



Publishable Final Report

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Table of Contents

List of Tables	5
List of Figures	5
Acknowledgements	5
This project has received funding from the European Union’s Seventh Programme for research, technological development and demonstration under grant agreement No 291866	5
4.1 Final publishable summary report	6
<i>4.1.1 An executive summary</i>	<i>6</i>
<i>4.1.2 A summary description of project context and objectives</i>	<i>7</i>
4.1.2.1 Project objectives and aim	7
4.1.2.2 Objectives	8
<i>4.1.3 A description of the main S&T results / foregrounds</i>	<i>10</i>
4.1.3.1 Structure and Coordination	10
4.1.3.2 Work progress and achievements	11
4.1.3.2 Work Packages	16
4.1.3.3 Joint Activities	22
4.1.3.4 Networking Activities	29
4.1.3.5 The next phase of European collaboration - – GEOTHERMICA	34
<i>4.1.4 The potential impact and the main dissemination activities and exploitation of results</i>	<i>34</i>
<i>4.1.4 The main dissemination activities and exploitation of results</i>	<i>38</i>
<i>4.1.5 Address of the project public website and relevant contact detail</i>	<i>40</i>
4.2 Use and dissemination of foreground	41
<i>4.2.1. Section A</i>	<i>41</i>
4.2.1.1 Publications	41
4.2.1.2 Dissemination activities	45
4.3 Report on societal implications	50

List of Tables

Table 1 Project consortium information	40
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List of Figures

Figure 1: The conceptual scheme of the Geothermal ERA-NET	10
Figure 2: Project Gantt Chart	11
Figure 3: Geothermal ERA NET workflow and development	12
Figure 4: The “three pillars” (research, industry, and the public sector) for successful progress of geothermal energy in Europe	12
Figure 5 Bottom up approach for the implementation of joint activities within the Geothermal ERA-NET.	19
Figure 6: Existing training programmes in the geothermal sector (http://www.geothermaleranet.is/joint-activities/geothermal-education/)	21
Figure 7 presents the project steps by laying the groundwork for national program owners and managers to jointly contribute to an environmentally friendly, competitive heat and the power transition, strengthens the security of supply and a resilient energy system, and helps achieve the aims of SET Plan and ENERGY UNION.	36
Figure 8. The Geothermal ERA-NET pillars	37

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4.1 Final publishable summary report

4.1.1 An executive summary

European funding for research and development into geothermal energy has up to 2012 been a predominantly a national and regional effort. Geothermal resources are local or regional resources, tightly coupled to the local geology and local specifics of markets for products derived from the utilization of geothermal energy. Save the efforts of the European Commission and its Directorate Generals for Research and Innovation, and Energy, there has been previous little cooperation with regards to an integrated approach to pan-European and transnational research and innovation in geothermal energy. Geothermal energy is – with the exception of some European regions that are unusually well-endowed with high quality resources such as Iceland, Italy or Turkey – a renewable energy source that has high barriers for business entry unlike, for example solar photovoltaics, wind energy or bioenergy, and experience also high barriers to launch substantive research and innovation programs. Concerted and coordinated technology maturation is challenging because of the lack of an integrated approach and the lack of understanding of common, trans-European challenges that need to be overcome. This is manifest in the low levels of funding available for geothermal energy both, in terms of national and trans-national, pan-European funding sources.

2012, the year the Geothermal ERA-NET was launched, marks a watershed. For the first time national and regional geothermal energy research program owners and managers from 10 European countries have come together to launch the Geothermal ERA-NET with the support of the European Commission.

4.1.2 A summary description of project context and objectives

4.1.2.1 Project objectives and aim

This ERA-NET was launched in 2012 supported by a EUR 2 million grant of the European Commission. Its principal aim has been to deepen European cooperation on geothermal research at national and administrative levels and enable the integration of national research programs. The Geothermal ERA-NET was one of the first steps towards a coordinated research in the EU through the SET-Plan (European Strategic Energy Technology Plan).

Through its actions, the Geothermal ERA NET aimed to increase the uptake of geothermal energy; not only to contribute to an increased share of renewables in the energy mix, but also to improve security of supply and increase energy savings in Europe, and thus ultimately having a strong positive impact on Europe's economy and competitiveness. By doing so, the Geothermal ERA-NET's activities delivered strategic contribution to the European Action Plan "Energy Policy for Europe".

Geothermal energy is an attractive renewable energy source, which not only contributes to the overall goals of the European Action Plan (30% CO₂ reduction, 20% energy savings, 20% renewables and 10% bio fuels), but may also help integrate intermittent renewable energies with its base load capacity whilst for the electricity generating sector also providing firm and flexible power services. Countries participating in this ERA-NET build on shared and strong ambitions to include geothermal energy into their goals for 2020 and 2050 on the reduction of CO₂ emissions and uptake of clean energy technologies.

The fundamental "raison d'être" of the Geothermal ERA-NET has been to support geothermal research in Europe and to encourage and enlarge the cooperation among geothermal research and innovation program owners and managers of energy agencies and ministries in Europe. The Geothermal ERA NET has assumed a prominent enabling role to assemble a previously fragmented picture and optimize geothermal RD&D delivery. It was an ambitious initiative to foster cooperation and integration of geothermal research funding agencies in Europe and beyond.

Geothermal resources have been used successfully and economically in locations in Europe where geological conditions are exceptionally favourable (e.g. Italy, Turkey and Iceland), and play an important role at the European scale making them accessible in different locations. Numerous projects in several countries (e.g., in France, Germany, Hungary and Switzerland) have started to make use of this source of energy applying new approaches and using local resources.

The Geothermal ERA-NET work program deepened the cooperation of national program owners and administrators of the participating countries and laid the groundwork for the integration of national research and development agendas into a coherent European geothermal research, development, deployment and innovation (RDD&I) program. The Geothermal ERA-NET focus was on the utilization of geothermal energy, from direct heating applications up to higher enthalpy resources and their corresponding uses (e.g. power generation). The Geothermal ERA-NET covered technical and non-technical issues in support of geothermal energy utilization.

The complimentary instrument which gathers the mostly academic research community is the EERA Joint Programme on Geothermal Energy EERA JPGE which has similar aims. The EERA JPGE contributes via research and development to the renewable energy targets for 2020 and beyond, in member and associated states. The Geothermal ERA-NET aimed to advance coordination activities with the EERA JPGE with a focus

on the implementation of commonly agreed objectives, joint activities and funding of joint transnational research actions.²

The cooperation contributed to the development of a European market for research, development and activities that are driven by excellence and value added which are not championing national entities that act exclusively on a local/national level. National program owner received an opportunity to coordinate program implementation beyond national boundaries.³

Geothermal ERA NET VISION

Minimize the fragmentation of geothermal research in Europe
Build on European know-how and know-who to utilize geothermal energy
Contribute to a framework to realise large opportunities in the utilization of geothermal energy through joint activities

The creation of the Geothermal ERA-NET was a necessary step on the path towards the exploitation of synergies and reduced fragmentation in the European geothermal energy research area. The project with its work program identified key challenges and bottlenecks, defined the actions to tackle them, established the investment levels needed, developed a strategy for prioritisation and thus to develop an understanding of the optimal level of intervention from member states that wish to advance geothermal development and deployment.

Research, development, deployment and innovation (RDD&I) is an essential element in the sustainable development of industrialized countries: the competitiveness of companies and the employment they can provide, both depend to a great extent on RDD&I. RDD&I is also essential for the support of other policies such as consumer and environmental protection. In short: the individual and collective wellbeing of citizens depends on the quality and relevance of RDD&I. Europe's energy sector is subject to powerful trends. One of them is a deep consensus to develop an increasingly sustainable and secure supply of energy. Similarly, countries are in the process of setting ever more ambitious goals to limit the adverse impact of climate change on people, the environment and the economy. In response, European countries have for example established national renewable energy action plans (e.g. NREAP, national energy strategies and implementation plans) which frequently feature geothermal energy for the supply of heat and power owing to its many benefits.⁴

4.1.2.2 Objectives

The project objective was the mutual opening up of national research programmes and research infrastructures, and the development of joint activities. To reach this target, the detailed objectives directed to this Geothermal ERA-NET were to:

- Complete the preliminary work required to create a European Geothermal Database whose purpose is to share information on legal and regulatory aspects, policies, measures, institutions, research projects and data.

² From <http://www.geothermaleranet.is/media/publications-2015/1-GAJ-2016-10--ERA-NET-Final-meeting.pdf>

³ From WoD page 32

⁴ Comprehensive Communication Plan WP5 – Cooperation with stakeholders WP 5 Gunter Siddiqi, Katharina Link, Rudolf Minder < Swiss Federal Office of Energy SFOE June 2016

- Exchange information on the status of geothermal energy, including national support schemes and RD&D activities and identification of gaps.
- Recommend measures to strengthen European geothermal development in order to meet short-term targets according to National Renewable Energy Action Plans (and similar endeavours in associated countries) and future contributions to renewable energy supply.
- Foster synergies at regional and pan-European level by mobilizing competitive and non-competitive funds for research in a more coordinated way through joint activities.
- Achieve a critical mass to address cross-thematic research targets, thus enhancing cooperation and avoiding fragmentation.
- Define possible schemes and barriers for the joint activities and recommend practical solutions.
- Prepare and execute transnational funding activities, required agreements on themes of the planned projects and on all implementation and administrative issues concerned.
- Increase transnational collaboration in research training and mobility in geothermal research, improving human capacity building, by sharing of best practices, gap analysis and improve science development and collaboration.
- Gain a clear understanding of the principal stakeholders for a successful, Europe wide coordination of publicly funded, national research, development, deployment and innovation programmes.
- Communicate with principal stakeholders and enhance public awareness toward the values and benefits of geothermal scientific and policy issues.
- Prepare the ground for the future formulation of a common European roadmap for geothermal energy technology research, development, deployment and innovation programme.

4.1.3 A description of the main S&T results / foregrounds

4.1.3.1 Structure and Coordination

The Geothermal ERA-NET divided its activities into 7 work packages. Figure 1 illustrates how they relate to each other and the overall strategy of the work plan.



FIGURE 1: THE CONCEPTUAL SCHEME OF THE GEOTHERMAL ERA-NET

WP 1 was the coordination work packages and ensured the smooth running of the project. The work performed in work packages 2, 4 and 6 was based on a bottom-up approach for the development of joint activities to be implemented in the second half of the project. This process started with extensive exchange of information regarding national approaches, policies and initiatives supporting geothermal energy research (WP2). The information exchange facilitated a common understanding among project participants about opportunities and barriers to future transnational research collaboration, setting the stage for other subsequent actions. The results from WP2 fed into WP4, where joint activities were defined and implemented in WP7. Special attention was given to issues of human resources and mobility in WP6, where joint interests and actions were identified in a bottom-up approach and fed into WP7 for implementation.

Work packages 3 and 5 supported the core activities during the entire project duration. WP3 comprised the proposal for implementation and partial the establishment of a comprehensive, fit-for-purpose geothermal information platform (essentially a network of national platforms) to share information necessary for developing joint research strategies, such as on legal and regulatory aspects, statistical data with principal parameters of geothermal energy utilization, institutions and on-going research projects. WP 5 on the other hand ensured efficient and structured collaboration with principal stakeholders to lessen the fragmentation of transnational research activities and policies. These work packages continuously interacted with WPs 2, 4 and 6.

4.1.3.2 Work progress and achievements

Following the overall aim of the Geothermal ERA-NET to accelerate deployment of geothermal energy by organizing and supporting the transnational activities of research and innovation, the consortium had been working with the aim of opening up national programs, pooling resources, improving cross border cooperation, achieving critical mass, and avoiding duplication of funds and efforts.



FIGURE 2: PROJECT GANTT CHART

Since the start of the Geothermal ERA-NET in 2012, the main focus has been put on exchanging information on the status of geothermal energy utilization, including national support schemes and research, development and deployment (RD&D) activities and the creation of an inventory report on these activities. From this information the consortium delivered results with an emphasis on gaining an understanding of the principal stakeholders. They include key industry players for a successful, Europe-wide coordination of publicly funded national RDD&I geothermal energy programmes.

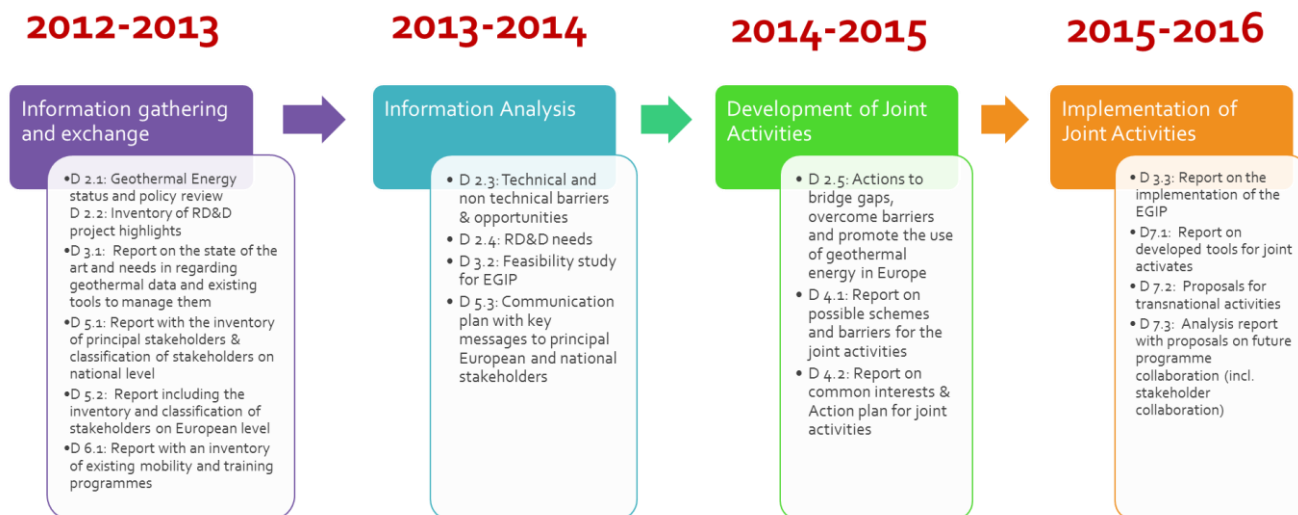


FIGURE 3: GEOTHERMAL ERA NET WORKFLOW AND DEVELOPMENT

In pursuit of the aim of the Geothermal ERA-NET to accelerate deployment of geothermal energy by organizing and supporting the transnational activities of research and innovation, the consortium faced the challenge to establish and enforce a network of stakeholders. The related activity contributed to the effort of building the “three pillars” (research, industry, and the public sector) for successful progress of geothermal energy in Europe. (Figure 4)

