

The European Geothermal RD&I Documents Search Engine - EGRISE: a Tool to Access Geothermal Projects Reports – H2020 DG-ETIP project

Eugenio Trumpy¹, Serena Botteghi¹, Philippe Dumas², Gianluca Gola¹, Ben Laenen³, Anna Pellizzone¹, Valentina Pinzuti², Pavel Sorin⁴, Adele Manzella¹

¹CNR, Via Moruzzi 1, 56124 Pisa, Italy

²EGEC, Place du Champ de Mars, 2 5eme étage 1050 Bruxelles, Belgium

³VITO, Boeretang 200 2400 Mol Belgium

⁴PENROSE-CDB, Square de Meeûs 35, 1000 Brussels, Belgium

e.trumpy@igg.cnr.it

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ABSTRACT

In order to describe RD&I in the deep geothermal sector also from a historical perspective, and to retrieve all the necessary information for highlighting success stories and gaps, an organized catalogue of deliverables of European projects has been created in the frame of the European Technology & Innovation Platform on Deep Geothermal (ETIP-DG) using Zenodo repository.

A platform was designed to provide a framework for accessing, retrieving and querying detailed and comprehensive collection of documents from past and actual RD&I projects and activities. The resulting search engine, the European Geothermal RD&I Document Search Engine EGRISE, is then embedded in the ETIP-DG website and offers a public access to the resources.

Primary users of the EGRISE were the working group leaders and all the members of ETIP-DG working on the drafting of the strategic documents, in particular the Strategic Research Agenda and the Roadmap and general public interested in EU projects. Recently, the tool was implemented allowing ETIP-DG members to contribute to the contents grow.

1. INTRODUCTION

The European Commission adopted an energy policy for Europe that included the preparation of a European Strategic Energy Technology plan (SET plan). The SET plan objective is to lower the cost of clean energy and put the EU industry at the forefront of the low carbon technology sector. To speed up these achievements, in 2016 nine European technologies and Innovation Platforms (ETIPs) were built. The ETIP on Deep Geothermal (ETIP-DG) is devoted to promote and boost the development of geothermal energy in Europe, reaching its full potential everywhere. This target is pursued according the Strategic Research and Innovation Agenda (SRIA) and the Technology Roadmap, which ETIP-DG released early 2019 and in June 2019 respectively (Pinzuti et al, 2019).

In order to describe the research, development and innovation (RD&I) in the deep geothermal sector, also from a historical perspective, and to retrieve all the necessary information for highlighting success stories and gaps, a detailed and comprehensive collection of documents from past and actual RD&I projects and activities has been designed.

The main information, e.g. the deliverables of European funded projects available on-line, has been collected and an organized catalogue has been created using Zenodo (Zenodo). Zenodo has been considered an ideal tool for the collection, since it is a repository for research outputs, created by OpenAIRE (OpenAIRE web site) and CERN and funded by European Commission (EC) to provide a place for researchers to deposit their research products. For ETIP-DG's purpose, all collected documents have been described with metadata and uploaded in Zenodo, in a Community called 'Deep Geothermal'.

The collected public documents are discoverable by a dedicated search engine named European Geothermal RD&I Document Search Engine (EGRISE), which is embedded in the ETIP-DG website (ETIP-DG website). This web-based collection was completed by June 2018, both for the front-end and for the upload of about 266 documents.

EGRISE uses modern ICT technologies, and provides a framework for accessing, retrieving and querying the documents collected for ETIP Deep Geothermal in Zenodo.

Primary users of the EGRISE platform were the working group leaders and all the members of ETIP-DG who worked on the preparation of the strategic documents, in particular the Strategic Research Agenda and the Technology Roadmap. Moreover, the access to the Geothermal Search Engine is guaranteed to the general public (ETIP-DG non-members) interested in EU projects report discovery upon requests.

The Platform is meant to be up and running for the entire lifetime of the ETIP-DG website. In order to keep EGRISE 'alive' and constantly updated, ETIP members are allowed to upload new useful or missing documents.

