

## An Outlook of Geothermal Energy Legal Status in Portugal

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### ABSTRACT

Shallow geothermal energy legislation concerning Ground Source Heat Pumps (GSHP) installation codes and environmental protection is incomplete and unclear, worldwide. In Portugal geothermal resources and geothermal energy usage are also not properly regulated. Underground Thermal Energy Storage (UTES) is not clearly defined, and finding the appropriate authority to license the well's drilling works is a hard task. Open circuit GSHP's are not yet common in Portugal and a license application for such a system is a cumbersome situation. There are several entities involved in the evaluation of an UTES project. For closed loop systems, the lack of legislation allows some market players to work without technical qualifications and the appropriated means, endangering the environment and prejudicing the image of geothermal energy; and designing and performing not sustainable or inefficient installations. A National Platform called PPGS (Portuguese Platform for Shallow Geothermal) is now working towards the definition of the general framework for geothermal energy. It is imperative to distinguish the concepts of geothermal resources and geothermal energy, and to analyse and regulate if the soil itself (in the absence of a fluid) should be considered as a natural resource, given its energy storage potential. The final target is to regulate the sector, to contribute to the development of shallow geothermal energy in Portugal and to produce some materials that will help players to act according with best practices.

### 1. INTRODUCTION

Despite the influence of shallow geothermal energy for primary energy savings and greenhouse gas reduction, the use of ground source heat pumps (GSHP) in many European countries still very far

from the desirable. The scenario of geothermal energy utilization for heating and cooling is very different from the one of geothermal energy use in electricity production.

In what concerns to shallow geothermal energy for air-conditioning purposes Sweden and Switzerland are forefront countries, where GSHP are common since 1980. Germany and France are catching up these countries, having a remarkable increase in the last decade. Almost all the other European countries are still emerging in this market but the present economic crisis is not helping on the stability of shallow geothermal energy exploitation (Egect, 2012).

Legislation inaccuracy, inadequate financial incentives, the absence of penetration schemes of other nature and a lack of specific know-how are some of the limitations to the growth of the GSHP market in Europe. In Mediterranean countries, some actions have to be taken in order to boost the adoption of this type of Renewable Energy Source (RES) systems. Those countries have special conditions for shallow geothermal energy exploration since the heating and cooling needs are similar.

Legislation is not a problem only in Europe, but all over the world. But, in Europe, one of the principal regions where GSHP's can be used massively, still not have proper regulations, trained players and generalized information among the population. Until now each country, or group of countries, has defined its own rules. No common guidelines or directives have been defined. Environmental aspects are a barrier too. The planning and drilling of a GSHP open circuit is generally a difficult theme and no proper rules exist (Stefanie Haehnleina et al, 2010), (B. Sanner, 2008).

Directive 2009/28/EC, April 2009, aims to contribute to promote the use of RES. Article 13 refer the need of procedures simplification and more technical support

to building owners. However no common practices are established; each country has the freedom to choose a path. Decree-law 141/2010, December 2010, partially transposed Directive 2009/28/EC to the Portuguese national right.

This source of renewable energy can significantly contribute to reduce the energy dependency of Europe and to keep her on the right path to reach 2020 targets: i) electricity production from renewable energy sources (RES), ii) mitigate climatic changes; iii) reduce greenhouse gas emissions.

## 2. SCOPE OF THE ARTICLE

This paper aims to explain the Portuguese panorama about geothermal energy legislation and what is now being done to respond to the new opportunities and needs. All the existing legislation dates back to 1990 and deals only with geological resources.

It is necessary to establish the adequate measures that can boost and help to promote the knowledge of activities related to shallow geothermal energy, using geothermal resources as well as the so-called new geothermal energy, defined by the technological evolution of GSHP's, for buildings heating and cooling and for domestic hot water production.

## 3. PORTUGUESE PLATFORM FOR SHALLOW GEOTHERMAL

PPGS is formed by members of several institutions such as professional associations, advanced graduation institutes and the main national authorities for energy issues. The platform is composed of people that work in energy or geology activities, either in training or design/project. The group has the capability of treating all aspects and tasks related to shallow geothermal energy using GSHP's, and to develop scientific and practical actions together with national and international partners.

The Platform was created to spread and disseminate knowledge about shallow geothermal energy in Portugal; to increase and promote its correct use; and to analyse all National and European related legislation, as well as many guidelines all over the world, with the goal of publishing new, adapted and more complete and relevant information applicable to Portugal. Similar platforms already exist in other countries, where their activity showed to be a good and effective mean to join the geothermal community and to promote a solid, organized and sustainable exploration and exploitation of the geothermal resources.