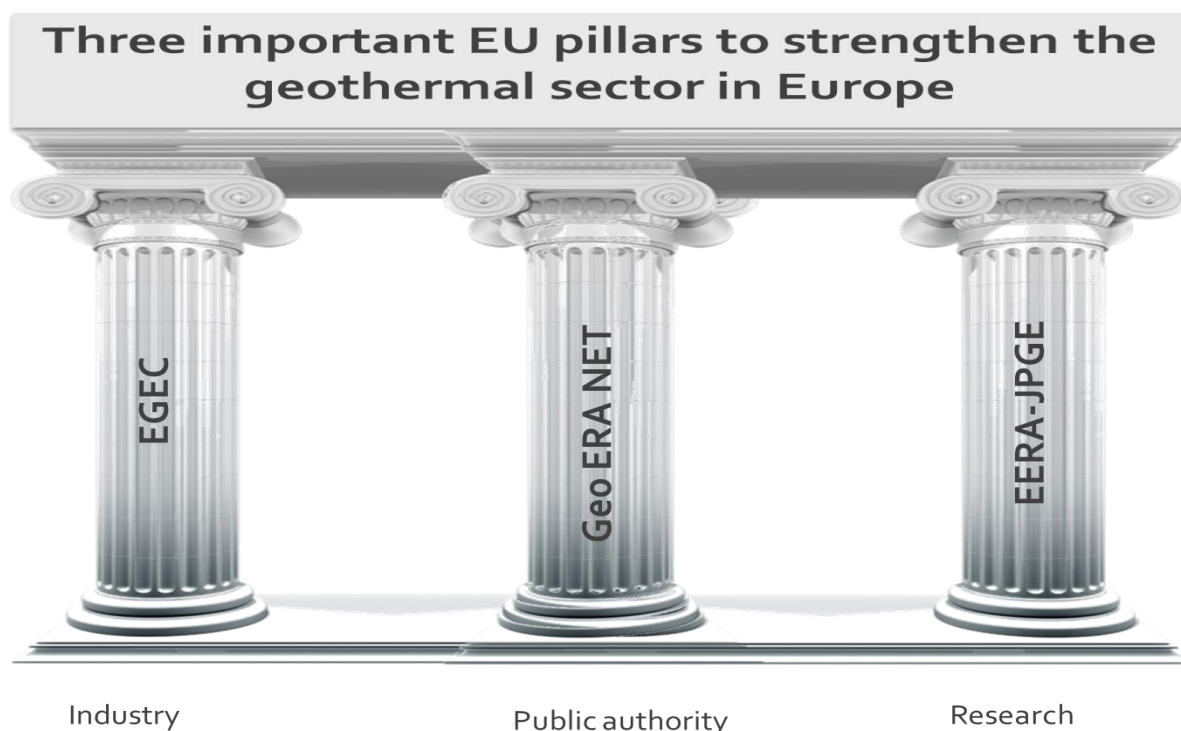


FIGURE 4: THE “THREE PILLARS” (RESEARCH, INDUSTRY, AND THE PUBLIC SECTOR) FOR SUCCESSFUL PROGRESS OF GEOTHERMAL ENERGY IN EUROPE

An active connection to stakeholders was established in the course of the Joint Activities, mainly during the organization of common workshops and surveys. In addition to industry participation during workshops, the consortium established links with two main geothermal networks:

- 1) EERA-JPGE: after a joint meeting held in Trieste on September 2014, a representative of Geothermal ERA-NET participated in all EERA-JPGE annual meetings;
- 2) the European Geothermal Energy Council (EGEC): EGEC was invited to participate in the WP3 meeting in Reykjavik on March 2013.

The recently established Geothermal Energy Technology and Innovation Platform (Geothermal ETIP), whose secretariat is hosted by EGEC, has invited a representative of the Geothermal ERA-NET Consortium (and of the newly established geothermal Cofund GEOTHERMICA in the future) to its board.⁵

A key strategy of the Geothermal ERA-NET was the development of Joint Activities JAs to enhance transnational information exchange and knowledge development to tackle key challenges and opportunities. The purpose of Joint Activities was to analyse common practices and opportunities. Seven topics were developed under the stewardship of steering committees for each JA Working Groups. JAs provided a set of collaboration meetings which were held with experts and program partners during the final two years of the Geothermal ERA-NET. Partners were encouraged to promote current exchange schemes, also by using the information on existing mobility and training programmes that were identified in previous reports and work packages.⁶

From an organisational point of view, the Geothermal ERA-NET developed strongly during the almost 6 years of cooperation.

(1) The familiarisation phase: during the initial phase which lasted about 2 years, meetings served as a point of focus where results were presented, collaborative work ensued and resolutions passed on how to progress. Importantly, the participants got to know each other and establish a trusted network among the participating country's program owners and managers. Importantly the Geothermal ERA-NET partners recognised that cooperation at the European level was not a small task but rather required substantial resources – particularly at the coordinator's institution and in view of a durable, long-term establishment of program owners and managers as one of three pillars supporting the development of Europe's uptake of geothermal energy utilization.

(2) The recognition phase: the subsequent years (2014-2015) routine meetings were held but the emphasis of the content-related work switched to the Joint Activities on the one hand and a focus on the strategic positioning of the ERA-NET to enable the switch from a mere time-limited project to an established network of program owner and managers.

(3) The maturation phase: during the final years (2015-2016) the Geothermal ERA-NET partners fully recognised the implication and strategic value of pan-European coordination and networking of national program owners and managers. This has culminated in the decision to continue strengthening the network and enter into an ERA-NET Cofund action while now explicitly recognising the financial and personnel resourcing required for pan-European cooperation.

⁵ http://www.geothermaleranet.is/media/publications-2015/Geothermal-ERA-NET-D7_4-Analysis-report.pdf page 9

⁶ http://www.geothermaleranet.is/media/publications/Geothermal-ERA-NET-D-6_3-Expert-Exchange-scheme-FINAL.pdf page 18

, Joint Activities workshops in order to develop the projects and fulfil requirements. Several telephone conferences were executed between partners and leaders on different programme issues. However, efforts have been put on the execution of Joint Activities. Results from meetings have been presented as follows:

- Brussels Annual Meeting- October 6-7, 2015
 - Financial status update
 - Overview of Joint Activities and statement
- Ankara Working Meeting- Feb 29- March 1, 2016
 - Progress development of Joint Activities
 - Joint Activities workshops and meetings
- Proposed Joint activities April– December, 2015
 - Progressing enhancements of transnational information exchange and knowledge development

Due to different structures and topics of national researcher programmes, common objectives and interests have been defined between ERA- NET partners. The Joint Activity (JA) working groups execute plan for seven Joint Activities (NWW, EGIP, OPERA, PRGeo, New Concepts, ReSus, and GEOSTAT) and funding agencies established commitments at national levels. To build sustainable structures for transnational policy coordination and project funding in geothermal research as a part of WP7, which coordinates strong, commonly agreed on framework and joint funding scheme. This has been published in D7.4 ([available online](#)) with applicable national legal rules and regulations. However, indicated possible barriers for the Joint Activities in the preparation period covered issues such as: distribution and handling of funding, lack of existing cooperation, private investment, national funding rules or laws, politics, national status for 2020/2050 goals, and funding budget, have been successfully solved and partners conducted all the meetings.

There were four JA meetings organized, where partners and other experts discussed the progress and development of the Joint Activities. There were three JA workshops where speakers presented the status of Joint Activities followed by a roundtable discussion among invited experts. These three workshops constitute the main activities in terms of expert exchange outside of the partner group.

Joint Activities have been set to first actions with effort on human resources and financial support, presents the effectiveness of transnational cooperation and smooth the way for more complex future joint activities, begin cooperation within the Geothermal ERA-NET, capability to produce fast results, take the main barriers into account, consider previous results and have an additional benefit for the development of geothermal energy in Europe.

In addition to planned deliverables the Geothermal ERA- NET consortium issued set of reports focusing on the comparison of international geothermal energy statistics, financing, innovation, operational issues, database platforms, where the main aim is to provide an overview of data collection by various international organizations. The reports from the JA workshops and meetings are available online <http://www.geothermaleranet.is/publication/reports/>

The last third reporting period of Geothermal ERA NET was focused on preparation the ground for the formulation of a common European action plan for geothermal energy technology research, development,

deployment and innovation supported by member states to prepare and implement Joint Activities (e.g. transnational funding activities)⁷.

Following the overall aim of the Geothermal ERA-NET to accelerate deployment of geothermal energy by organizing and supporting the transnational activities of research and innovation, the consortium has been working with the aim of opening up national programs, pooling resources, improving cross border cooperation, achieving critical mass, avoiding duplication of funds and efforts. After analysing the running and funded national programmes covering geothermal activities, the partners could not meet the condition for funding transnational activities by means of Joint Calls, and focused mostly on Joint Actions on a collaborative base. These coordinated activities established the nucleus of a collaboration that is projected beyond the limit of the actual Geothermal ERA-NET.

A real occasion for future collaboration is represented by GEOTHERMICA, the geothermal ERA-NET Co-fund Action recently approved by the European Commission, which expands the Geothermal ERA-NET Consortium and will build on the efforts and successes of the Geothermal ERA-NET by funding Joint Calls and further implementing joint activities, starting with those already launched in the Geothermal ERA-NET.

Following the positive feedback from the geothermal community, the Geothermal ERA-NET consortium decided to continue the work of OpERA – Operational issues of geothermal installations in Europe, and establishing “OpERA-pedia”, a web-based knowledge transfer system coupled to the website of Geothermal ERA-NET, which will in the future be the basis for the GEOTHERMICA website. National contracts/subsidies from five countries (Germany, the Netherlands, Iceland, France and Switzerland) will support experts for shaping and producing a document regarding operational issues, including examples of issues and solutions.

Geothermal ERA-NET launched the concept of EGIP and provided the pillars for its implementation. With little money and effort provided by participants, EGIP implementation reached the point of a pilot platform, used as a showcase for establishing the stakeholder’s interest in the matter, which proved to be high. A vision for EGIP intended architecture and implementation was described in the [Work Package 3](#) deliverables and the report finalized by the EGIP Group of Experts, including some open issues, recommendations and guidelines for data harmonization of some, high priority themes. These documents are a main reference for coordinated efforts to be funded at national level (data preparation, harmonization and publication), and requires an optimal collaboration among national agencies, research activities represented by EERA-JPGE (European Energy Research Alliance – Joint programme Geothermal Energy), and the potential collaboration established by the GeoERA-NET, a Co-fund Action related to geodata systems. The implementation of EGIP platform as a web-based tool can be organised in the frame of the Geothermal ETIP (Geothermal Technological and Innovation Platform) and in collaboration with the industrial sector represented by the Geothermal ETIP and EGEC (European Geothermal Energy Council). The main recommendation is therefore to proceed and reinforce the collaboration already established among main stakeholders, and in particular among the different geothermal networks (EERA-JPGE, EGEC, Geothermal ETIP), maintaining the central role of national authorities with respect to industry and research communities.

The implementation of Joint Calls, Common Programmes and Collaborative Activities provide important opportunities to build more collaboration among the countries participating to Geothermal ERA-NET, opening up national programs, pooling resources, improving cross border cooperation, achieving critical mass, avoiding duplication of funds and efforts. The present report provides guidelines for competitive and

⁷ <http://www.geothermaleranet.is/media/publications-2015/1-GAJ-2016-10--ERA-NET-Final-meeting.pdf> p5

non-competitive funding mechanisms and collaborative activities. Its aims facilitated not only the production of calls but also consider and promote the favourable conditions for common programming.⁸

The main geothermal problems: Unclear vision on geothermal issues at the European level, lack of commitment to the geothermal sector by national government, Lack of collaboration and coordination between stakeholders (e.g. industry, academia). Unclear vision and lack of cooperation is one of the biggest problem for the geothermal sector - including regarding financing. Factors industry and policy sectorial

4.1.3.2 Work Packages

Work Package 2 Information exchange on national incentives and status of geothermal energy

The overview of ongoing international work preceded and continued in a complimentary fashion the Geothermal ERA-NET's joint activities. Although the work on WP2 was finalised in M30 and results were used to continue with further developments in WP4, national incentives and their status continued to evolve. Updates were provided in a regular fashion throughout the Geothermal ERA-NET. The formal report concluded with suggestions for joint activities on: operational issues, a European Geothermal Information Platform, new concepts, and risk mitigation. The actual definition and selection process was be taken up in WP4.

The work was carried out in tight cooperation of national agencies and organisations at European (EERA, EGEC, etc.) and particularly at national levels (national geothermal associations, research institutes, etc.). Apart from questionnaires and web-based interaction this has been achieved via face-to-face meetings, workshops and conferences.

The Geothermal ERA-NET recommends that updates are provided on a regular basis comprising:_

- short (1-page) overviews of key research and innovation projects that have a transnational impact (annually)
- updates on energy policies (annually)
- updates on policy support measures targeting geothermal energy (annually)
- updates on status of geothermal energy uptake (annually)

A number of partner countries participate in the IEA's Geothermal Technology Collaboration Program (www.iea-gia.org) where similar updates are provided.

Work Package 3 Towards a European Geothermal Information Platform (EGIP)

The Work Package 3, in the frame of Geothermal ERA-NET, aimed at considering the boundary conditions and at executing the preliminary work to pave the way for the implementation of the European Geothermal Information Platform, (EGIP). During the initial two year of the Geothermal ERA-NET, two reports were delivered, D3.1 "Report on the state-of-the-art and needs in regarding geothermal data and existing tools to manage them" and D3.2 "Feasibility study for a European Geothermal Platform". The former focused on the-state-of-the-art in terms of data and databases on geothermal and the latter on a description of a possible approach to implement such geothermal platform at European level respectively.

⁸ <http://www.geothermaleranet.is/media/publications/Funding-of-R&D-and-Geo-Projects-Slovenia-21.10.2016-October,-BP-final.pdf> pp.55-59 and http://www.geothermaleranet.is/media/publications-2015/Geothermal-ERA-NET-D7_4-Analysis-report.pdf

The WP3 reports highlight the key tasks during in the second half of the Geothermal ERA-NET from spring 2014 up to autumn 2016. The main results were the scientific and technical preparation of EGIP, 2) a survey of the state-of-art and the identification of stakeholder's needs, 3) the preparation of a feasibility study and lastly, 4) the follow-up of the implementation.

The activity within WP3 produced a scientific paper on the methodology used to set up the EGIP pilot ("Building a European geothermal information network using a distributed e-Infrastructure" published in the International Journal of Digital Earth⁹). Secondly, the activity on EGIP continued in a second Joint Activity (JA) addressed to 'Tuning EGIP for target users'. The aim was to engage national and trans-national stakeholders to participate in a web survey. The web survey established important aspects regarding the future possible implementation of a European Geothermal Information Platform: the most relevant and most interested stakeholder groups were identified for whom the realisation of EGIP would be very useful, the prioritisation of a range of raw/primary data, interpreted data and documents; finally the web survey identified the focus areas related to the most relevant applications of geothermal energy for an eventual realisation of EGIP. The results are described in the report "[Tuning EGIP for Target Users EGIP Web Survey Results](#)".