2. DATA COLLECTION

To implement the EGRISE some tasks have been performed: 1) search and collection of documents; 2) definition of the rules to prepare documents metadata; 3) metadata creation and document upload. In next sections, the above mentioned activities are described.

2.1 Collection of Documents

During the last years, many geothermal projects funded by the EU in the frame of different programmes (e.g., H2020, FP7, FP6, IEE, INTERREG, ...) produced a large amount of reports. Reports are usually published and made available in the project websites. Search operations for recent geothermal projects were overall easy. This cannot be said for old (e.g. those funded in FP6 or FP5 programmes) and national or local projects (e.g., those funded in INTERREG or national programmes).

The CORDIS web portal (CORDIS) was very useful since H2020, FP7 and sometimes FP6 project description were found. By using the text field with the 'geothermal' keyword all the geothermal projects were listed. The list was then refined highlighting the deep geothermal projects. Only in a few cases project reports are made available.

On the other end the KEEP web portal (KEEP) is the only source of aggregated data regarding project and beneficiaries of European Union cross-border, transnational and interregional cooperation programmes among member states and between member States and neighboring countries. KEEP portal covers the 2000-2006, 2007-2013 and 2014-2020 periods.

Thanks to the above mentioned portals, the main project information were mapped and stored in a summary spreadsheet. For each project the program, the acronym, the title, the number of available deliverables, the web site URL, the project lifespan, the starting date, ending date, number of contract, the coordinator, the EC grant and the total budget were registered.

From the gathered project information, each project website – if still on-line – was visited and the available project deliverables were downloaded and collected.

2.2 Rules for Metadata Compilation

To facilitate the homogeneous uploading and description with metadata, a definition of the way of work was required. For example, one of the main issue fill-in metadata was the choice of keywords, since they were strategic for the type of analysis to be performed for ETIP-DG as well as for document discovery.

We established the use of at least 4 keywords, defined as follows: i) a fixed keyword 'geothermal energy'; ii) at least one keyword chosen among the following categories: a) exploration; b) drilling; c) production; d) surfaces systems/generation; e) non-technical; f) environmental; iii) if one keyword is 'exploration' to choose another keyword among the following topics: a) geochemistry, b) geophysics, c) structural geology, d) hydrogeology, e) geochronology, f) volcanology; iv) if one keyword is 'non-technical' to choose another keyword among the following topics: a) social aspects, b) codes & definitions, c) energy sector status, d) skills education & training, e) research roadmaps, f) regulatory aspects, g) economics, h) financing; v) a keyword with the name of the location if the document is referred to a particular place; vi) the country if the document is referred to a particular nation as last keyword. It was possible to assign more than one category to one document at point ii) and more than one topic referred to point iii) and iv).

2.3 Document Reusability

During this work, there were concerns about the re-usability of the documents produced by the EU geothermal projects. Although the EC recommends an Open Access policy for the H2020 funded research projects, this is not so obvious for those projects funded with previous funding programmes. Moreover, it is not always clear which license of access and re-use was adopted in the collected documents mainly for what concerned different purposes beyond the aim of the single project.

To assure the maximum transparency of ETIP-DG activity, all the coordinators of the projects who produced the collected documents were contacted by mail and informed about the initiative and invited to participate to ETIP-DG. They were given the possibility to remove the documents from the Zenodo repository if they considered it improper to store the deliverables beside the running project websites. Up to now none of them requested such removal.

3. THE EGRISE APPLICATION

The European Geothermal RD&I Document Search Engine (EGRISE) is a web based application that uses the Zenodo repository as back-end to store and describe documents with metadata and a dedicated web user interface as front-end to allow users to discover the archived project documents. Back-end-front-end connection is guaranteed by the application program interface (API) provided by Zenodo. By means of the API code, from the web user interfaces the user requests for a document, which is sent to the Zenodo back-end, which interprets the API request and sends back to the front-end the information on the discovered document (Fig. 1).

