

Report on the National and European Mobilisation of the eight RD&I Activity Resources

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Introduction

The **Strategic Energy Technology** plan (**SET-Plan**) has been the research and innovation pillar of the EU's energy and climate policy since 2007. It was revised in 2015 to effectively line up with the EU's "**Energy Union research and innovation priorities**". On 24 December 2018 the Regulation on the governance of the energy union and climate action ((EU)2018/1999) entered into force.

The Energy Union research and innovation priorities contain a dedicated vision for each technology area and sets ambitious targets. For each of these technology areas, Implementation Plans have been developed.

Within the SET Plan the member states and the EU Commission agreed on an ambitious set of research and innovation (**R&I**) priorities for deep geothermal energy actions. In order to achieve these, a specific geothermal Implementation Plan (**IP**) was developed and is currently under execution. It identifies eight priorities for R&I actions, two non-technical barriers and two cross-cutting issues.

The eight R&I priorities for the deep geothermal sector are:

1. Geothermal heat in urban areas (TRL 7-9);
2. Materials, methods and equipment to improve operational availability
 - a. improve operational availability (TRL: Equipment 5-9) and
 - b. high temp., corrosion, scaling (TRL: Materials 4-6);
3. Enhancement of reservoir (conventional and unconventional (TRL 4-8),
4. Improvement of performance (TRL 5-8),
5. Exploration techniques (TRL 5-8),
6. Drilling techniques (TRL 3-7),
7. Flexibility from geothermal CHP plants (TRL 4-9) and
8. Zero emissions power plant (TRL 5-7).

Non-technical barriers are:

- Community and stakeholder acceptance of geothermal projects and
- Risk mitigation.

And the two cross-cutting issues are:

- Knowledge transfer + training and
- Recommendation of an open-access policy to geothermal information

European Energy Research Alliance in the SET-Plan

In 2007 the Commission proposed to create a European Energy Research Alliance (**EERA**). The mandate was to shift from the model of collaborating on projects towards a new paradigm of implementing programmes. The aims were to align these programmes with the SET-Plan priorities, network existing but disperse capacities and build durable partnerships with industry. Today, the European Energy Research Alliance (EERA) is the largest energy research community in Europe, covering the range of all low carbon technologies – and related systems – defined in the SET- Plan. EERA brings together about 250 research centres and universities across 30 SET-Plan countries representing about 50 000 energy experts. It is the formal research pillar of the SET-Plan and has been the main facilitator for allowing a proactive participation of the research community, at executive and expert levels, towards the SET-Plan.

EERA is organized in 17 thematic Joint Programmes (JPs). In each JP, typically dozens of research organisations from across Europe collaborate along a joint research agenda. The EERA JPs have their research agenda fully aligned with the SET-Plan priorities.

One of the JPs is focusing on geothermal energy actions and has eight sub-programmes.

EERA JP Geothermal Energy Sub-Programmes operate in the Research Areas of RD&I Actions

EERA JP Geothermal Sub-Programmes	Contributions to RD&I action
SP1 Assessment of Geothermal Resources	1 / 3 / 5
SP2 Exploration of Geothermal Reservoirs	3 / 5
SP3 Constructing Geothermal Wells	6
SP4 Resource Development	3
SP5 Energy Conversion Systems	1 / 2 / 4 / 7 / 8
SP6 Operation of Geothermal Systems	7
SP7 Sustainability, Environment and Regulatory Framework	Cross cutting
SP8 Computing and Data Management	Cross cutting

Task 3.2 of work package 3 deals with the challenge to mobilise public resources towards the execution of the eight R&Is of the IP by researchers.

Implementation of Task 3.2

Based on effective resources the following actions were initiated:

1. Identify appropriate resources to implement the IP RD&I actions, by communicating with selected scientific stakeholders from EERA organisations and non-EERA organisations.
2. Discuss with the research community in annually performed Workshops the optimization of resources towards the execution of the different RD&I actions, by identifying gaps, links with other IWGs, cross thematic use of resources and the use of in-kind resources.