Working towards a European Geothermal Database was a target of the Geothermal ERA-NET proposal that led to the EGIP concept (European Geothermal Information Platform). The goal of EGIP was to pilot the facilitation of access to geothermal information at transnational level. This pilot was an important step to structure the geothermal sector and assist scientists, stakeholders, investors and geothermal developers in identifying relevant datasets. EGIP was envisaged as a Web tool gathering data and knowledge from national providers following the European INSPIRE directive (INSPIRE, 2007) with the ultimate goal to harmonize the geothermal sector at EU level and to improve the definition of INSPIRE content.¹⁰

WP3 activities fostered the implementation of EGIP implemented a pilot program, which contains the main insights identified by the EGIP Expert Group to be considered and adapted to the context where EGIP will be implemented.¹¹

The EGIP Expert Group recommends paying attention to the following considerations related to the intended EGIP implementation:

To prepare the EGIP implementation, a comprehensive catalogue of relevant geothermal data themes consistent with the related INSPIRE guidelines is necessary. Minimal data sets include geodata (spatial data such as e.g. subsurface temperature) and non-geodata (unstructured data and documents such as e.g. national incentives for geothermal energy). Common and coherent initiatives on data harmonization to enable the coordination of the geothermal actors and the definition of shared ways of working. Ultimately, this will lead to consistent application of a European code for reporting guidelines for geothermal resources and reserves, and on the other hand to the harmonization of geothermal data in the scope of the INSPIRE directive. Key is a comprehensive capture of the essential stakeholders: scientists, investors, developers, decision makers dealing with geothermal energy should be taken on board as soon as possible to ensure that the propositions fit their needs. Importantly, EGIP needs a long-term governance framework which will sustain accessibility and the update of data set, and to allow the evolution of the platform for fitting the user's demand. Finally, fully harmonized European cross-border coverage requires transnational cooperation

⁹Building a European geothermal information network using a distributed e-Infrastructure, Eugenio Trumpy, Gianpaolo Coro, Adele Manzella, Pasquale Pagano, Donatella Castelli, Philippe Calcagno, Annamaria Nador, Thorvaldur Bragasson, Sylvain Grellet, and Gunter Siddiqi, International Journal of Digital Earth Vol. 9, Iss. 5, 2016, <http://dx.doi.org/10.1080/17538947.2015.1073378>

¹⁰ http://www.geothermaleranet.is/media/publications/Geothermal-ERA-NET-REPORT-EGIP-implementation_final.pdf

¹¹ as above

and great effort as is evidenced by occasional transnational projects which are dedicated to harmonization issues.

Work Package 4 Development of joint activities

To create a scheme for the implementation of trans-European cooperation on geothermal energy, WP4 “Development of joint activities” proposed a bottom up-approach for the realization of joint activities on the base from results in WP2. This approach is based on the previous results of the Geothermal ERA-NET and present the main benefits of a European cooperation scheme by identifying joint activities, defining possible schemes and barriers for the joint activities, and preparing an action plan for implementation of joint activities in WP6. The approach combines the following requirements:

- Minor effort of financial and human resources
- Based on the input from the geothermal community to ensure the necessity of the results
- Integration of stakeholders from the different fields of geothermal energy
- Capable to produce high-quality results and solutions for non-technical and technical issues
- Capable to identify several topics for joint calls In a second phase this scheme was further developed and combined with the thematic needs on RD&D knowledge and information exchange and solutions to overcome non-technical and regulatory barriers extracted from the results of WP2 “Information exchange on national incentives and status of geothermal energy”.

As a result seven joint activities on different topics were proposed:

- NWW – New ways of working: Financial Instruments and Funding of RD&D and Geothermal Projects
- OpERA – RD&D Knowledge Exchange on operational issues of geothermal installations in Europe
- PRGeo - RD&D Knowledge Exchange on public relations for geothermal energy
- New Concepts for geothermal energy production and usage
- ReSus - RD&D Knowledge Exchange on reservoir sustainability
- Tuning EGIP (European Geothermal Information Platform) for target users
- Geostat - Towards Consistency of geothermal data specific activities and working groups follow partly iterative and partly continuous approaches.

In addition the different working groups, coordinated by a steering committee of two countries for each activity, have developed an action plan until the end of the Geothermal ERA-NET. The first major milestone in all of the actions took place in autumn 2015 during the meeting of the Geothermal ERA-NET, where results of activities were presented and future activities decide, including a possible joint call scedule.¹²

Based on the requirements of the European geothermal community, the WP 4 “Development of joint activities” of the Geothermal ERA-NET identified and developed a scheme for the realization of joint activities to foster the European cooperation in the field of geothermal energy. The scheme followed a bottom-up approach to show the additional benefit of cooperation with a minor effort on financial and human resources. This approach is capable to set the corner stone for more complex future joint activities, also with the possibility of a higher financial input. In a first phase, seven different joint activities were developed and initiated, covering cooperation of the European research funding institutions on non-technical barriers, a RD&D knowledge exchange on operational issues, public relations, new concepts, reservoir sustainability, the implementation of a European Geothermal Information Platform and a working

¹² http://www.geothermaleranet.is/media/publications/Geothermal-ERA-NET-D4_2-Report-on-common-interests-for-joint-activities-and-action-plan-NT.pdf

group on the consistency of geothermal data. All activities were started in the first five month of 2015 and delivered results until the end of the year. Besides the organization of multilateral cooperation on the different topics, several events were planned, including expert round table discussions and workshops. In addition all compiled results of the specific working groups were disseminated widely. The implementation of the presented activities and working groups is the first step towards an extensive knowledge and information exchange on geothermal energy in Europe. This exchange is initiated by the Geothermal ERA-NET consortium and therefore based on the decisions of the national research program owners and managers. The consortium is technology focused but independent from the industry and national research communities.¹³

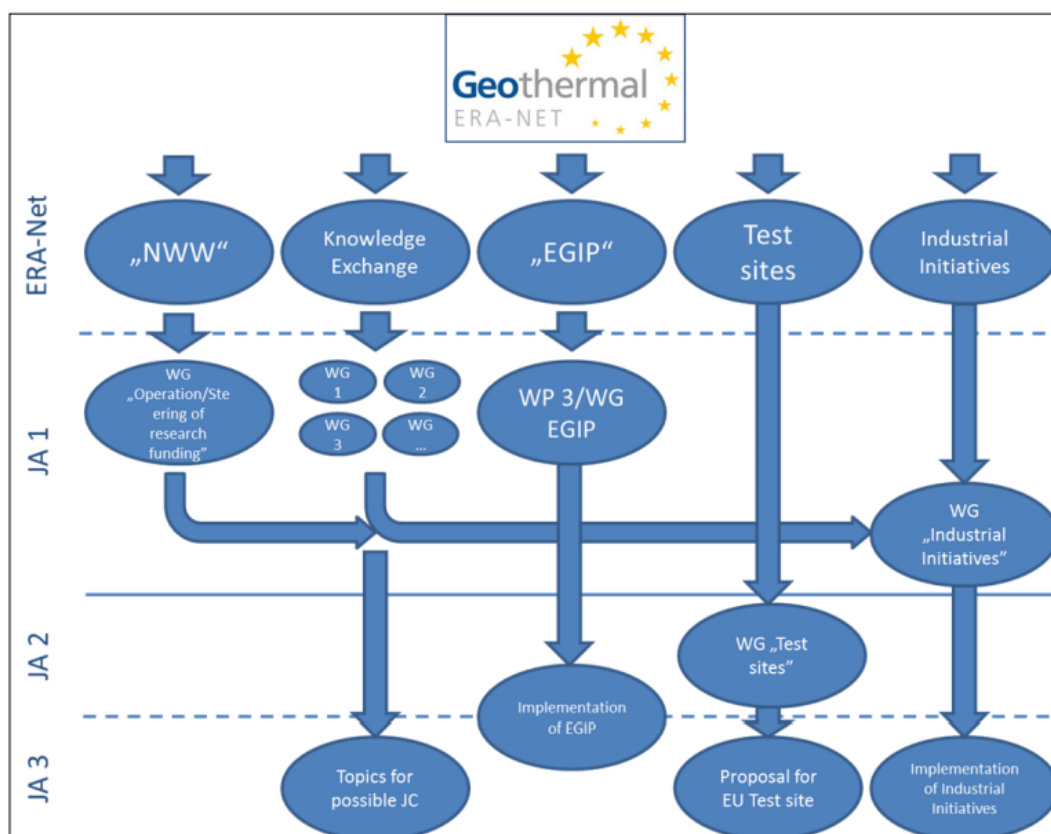


FIGURE 5 BOTTOM UP APPROACH FOR THE IMPLEMENTATION OF JOINT ACTIVITIES WITHIN THE GEOTHERMAL ERA-NET.

Work Package 5 Cooperation with Stakeholders

“Cooperation with Stakeholders” aimed at the overall goal to engage principal stakeholders for the coordination of geothermal RDD&I in a European research agenda from the viewpoint of program owners and program managers. The ultimate purpose is to assure that national and regional parliaments and administrations support the cooperation and mutual opening up of geothermal energy research programs which leads to increased productivity and optimal use of national resources to promote the uptake of

¹³ http://www.geothermaleranet.is/media/publications/Geothermal-ERA-NET-D4_2-Report-on-common-interests-for-joint-activities-and-action-plan-NT.pdf conclusions

geothermal energy. The key stakeholders have been characterized in terms of their importance and influence on the strategic direction and the coordination of a pan-European geothermal RDD&I program.

1. Political Stakeholders of the EU; especially the EU Commission and the Directorate-Generals (DGs) for Energy, and Research and Innovation.
2. Partners of the Geothermal ERA-NET (national program owners / funding agencies)
3. Program owners / Funding agencies of Non-ERA-NET EU countries and non-European countries with significant geothermal RDD&I programs
4. National members of the SET-Plan Steering Group
5. European Geothermal Industry Associations (EGEC, GEOELEC-Platform, Geothermal Technology Panel of the RHC-Platform)
6. EERA – JPGE Joint Program on Geothermal Energy

The following 12 key messages demonstrate in simple language phrases the value, benefits and strength of concerted transnational research and innovation. They have been mapped to some of the joint activities to exemplify how key messages are being lived:

1. Boost the European research and innovation value chain by developing a European innovation system for geothermal energy;
2. Reduce the fragmentation in the European geothermal energy RDD&I arena;
3. Eliminate gaps, avoid overlap and unnecessary duplication, and maximise synergies;
4. Drive towards optimal allocation of national resources (funds, personnel and time) according to the strengths of national players and resource specifics while freeing up resources that are better deployed in other regions and organizations to deliver expected results;
5. Help industry to identify best research partners;
6. Give national program owners an opportunity to coordinate program implementation beyond national boundaries;
7. Enhance existing strengths by competitively awarded Europe-wide RD&D projects;
8. Facilitate Europe-wide roll-out of R&I results to the industry;
9. Remove research and innovation barriers to enhance the efficiency in the development of geothermal energy;
10. Strengthen the research infrastructure and areas of specification / utilisation;
11. Contribute to the development of a European market for research, development and activities that is driven by excellence and value added rather than championing national entities that act exclusively on a local or national level;
12. Position Europe in a worldwide context.

Most importantly, the success of engaging the key stakeholders has been the formulation of a follow-up ERA-NET Cofund Action, GEOTHERMICA, which pools significant national financial and human resources to promote a pan-European geothermal energy RDD&I program via at least one joint call and a number of joint actions. GEOTHERMICA will be launched in 2017, and will last until the first quarter of 2022.

The actions will ensure efficient and structured collaboration with principal stakeholders in order to further reduce the fragmentation of transnational research activities and policies and to maximize synergies. Existing technology platforms will be mobilized and large scale projects which would not be possible at national level will be supported and encouraged.

Work Package 6 Transnational Mobility and Training (RANNIS)

The issue of human resources within the energy sector has been widely discussed in recent years. Employment within the sector is expected to increase in coming years, the current workforce is approaching retirement, and skill shortages have already been reported. Adequate training and educational opportunities also seem to be limited within certain areas of the sector. It is within this realm of discussion that task in WP6 of the Geothermal ERA-NET is centred. The task has a clear focus on human resources within the geothermal sector, as well as potential knowledge gaps and training needs. The work is based on the results from the mapping the inventory of available mobility and training programmes and compared with the long term ambitions for the use of geothermal resources in Europe. A working group identified possible training needs and knowledge gaps that are addressed in order to achieve adequate human resources for meeting those goals. The task-force looked into the need for transnational programme collaboration, mutual opening of national programmes, establishment of common programmes and need for dedicated programmes at community level. The result analyzed the various options and recommendations for collaboration in the area of human resources, mobility and training.



FIGURE 6: EXISTING TRAINING PROGRAMMES IN THE GEOTHERMAL SECTOR (<http://www.geothermalera-net.is/joint-activities/geothermal-education/>)

The objectives constructed a clearer view of both the future of educational and training opportunities within the sector, as well as current and future needs of human resources to fulfil renewable energy goals, such as those stipulated in the EU's renewable energy directive.

The working group that undertook the task saw it as being essentially twofold:

- a. to map future human resources, i.e. students undertaking geothermal education, and potential knowledge gaps in education and training offerings to this group and

- b. to assess the current supply of human resources within the sector and future prospects in this area.

Having a clearer view of the current and perceived future situation would hopefully provide all relevant parties with useful information regarding which direction to take in terms of efficient actions, such as collaboration and joint actions.¹⁴

Work Package 7

A key activity within Work Package 7 is to support transnational activities, to provide a commonly agreed framework for joint funding scheme and recommendation for a structured collaboration beyond the duration of the project. After analysing the running and funded national programmes covering geothermal activities, the Geothermal ERA-NET partners could not meet the condition for funding transnational activities by means of Joint Calls, and focused mostly on Joint Actions on a collaborative base. These coordinated activities, which were described in the previous reports from WP7, established the nucleus of a collaboration that is projected beyond the limit of the actual Geothermal ERA-NET

The Geothermal ERA-NET has established a long-lasting strategic collaboration, bringing together owners of European national geothermal research and innovation programmes, and bridging the public sector to Europe's industry and research and innovation communities. The former are represented by actors such as the European Geothermal Energy Council EGEC, the European Technology and Innovation Platforms (ETIP) on Deep Geothermal and Renewable Heating and Cooling, while the latter are organized in the European Energy Research Area's Joint Program on Geothermal Energy (EERA-JPGE) and other actors. A new era of geothermal coordination has been launched in the recent years, also thanks to the Geothermal ERA-NET projects, as testified by the coordinated effort for producing the geothermal Declaration of Intent for the European SET-PLAN recently approved by the European Commission. The fragmented scenario characterizing the sector when the Geothermal ERA-NET started its activity has been composed in a more defined picture, paving the road to the robust and coordinated support established by GEOTHERMICA, where the Joint Activities launched in the frame of Geothermal ERA-NET will find the right condition for development and new topics, new innovative ideas will be proposed. With GEOTHERMICA the collaboration within the public sector has been expanded, and the participants will be able to cement and strengthen the central role of national authorities with respect to industry and research communities, therefore strengthening the European geothermal sector as a whole.

The main recommendation is therefore to proceed and reinforce the collaboration already established among main stakeholders, and in particular among the different geothermal networks (EERA-JPGE, EGEC, Geothermal ETIP), maintaining the central role of national authorities with respect to industry and research communities.¹⁵

4.1.3.3 Joint Activities

There are various possible ways for international collaboration of national research and innovation programme owners and managers to foster utilization of geothermal energy and innovation in Europe, which may in principle range from information exchange to multinational financing of demonstration projects.