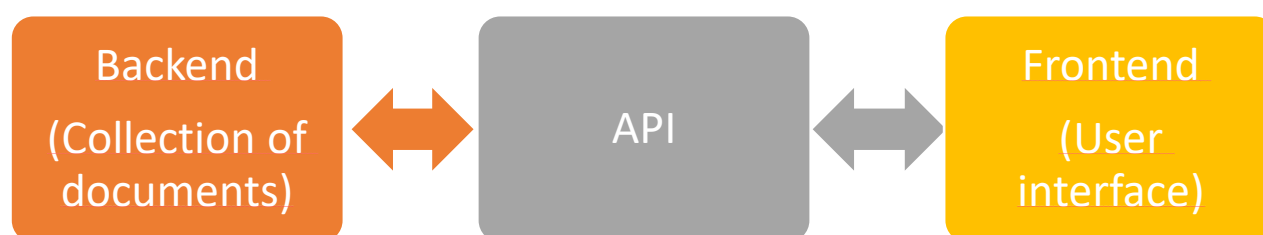


Figure 1: GSE architecture.

3.1 The Zenodo Back-End

In Zenodo, a digital object identifier (DOI) is automatically assigned in case the document has not yet one. Otherwise Zenodo gives the possibility to insert the existing document DOI in a specific metadata field. The documents uploaded in Zenodo are stored in the CERN cloud infrastructure. Zenodo is compliant with the open data requirements of Horizon 2020, the EU Research and Innovation funding programme and OpenAIRE, the EC-funded initiative in support of the OA policies of the European Union (Zenodo web site). Moreover, Zenodo allows to organize your own repositories by creating communities and identifies grants to be related to documents on research funded by the EC via OpenAIRE.

Eventually Zenodo is compliant to the DataCite Metadata schema and follow the FAIR principles (i.e., Findable, Accessible, Interoperable, Reusable) (Wilkinson, et al. 2016).

3.2 The EGRISE Front-End

The general public (non-ETIP members) can access EGRISE directly from the main menu of the ETIP-DG website. The users are requested to provide some general information (i.e., First name, Family name, email address, country, and reason for requesting access) and to declare that the data retrieved will not be misused. An email informs the applicant that the request has been accepted and shows a link to a page for creating the credentials to log-in and access the Geothermal Search Engine.

ETIP-DG members are allowed to access EGRISE from the ETIP-DG website by using the Members Menu after the log-in. A dedicated menu item links ETIP-DG members to the EGRIS front page.

The EGRISE web user interface is embedded in the ETIP-DG website. It was developed by Penrose-cdb by using the API provided by Zenodo to allow the interaction with the back-end and by taking into account the style and layout of the ETIP-DG web site to guarantee a common look and feel.

3.3 Using EGRISE

The search engine front page appears in Figure 2. Documents can be retrieved using the general search tool (i.e., the free text box “Enter your search term”, see Fig. 2), which searches for words in all fields of the metadata used to describe the documents uploaded in Zenodo (e.g., Authors, document Title, Project name, Funding Program, Abstract and all the abstract content). The search is case insensitive.

With the help of the keywords, documents have also been categorized using the ETIP-DG Working Group Titles (i.e., exploration, drilling, production, surface systems / generation, environmental and non-technical), so that they can be easily filtered out by category. Other ways to filter documents is by Funding Programme, Project Title and Documents type. The resulting documents can even be sorted by publication date or title.

When a document is chosen, it can be explored by clicking on its title or on the magnifier icon. The exploration brings to the Summary Page of the document (Fig. 3) where the user has access to the main metadata of the document, including its keywords, its abstract and may download the pdf of the complete document by using the set icon.

