European Technology
Deep Geothermal
& Innovation Platform

Towards a Vision document

Deep geothermal ETIP process

1) Vision:
- A WG composed by R Bertani, B Leray and JD Van Wees to propose a draft
- Validation by the SC
- Publication by end 2017

2) Strategic Research Agenda:
- WG activities: collect research results and list research topics

3) Roadmap: from 2018

Content of the Vision document

- A 10-page document
- Provide the state of the art 2017
- Indicate potential in terms of production adn market share
- Detail the role of geothermal in the energy mix and the energy system
- Mention the steps 2030, 2040,2050

Methodology

- Based on geothermal h&c and geothermal electricity visions published in 2010
- Update them
- Merge them, focusing on deep geothermal but mentioning shallow

Geothermal h&c Vision 2030

Renewable Heating & Cooling
European Technology Platform

Geothermal Heat Pumps & Underground Thermal energy Storage

- **Firmly established on the market in all EU countries. Integrated in energy systems for building, combined with other RES, in particular in H&C networks.**
- **Geothermal energy storage developed for seasonal storage, with specific applications for waste heat from industry (high temperature storage).**
- **Key provider for heating and cooling for individual houses, commerce and services.**

Direct uses – District heating

- **Develop commercial deep geothermal projects for industrial use and agriculture applications, desalination and innovative applications**
- **Development of large integrated district heating and cooling systems in which geothermal energy is flexibly used in different forms, alone or in combination with other RES.**

Heat from geothermal CHP systems (Binary and EGS)

- **Cogeneration with Enhanced Geothermal Systems and Low temperature power plants, micro cogeneration**
- **Develop new district heating systems for dense urban area**

A European vision for geothermal electricity (TP GEOELEC)

Three focal points

- By 2020: Establishing the base of a European geothermal industry
- By 2030: towards a competitive source of electricity
- Beyond 2030: a substantial part of the base-load electricity supply

Three categories

- Hydrothermal
- Binary Plants
- EGS

Three Temperature ranges

- Medium Enthalpy 80-180 ° C
- High Enthalpy 180-390° C
- Supercritical/Unconventional 390-600° C

UPDATES

- **Power generation:**
  - EGS: to be replaced by “deep hydrothermal system”, DHS?
  - Landau: what to mention about?
  - Hydraulic fracturing: to be removed, which means the idea of “engineering based industry” vs “resource base” would be obsolete?
  - Fossil fuel electricity production cost increase? Who could say that nowadays (we could instead expect a long period of low hydrocarbon prices, driven down by the development of renewable energies
- **Direct heat**
  - Remains “resourced” based
  - Stress on the benefits of cogeneration
  - Stress on the benefit of associating deep geothermal heat production with shallow UTES systems (improvement of the load factor through storage at shallow level, particularly when recharge through cooling is not an option)
  - thermal conduction option (with cheap wells and heat pumps)?
  - Cheap exploration technologies (some improvement from the time of the current documents)

VISION

A shopping list

- Geothermal as distributed generation/cogeneration
- Geothermal & smart grid/cities
- Geothermal &distribution networks
- Geothermal & flexible generation ➔synergy with intermittent « other renewables »
- Customer perspective: diffusion of geothermal knowledge and acknowledgement
- Geothermal should not be seen as « exotic »
- Geothermal focal point in traditional high enthalpy areas for massive production
- Geothermal in islands/remote areas
- Geothermal & hybrid plants
- Money should not be the matter
- Stress on existing technologies and their development as well as disruptive ideas, in the thermodynamical limits
- Geothermal everywhere: heat under our feet
- Geothermal: pleasure & leisure
- Geothermal & job creations: sustainability & social aspects
- Europe # 1 in geothermal: the industrial leadership

A New European vision for geothermal electricity

Three focal points

- By 2030: Statement #1
- By 2040: Statement #2
- By 2050 & Beyond: Statement #3

Three Temperature ranges

- Medium Enthalpy 80-180 °C
- High Enthalpy 180-390°C
- Supercritical/Unconventional 390-600°C

Three categories

- Small: Geothermal in urban environment or integrated in agricultural appications
- Large: traditional productive poles from typical high temperature resiources
- Unconventional: EGS, Supercritical, …

Geothermal as a friendly dog

GEOTHERMAL can work with you and for you

Geothermal as a friendly dog

GEOTHERMAL can give you warm

Geothermal as a friendly dog

GEOTHERMAL can pamper you

Geothermal in the city of tomorrow