¹⁴ http://www.geothermaleranet.is/media/publications-2015/Geothermal-ERA-NET-D6_2-Human-Resources-Identification-of-Training-Needs-and-Knowledge-Gaps-%E2%80%93-Survey-Results-NT.pdf page 10

¹⁵ http://www.geothermaleranet.is/media/publications-2015/Geothermal-ERA-NET-D7_4-Analysis-report.pdf page 3

The Geothermal ERA NET is one of a large number of ERA NETs that all aim to move forward their specific field. The ERALEARN initiative of the European Commission helps ERA NETs to benefit from their mutual experiences. The mapping and monitoring effort, supported by ERALEARN, has resulted in the following three groups of joint activities:

- Structuring common RD&D efforts:
- RD&D quality assurance:
- Human resources:

A comment that must be made is that the majority of the ERA NETs focus on joint R&D, while the Geothermal ERA NET and other energy ERA NETs foster the cooperation between organisations that are both involved in R&D and in implementation activities. This results in a wider scope for possible joint activities.

To minimize the administrative burden, joint activities are fit-for-purpose and cost-effective. Within the Geothermal ERA NET, the approach was to consider various levels of potential joint activities. The following options were developed:

JA1 Information Exchange/ Knowledge Exchange groups) - low budget

Working groups would address issues through dedicated meetings, /workshops, and visits. This proves to be a very effective and easy to organise way to ensure that progress in a number of European countries is shared on a European scale.

JA2 Joint work/review – limited budget

These are joint assignment, e.g. to have an expert company produce a status report on a specific issue, a detailed study to solve a specific issue etc. All interested countries contribute funding for such an assignment, which results in a benefit to all.

JA3 Joint Call – significant budget

A joint call allows stakeholders in the participating countries to work jointly on developing new insights and new systems, in contrast to the first two types of joint activities that essentially aim to improve availability or analysis of existing information.

To create a scheme for the implementation of trans-European cooperation on geothermal energy, work package (WP) 4 “Development of joint activities” builds on a bottom-up approach for the realization of joint activities. This approach is based on the previous results of the Geothermal ERA-NET and delivers benefits of a European cooperation scheme. The approach combines the following requirements (see also Geothermal ERA NET deliverable, D 4.1):

- Minor effort of financial and human resources
- Based on the input from the geothermal community to ensure the necessity of the results
- Integration of stakeholders from the different fields of geothermal energy
- Capable to produce high-quality results and solutions for non-technical and technical issues
- Capable to identify several topics for joint calls

In a second phase this scheme was further developed and combined with the thematic needs on RD&D knowledge and information exchange and solutions to overcome non-technical and regulatory barriers.

In summary, 7 Joint Activities (JA) on various topics were proposed:

- NWW – New ways of working: Financial Instruments and Funding of RD&D and Geothermal Projects
- OpERA – RD&D Knowledge Exchange on operational issues of geothermal installations in Europe
- PRGeo - RD&D Knowledge Exchange on public relations for geothermal energy
- New Concepts for geothermal energy production and usage
- ReSus - RD&D Knowledge Exchange on reservoir sustainability
- Tuning EGIP (European Geothermal Information Platform) for target users
- Geostat - Towards Consistency of geothermal data

The specific activities and working groups follow partly iterative and partly continuous approaches. In addition, the different working groups are coordinated by a steering committee of two countries for each activity, have developed an action plan until the end of the Geothermal ERA-NET.

Financial Instruments and Funding of RD&D and Geothermal Projects

The overall objective of this activity is to improve the synergies between different players in the field of geothermal utilization, to improve funding processes in R&D and the possibilities for project financing with the goal to strengthen European geothermal development for economic opportunities, energy security and mitigate climate change.

A better understanding of this financial landscape is beneficial to all stakeholders in defining the barriers and recommend practical solutions, e.g. to prioritize in future joint calls, increase investments and growth of geothermal projects in Europe.

The Joint Activity "New Ways of Working" goals are to improve in the working practice of national funding institutions and the collaboration with their European counterparts.

The main process focus of this activity is to

- Analyse the financial instruments that are available and how they operate – and map the operational structure of the different national funding bodies, including policy and funding rules in R&D and industrial projects.
- Highlight the main barriers and opportunities, and how these instruments can more easily work together

OpERA – RD&D Knowledge Exchange on operational issues of geothermal installations in Europe

The major advantage of geothermal energy over other renewable energy sources is the time and site independent availability of the geothermal resource. To use this advantage, the operational availability of geothermal energy installations has to be stable on a high level. Scaling and material corrosion for instance, are issues in many geothermal areas in Europe (for example: boiling point scaling in production wells (calcium carbonate; metal sulphides), scaling in surface equipment (mostly amorphous silica; calcium carbonate and sulphides to a lesser degree), scaling in reinjection wells (amorphous silica). Both lead to

breakdown times due to necessary repair or service works. Also other issues like high gas content of the thermal brine or pressure related issues have to be discussed.

To create a platform for this discussion the OpERA working group was founded. The OpERA working group aimed on bringing together the national experts (Plant owners, project developers, researchers) to provide an overview of potential solutions, like adapted materials in the geothermal installation, the use of inhibitors or optimized pipe geometries or well design. Therefore, OpERA provided a platform for technical knowledge exchange to solve Operational issues on a European base.

As a first step towards this European knowledge exchange, OpERA organized a workshop on operational issues on the 1st & 2nd of October 2015 in Vaals (NL). 37 experts from 11 countries participated in the workshop. On the first day country overviews from Hungary, Italy, the Netherlands, Slovenia, Germany, Iceland, Switzerland, France, Denmark and Austria were presented to create an overview of the most urgent operational issues in Europe. These issues were summarized in the “OpERA-Magna Carta” (respecting the 800th anniversary of the real Magna Carta in 2015) which shows solved and unsolved issues on scaling, gas content, corrosion and reinjection by country.

The second day was structured with four topical sessions on scaling, scaling & gas content, corrosion and re-injection issues. In these sessions 13 presentations on specific issues, possible solutions and examples from different locations were held.

Both days were enveloped by discussion & summary sessions moderated by a specialist for operational issues from the oil & gas industry. The experts participated very actively in the fruitful discussions and solutions for several issues were addressed on a European base.

In the last session of the workshop, the “OpERA-Expert Group” was founded, to create a joint publication on operational issues in Europe. 22 experts accepted to provide input for this publication. Besides the country overviews and the “OpERA-Magna Carta” the publication will entail summaries of the general, solved and unsolved issues in the different topical fields and several excurses on specific topics as e.g. carbonate scaling, corrosion in low enthalpy fields or induced seismicity. The OpERA Joint Activity revealed the necessity of a trans-european knowledge exchange on specific topics and showed, that the community appreciates a neutral platform to discuss urgent issues on an open level without any country or company based restrictions. During the whole workshop the focus was on topics and solutions and not on competition. Therefore “OpERA” was a showcase, how a European geothermal community can work together in the future to support the further development of geothermal energy. Following the workshop and the publication further activities like a transnational online information system on operational issues are planned.

PRGeo - RD&D Knowledge Exchange on public relations for geothermal energy

Sadly, known by the geothermal community, the lack of public acceptance for geothermal energy installations often hampers further developments in many countries. Furthermore, the advantages of using geothermal energy are little known, and media reports often spread information rather on its disadvantages (e.g. high upfront costs, drilling risks, environmental threats such as induced seismicity, ground swelling, pollution of ecosystems by the surface inlet of deep geothermal brines, etc.). The origin of the sceptical view on geothermal energy varies from the lack of information about the technology to wrong conflict management from project owners. As a result, political decision makers and potential investors have concerns about possible risks in implementing geothermal projects, and social resistance often results in significant slowdowns of the projects.

The joint activity PR-Geo aimed to exchange knowledge on the diverse approaches of Public Relations (PR) experienced in different European countries in order to make sure that geothermal energy can play its optimal role in Europe's future energy supply. A side event at the German Geothermal Conference at Haus der Technik in Essen was organized on November 4th 2015 with five invited speakers who presented the PR aspect of various types of projects from France, Germany, Italy and Switzerland.

The workshop concluded that although the PR work has been reinforced among project developers and operators in the recent years, it still can be optimized, especially by streamlining focused messages to the different target groups. Each geothermal energy project is unique. This applies both to the geological and technical characteristics and to the socio-demographic conditions. Therefore, the same and proper measures cannot be applied to all projects. Although different types of project examples were presented and discussed at the workshop, it was generally concluded that the acceptance of geothermal projects is a question of trust. PR work can therefore only be successful if it manages to create a basis of trust in which early, honest and strategically oriented communication has a crucial role.

New Concepts - RD&D Knowledge Exchange on new concepts for geothermal energy generation and use

The New Concepts (JA) mission is to stimulate creative concepts for European innovators in geothermal utilization and technology. It highlights opportunities in direct utilization of low enthalpy geothermal energy such as geothermal heat and cooling for smart cities, food production, and cosmetics. The activities create cooperation between the CleanTech sector and the European business network and display successful innovative projects. Crucial in this JA is expanding and stimulating new opportunities. Trend in renewable energy is changing constantly and current EU statistics indicate a significant growth and importance of geothermal energy each year. New European Union Research and Innovation funding programmes, increased geothermal energy supports up to 15% or to almost 70M€ financial support and additional 30M€ in renewable heating and cooling.

New Concepts (JA) workshop was held in Geneva on October 30, 2015. It was organised by Geothermal ERA NET leaders, Iceland and the Netherlands, together with IEA Geothermal, and supported by Swiss Federal Office of Energy.

The workshop displayed the opportunities in the geothermal sector and stimulated growth of its industry in Europe. The focus was put on new and innovative applications of geothermal energy utilisation at a European level with interest from worldwide examples.

The workshop included an overview of GEO Innovative opportunities and pilot projects enhancing possibilities from small innovative ideas to large industry in Geothermal. The event had three sessions presented by specialists from Europe and one session based on worldwide example:

- Session I: EGS projects + direct use applications
- Session II: Direct use applications (new concepts – built environment)
- Session III: Direct use applications (new concepts – other sectors)
- Session IV: Innovative Applications of Geothermal Direct Use worldwide
- Visionary Panel Discussion, Conclusions and Next Steps

Each session had significant importance on different geothermal application issues. The closing session of the workshop included a visionary panel with ideas of future in geothermal energy development. The

visionary panel had a challenging task for participants, which was to draw the future of geothermal with famous wax crayons from the 100-year-old Geneva- based company "Caran d'Arche". The outcome of delivered cartoons will be a part of the proceeding released in spring 2016.

The Geothermal ERA NET New Concepts may convey its aspirations to its stakeholders by communicating effectively and efficiently the benefits of such a framework and, eventually receive their long-lasting support in the development of this framework

ReSus - RD&D Knowledge Exchange on reservoir sustainability

To foster sustainable and safe use of geothermal reservoirs as well as increase the lifetime of the resource, boreholes and system components, it is crucial to understand the physical properties of the reservoir rocks and fluids and their interaction during the exploitation process.

The Joint Activity (JA) "ReSus" (Reservoir Sustainability) focus on setting up a platform to study geothermal reservoir sustainability, comparing the current practice used by the operators, highlighting the best solutions and studying the unsuccessful cases, in order to animate a fruitful debate to capture the current state-of-the-art and explore possible scenarios for future economic and sustainable exploitations.

Beyond the scientific community, the topic of such a JA clearly interests even regulatory authorities and operators who seek to implement sustainable development strategies.

The ReSus JA working group organized a web questionnaire to highlight the objectives of the stakeholders regarding reservoir sustainability and to collect their practices to achieve them. The questionnaire was structured in 2 parts. Part 1 investigated the respondent institution typologies, the institution principle interests, the reservoir horizontal and vertical scale field of interest. Part 2 surveyed the reservoir sustainability concept from three different point of view, i.e., Economic profitability, Public acceptance and Environmental impact.

The ReSus survey was conducted firstly in September 2015 and secondly in march 2016. The extension allowed to retrieve more input from European stakeholders. The preliminary results were presented during the Geothermal ERA-NET meeting in Reykjavik in April 2016. A report at completion of the ReSus JA is currently in preparation that will include the survey results as well as the main outcomes and recommendations gathered by this JA.

Tuning EGIP for target users

The work dedicated to the European Geothermal Information Platform (EGIP) is the first Joint Activity performed by some of Geo ERA-NET partners. Started in 2012, it produced a State of the art report and a Feasibility study (2013) that led to the development of a Pilot (2014). The results have been published by Trumpy et al. (2015).

Late 2014, the Geo ERA-NET project consortium and the Supervisory Board decided that a further step of EGIP evaluation was necessary. Consequently, this "Tuning EGIP for target users" JA aims to perform an analysis of the boundary conditions for such Geothermal Information Platform at European level. The JA is based on the experience learned from the EGIP Pilot in order to propose its complete implementation. A Web survey has been conducted to give the EGIP Pilot accessible to European stakeholders and to collect their feedback on effective needs, impacts and benefits that EGIP must have. The results and conclusions of this survey are described in the Tuning EGIP JA report (2016).

Early 2016, the EGIP Expert Group was created to formulate INSPIRE oriented guidelines for the harmonization of geothermal data, and to envisage a call for tender for the implementation of EGIP. The

Expert Group is supported by an Extended Expert Group gathering technical skills especially regarding the INSPIRE European Directive and geothermal databases. During the final course of Geo ERA-NET, the Expert Group will produce an overview of EGIP to prepare its implementation. Such a document will be dedicated to whom will take care of the development of the Information Platform. Considering the close end of the GEO ERA-NET project, the Expert Group also seeks for opportunities to find a framework where EGIP could come true.

Geostat - Towards Consistency

Data on geothermal energy is collected by various international organizations. These collections are based on questionnaires which are different although the objective is to collect the same data. Due to these differences the same data can be misunderstood, misinterpreted and give wrong signals. Therefore, a common ground is needed to enable use and comparison of energy statistics, increase reliability, security and decrease fragmentation in line with the aim of these organizations, motions and regulations.

Here are proposed objectives with measurable indicators and how GeoStat can achieve these:

1. Participating countries to aim at reducing the difference between industry and official statistics below a defined benchmark for year 2020. The following indicators are proposed on a national level annually:

- Total Net Maximum Electrical Capacity
- Total Electricity Generation
- Total Geothermal Direct Use and Heat in Final Use

GeoStat could facilitate by aiming at identifying the source of error in each case with dissemination and discussions on terminology and definitions and direct comparison of statistics for each nation.

2. Participating countries to aim at reducing duplication of efforts domestically. Measureable indicators suggested:

- Number of months until Joint Questionnaires to IEA and Eurostat on Renewables and Electricity and Heat are made available.

GeoStat could assist in making the files accessible electronically on a website with other sources accessible on a national basis.

3. Collaboration between entities on a domestic level having the following indicator:

- The respective experts responsible for each data submission for both official and industry statistics know about each other.

GeoStat can make the connections between experts on a domestic level.