For the ETIP-DG member, it is now possible to contribute to the EGRISE by uploading missing and important geothermal documents following the instruction available in the front page. By using the special button ‘How to upload a document on EGRIS’, guidelines can be downloaded. The guidelines help ETIP-DG members in all the steps needed to upload and correctly describe with metadata new uploadable documents. In particular, hints on possible metadata values are suggested. Moreover, a detailed explanation on how to insert the keyword is described.

3.4 EGRISE Statistics

As mentioned, EGRISE currently includes 266 documents, where the most are pdf (264) and the oddment are xls (2) and zip (1). The majority of the documents are publications (251) of which 198 are project deliverables, 33 reports, 8 articles, 7 conference papers, 2 books and other 3 generic documents. In addition, 8 presentations, 3 posters, 2 software and other 2 generic documents are stored in EGRISE.

Documents from FP7 programme are the most (27%), followed by those from FP6 (26%). H2020 documents are only 13% because at the moment of the EGRISE preparation (June 2018) H2020 funding programme was in the mid of his life and many projects had not yet delivered their most products, see Fig. 4a. The collected document result mostly related to ‘Exploration’ category (36%) and ‘non-technical’ (30%). The remaining 34% is divided among the other categories: 14% production; 9% environmental; 6% drilling; 5% surface and generation, see Fig. 4b. Transenergy, Geothermal ERANET, ENGINE, IMAGE and Geoelec have available more than 25 deliverables and seem to be the most productive, see Fig. 4c. However, the results reported in Fig.4c are not completely real since many project were not finished at the moment of EGRISE construction or could have deliverables not publically available, as is the case of DESCramble or other project including industrial partners.

