



www.geothermaleranet.is

EDITORIAL

by Guðni A Jóhannesson, Coordinator



Post ERA NET possibilities

It is now 3 fruitful years since the birth of the Geothermal ERA NET program in 2012. Important milestones have been reached, and various activities have taken place, e.g. several working groups and reports evaluating different aspects of the geothermal sector as a step towards policy recommendation

and implementation of joint activities. The focus of our work has been among other on following elements.

- Exchange information on the status of geothermal energy.
- Lay groundwork to create a European Geothermal Information Platform.
- Highlight barriers and recommend practical solutions.
- Communicate with principal stakeholders and enhance public awareness on the added value and benefits of geothermal scientific and policy issues.
- Increase transnational collaboration in research training and mobility.

The program is one of the three important EU pillars to strengthen geothermal sector and its development. It will provide various opportunities and future joint activities in terms of development of geothermal energy and cooperation between partners at pan-European level.

One important element of the Geothermal ERA NET is to link together the geothermal industry pillar, the research pillar and the policy pillar by increasing cooperation and consultation between those pillars and stakeholders to strengthen geothermal assessment and policy recommendation. ERA NET vision is to minimize the fragmentation of geothermal research, build on European know-how and know-who to utilize geothermal energy and to framework large opportunities in the utilization of geothermal energy through **Joint Activities (JAs)**.

Viable development areas

Direct use for space heating and cooling

The European low enthalpy geothermal sources that are widely found are suitable for space heating and cooling, and have high potential for replacing gas. The space cooling can be accomplished through adsorption cooling locally or distributed by district cooling networks.

High enthalpy resources

The Geothermal ERA NET will focus on the utilization of geothermal energy, from direct heating use up to higher enthalpy resources and their corresponding use. To ensure appropriate linkages to related R&D activities (renewable heating and cooling via ground storage heat pumps, power distribution and transmission) the interface with related ERA NETs and SmartGrids, was enhanced to avoid overlap.

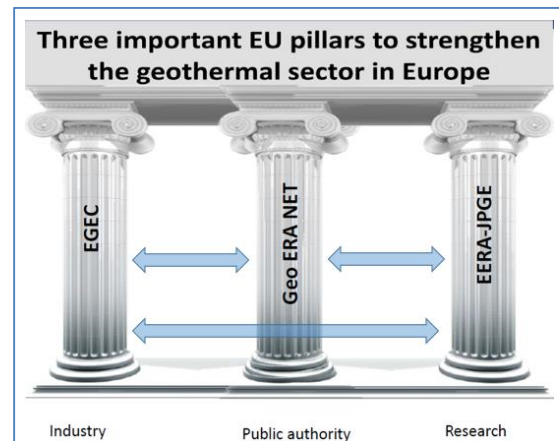
The Geothermal ERA Net is supported by the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 291866

Multiple revenue streams

Even if the utilisation of geothermal energy has been primarily developed for electricity generation and space heating, it also provides opportunities for low end use of the energy for balneology, aquacultures, horticultures food processing and advanced chemistry.

Other issues

The importance of the geothermal sector is increasing in Europe and as it seems that the gas crisis in Europe is indeed heating crisis as the natural gas consumed in EU is mainly used for heating purposes.



The issues of energy security and mitigation of climate change are also closely related. It is therefore important to formulate a strategy to promote a switch, including in district heating from gas towards renewable energy sources like geothermal. ERA NET cooperation has been focusing on highlighting barriers and recommending practical solutions, regarding various fields like, technology, additional financing and risk, economic benefits, transnational collaboration and public awareness, etc.

Portugal (Azores), Slovenia and Hungary have become 3 additional members since the start of ERA NET. A few others additional countries have also asked for a membership indicating increasing interest from countries to expand and continue cooperation, indicating a growing demand for ERA NET activities.

Geothermal resources can mainly be harnessed by various ways, e.g. shallow geothermal (mainly GSHP), deep geothermal resources (direct heat) and geothermal power capacity, and there is a great additional potential for growth. The sector can contribute significantly by various ways, towards energy security, economic opportunities and mitigate climate change by more coordinating policy formulation and implementation, based on increasing cooperation between various stakeholders and public authorities. The cooperation between European countries through ERA NET provides therefore a unique and integrated opportunities to further develop and promote utilization of geothermal energy in Europe.