When conducting a survey among the members of the EERA JP Geothermal Energy, the following contributions to the various FD&I actions were indicated :

RD&I Actions	EERA workforce [pm/year]
Geothermal heat in urban areas	346
Materials, methods and equipment to improve operational availability (high temperatures, corrosion, scaling)	240
Enhancement of conventional reservoirs and deployment of unconventional reservoirs	410
Improvement of performance (conversion to electricity and direct use of heat)	203
Exploration techniques (including resource prediction and exploratory drilling)	468,5
Advanced drilling/well completion techniques	319
Integration of geothermal heat and power in the energy system and grid flexibility	216
Zero emissions power plants	32

EERA, together with other key stakeholders, organised a large-scale conference "EGW 2019" along the different EERA geothermal sub-programmes, where many relevant issues of the R&D&I actions were discussed (<https://indico.scc.kit.edu/event/343/overview>). This thematic workshop took place on 9 and 10 October.

Prior to conducting an initial workshop to discuss ways to optimise research resources, an online survey was created and non-EERA members were invited to provide information on their ongoing research activities (<https://ec.europa.eu/eusurvey/runner/8672d9d4-6f38-2a7a-eb71-78118511b654>) and to participate in the workshop. This information was available on the EERA web-site of the JP Geothermal energy and was communicated to the members of the Deep Geothermal IWG.

On 8 October, just before the EGW 2019 workshop, an open Support Unit (SU) workshop was organised to discuss gaps and potential links with other IWGs.

Agenda of the workshop had the following items:

- Bring national projects together, discuss future projects and IP sharing mechanism;
- Discuss best management mechanism for co-operation in cross-border projects, funded by different member states (**MEs**).

In appendix 1 is the full agenda of the workshop.

Results of the Support Unit Workshop for Optimising the Research Landscape and Outlook

The participants shared the opinion that structuring future research actions is important and should be one focus of the workshop.

Participants agreed that the EERA-JP coordinator Inga Berre should lead an EERA working group to support the update of the deep geothermal implementation Plan (IP). The EERA-IWG support team will assist her. It is intended to analyse deliverables in order to collect arguments justifying a change of the IP.

An organized catalogue of deliverables of European projects has been created in the frame of the European Technology & Innovation Platform on Deep Geothermal (ETIP-DG), in order to describe RD&I in the deep geothermal sector also from a historical perspective, to retrieve all the necessary information for highlighting success stories and to list gaps from past and actual RD&I projects and activities. On top of it a platform was then designed to provide a framework for access, retrieve and query details. The resulting search engine, the European Geothermal RD&I Document Search Engine EGRISE, is embedded in the ETIP-DG website and offers a public access (<https://www.etip-dg.eu/geothermal-research-search-engine/>). The EERA-IWG support team help to collect additional information from the MS research organisations.

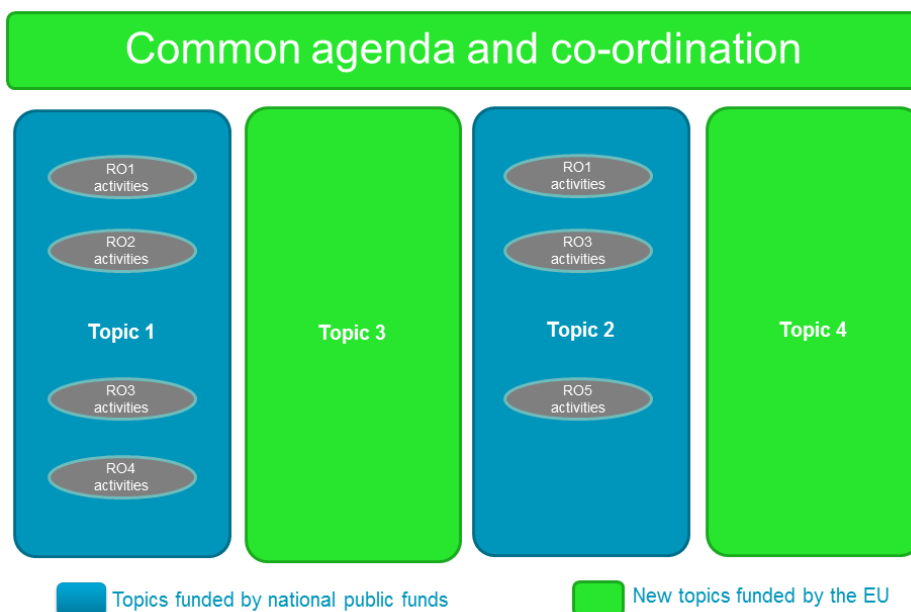
Deadline for the modified Deep Geothermal IP is June 2020.

The second key topic of the SU workshop were coordination and support actions in standard research projects.