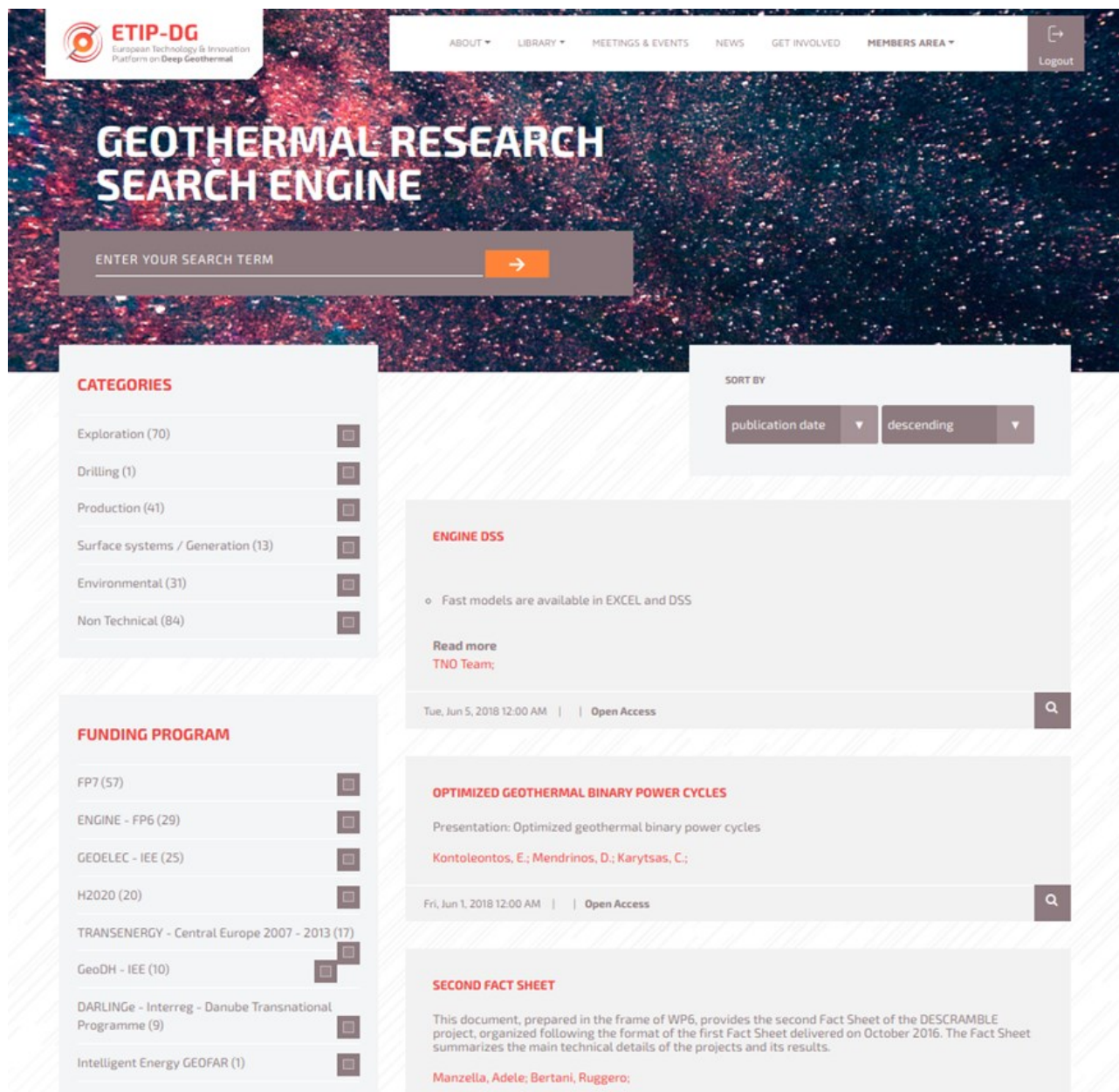
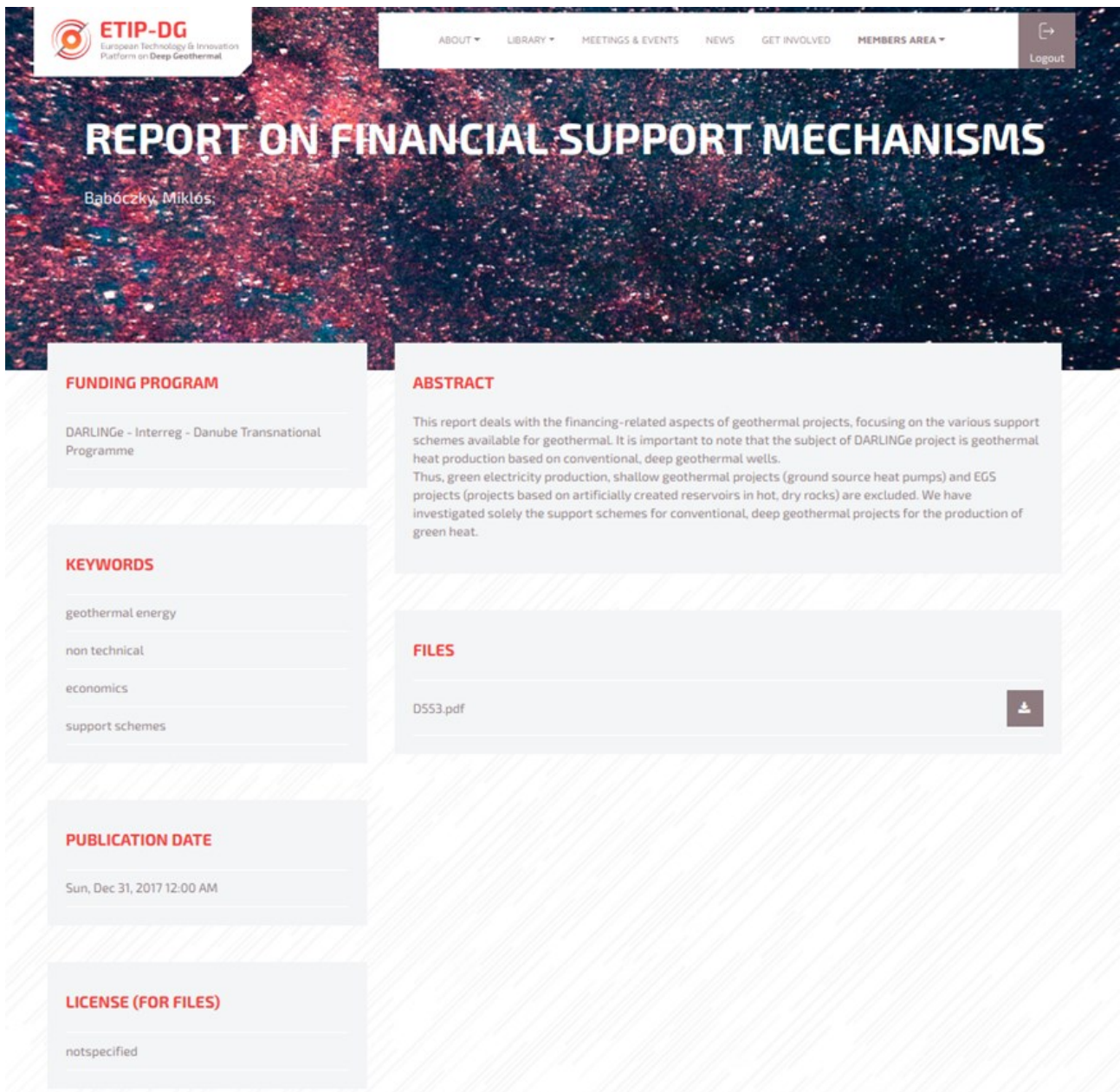