GEOHERMAL NEWS

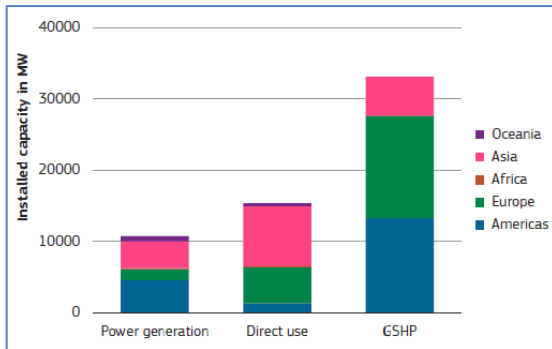
Based on a recent release (2015) of the **2014 JRC Geothermal Energy Status Report**, from the European Commission, geothermal power and heat installations draw their energy from resources of variable depths and temperatures and no general consensus has been agreed on how to classify geothermal heat sources and production. However, when reporting on production values, the following classification according to [Antics et al. 2013] and Directive 2009/28/EC [EC 2009a] which has been adopted by Eurostat and national statistics offices, was used:

- Power generation
- Direct use
- Ground source heat pumps (GSHP)

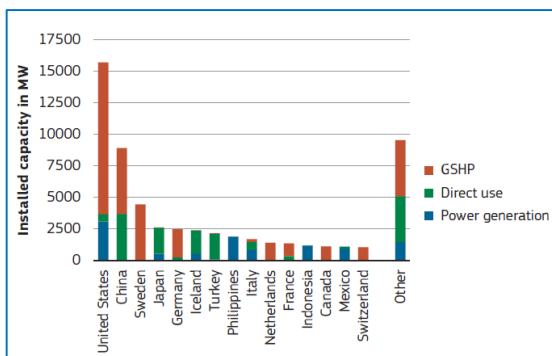
Global GSHP market growth, driven by rising electricity and oil prices.

The report among others analyses global trend in above these three groups of the geothermal sector. The biggest markets for geothermal energy are in America, Europe and Asia and the installed capacity for GSHP is greatest, followed by direct use and power generation.

Geothermal Global Installed Capacity, 2010 for Power Generation, Direct use and GSHP



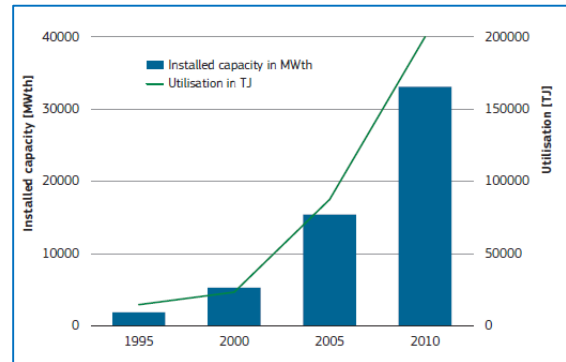
Geothermal Installed Capacity by Countries, 2010 for Power Generation, Direct use and GSHP



It is notable that some countries show significant shares for GSHP while others dominate power generation. Highest total installed capacity of geothermal energy is in the United States, followed by China, and Sweden.

The data from the report, shows that installed capacity for ground source heat pumps by far exceeds installed capacity for power generation and direct use. However, it is stated that statistical data do not report the use of ground source heat pumps (shallow geothermal energy). Irregularly, they are subsumed under direct use. It is also interesting that both global installed capacity for GSHP and use, show a dramatic increase. In 2010, installed capacity was more than two times higher than 2005 about 18 times higher compared to 1995 and utilisation increased by 1200 % between 1995

Geothermal Installed Capacity for GSHP 1995 - 2010



and 2010. The global geothermal heat pumps market is expected to have a 13.1% compound annual growth rate (CAGR) from 2014 to 2020, reaching \$130.5 (c. €119.) billion by the end of 2020, says the new market research report from Transparency Market Research. (Sources: the 2014 JRC Geothermal Energy Status Report). https://ec.europa.eu/jrc/sites/default/files/jrc_geothermal_report_final.pdf

EC launches funds for sustainable energy

"From 2014-2020 more than €38 billion of Cohesion Policy funding will be invested in achieving the Energy Union strategy and boosting the shift towards a low carbon economy in all sectors – this represents more than a doubling of funding compared to the previous period," said Corina Crețu, European Commissioner for Regional Policy.