4. Simplified process across organizations and reducing duplication of efforts with the following indicators:

- Associations and lobby groups should peer review official statistics.
- Terminology of industry should be adapted to official statistics when possible.
- Terminology of official statistics should be clear and understandable.

The intention of GeoStat is to make the connections and starting the review process in cooperation with the partners and to make the terminology clearer. GeoStat will write a short manual with terminology and definition already identified in this report, in particular for thermal capacity.

The seven presented joint actions are the base for the trans-European collaboration in the most relevant fields of geothermal energy. Topics identified in earlier steps of the implementation process can be addressed in a second phase of joint activities in the future. The selected actions are capable to enable and to foster a multinational cooperation for the development of geothermal energy. This can also be the starting point for more complex (JA2&3) activities in the future, if the benefit of multinational collaboration can be shown on the selected level with minor financial effort. The planned steps of each joint activity will be presented in chapter 3. Possible further steps and activities are presented in chapter 4.

4.1.3.4 Networking Activities

Besides partner meetings, where experts from the partnering countries were brought together, joint activities and workshops were organised with leading experts from Europe. Seven topics were selected to run as joint activities and three workshops conducted.

There were twelve European countries participating in the project and twenty-five experts from partner organizations involved in the project, thereof twelve leading experts. These experts, among others, participated in various activities and meetings during the lifespan of the network.

From May 2015 to October 2016 there were a total of nine meetings involving Joint Activities events and project working meetings with results presented below:¹⁶

1. 1st Kick off meeting in Reykjavík, May 30th – 31st, 2012. Participants introduces themselves to each other, discussed the general review of the project, practical issues related to finances and reporting to the EC, admission of the new Hungarian partner HGGI and admission of new partners in general. Participants discussed the work ahead and the objectives of the Work Packages. Orkustofnun organized a technical tour, for the participants to see and experience great examples on how geothermal energy is utilized in different ways in Iceland. The meeting closed with meeting conclusion and final decisions on next steps. Number of participants: 19
2. 2nd working meeting in Pisa, September 13th - 15th, 2012. There were presentations on Work Packages, potential partners were discussed and the draft version of the website was presented. Þorvaldur Bragason presented few thoughts on data collection followed by a discussion among participants. Björn Víkingur Ágústsson introduced the first draft of a questioner to collect information on mobility and training and practicalities regarding the questioner was discussed. Adele Manzelle presented a general overview of the geothermal situation in Italy with a specific introduction on the Italian geothermal databases and datasets. Work Packages 2 and 5 were discussed. Next meetings were scheduled and next steps were discussed and approved. CNR organized a very interesting technical tour to the Ladarello geothermal area and to other interesting geothermal sites in Tuscany. Number of participants: 16
3. 3rd working meeting in Reykjavík, March 4th - 5th, 2013.

The first day participants discussed general overview of the project and support schemes for geothermal power, information exchange on national incentives and status of geothermal energy. Each partner (except Slovakia) presented a country presentation giving country overview/highlights based

¹⁶ http://www.geothermaleranet.is/media/publications/Geothermal-ERA-NET-D-6_3-Expert-Exchange-scheme-FINAL.pdf summary

on the answers from the WP2 questionnaire and selected geothermal projects. The meeting ended with meeting conclusion and final decision on next steps and participants attended the Iceland Geothermal Conference. On the second day participants discussed the WP3 questionnaire, preliminary results, the envisaged European Geothermal Background and next steps. There were various presentations which provided an overview on the running activities and the status of data organization among the European countries. Number of participants: 23

4. 1st EGIP Roundtable meeting in Pisa, June 3th, 2013.

Participants discussed WP3 topics, the envisaged European Geothermal Platform and the final outcome of the WP3 questionnaire including information from all consortium partners. Eugenio Trumpy presented the roadmap to achieve the next WP3 deliverable on EGIP feasibility study and the main features regarding EGIP both on the contents and functionalities. Þorvaldur Bragason provided an overview of Icelandic geothermal information system as an example of geothermal information organization. Participants discussed stakeholders, and the reason of the EGIP implementation and participated in working activities related to the feasibility that would be developed in distinct stages. Number of participants: 12

5. IRENA meeting in Pisa, June 4th 2013.

It was the first expert meeting on geothermal energy, alongside the European Geothermal Congress in Pisa, June 3rd – 7th. The hosts were CNR and Enel Greenpower. There was a presentation and discussion on The Global Atlas – IRENA – project history and development, data infrastructure, interface and tools and analysis of existing database identified by IRENA. There were presentations on data collection, existing geothermal data collected by the IGA information committee, added-value of the Global Atlas initiative in the context of Geothermal energy, followed by discussion chaired by IGA. There was group work where the participants worked as a group to further discuss the scope of the Global Atlas, datasets and tools the Atlas should make available and then each group reported. The meeting ended with summary and conclusions. Number of participants: 12

6. 3rd Geothermal ERA NET General Assembly meeting in Budapest, September 9th – 10th, 2013.

Participants discussed the current status of the ERA NET work and the involvement and participation of potential newcomers to the project. There was a presentation on issues related to periodic activity and management reports for the EC among common errors in cost claims and how to avoid them. There was discussion on the feasibility study for a European Geothermal Database, Work Packages were presented and discussed and Rudolf Minder led a discussion on the classification of stakeholder on European level and communication plan followed by discussion on next steps. Number of participants: 16

7. 6th Working meeting, in Gstaad, March 11th – 12th, 2014.

The first reporting period was discussed and financial status. Participants determined meeting plans and presented and discussed the Work Packages. Number of participants: 19

8. 7th Working meeting took place in Trieste, September 10th, 2014.

Guðni A. Jóhannesson started with a short introduction to the Bráðarbunga volcanic eruption, welcomed new partners and gave an overview of the project status. There was an introduction to the Project Review and presentation of the experts from the EC. Then participants discussed the status of the Work Packages. Adele Manzella gave an overview of what needs to be done on the implementation of joint activity. Subsequently Eugenio Trumpy presented the status and implementation of EGIP pilot, what problem should it solve and who should use it. Participants went

over project review, discussion, summary and main findings of future policy. The meeting ended with summary and final remarks. Number of participants: 20

9. PSB meeting (Supervisory Board Meeting) in Leiden, December 4th, 2014.

The technical review of the ERA NET was discussed thoroughly as well as the reaction of the coordinator. Three issues were discussed most: commitments of partners and amendments of GA, quality of reports and cooperation beyond the ERA NET. Decisions were made by participants regarding these issues. The proposed activities were discussed and decision taken on leaders and participants in the activities. Participants went over the time-plan and next steps and the development and prioritization of Joint Activities. Number of participants: 15

10. 8th Working meeting in Offenburg, March 4th, 2015.

The theme of the meeting was discussion and decision on an action plan for the Joint Activities as well as reminding partners to deliver the pending deliverables. The meeting approved a plan for action and critical next steps were identified. Number of participants: 21

11. Annual Geothermal ERA NET meeting in Brussels, October 6th – 7th, 2015.

The theme of the meeting was discussion and decision on future development of Joint Activities and joint calls. As well as introducing the last periodic report and financial status. Stephan Schreiber gave an overview on the development of Joint Activities and the seven Joint Activities were presented by the JA leaders. Number of participants: 18

12. Geothermal ERA NET working meeting in Ankara, Turkey, February 29th - March 1st, 2016.

The meeting began with a short presentation on the status of the ERA NET. Progress and development of Joint Activities was presented and the seven JA were introduced with a special focus on the JA2 OpERA and EGIP. Kaan Karaöz gave a short presentation on Tubitaks involvement in Horizon 2020 projects and Dr. Siir Kilkis gave a comprehensive country overview of Turkey's involvement in geothermal and the latest developments. The remaining part of the meeting was devoted to the preparation of continued cooperation on geothermal through the GEOTHERMCIA Cofund action. Number of participants: 13

13. Geothermal ERA NET meeting in Hveragerði, Iceland, April 25th – 26th, 2016.

The meeting started, as usual, with a short presentation on the status of the ERA NET and information on updated deliverable deadlines and budget. Participants discussed progress and development of Joint Activities and project leaders gave presentations on the status and overview of each JA. Number of participants: 23

There were four JA meetings organized, where partners and other experts discussed the progress and development of the Joint Activities. There were three JA workshops where speakers presented the status of Joint Activities followed by a roundtable discussion among invited experts. These three workshops constitute the main activities in terms of expert exchange outside of the partner group.

Presentation of JA workshop and meetings below:

A. JA GeoStat meeting in Melbourne, April, 2015.

Data on geothermal energy is collected by various international organizations. These collections are based on questionnaires which are all different, although the objective is to collect the same data. Due to these differences the same data can be misunderstood, misinterpreted and give wrong signals. Therefore, a common ground is needed to enable the use and comparison of energy statistics, increase reliability, security and decrease fragmentation in line with the aim of these organizations, motions and regulations. Following are the proposed objectives with measurable indicators and how GeoStat can achieve these: 1. Participating countries aim at reducing the difference between industry and official statistics below a defined benchmark for year 2020. 2. GeoStat could facilitate by aiming at identifying the source of error in each case with dissemination and discussions on terminology and definitions and direct comparison of statistics for each nation. 3. Participating countries to aim at reducing duplication of efforts domestically. 4. Collaboration between entities on a domestic level having the following indicator: 5. Simplified process across organizations and reducing duplication of efforts with the following indicators The intention of GeoStat is to make the connections and starting the review process in cooperation with the partners, and to make the terminology clearer. GeoStat will write a short manual with terminology and definition already identified in this report, in particular for thermal capacity.

This involved informal meetings with several people who report geothermal statistics to IGA to introduce them to GeoStat, the structure and implementation of the project, and ask for their cooperation and input. Their response was overall positive and the conversations conveyed several issues and topics that had not been previously considered. The purpose of the GeoStat Joint Activity is to propose a solution to official energy statistics comparison where Geothermal is sometimes overlooked. GeoStat will facilitate by aiming at identifying the source of error in each case with dissemination and discussion on terminology and definition and direct comparison of statistics for each nation. The final goal is to reduce discrepancies and facilitate harmonization of geothermal energy statistics. No meeting list exists. Number of participants: 9;

- B. JA OpERA Workshop in Vaals, 1st - 2nd October, 2015. The OpERA Joint Activity is led by Netherlands and Germany. The OpERA working group brought together the national experts (Plant owners, project developers, researchers) to provide an overview of potential solutions like adapted materials in the geothermal installation, the use of inhibitors or optimized pipe geometries or well design. OpERA intends to provide a platform for technical knowledge exchange to solve Operational issues on a European base. As a first step towards the European knowledge exchange, OpERA organized a workshop on operational issues called "Operational Issues of Geothermal Installations in Europe". The workshop included a country overview on operational issues and specific sessions on "Scaling", "Corrosion", "Gas content" and Reinjection issues". Experts brought together expertise on both practical and theoretical issues of operating geothermal wells from all over Europe and discussed solved and unsolved issues, in sessions moderated by a renowned expert from the oil and gas industry and consider ways to enhance European progress. Number of participants: 37
- C. JA NWW (New Ways of Working) Workshop, Brussels, October 5th, 201. The theme of this workshop was "Financial Instruments and Funding of RD&D and Geothermal Projects – Barriers and Opportunities and Policy Recommendation". The first session was on R&D activities in the ERA-NET countries, national research funding needs, barriers, opportunities and policy recommendation. The second session was on projects in the ERA-NET countries, national project funding needs, barriers, opportunities and policy recommendation. Speakers gave presentation and after each session discussions among speakers and participants followed about priorities and next steps. The overall objective of Joint Activity "New Ways of Working" is to improve the synergies between different players in the field of geothermal utilization and

improved funding in R&D and project financing across national borders. It is also to strengthen European geothermal development for economic opportunities, energy security and mitigate climate change. Number of participants: 21

- D. JA New Concepts Workshop, Geneva, October 30th, 2015. The New Concept Joint Activity is a working group of the Geothermal ERA-NET on a mission to stimulate creative concepts for European innovators in geothermal utilization and technology. The group is looking at opportunities in direct utilization of low enthalpy geothermal energy such as geothermal heat and cool for smart cities, food production, and cosmetics. The theme of this workshop was “New and Innovative Applications of Geothermal Energy” and included overview on GEO innovative opportunities and pilot projects enhancing possibilities from small innovative ideas to large industry in Geothermal. There were 4 sessions where speakers from participating countries presented their topics, followed by discussion among participants at the end of each session. Participants got an introduction to Geo Innovative Opportunities (IEA Geothermal and Geothermal ERA-NET + New Concepts), EGS projects and direct use applications (new concepts – built environment and new concepts – other sectors) and innovative applications of geothermal direct use worldwide. After the four sessions there was a visionary panel discussion, conclusion and next steps followed by networking reception. Number of participants: 36
- E. JA PRGeo, Essen, November 11th, 2015. Geothermal energy is an important component of the future energy supply in Europe, offering a wide range of possible applications and having a great potential of development in many European countries. However, the advantages of using geothermal energy are little known, and media reports often spread information on its disadvantages making headlines. The lack of public acceptance for geothermal energy installations hampers the further development of geothermal energy in many countries. The origin of the sceptical view on geothermal energy varies from the lack of information on the technology to wrong conflict management from project owners e.g. in the case of induced earthquakes. As a result, political decision makers and potential investors have concerns about possible risks in implementing geothermal projects, and social resistance often results in significant slowdowns of projects. To make sure that geothermal energy can play its optimal role in Europe’s future energy supply, it is essential to address strategic groups of political decision makers, potential investors and the public to mitigate the possible concerns that may block an increased use of geothermal technologies. The basic task of public relations is to establish, strengthen or expand the contact between a client or employer and a defined stakeholder group. Number of participants: 6
- F. JA EGIP Expert Group work. Following a comprehensive work towards European Geothermal Information Platform called EGIP the Geothermal ERA NET consortium decided to form a special EGIP Expert group to recommend measures for implementation of EGIP with specific consider towards the INSPIRE directive. The group consists of five experts with extensive experience in handling and analysis data as well as being familiar to the work that has already taken place on EGIP within the Geothermal ERA NET. Already eleven teleconference meetings have taken place within the JA EGIP Expert Group and the Group will publish a report on its recommendations and considerations before the end of the ERA NET. Number of participants: 5

To run a traditional expert scheme was deemed to be unreasonable, but partners were encouraged to promote current exchange schemes, also by using the information on existing mobility and training programmes that were identified in previous reports of this work package.

Besides partner meetings where experts from the partnering countries were brought together, joint activities and workshops were organised with leading experts from Europe. Seven topics were selected to run as joint activities and three workshops conducted.

In fact, the network has given experts in the field of geothermal to meet and to exchange views. Even though a mobility scheme was not established this exchange of views between experts have led to a much more visibility of the geothermal sector in Europe.

4.1.3.5 The next phase of European collaboration – GEOTHERMICA

The GEOTHERMAL ERA-NET has provided a strong platform for continued collaboration among Europe's geothermal research and innovation program owners and managers. Four years of intensive exchange and collaboration on research policies, programming, funding instruments and frequent interpersonal exchange have enabled the formation of strong relationships among participants. So much so, that the Geothermal ERA NET member countries intend to move to a subsequent stage in coordination of national research and innovation programme. Building on joint activities and prioritization of trans-European common research and innovation topics and themes, and the continued support and facilitation of the European Commission to enhance and strengthen cooperation and coordination of national research and innovation programmes, a large number of GEOTHERMAL ERA NET countries and new European partners have teamed up to launch an ERA NET Cofund Action.