Figure 2: Screenshot of the upper part of the search engine. Categories and funding programmes filters are shown on the left side.



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REPORT ON FINANCIAL SUPPORT MECHANISMS

Babóczy, Miklós

FUNDING PROGRAM

DARLINGe - Interreg - Danube Transnational Programme

ABSTRACT

This report deals with the financing-related aspects of geothermal projects, focusing on the various support schemes available for geothermal. It is important to note that the subject of DARLINGe project is geothermal heat production based on conventional, deep geothermal wells. Thus, green electricity production, shallow geothermal projects (ground source heat pumps) and EGS projects (projects based on artificially created reservoirs in hot, dry rocks) are excluded. We have investigated solely the support schemes for conventional, deep geothermal projects for the production of green heat.

KEYWORDS

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non technical
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support schemes

FILES

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LICENSE (FOR FILES)

notspecified

Figure 3: Screenshot of the Summary Page for a document, once a document is selected.



Figure 4: Some statistics from EGRISE contents: a) documents distribution among EU funding programmes; b) documents distribution per category; c) documents available by projects.

4. CONCLUSIONS

By the efforts described in this paper, the collected documents in EGRISE are enriched and enhanced with time. The geothermal information is then organized and offered from a single platform and can be used for different purpose such as for drafting strategic documents, preparing project proposal, assessing the geothermal sector's state-of-the-art for different topics in order to foster the research, for development and innovation and for scientific papers. EGRISE is a tool which aims to offer all the accessible geothermal knowledge produced by EU projects for different kinds of stakeholders.

An important added value is the possibility to have all the resources uniquely identified thanks to the DOI that can be assigned, if not existing, which makes the resource citable for the scientists.

Moreover, the EGRISE architecture and design guarantees for the stored documents the compliance with the FAIR principles that are the base of the Open Access policy, and in turn provide research results in Open Access as one of the main steps toward the concept of Open Science that is crucial to speed up the growth of a technological sector as the Geothermal one. Open Access (together with public engagement, science education, ethics and gender equality) is also one of the five key pillars of Responsible Research and Innovation (RRI), the research and innovation approach encouraged by the European Commission in order to better align R&I to the needs of society.

EGRISE is an 'alive' system, but to keep it always updated and efficient we need contributions firstly by the ETIP-DG members with new document uploads and afterword by all the interested audience to improve document descriptions (e.g., the choose of right keywords), or providing other not accessible documents on internet or by general commenting and hinting.

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