<http://egec.info/egec-newsletter-may-2015/>

Next SET-Plan Conference September 2015

The 8th SET Plan conference will take place on 21-22 September 2015 at the European Convention Centre Luxembourg, during the Luxembourg's Presidency of the European Union Council. It will represent a unique forum to exchange information on new developments in the SET-Plan in response to the great energy challenges ahead of the European Union.

Scotland investment on geothermal energy

Geothermal Energy Challenge Fund launched by Energy Minister Fergus Ewing in March 2015 provides £250,000 to unlock Scotland's geothermal potential to support research into exploring Scotland's geothermal capacity to meet the energy needs of local communities.

Plasma drilling in Slovakia - PLASMABIT

Plasmabit technology which has been developing by GA Drilling headquartered in Bratislava, Slovakia is based on high-energy electric plasma. The PLASMABIT technology enables to drill at a constant higher speed, without any need to change a drilling bit on regular basis, which much less cost of the operations.

<http://www.gadrilling.com/>

France launches GEODEEP Fund

In March 2015, France announced the creation of GEODEEP, a new 50-million Euro risk insurance fund dedicated to deep geothermal energy. The fund aims to protect project operators against the geological risk faced during the exploration and exploitation phases.

<http://egec.info/page/2/>

World Geothermal Congress (WGC) News

The world Geothermal Congress took place in 19-24 April 2015 in Melbourne, Australia. It is reported that the direct use of geothermal has seen a massive 45% growth since 2010, with installed capacity now reaching 70,330 MWth across 82 countries. The utilization of geothermal energy for direct use of heat has helped

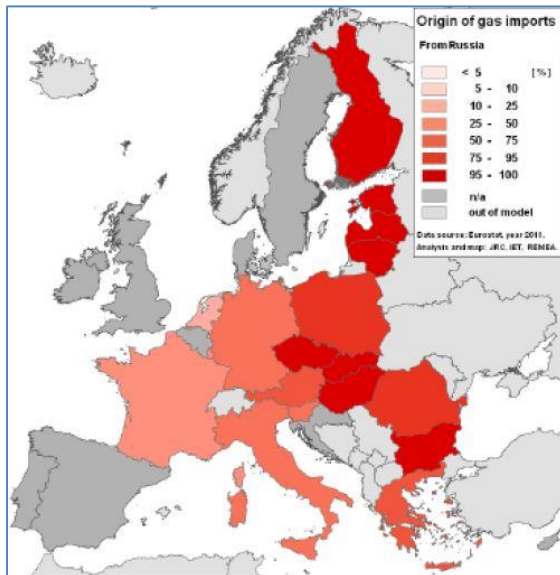
prevent emissions of 148 million tonnes of CO2 annually. More than half of the direct use globally comes from Ground Source Heat Pumps (GSHP), with balneology accounting for 20% and space heating for 15% (89% of this is used for district heating). There has been a major increase in number of countries making use of GSHP, from 26 in 2010, to 48 in 2014; the leading countries in terms of installed capacity are, in descending order, the USA, China, Sweden, Germany, and France. This has also helped create employment, with 34,000 person years now spent in 52 countries annually. Source: wgc2015.com.au/

Fuel Switch to Renewables in the Heating and Electricity Sector – EGEC Report

In April 2015, EGEC released a new report “Fuel Switch to Renewables in the Heating and Electricity Sector” on an action plan for a Resilient Energy Union with a Forward-Looking Climate Change Policy. In the paper, the European Geothermal Energy Council (EGEC) puts forward its key recommendations for the structural reforms needed to improve security of supply, namely through fuel switch in the heating and electricity sectors.