Models from the past EU framework programmes were the Integrated Research Programme projects (IRPs) from FP7 and the European Common Research and Innovation Agendas (ECRIA) projects from the H2020 work-programmes. The objective of the IRP and the ECRIA projects was to support the operation and delivery of integrated research Programmes that bring together and integrate on a European Scale, Programmes or projects of a critical mass of research performers from different Member States and Associated Countries, to advance the longer term research agenda of the SET Plan roadmaps.

In addition and also for supporting the objective of the instruments, the following actions were foreseen:

- 1.) Exchange of researchers to facilitate co-operation and to ensure an efficient implementation;
- 2.) Shared use of existing research facilities, models, databases and activities to support scientific communities and industry in their access;
- 3.) Transfer of knowledge activities. These activities aims at reinforcing the partnership with industry in the context of the SET Plan European Industrial Initiatives e.g., activities to foster the use of research outcomes and infrastructures by industry as well as to include industrial needs into the research priorities.



ECRIA structure

All the SET-Plan implementation plans and RD&I actions rely on multiple projects and on in-kind resources from energy research stakeholders. It is very useful to identify topics where different research activities contribute to a new research activity that integrates the

knowledge of the other research activities and builds on this to accelerate research efforts through team building.

In addition support and coordination actions will improve the knowledge transfer between the contributors of an RD&I actions.

Especially an exchange of knowledge between industry performers and researchers from universities or research centres is of high added value in the geothermal research field, e.g. high level drilling expertise is often available in industry by experienced employees, but a general information transfer to a wider community is not organised and the knowledge is often lost when these people will retire.

An European exchange of researchers between different ERA-net projects would improve the skills of the researchers in each MS, would give projects a real European dimension and accelerate the implementation of the IP. The additional cost for short term stays of 1-3 month are minor.

Another examples for improving the research impact:

The KIT is establishing a **Helmholtz Metadata Collaboration (HMC)** platform. In the near future research data of the Helmholtz Association will be stored by using the FAIR principles for metadata. How can we combine different metadata storage system across MS and organisations for the benefit of all stakeholders in the future?

Conclusion

The EERA JP Geothermal has sub-programmes, which are partially structure like the IP RD&I actions. All IP actions are covered by EERA JP activities. But the EERA JP is still only a network with high ambitions. It needs further incentives to intensify the co-operation and to structure the joint efforts better. Some examples how this could be performed were discussed in the SU workshop in Karlsruhe on October 8th.

The IP is under revision. The EERA JP Steering Committee will meet on 20 February to discuss how to proceed with the completion of the IP and to prepare a joint statement by the research stakeholders.

Appendix 1 : Support Unit Workshop for Optimising Resources

Date: Tuesday 8th October 2019

Time: 12:30 – 17:00

Venue: Karlsruhe Institute of Technology (KIT)
Adenauerring 20a (Building 50.41, Room 045)
76131 Karlsruhe
Germany

Time	Topic
11:45-12:30	Lunch
12:30-12:40	Welcome (T.Kohl)
12:40-13:00	Introduction (H.Ihssen) <ul style="list-style-type: none"> • Geothermica • R&I activities at JP GE
13:00 -14:00	Discussion on possible structures to organize the optimization of research efforts in Europe. What are the management needs? Could we request support dedicated support from the funding agencies? How to focus on the IP actions? Looking for Cross-cutting topics, which might be of interest for other IWGs.
14:00-14:15	Coffee Break
14:15-16:00	Parallel sessions on the IP actions
16:00-16:30	Remarks and feedback from working groups
16:30-18:00	EERA JP Geothermal Management Board Meeting (only for MB members)
19:00	Dinner at Alte Bank

List of Participants:

1	Chris	Rochelle	British Geological Survey
2	Charlotte	Gannefors Krafft	NORCE
3	Philippe	Calcagno	BRGM
4	Inga	Berre	University of Bergen
5	Domenico	Liotta	University of Bari
6	Erlend	Randeberg	NORCE
7	Kristian	Bär	TU Darmstadt

8	Judith	Bremer	KIT
9	Adele	Manzella	CNR
10	Lorenzo	Talluri	Università degli Studi di Firenze
11	Thomas	Kohl	KIT
12	Ernst	Huenges	Helmholtz Centre Potsdam GFZ German Research Centre for Geosciences
13	Jean	Schmittbuhl	EOST/IPGS - Université de Strasbourg/CNRS
14	Giuseppe	Mandrone	UniTo (Italy)
15	Jan-Diederik	van Wees	TNO/UU
16	Astu Sam	Pratiwi	University of Geneva
17	Frank	van Bergen	TNO