ERA NET Cofunds under Horizon 2020 support joint programming initiatives of European countries, in their preparation, establishment of networking structures, design, implementation and coordination of joint activities as well as Union topping-up of a trans-national call for proposals.

To this effect, 16 geothermal energy research and innovation programme owners and managers from 13 countries have come together and have formulated a plan to develop GEOTHERMICA as an ERA NET Cofund. GEOTHERMICA has been submitted in April 2016 to the European Commission for consideration as an official and sanctioned ERA-NET Cofund. Participating research and innovation program owners and managers hail from Belgium, Denmark, France, Germany, Iceland, Italy, the Netherlands, Portugal, Romania, Slovenia, Spain, Switzerland and Turkey.

Specifically, GEOTHERMICA aims to launch joint actions that demonstrate and validate novel concepts of geothermal energy utilization within the energy system and that identify paths to commerciality. Joint actions comprise joint calls and coordination activities, which will strengthen Europe's geothermal energy sector by building a tightly interconnected and well-coordinated network of European funding agents. For a first joint call, some EUR 30 million will be made available for a small number of major demonstration projects. Joint calls will have a strong industry participation with a targeted 50% contribution towards work programs and budgets of successful proposals. In addition to joint programming and joint calls, a number of additional activities will be undertaken to develop shared and deep knowledge, to promote operational excellence, to exchange good practices in the realm of support policies, and to define strategic recommendations related to long-lasting and durable joint pursuits of research and innovation.

Ultimately, a strong public sector will complement the research and innovation community as well as Europe's geothermal industry sector to build an overall strong European geothermal energy sector ready to contribute to the European Energy Union, the implementation of the SET Plan as specified by the SET Plan Roadmap.

4.1.4 The potential impact and the main dissemination activities and exploitation of results

The realization of the Geothermal ERA-NET, its objectives, work programme, approach and ambitions has led to the emergence of a new player in Europe's geothermal sector. Hitherto fragmented national program owners and managers of 10 European countries have assembled themselves and have learned to speak with

one single voice – loosely termed the “public authorities” (Figure 1Figure 8). Learning «how to speak with a single voice» has been the central theme during the final years of the Geothermal ERA-NETs.

The formal way: Besides the formation of a core group of representatives from national program owners and managers, the Geothermal ERA-NET has ventured into the establishment of a range of platforms in a formalized manner. The principal vehicle to advertise the presence of this concerted group of «public authorities» to the European geothermal sector was the establishment of Joint Activities that cover not only the way Geothermal ERA-NET countries operate and manage the technology maturation chain from the perspective of national program owners and managers (WPs 2, 3 and 4 as well as JA New Ways of Working). But also, the Geothermal ERA-NET has also established platforms that enable addressing major RDD&I themes which require the attention of the entire geothermal sector (e.g. JA EGIP, JA ReSus and JA Opera). Beyond that, the development of new themes regarding the utilization of geothermal energy has been at the core of the JA New Concepts. The Geothermal ERA-NET has also recognized that the benefits and impact of geothermal energy has been hampered by an uncoordinated approach of the IEA, EUSTAT and national data collection activities to gathering statistics related to geothermal energy supply, demand and uptake. JA GeoStat has been developed to increasingly harmonize the gathering and use of such statistics. Last, but not least, the public tolerance and acceptance of facilities and installations for the supply of energy, their construction and operation is increasingly limited unless good practices are followed – the sharing of such good practices has been the subject of JA PR-GEO.

The informal way: Prior to the establishment of the Geothermal ERA-NET the sole institutionalized and durable platform for dialogue has been the IEA’s Geothermal Technology Cooperation Program – which has only limited European participation yet a world-wide outreach and coverage. Now, with the Geothermal ERA-NET a dense European network has been established. Importantly, the Geothermal ERA-NET has been highly successful in establishing a Network of European program owners and managers. Communication paths have been established between national program owners and managers («who-is-who» and «who-does-what») and gateways have been built that enable an almost effortless communication. The Geothermal ERA-NET has enabled exchanges on geothermal policy instruments between Germany, the Netherlands, France and Switzerland have been enabled (e.g. joint workshops on exploration risk mitigation via geothermal guarantee programs, joint workshops on regulations regarding concessions, licences, work programs, regulatory oversight). Also joint evaluations of major research projects have been triggered by the establishment of the Geothermal ERA-NET, thus avoiding inconsistent funding decisions.

Member countries of the Geothermal ERA-NET have recognized that ambitions and achievements reflect the ambitions of their national energy policies as well as that of the European Commission expressed through the Energy Union, and the SET Plan Integrated Roadmap with its key actions.

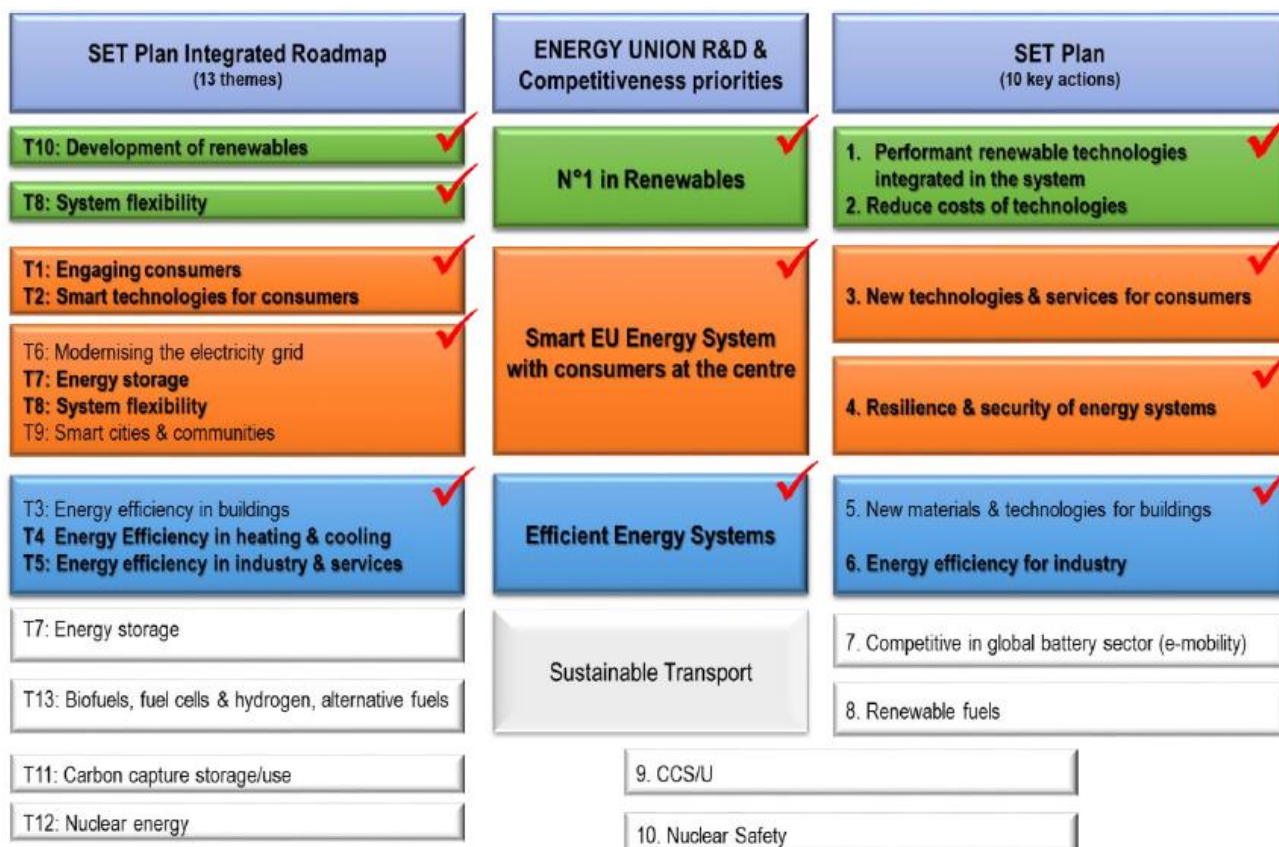


FIGURE 7 PRESENTS THE PROJECT STEPS BY LAYING THE GROUNDWORK FOR NATIONAL PROGRAM OWNERS AND MANAGERS TO JOINTLY CONTRIBUTE TO AN ENVIRONMENTALLY FRIENDLY, COMPETITIVE HEAT AND THE POWER TRANSITION, STRENGTHENS THE SECURITY OF SUPPLY AND A RESILIENT ENERGY SYSTEM, AND HELPS ACHIEVE THE AIMS OF SET PLAN AND ENERGY UNION.

The Geothermal ERA-NET has laid the groundwork for «public authorities» to build a strong pillar by identifying main technological themes (resources and reserves, geothermal reserves development, as well as utilization and operational excellence) will lead to a much more efficient allocation of resources and thus to substantial improvements of the sector's commercial value proposition. Major advances in crosscutting European approaches to sustainability, knowledge sharing, a strong and positive face to the wider public, and an effective policy, legal and regulatory framework will lead to a much stronger framework of Europe's geothermal sector while maintaining a strong outlook on the interdependence with and benefits to Europe's energy system.

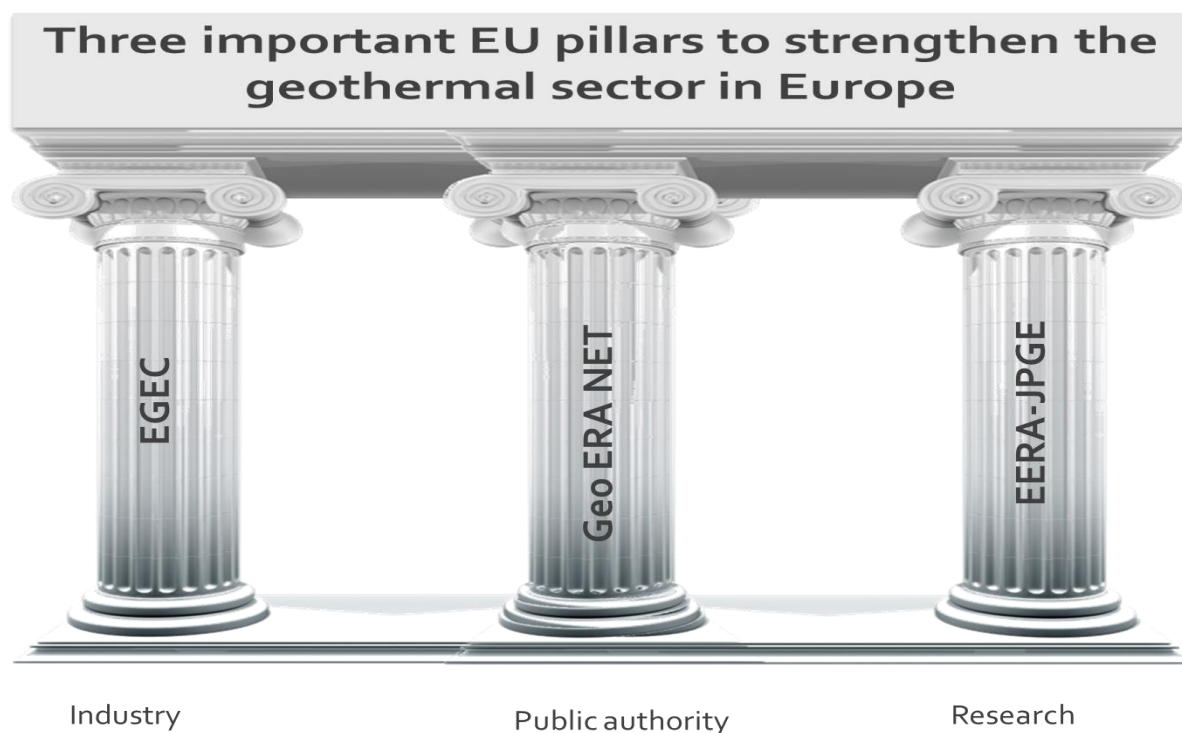


FIGURE 8. THE GEOTHERMAL ERA-NET PILLARS

The Geothermal ERA NET has for the beginning brought together owners of European national geothermal research and innovation programmes. By having learned how to work together, this platform will in future provide support to industry and Europe's research and innovation community. The former are represented by actors such as the European Geothermal Energy Council EGEC, and the European Technology and Innovation Platforms (ETIP) on Deep Geothermal, and Renewable Heating and Cooling, while the latter are organized in the European Energy Research Area's Joint Program on Geothermal Energy (EERA-JPGE) and other actors. There are of course many more players in each of the pillars (*Figure 8*).

The other pillars have noted the existence of the Geothermal ERA-NET. The Geothermal ERA-NET has a permanent representative in the ETIP on Deep Geothermal – a platform developed in the framework of the new integrated SET-Plan Communication which defines the EU's Research and Innovation strategy. It identifies actions based on system needs, adapts structures created under the original SET plan to ensure more effective interaction between stakeholders, and measures progress against established performance indicators. The European Commission has published with input from the Geothermal ERA-NET an «Issue Papers» which underlies a «Declaration of Intent» on how to progress the uptake and utilization of deep geothermal energy. The Declaration of Intent records the agreement reached between representatives of the European Commission services, representatives of the EU Member States, Iceland, Norway, Turkey and Switzerland, (i.e. the SET-Plan Steering Group).

The interaction between the research community and national program owners and managers is structured via formal and frequent exchanges with the European Energy Research Alliance's Joint Program on Geothermal Energy (EERA-JPGE).

Most importantly, however, the Geothermal ERA-NET has achieved the critical milestone of a continued formal collaboration of national program owners and managers. Four years of intensive exchange and

collaboration on research policies, programming, funding instruments and frequent interpersonal exchange have enabled the formation of strong relationships among participants. So much so, that the GEOTHERMAL ERA-NET member countries intend to move to a subsequent stage in coordination of national research and innovation programme. Building on joint activities and prioritization of trans-European common research and innovation topics and themes, and the continued support and facilitation of the European Commission to enhance and strengthen cooperation and coordination of national research and innovation programmes, a large number of GEOTHERMAL ERA-NET countries and new European partners have teamed up to launch an ERA NET Cofund Action.

ERA-NET Cofund Actions under Horizon 2020 support joint programming initiatives of European countries, in their preparation, establishment of networking structures, design, implementation and coordination of joint activities as well as Union topping-up of a trans-national call for proposals.

To this effect, 16 geothermal energy research and innovation programme owners and managers from 13 countries have come together and have formulated a plan to develop GEOTHERMICA as an ERA-NET Cofund Action. GEOTHERMICA has been submitted in April 2016 to the European Commission for consideration as an official and sanctioned ERA-NET Cofund Action and has received a positive endorsement. Pending the signature of the Grant and Consortium Agreements, GEOTHERMICA will be launched on 1 January 2017. Participating research and innovation program owners and managers hail from Belgium, Denmark, France, Germany, Iceland, Italy, the Netherlands, Portugal, Romania, Slovenia, Spain, Switzerland and Turkey. Hence the Geothermal ERA-NET has also achieved one of its major aims, which is to grow and onboard European program managers and owners – thus strengthening the ERA-NET role of a central pillar supporting Europe's geothermal sector.