In the report it is stated that dependency on imported natural gas varies across the EU (see enclosed picture). “The picture is particularly serious in 12 Member States, which have more than 50% of their total gas supplies coming from Russia. On the contrary, countries such as Sweden and Denmark are more resilient from external shocks. This is due to the structural reforms, including strong support to renewables, undertaken following the oil shocks in the 1970s. The most vulnerable Member States should follow this example. Otherwise, their imports will continue to rise dramatically with yet

Gas imports from Russia to EU in 2011.



unknown negative political and economic implications.” In the report it is also stated that “for a resilient Energy Union the EU must therefore have a clear political objective to promptly replace its natural gas consumption with local renewable energy. Moderating energy demand will help, but cannot solve alone such a long-standing structural problem”.

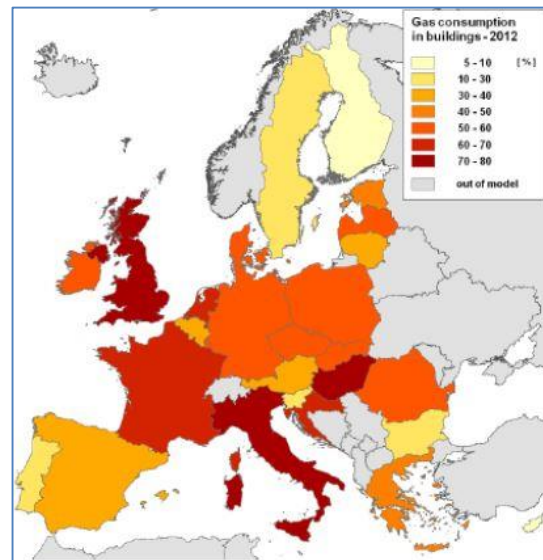
Today’s gas crisis is a heating crisis

In the report it is estimated that “EU gas imports from Russia are mostly used to cover its extensive heating demand which accounts for almost 50% of its final energy consumption. Across all economic sectors, natural gas consumed in the EU is mainly used for heating purposes. For instance, 40% of the natural gas consumed in the EU is used in residential and tertiary

buildings mainly for space heating and domestic hot water. The EU’s building sector consumes up to 61% of all net imported gas. Significantly, those Member States most dependent on Russian gas imports, consume more than 40% of their gas in buildings, reaching up to 79% in Hungary. EGEC <http://egec.info/wpcontent/uploads/2015/04/EGEC-Action-Plan-Fuel-Switch.pdf>

In the report it is also stated that “**The gas crisis that the EU faces today is therefore mainly a heating crisis.** Also, 25% of the natural gas is used by industries in order to provide steam and heat needed in their production process. In comparison, power generation solely accounts for 31% of natural gas consumption in the EU. **All in all, three quarters of natural gas in the EU is being used for heat.**”

Gas consumption in residential buildings in 2012



The EGEC report gives several recommendation e.g.

- Renewables for heating and cooling and flexible renewable electricity generation must be a pillar of the EU’s energy security strategy and of the Energy Union.
- EU’s large gas imports are mainly used to cover its extensive heat demand in the building and industry sectors. The EU heat supply also relies on oil and coal making it unsustainable and even more dependent on imports of fossil fuels.
- In the heat sector it is crucial to collect and update regularly reliable statistics on and distinguish between energy sources, enablers, and end-users. This would enable informed decision making.
- It is crucial to mobilise existing Structural and Investment Funds as well as the new European Fund for Strategic Investments to finance RES heating and cooling and flexible renewable electricity generation. Financing tools must include risk capital, guarantees and grants.
- Implementation of existing legislation is essential. Member States must notably launch large national information campaigns to increase awareness of citizens and facilitate access to information regarding suppliers and installers.
- In order to overcome the main barrier for the development of deep geothermal energy, i.e. the geological risk, public risk insurances in the form of repayable grants in emerging geothermal markets to public-private funds in more mature markets are attractive support schemes. The idea of a pan-European risk mitigation fund should be further explored.