The actions to be taken in a near future are the definition of professional qualifications for drillers, geologists and designers working in shallow geothermal. From these skill profiles the PPGS will also contribute to the production of the curricula contents necessary for the training of the professionals in this market. The PPGS has members that have been

collaborating with the European Training Board (of Geotrainer by EGECE/EEG<sup>1</sup>), which will help to transpose some of the European curricula contents and methodologies.

Another goal facing the PPGS constitutes the production of reference information about the parameters of the Portuguese underground as a basis for decision support on the part of national actors. In this context PPGS aims to promote geothermal resource surface mapping. It is considered that creating a cartographic document for surface temperatures till 400m deep is essential to provide geological information to assist the project designers, drillers and the authorities. This geothermal potential map should be available online and provide a clear indication of the existing geothermal sites, by type of use. This Geographic Information System (GIS) will also provide a registration database containing all information about the shallow geothermal exploitation in the country and allow better planning and management of the resource, either economically and environmentally.

## 4. RESEARCH AND DEBATE FOR NEW LEGISLATION

Decree-law 90/90 of 16 of March is still ruling and defines what a geological resource is. Decree-law 87/90 of 16 of March is also in force and establishes the rules for geothermal resources exploration and exploitation. Geothermal energy as a resource for electricity production is used only in the Azores, since the 80's of the last century. Shallow geothermal energy exploitation with GSHP's is not legally defined in Portugal, but it was already recognized as a potential contributor to the reduction of energy dependency (PNAER – National Action Plan for Renewable Energies).

Shallow geothermal energy, particularly through the development of geothermal system for buildings heating and cooling and for domestic hot water production, has a tremendous potential given its availability and opportunities of utilization. The incentives for power production from renewable energies are defined in the Decree-Law 225/2007 of May 31 and Ordinance 865/2009 of August 13.

The Energy Performance of Buildings Directive (EPBD), transposed to national right by Decree-Law 79/2006 of April 4, states that geothermal energy (direct use), as well as other renewable energies, should be mandatory for new and refurbished buildings, whenever economically viable.

Discussions are under course within the PPGS towards the definition of geothermal resources, with or without the presence of a fluid (with more or less than 20°C),

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as well as about the use of the soil for underground thermal energy storage.

The analysis of the Water Frame Directive, Directive 2000/60/EC October 2000 and VDI's 4640, part 1, 2 and 3 lead to the conclusion that the competent authorities within the environment subjects should be involved in the work of the PPGS. In fact, subterranean waters direct use, drilling across several aquifers, ground temperature changes and soil and water contamination are some of the aspects that have to be carefully evaluated.

A new regulation shall indicate that the licensing of new sites must be supported by the definition of some aspects such as the location, the geological scenario, the methods for boreholes drilling and the aimed GSHP's installation capacity. Some international standards or directives will be recommended while a complete guide is not available in Portugal.

At this moment it is not clear yet who will provide accreditation to the qualified technicians involved in a GSHP installation, as well as the contents of the courses that they must undertake are still to be defined. However it is obvious that all of them will have to get or improve knowledge on common subjects for a general understanding between different actors, in the conception and assembling of an installation.

## 5. GOALS

The main goals of the Portuguese Platform for Shallow Geothermal are: (i) to help creating new and well defined legislation; (ii) to support the communication and improved knowledge within the geothermal community (national and international) regarding GSHP's systems; (iii) to contribute for the spreading of GSHP's systems into the national market, as well as to develop guidelines for the design of training actions for installers, drillers and designers; (iv) and to encourage the use of this renewable energy source in several applications.

At the moment, a new legislative document is being prepared by the Directorate General for Energy and Geology to define shallow geothermal energy exploitation scenarios. The Platform is helping in the preparation of this decree-law that hopefully will provide a frame for all ways of energy collected from the soil, for direct uses, with GSHP's or to produce electricity. All the analysed information will be adapted to the national reality. Some complementary legislation (ordinances) is already identified as necessary, to provide to market players technical values and rules for installation purposes (distance between BHE's, to neighbours, max temperature of injection, etc.).

PPGS aims to alert the society for the GSHP's technology and its advantages, promoting an image of a secure investment for the potential consumers, based

on a market that provides trained and accredited technicians and on demonstration of well-succeeded installations.

## 6. CONCLUSIONS

It is consensual that some guidelines for technicians and companies have to be defined, at least at National level, if not at a regional or global level. A European standard is hard to achieve, given the differences of the ground characteristics, of air temperature and natural resources between different regions. The adoption of VDI's 4640 guidelines is a good provisional principle in Portugal, but some adjustments have to be made, preferably on the basis of a newly designed document.

The publication of technical manuals and of a national map of the shallow geothermal potential will be of crucial importance for a more secure planning of GSHP's installations, for consumers to carry the risk of installing a GSHP system and even for authorities to license a new project.

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L. Coelho et al.

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