Specifically, GEOTHERMICA aims to launch joint actions that demonstrate and validate novel concepts of geothermal energy utilization within the energy system and that identify paths to commerciality. Joint actions comprise joint calls and coordination activities, which will strengthen Europe's geothermal energy sector by building a tightly interconnected and well-coordinated network of European funding agents. For a first joint call, some EUR 30 million will be made available for a small number of major demonstration projects. Joint calls will have a strong industry participation with a targeted 50% contribution towards work programs and budgets of successful proposals. In addition to joint programming and joint calls, a number of additional activities will be undertaken to develop shared and deep knowledge, to promote operational excellence, to exchange good practices in the realm of support policies, and to define strategic recommendations related to long-lasting and durable joint pursuits of research and innovation.

Ultimately, a strong public sector will complement the research and innovation community as well as Europe's geothermal industry sector to build an overall strong European geothermal energy sector ready to contribute to the European Energy Union, the implementation of the SET Plan as specified by the SET Plan Roadmap.

4.1.4 The main dissemination activities and exploitation of results

During the project lifetime (April 2012 – October 2016), Geothermal ERA-NET conducted various dissemination activities aimed at promoting its research to the widest and varied audience possible. The dissemination and communication plan was planned at M1-M3 and placed on the project web. The coordination office provided information for dissemination activities by project partners by presenting information on the dissemination scheme of the project, the aim of those actions, the communication tools, and the activities for exchange of information.

Main dissemination tools and activities achieved during the project presented below:

- **Project website.** The website (www.geothermaleranet.eu) was made available on September 14, 2012 (month 3 of the project). It has been used as a dissemination channel, describing project activities and outcomes such as latest news, articles, presentations, reports. The domain name was registered for a period of 5 years and the website will be maintained at least 1 year after the project ends.

The numbers outcome:

- News items posted: 18,
- Publications shared with stakeholders: 114,
- Sessions: 3.000,
- Number of news per month: 1
- **Project EGIP: the website** (<http://egip.igg.cnr.it/>) available since 2013, has been used to build a platform working towards a European Geothermal Database was a target of the Geothermal ERA-NET proposal that led to the EGIP concept (European Geothermal Information Platform). The goal of EGIP is to facilitate the access to geothermal information at the European level. This will be an important step to structure the geothermal sector and help scientists, stakeholders, investors and geothermal developers. EGIP is envisaged as a Web tool gathering data and knowledge from national providers following the European INSPIRE directive (INSPIRE, 2007) to harmonize the geothermal sector at EU level and to improve INSPIRE contents. **Logo, presentations and deliverable templates:** A logo ([link](#)) was created in order to identity the project unique look. Templates for PowerPoint presentations and deliverables were created to ensure distinctive presentation to external audiences.
- **Newsletter:** A total of three Newsletters (<http://www.geothermaleranet.eu/publication/newsletters/>) were disseminated during the project period and emphasise project activities, outputs, upcoming events and other geothermal information. Newsletters was posted online and sent to the project partners
- **Press releases:** A total of 12 press releases were published during the project period to world news media, various geothermal energy related mailing lists and the project dissemination database
- **Project documents:**
 - Posters
 - Brochures
- **Publications:** the project released 2 proceedings for international conferences
- **Project workshops:** a total of 7 workshops were organized connected to the Joint Activities in last twelve months of the project (April 2015-January 2016). Workshop took place in Europe and one meeting in Australia during the WGC 2015

4.1.5 Address of the project public website and relevant contact detail

Geothermal ERA-NET www.geothermaleranet.eu

Contact: Grensásvegur 9, IS-108 Reykjavík | Phone: +354 569 6000 | Fax: +354 568 8896 | Email: os@os.is

TABLE 1 PROJECT CONSORTIUM INFORMATION

Parti no. *	Participant organisation name	Participant short name	Principal contact	Country
1	Orkustofnun (National Energy Authority)	OS	Guðni A. Jóhannesson	Iceland
2	Rijksdienst voor Ondernemend Nederland	RVO	Paul RAMSAK	The Netherlands
3	Federal Department of the Environment, Transport, Energy and Communication (DETEC)	SFOE	Gunter SIDDIQI	Switzerland
4	The National Research Council of Italy	CNR	Eugenio TRUMPY	Italy
5	Project Management Jülich	Jülich	Stephan SCHREIBER	Germany
6	ADEME - French Agency for Environment and Energy Management	ADEME	Philippe LAPLAIGE	France
7	Icelandic Centre for Research	RANNIS	Sigurdur BJÖRNSSON	Iceland
9	SCIENTIFIC AND TECHNOLOGICAL RESEARCH COUNCIL OF TURKEY	TUBITAK	MUZAFFER KAAN KARAÖZ	Turkey
10	Ministry of Education, Science, Research and Sport of the Slovak Republic	MESRS	Jana STADTRUCKEROVA	Slovakia
11	Hungarian Geological and Geophysical Institute	MFGI	Annamária NÁDOR	Hungary
12	Geological Survey of Slovenia	GeoZS	Andrej LAPANJE	Slovenia
13	Azores Electricity (EDA – Electricidade dos Açores)	EDA	Maria Matilde CUNHA	Azores, Portugal

4.2 Use and dissemination of foreground

4.2.1. Section A

4.2.1.1 Publications

TEMPLATE A1: LIST OF SCIENTIFIC (PEER REVIEWED) PUBLICATIONS, STARTING WITH THE MOST IMPORTANT ONES										
NO.	Title	Main author	Title of the periodical or the series	Number, date or frequency	Publisher	Place of publication	Year of publication	Relevant pages	Permanent identifiers ¹⁷ (if available)	Is/Will open access ¹⁸ provided to this publication?
1	Building a European geothermal information network using a distributed e-Infrastructure	Eugenio Trumphy, Gianpaolo Coro, Adele Manzella, Pasquale Pagano, Donatella Castelli, Philippe Calcagno, Annamaria Nador, Thorvaldur Bragasson, Sylvain Grellet & Gunter Siddiqi	International Journal of Digital Earth	Volume 9, 2016 - Issue 5	Taylor and Francis Inc.		2015		http://www.tandfonline.com/doi	Yes
2	International Collection of Geothermal Energy Statistics Towards reducing fragmentation and improving consistency	Jónas Ketilsson - Orkustofnun Tryggvi Sigurðsson - Orkustofnun Erna Rós Bragadóttir - Orkustofnun	JA Report		Orkustofnun		2015		http://www.geothermaleranet.is	Yes

¹⁷ A permanent identifier should be a persistent link to the published version full text if open access or abstract if article is pay per view) or to the final manuscript accepted for publication (link to article in repository).

¹⁸ Open Access is defined as free of charge access for anyone via Internet. Please answer "yes" if the open access to the publication is already established and also if the embargo period for open access is not yet over but you intend to establish open access afterwards.

3	Joint Activity Tuning EGIP for target users- Web survey results	E. Trumpy (CNR), C. Minnig (Swisstopo)Cooperation Team: P. Bragason (OS), P. Calcagno (BRGM), S. Grellet (BRGM), H.P. Ingolfsson (OS), H. R. Jamshidnia (OS), A. Nador (MFGI), A. Lapanje (GeoZS), A. Manzella (CNR), B. Petursson (OS)	JA Report		Orkustofnun		2016		http://www.geothermaleranet.is	Yes
4	Joint Activity New Concepts – New and Innovative Applications of Geothermal Energy	A.W. Stoklosa, G. Breembroek, P. Ramsak, H.P. Ingolfsson	JA Report		Orkustofnun		2016		http://www.geothermaleranet.is	Yes
5	Joint Activity OpERA - Operational issues in Geothermal Energy in Europe, Status and overview	Stephan Schreiber (Project Management Jülich); Andrej Lapanje (Geological Survey of Slovenia); Paul Ramsak and Gerdi Breembroek (Netherlands Enterprise Agency)	JA Report		Orkustofnun		2016		http://www.geothermaleranet.is	Yes
6	Joint Activity PRGeo - Workshop content and discussion results	Manuela RichterForschungszentrum Jülich; Projekträger Jülich	JA Report		Orkustofnun		2015		http://www.geothermaleranet.is	Yes
7	Joint Activity ReSuS - Survey results and next steps	Eugenio Trumpy, Adele Manzella, Philippe Calcagno, Simon Lopez	JA Report		Orkustofnun		2016		http://www.geothermaleranet.is	Yes
8	Joint Activity EGIP Expert Group Report	Philippe Calcagno, Thorvaldur Bragason, Christian Minnig, László Sörös, Eugenio Trumpy	JA Report		Orkustofnun		2015		http://www.geothermaleranet.is	Yes

9	European cooperation on geothermal research through the GEOTHERMAL ERA NET	Gudni A. Jóhannesson, Hjalti P. Ingólfsson, Gunter Siddiqi, Paul Ramsak, Gerdi Breembroek, Adela Manzella, Eugenio Trumpy, Stephan Schreiber, Baldur Pétursson, Alicja W. Stoklosa, Sigurdur Björnsson, Philippe Calcagno, Martino, Lacirignola, Andrej Lapanje, Annamaira Nador, Matilde Cunha, Jana Stadtruckerová, Kaan Karaoz	European Geothermal Congress 2016 Strasbourg, France, 19-24 Sept 2016		EGEC		2015		http://europeangeothermalcongr	Yes
10	International Cooperation on Geothermal Research Through the Geothermal ERA-NET	Guðni A JOHANNESSON, Hjalti Pall INGOLFSSON, Jonas KETILSSON, Baldur PÉTURSSON, Paul RAMSAK, Adele MANZELLA, Stephan K SCHREIBER, Gunter SIDDIQI, Sigurdur BJORNSSON	Proceedings World Geothermal Congress 2015 Melbourne, Australia, 19-25 April 2015		Stanford		2015		http://www.geothermaleranet.is	
11	Building a European geothermal information network using a distributed e-Infrastructure	Eugenio Trumpy, Gianpaolo Coro, Adele Manzella, Pasquale Pagano, Donatella Castelli, Philippe Calcagno, Annamaria Nador, Thorvaldur Bragasson, Sylvain	International Journal of Digital Earth	Volume 9, 2016 - Issue 5	Taylor and Francis Inc.		2015		http://www.tandfonline.com/doi	Yes

		Grellet & Gunter Siddiqi								
12	International Collection of Geothermal Energy Statistics Towards reducing fragmentation and improving consistency	Jónas Ketilsson - Orkustofnun Tryggvi Sigurðsson - Orkustofnun Erna Rós Bragadóttir - Orkustofnun	JA Report		Orkustofnun		2015		http://www.geothermalera.net	Yes

4.2.1.2 Dissemination activities

TEMPLATE A2: LIST OF DISSEMINATION ACTIVITIES

NO.	Type of activities ¹⁹	Main leader	Title	Date/Period	Place	Type of audience ²⁰	Size of audience	Countries addressed
1	Presentations	FEDERAL DEPARTMENT FOR ENVIRONMENT TRANSPORTS ENERGY AND COMMUNICATION	Geothermal ERA NET	4.9.2012	Renewable Heating & Cooling Technology Platform panel meeting, Burssels	Scientific community (higher education, Research) - Industry - Policy makers	50	wide range of European countries representing industry, research institutions and public administrat
2	Presentations	MINISTERIE VAN ECONOMISCHE ZAKEN, LANDBOUW EN INNOVATIE	Cooperation between European countries through the Geothermal ERA-	7.3.2013	Iceland Geothermal Conference, Conference Center	Scientific community (higher education,	600	International conference

¹⁹ A drop down list allows choosing the dissemination activity: publications, conferences, workshops, web, press releases, flyers, articles published in the popular press, videos, media briefings, presentations, exhibitions, thesis, interviews, films, TV clips, posters, Other.

²⁰ A drop down list allows choosing the type of public: Scientific Community (higher education, Research), Industry, Civil Society, Policy makers, Medias, Other ('multiple choices' is possible).

			NET		Harpa – Reykjavík, Iceland	Research) - Industry - Civil society - Policy makers - Medias		
3	Posters	ORKUSTOFNUN	Geothermal ERA NET	22.4.2013	4th European Conference on Renewable Heating & Cooling	Scientific community (higher education, Research) - Industry - Civil society - Policy makers - Medias	200	Whole Europe
4	Presentations	ORKUSTOFNUN	Cooperation between European countries through the Geothermal ERA-NET	23.4.2013	4th European Conference on Renewable Heating & Cooling, Dublin Ireland	Scientific community (higher education, Research) - Industry - Civil society - Policy makers - Medias	200	Whole Europe
5	Presentations	Ministry of Education, Science, Research and Sport	Cooperation within Geothermal ERA-NET	20.5.2013	Seminar on research infrastructures, JPI and ERA-NET, Warsaw Poland	Scientific community (higher education, Research) - Policy makers		Wide range of eastern European countries
6	Oral presentation to a scientific event	ORKUSTOFNUN	Keynote: Cooperation between European countries through the Geothermal ERA-NET	4.6.2013	European Geothermal Congress 3-7 June 2013, Pisa Italy	Scientific community (higher education, Research) - Industry - Civil society - Policy makers - Medias	500	At least 40 countries in Europe and overseas attended the congress and side events

7	Oral presentation to a scientific event	ORKUSTOFNUN	Cooperation between European countries through the Geothermal ERA-NET	4.6.2013	Global Atlas IRENA expert meeting, Pisa, Italy	Scientific community (higher education, Research) - Industry - Policy makers	50	IRENA countries
8	Oral presentation to a scientific event	MINISTERIE VAN ECONOMISCHE ZAKEN, LANDBOUW EN INNOVATIE	Korea-EU R&D Forum	25.6.2013	Thon Hotel, Wetstraat 75, Brussels	Policy makers		Korea and EU countries
9	Oral presentation to a wider public	ORKUSTOFNUN	Geothermal in Iceland	4.3.2015	GeoTherm Offenburg	Scientific community (higher education, Research) - Industry - Civil society - Policy makers - Medias	500	European
10	Oral presentation to a wider public	MINISTERIE VAN ECONOMISCHE ZAKEN	Cooperation between European countries through the Geothermal ERA NET	6.4.2015	European Technology and Innovation Platform (ETIP) on Deep Geothermal constitutional Meeting	Scientific community (higher education, Research) - Industry - Civil society - Policy makers	50	European
11	Oral presentation to a scientific event	ORKUSTOFNUN	International Cooperation on Geothermal Research Through the Geothermal ERA-NET	19.4.2015	WGC2015 Melbourne, Australia	Scientific community (higher education, Research) - Industry - Policy makers	2500	International Congress

12	Organisation of Workshops	ORKUSTOFNUN	JA GeoStat	24.4.2015	WGC2015 Melbourne, Australia	Industry - Civil society - Policy makers	10	International Congress
13	Organisation of Workshops	MINISTERIE VAN ECONOMISCHE ZAKEN	JA OpERA Operational Issues	1.10.2015	Vaals The Netherlands	Scientific community (higher education, Research) - Industry - Policy makers	37	European
14	Organisation of Workshops	ORKUSTOFNUN	JA NWW New Ways of Working	5.10.2015	Brussel Belgium	Scientific community (higher education, Research) - Industry - Civil society - Policy makers	21	European
15	Organisation of Workshops	ORKUSTOFNUN	JA New Concepts	31.10.2015	Geneve, Swiss	Scientific community (higher education, Research) - Industry - Civil society	36	European
16	Organisation of Workshops	FORSCHUNGSZENTRUM JUELICH GMBH	JA PRGeo- Public Relations	11.11.2015	Essen Germany	Industry - Policy makers - Medias	6	European
17	Organisation of Workshops	MINISTERIE VAN ECONOMISCHE ZAKEN	Knowledge exchange on geothermal energy the Netherlands & Slovenia	19.2.2016	Ministry for Infrastructure of Republic of Slovenia	Policy makers	20	Slovenia, Netherlands

18	Oral presentation to a scientific event	ORKUSTOFNUN	European cooperation on geothermal research through the GEOTHERMAL ERA NET	19.9.2016	EGC Geothermal Workshop, Strasbourg France	Scientific community (higher education, Research) - Industry - Policy makers	800	International Congress
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4.3 Report on societal implications

Replies to the following questions will assist the Commission to obtain statistics and indicators on societal and socio-economic issues addressed by projects. The questions are arranged in a number of key themes. As well as producing certain statistics, the replies will also help identify those projects that have shown a real engagement with wider societal issues, and thereby identify interesting approaches to these issues and best practices. The replies for individual projects will not be made public.