PROGRAM NEWS

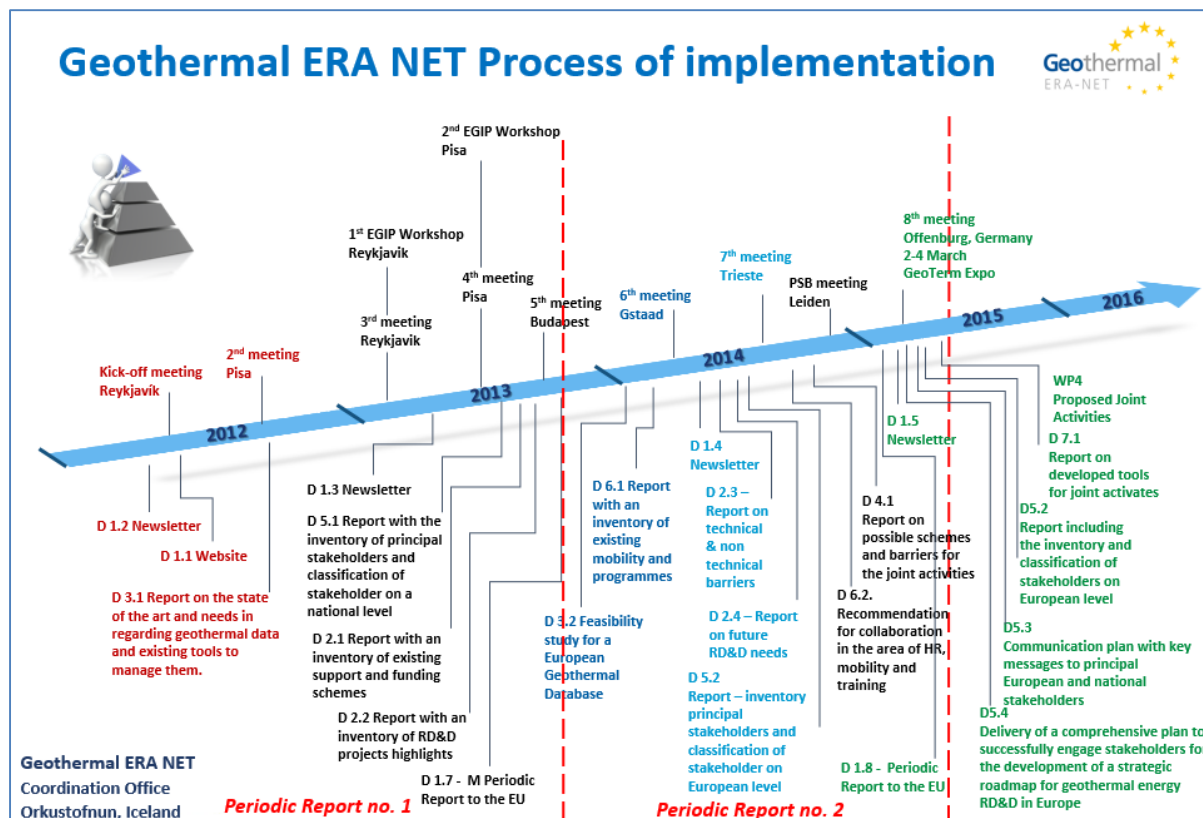
Achievements and progress

The first 36 months since the birth of the Geothermal ERA-NET in 2012, the focus has been on exchanging information on the status of geothermal energy utilization, e.g. national support schemes and research, development and deployment (RD&D) activities and the creation of an inventory report on these activities.

In this period - months 18–36, four meetings with workshops have been held in Gstaad (March, 2014), Trieste (September, 2014), Leiden (November, 2014) and Offenburg (March 2015). Additionally the several telephone conferences have been executed between partners and leaders on different programme issues.

which coordinates strong, commonly agreed on framework and joint funding scheme. This will be consistent with applicable national legal rules and regulations. However, there has been also indicated possible barriers for the joint activities 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.

Even though barriers can appear, main goal for Joint Activities have been set: 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



Efforts have been put on development and execution of Joint Activities. Due to different structures and topics of national researcher programmes, common objectives and interests have been defined between ERA- NET partners.

The Geothermal ERA-NET Work Packages

The Geothermal ERA-NET Work Packages program are split into 7 Work Packages:

WP1. Coordination and Management

WP2. Information exchange on National incentives and status on geothermal energy

WP3. Towards a European Geothermal Database

WP4. Development of Joint Activities

WP5. Coordination with Stakeholders

WP6. Transnational Mobility and Training

WP7. Implementation of Joint Activities

See more information <http://www.geothermaleranet.is/>

The Joint Activity working groups have prepared plan and procedures 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,

account, consider previous results and have an additional benefit for the development of geothermal energy in Europe.

