is the development of several reliable, safe, high efficiency and high capacity heat pumps working with the two most promising natural refrigerants: hydrocarbons and CO2, together with a set of improved components and auxiliary devices adequate for the efficient and safe use of the two refrigerants. The project aims to reach a higher efficiency (10-20% SPF improvement) and lower Carbon footprint (20% lower TEWI) than the current state of the art HFCs/HFOs or Sorption heat pumps.

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9.2.5 GEISER

Started in January 2010; End date: June 2013; EC funding: 5,308,869 Euros

The GEISER (Geothermal Engineering Integrating Mitigation of Induced Seismicity in Reservoirs) project addresses several of the major challenges the development of geothermal energy is facing, including the mitigation of induced seismicity to an acceptable level. The main goals are (i) to understand the processes and mechanics of induced seismicity in geothermal systems, (ii) to develop mitigation strategies, and (iii) to provide legal and administrative guidelines for licensing of geothermal power generation.

To address the above objectives, four main topics have been identified

(1) ***Analysis of induced seismicity*** from representative reservoirs throughout Europe, with input from experts and data from regions outside Europe (Berlín, El Salvador; The Geysers, USA). Induced seismic activity has been analysed in space and time and its relationship with injection and production parameters, the local stress field and the geological setting have been investigated. These datasets are compared with other project data, where injection did not cause significant seismicity.

(2) ***Understanding the geomechanics and processes*** involved in induced seismicity. The influence of factors such as temperature, poroelasticity, fluid injection rate, existing fault segments, local stress regime and time dependent effects have been investigated to constrain the possible mechanisms involved during fluid injection using various modelling approaches as well as laboratory experiments.

(3) ***Consequences of induced Seismicity*** have been addressed by providing an assessment of the seismic hazard presented by events triggered through human activity in comparison to natural seismicity. Results from (1) and (2) have been used to quantify the probability of triggering larger seismic events and to define the potential damage caused by ground shaking. This activity will result in guidelines for licensing and site development for local authorities and industry.

(4) ***Strategies for the mitigation of induced seismicity***. On the basis of the recommendations formulated in (3) and of the results of (1) and (2) strategies for “soft injection” will be proposed. The optimisation of a monitoring network and a real-time monitoring system will be presented to help authorities and operators minimize the seismic hazard and manage the risks during operations and production. Experience of past seismic events caused by mining and in the oil and gas industry will be included to address the proper handling of public awareness and acceptance.

By the end of the project, GEISER will provide best practice guidelines for safe and reliable EGS operations, centered on a probabilistic framework for the assessment of the risk posed by induced seismicity during all phases of a project. The cornerstone of this framework is a well tested, forward-looking traffic light system, to be implemented in real-time in future EGS applications. This dynamic forecasting framework predicts the expected seismicity in the next hours and days. It is based initially on prior information, such as the proximity to faults, the subsurface stress conditions etc., but then is updated on the fly with real-time measurements of the observed induced seismicity and down hole pressure conditions.

GEISER will also propose a strategy to enhance public support for EGS projects, based on lessons learned from past projects. A cost-benefit balance for the stakeholders throughout the entire exploration and production workflow is important, capable of identifying and properly addressing different interests and risks regarding a specific EGS project. Special attention has to be paid to risk perception. Nuisance and trivial damage should be addressed with care and considered as a significant project risk. For non-structural damage, a pre-agreed procedure is needed to evaluate and compensate the costs.

The GEISER research efforts and best practice guidelines are important steps to enable the efficient and safe use of deep geothermal energy resources throughout Europe.

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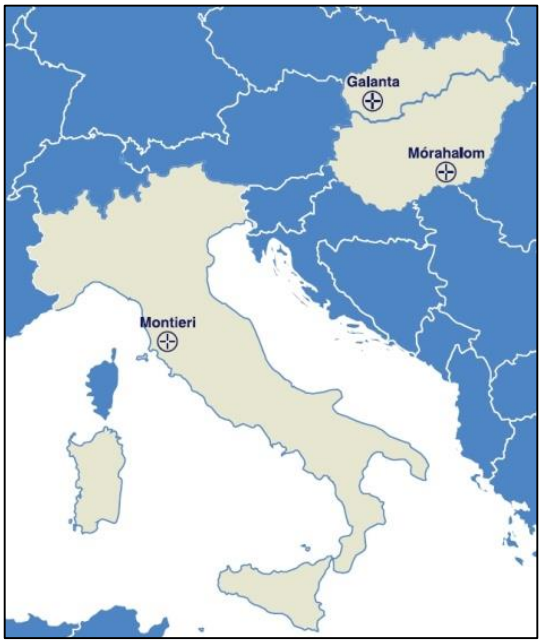
9.2.6 GEOCOM

Started in January 2011; End date: December 2014; EC funding: 3,513,704 Euros

The *Geothermal Communities* project lines up the best available technologies in the use of geothermal energy combined with innovative energy-efficiency measures and integration of other renewable energy sources at three different pilot sites (Hungary, Slovakia and Italy).



In addition to the demonstration component through the parallel implementation of three ambitious development works there is also a strong complementary component of research focusing on making geothermal projects more cost efficient and technologically sound.

Furthermore the project will integrate a number of cities as project partners (from Serbia, Romania, Poland and Macedonia) which either already have ongoing geothermal systems in the need of adopting new technologies or would like to implement new systems from scratch aided by the project's results.

Project achievements so far include the full realisation of project components at the **Galanta** site covering the retrofitting of the proposed multi-storey buildings combined with the installation of the PV systems on their rooftops as well as the extension of the geothermal district

heating loop to serve an ever denser heat market and full retrofitting of one of the local elementary schools (facade insulation, replacement of doors and windows in two stages and solar PV panels on the rooftops).

The **Mórahalom** demo site in Hungary also managed to conclude all of its retrofitting related obligations on the selected public buildings and successfully finalised the installation of one of the two proposed CHP engines which also take advantage of the separated CH_4 content of the extracted thermal water. Commissioning of the second CHP engine and implementation of the CONCERTO monitoring system and the LED-based public lighting system are still to come.

After some public procurement related and legal issues the **Montieri** demo site has started the realisation of the project elements as well. At the moment the district heating system is under construction (on the right), which is expected to be finished by the end of summer 2013. Retrofitting of the designated buildings will commence afterwards. Montieri is also to host the following consortium meeting in June 2013 where the project partners will have the chance to gain firsthand experience on the realisation of the flagship investment of the GEOCOM project.

The research topics have been also running parallel with the demonstration activities since the start of the project. Within this realm new avenues of retrofitting were investigated to be applied on historic buildings and also a comprehensive study was issued detailing the potential combination of solar, wind and biomass energy with geothermal energy with special focus on Central-Eastern

Europe. The socio economic research is currently on its way while the training and monitoring aspect of the project is still to be realised.

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