A General Information <i>(completed automatically when Grant Agreement number is entered.</i>	
Grant Agreement Number:	
Title of Project:	
Name and Title of Coordinator:	
B Ethics	
1. Did your project undergo an Ethics Review (and/or Screening)? If Yes: have you described the progress of compliance with the relevant Ethics Review/Screening Requirements in the frame of the periodic/final project reports? Special Reminder: the progress of compliance with the Ethics Review/Screening Requirements should be described in the Period/Final Project Reports under the Section 3.2.2 'Work Progress and Achievements'	No
2. Please indicate whether your project involved any of the following issues (tick box) :	
RESEARCH ON HUMANS	
• Did the project involve children?	No
• Did the project involve patients?	No
• Did the project involve persons not able to give consent?	No
• Did the project involve adult healthy volunteers?	No
• Did the project involve Human genetic material?	No
• Did the project involve Human biological samples?	No

• Did the project involve Human data collection?	No
RESEARCH ON HUMAN EMBRYO/FOETUS	
• Did the project involve Human Embryos?	No
• Did the project involve Human Foetal Tissue / Cells?	No
• Did the project involve Human Embryonic Stem Cells (hESCs)?	No
• Did the project on human Embryonic Stem Cells involve cells in culture?	No
• Did the project on human Embryonic Stem Cells involve the derivation of cells from Embryos?	No
PRIVACY	
• Did the project involve processing of genetic information or personal data (eg. health, sexual lifestyle, ethnicity, political opinion, religious or philosophical conviction)?	No
• Did the project involve tracking the location or observation of people?	No
RESEARCH ON ANIMALS	
• Did the project involve research on animals?	No
• Were those animals transgenic small laboratory animals?	No
• Were those animals transgenic farm animals?	No
• Were those animals cloned farm animals?	No
• Were those animals non-human primates?	No
RESEARCH INVOLVING DEVELOPING COUNTRIES	
• Did the project involve the use of local resources (genetic, animal, plant etc)?	No
• Was the project of benefit to local community (capacity building, access to healthcare, education 3etc)?	No
DUAL USE	
• Research having direct military use	No
• Research having the potential for terrorist abuse	No

C Workforce Statistics

3. Workforce statistics for the project: Please indicate in the table below the number of people who worked on the project (on a headcount basis).

Type of Position	Number of Women	Number of Men
Scientific Coordinator		2
Work package leaders	1	6
Experienced researchers (i.e. PhD holders)	4	10

PhD Students	0	0
Other	3	5
4. How many additional researchers (in companies and universities) were recruited specifically for this project?	3	
Of which, indicate the number of men:	2	

D Gender Aspects

5. Did you carry out specific Gender Equality Actions under the project?	☐	Yes
	☒	No

6. Which of the following actions did you carry out and how effective were they?

	Not at all effective	Very effective
☐ Design and implement an equal opportunity policy	☐ ☐ ☐ ☐ ☐	
☐ Set targets to achieve a gender balance in the workforce	☐ ☐ ☐ ☐ ☐	
☐ Organise conferences and workshops on gender	☐ ☐ ☐ ☐ ☐	
☐ Actions to improve work-life balance	☐ ☐ ☐ ☐ ☐	
☐ Other:		

7. Was there a gender dimension associated with the research content – i.e. wherever people were the focus of the research as, for example, consumers, users, patients or in trials, was the issue of gender considered and addressed?

☐ Yes- please specify

☒ No

E Synergies with Science Education

8. Did your project involve working with students and/or school pupils (e.g. open days, participation in science festivals and events, prizes/competitions or joint projects)?

☐ Yes- please specify

☒ No

9. Did the project generate any science education material (e.g. kits, websites, explanatory booklets, DVDs)?

☐ Yes- please specify

☒ No

F Interdisciplinarity

10. Which disciplines (see list below) are involved in your project?

☐ Main discipline²¹: Energy

☐ Associated discipline²¹:

Research and Innovation

☐

Associated discipline²¹:

Regional Policy

G Engaging with Civil society and policy makers

11a Did your project engage with societal actors beyond the research community? (if 'No', go to Question 14)

☐

Yes

☒

No

11b If yes, did you engage with citizens (citizens' panels / juries) or organised civil society (NGOs, patients' groups etc.)?

☐ No

☐ Yes- in determining what research should be performed

☐ Yes - in implementing the research

☐ Yes, in communicating /disseminating / using the results of the project

11c In doing so, did your project involve actors whose role is mainly to organise the dialogue with citizens and organised civil society (e.g. professional mediator; communication company, science museums)?

☐

Yes

☐

No

12. Did you engage with government / public bodies or policy makers (including international organisations)

☐ No

☐ Yes- in framing the research agenda

☐ Yes - in implementing the research agenda

☐ Yes, in communicating /disseminating / using the results of the project

13a Will the project generate outputs (expertise or scientific advice) which could be used by policy makers?

☐ Yes – as a **primary** objective (please indicate areas below- multiple answers possible)

☐ Yes – as a **secondary** objective (please indicate areas below - multiple answer possible)

☐ No

13b If Yes, in which fields?

²¹ Insert number from list below (Frascati Manual).

Agriculture		Energy		Human rights	
Audiovisual and Media		Enlargement		Information Society	
Budget		Enterprise		Institutional affairs	
Competition		Environment		Internal Market	
Consumers		External Relations		Justice, freedom and security	
Culture		External Trade		Public Health	
Customs		Fisheries and Maritime Affairs		Regional Policy	
Development Economic and		Food Safety		Research and Innovation	
Monetary Affairs		Foreign and Security Policy		Space	
Education, Training, Youth		Fraud		Taxation	
Employment and Social Affairs		Humanitarian aid		Transport	

13c If Yes, at which level?

- ☐ Local / regional levels
- ☐ National level
- ☐ European level
- ☐ International level

H Use and dissemination

14. How many Articles were published/accepted for publication in peer-reviewed journals? **10**

To how many of these is open access²² provided? **9**

How many of these are published in open access journals? **7**

How many of these are published in open repositories? **7**

To how many of these is open access not provided? **0**

Please check all applicable reasons for not providing open access:

- ☐ publisher's licensing agreement would not permit publishing in a repository
- ☐ no suitable repository available
- ☐ no suitable open access journal available
- ☐ no funds available to publish in an open access journal
- ☐ lack of time and resources
- ☐ lack of information on open access
- ☐ other²³:

15. How many new patent applications ('priority filings') have been made? **0**
("Technologically unique": multiple applications for the same invention in different jurisdictions should be counted as just one application of grant).

16. Indicate how many of the following Intellectual Property Rights were applied for (give number in each box).	Trademark	0
	Registered design	0
	Other	0

17. How many spin-off companies were created / are planned as a direct result of the project? **0**

²² Open Access is defined as free of charge access for anyone via Internet.

²³ For instance: classification for security project.

Indicate the approximate number of additional jobs in these companies:		0		
18. Please indicate whether your project has a potential impact on employment, in comparison with the situation before your project: <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top; border-right: 1px solid black; padding: 5px;"> ☐ Increase in employment, or ☐ Safeguard employment, or ☐ Decrease in employment, ☒ Difficult to estimate / not possible to quantify </td> <td style="width: 50%; vertical-align: top; padding: 5px;"> ☐ In small & medium-sized enterprises ☐ In large companies ☐ None of the above / not relevant to the project </td> </tr> </table>			☐ Increase in employment, or ☐ Safeguard employment, or ☐ Decrease in employment, ☒ Difficult to estimate / not possible to quantify	☐ In small & medium-sized enterprises ☐ In large companies ☐ None of the above / not relevant to the project
☐ Increase in employment, or ☐ Safeguard employment, or ☐ Decrease in employment, ☒ Difficult to estimate / not possible to quantify	☐ In small & medium-sized enterprises ☐ In large companies ☐ None of the above / not relevant to the project			
19. For your project partnership please estimate the employment effect resulting directly from your participation in Full Time Equivalent (FTE = one person working fulltime for a year) jobs: Difficult to estimate / not possible to quantify		Indicate figure: ☒		
I Media and Communication to the general public				
20. As part of the project, were any of the beneficiaries professionals in communication or media relations? ☐ Yes ☒ No				
21. As part of the project, have any beneficiaries received professional media / communication training / advice to improve communication with the general public? ☐ Yes ☒ No				
22 Which of the following have been used to communicate information about your project to the general public, or have resulted from your project? <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top; border-right: 1px solid black; padding: 5px;"> ☒ Press Release ☒ Media briefing ☐ TV coverage / report ☐ Radio coverage / report ☒ Brochures / posters / flyers ☐ DVD /Film /Multimedia </td> <td style="width: 50%; vertical-align: top; padding: 5px;"> ☒ Coverage in specialist press ☒ Coverage in general (non-specialist) press ☒ Coverage in national press ☒ Coverage in international press ☒ Website for the general public / internet ☒ Event targeting general public (festival, conference, exhibition, science café) </td> </tr> </table>			☒ Press Release ☒ Media briefing ☐ TV coverage / report ☐ Radio coverage / report ☒ Brochures / posters / flyers ☐ DVD /Film /Multimedia	☒ Coverage in specialist press ☒ Coverage in general (non-specialist) press ☒ Coverage in national press ☒ Coverage in international press ☒ Website for the general public / internet ☒ Event targeting general public (festival, conference, exhibition, science café)
☒ Press Release ☒ Media briefing ☐ TV coverage / report ☐ Radio coverage / report ☒ Brochures / posters / flyers ☐ DVD /Film /Multimedia	☒ Coverage in specialist press ☒ Coverage in general (non-specialist) press ☒ Coverage in national press ☒ Coverage in international press ☒ Website for the general public / internet ☒ Event targeting general public (festival, conference, exhibition, science café)			
23 In which languages are the information products for the general public produced? <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top; border-right: 1px solid black; padding: 5px;"> ☐ Language of the coordinator ☐ Other language(s) </td> <td style="width: 50%; vertical-align: top; padding: 5px;"> ☒ English </td> </tr> </table>			☐ Language of the coordinator ☐ Other language(s)	☒ English
☐ Language of the coordinator ☐ Other language(s)	☒ English			

Question F-10: Classification of Scientific Disciplines according to the Frascati Manual 2002 (Proposed Standard Practice for Surveys on Research and Experimental Development, OECD 2002):

FIELDS OF SCIENCE AND TECHNOLOGY

1. NATURAL SCIENCES

- 1.1 Mathematics and computer sciences [mathematics and other allied fields: computer sciences and other allied subjects (software development only; hardware development should be classified in the engineering fields)]
- 1.2 Physical sciences (astronomy and space sciences, physics and other allied subjects)
- 1.3 Chemical sciences (chemistry, other allied subjects)
- 1.4 Earth and related environmental sciences (geology, geophysics, mineralogy, physical geography and other geosciences, meteorology and other atmospheric sciences including climatic research, oceanography, vulcanology, palaeoecology, other allied sciences)
- 1.5 Biological sciences (biology, botany, bacteriology, microbiology, zoology, entomology, genetics, biochemistry, biophysics, other allied sciences, excluding clinical and veterinary sciences)

2 ENGINEERING AND TECHNOLOGY

- 2.1 Civil engineering (architecture engineering, building science and engineering, construction engineering, municipal and structural engineering and other allied subjects)
- 2.2 Electrical engineering, electronics [electrical engineering, electronics, communication engineering and systems, computer engineering (hardware only) and other allied subjects]
- 2.3. Other engineering sciences (such as chemical, aeronautical and space, mechanical, metallurgical and materials engineering, and their specialised subdivisions; forest products; applied sciences such as geodesy, industrial chemistry, etc.; the science and technology of food production; specialised technologies of interdisciplinary fields, e.g. systems analysis, metallurgy, mining, textile technology and other applied subjects)

3. MEDICAL SCIENCES

- 3.1 Basic medicine (anatomy, cytology, physiology, genetics, pharmacy, pharmacology, toxicology, immunology and immunohaematology, clinical chemistry, clinical microbiology, pathology)
- 3.2 Clinical medicine (anaesthesiology, paediatrics, obstetrics and gynaecology, internal medicine, surgery, dentistry, neurology, psychiatry, radiology, therapeutics, otorhinolaryngology, ophthalmology)
- 3.3 Health sciences (public health services, social medicine, hygiene, nursing, epidemiology)

4. AGRICULTURAL SCIENCES

4.1 Agriculture, forestry, fisheries and allied sciences (agronomy, animal husbandry, fisheries, forestry, horticulture, other allied subjects)

4.2 Veterinary medicine

5. SOCIAL SCIENCES

5.1 Psychology

5.2 Economics

5.3 Educational sciences (education and training and other allied subjects)

5.4 Other social sciences [anthropology (social and cultural) and ethnology, demography, geography (human, economic and social), town and country planning, management, law, linguistics, political sciences, sociology, organisation and methods, miscellaneous social sciences and interdisciplinary , methodological and historical S1T activities relating to subjects in this group. Physical anthropology, physical geography and psychophysiology should normally be classified with the natural sciences].

6. HUMANITIES

6.1 History (history, prehistory and history, together with auxiliary historical disciplines such as archaeology, numismatics, palaeography, genealogy, etc.)

6.2 Languages and literature (ancient and modern)

6.3 Other humanities [philosophy (including the history of science and technology) arts, history of art, art criticism, painting, sculpture, musicology, dramatic art excluding artistic "research" of any kind, religion, theology, other fields and subjects pertaining to the humanities, methodological, historical and other S1T activities relating to the subjects in this group]



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2