Propose for joint actions are: building bridge gaps, overcome barriers and promote the use of geothermal energy in Europe. Preliminary discussion and further work is focused on clustering workshops (TNT B&O / RD&D), modelling cooperation with joint activities, implementing approach to finalise D2.5, creating supplementary workshop for WP2 and WP4 as a choice of JA's. As a result of meeting in Leiden, it has been decided to create 8 working groups for the final formulation of JA. Each Joint Activity has two leading countries and creates different numbers of participating countries followed by lots of discussions merging of JA or re-arrangements afterwards.

In April 2015 most of Joint Activities had their kick off meetings during which partners decided on overall budget for them and planned actions such as: five European workshops, three interactive events (e.g. round table, idea factory, etc), national workshops and presentation events, as well as planned publications with four workshop proceedings.

Geothermal ERA-NET Joint Activities (JA)

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

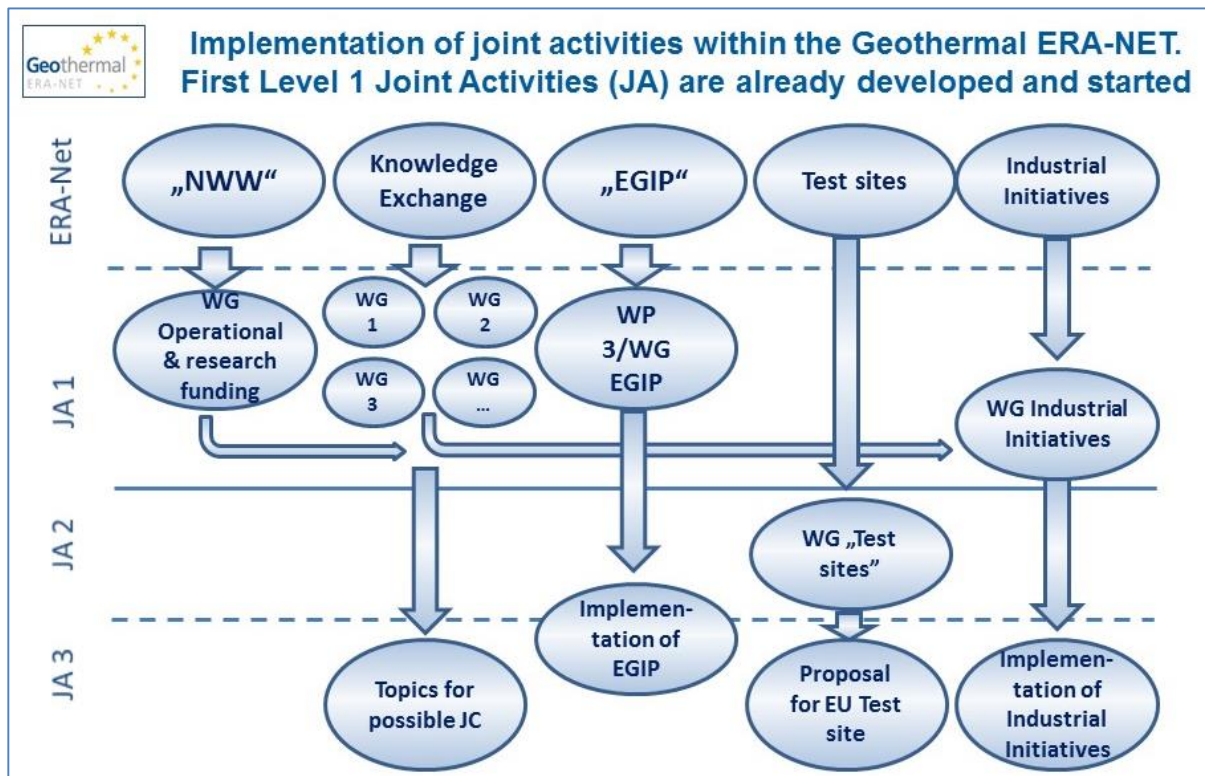
The specific activities and working groups follow partly iterative and partly continuous approaches. In addition the different working groups are coordinated by a steering committee of two countries for each activity, have developed an action plan until the end of the Geothermal ERA-NET.

The first major milestone in all of the actions is the autumn meeting of the Geothermal ERA-NET 2015, where first results of all activities will be presented and future activities, including a possible joint call will be planned.

Ongoing work on joint activities

**New Ways of Working (NWW)
Financial Instruments and Funding of RD&D and Geothermal Projects**

The main goals are to improve in the working practice of national funding institutions and the collaboration with their European counterparts, to strengthen European geothermal development for economic opportunities, energy security and mitigate climate change. **A working**



extracted from the results of work package 2 “Information exchange on national incentives and status of geothermal energy”.

As a result 7 Joint Activities (JA) 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

group meeting will be held in Brussels on 5th of October in cooperation with EGEC with input from financial bodies, EU etc. The meeting will be open for all ERA NET members and guests.

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. As a first step towards the European knowledge exchange, OpERA organizes an invited workshop on operational issues on the **1st & 2nd of October 2015 in Vaals (NL)**, close to the ancient natural geothermal wells of Charlemagne in **Aachen (D)**. This workshop include a country overview on operational issues and specific sessions on “Scaling”, “Corrosion”, “Gas content” and “Reinjection issues”.

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

This joint activity aims on fostering the social acceptance of all geothermal energy technologies in Europe, to a wider public the benefits, by providing reliable and objective information. Furthermore, it increases local awareness and encourages participation in the planning of geothermal projects, thus reducing their implementation times. A workshop on this topic will take place in the framework of the German Geothermal Conference (DGK) on the 2.11.2015 in Essen, Germany.

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

The aim of this working group is to stimulate creative new directions/concepts related to geothermal (in utilization and technology) and showcase successfully and innovative (demo/pilot) projects in the geothermal field. For instance, opportunities can be the direct utilizing of low enthalpy geothermal resources, ranging from innovative solutions in district heating to drying of food, cultivation of algae and fish.

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 very important to understand the physical properties of the reservoir rocks and fluids and their interaction during the exploitation process. As such, reservoir properties play a major role in delivering energy from the geothermal system to the wellhead. The state-of-the-art with regards to sustainability of reservoirs and identification of a possible research topic for a future project call will be formulated through a workshop to foster the knowledge and information exchange on the topic will be organized.

Tuning EGIP for target users

This Joint Activity (JA) is aimed to perform a final analysis of the boundary conditions for the complete implementation of such Geothermal Information Platform at European level. To this aim the JA we propose will set up a working group of experts and stakeholders who have to clearly identify the interest and need for data sharing.

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. 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.



The Geothermal ERA NET group at its annual meeting in Trieste in Italy, September 2014.

List of partners:

Iceland - OS (Orkustofnun) (Coordinator)

<http://www.nea.is/>

Iceland - RANNIS (Icelandic Centre for Research)

<http://www.rannis.is/>

The Netherlands - Rijksdienst voor Ondernemend

Nederland: <http://english.rvo.nl/>

Switzerland – SFOE (Swiss Federal Office of Energy)

<http://www.bfe.admin.ch/index.html?lang=en>

Italy – CNR (The National Research Council of Italy)

<http://www.cnr.it/sitocnr/home.html>

Germany – Jülich (Project Management Jülich)

<https://www.ptj.de/>

France - ADEME (French Agency for Environment and

Energy Management), BRGM as third party of ADEME

<http://www.ademe.fr>

Turkey - TUBITAK (Scientific and Technological

Research Council of Turkey): <http://www.tubitak.gov.tr>

Slovakia MESRS (Ministry of Education, Science,

Research and Sport of the Slovak Republic)

<https://www.minedu.sk/about-the-ministry/>

Hungary – HGGI (The Energy Efficiency, Environment

and Energy Information Agency): <http://www.mfgi.hu>

Slovenia - GeoZS (Geological Survey of Slovenia)

<https://www.geo-zs.si/>

Portugal - EDA (Electricidade dos Açores)

<https://www.eda.pt/>

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