Shallow geothermal priorities

1 – Improvement in Shallow Geothermal Ground-Coupling technologies

1) European-wide Geoactive Structures Alliance on integrating shallow geothermal in foundation piles or underground structures, including development of a network of laboratories to create 4 testing and demonstration sites.

2) Improvement in shallow geothermal drilling technology and machinery for cost reduction and reduced impact (automation, minimum invasiveness, drilling for refurbishment incl. historical)

3) Borehole characterization by measurements while drilling (MWD), geophysical logging, tools for quality control and monitoring

4) Optimization of the borehole-grout-pipe system, solving current grouting problems (fractures, freezing, and other), and development of measuring and control tools

5) Methods and materials for enhancement of thermal properties of the ground

2 – Shallow geothermal – GSHP Systems, integration and environment

1) Shallow geothermal system integration with other renewable technologies, both on the electric (e.g. deep geothermal, wind, PV) and thermal (e.g. solar thermal, biomass, deep geothermal) side; demand response and storage technologies

2) Integrated control of ground source heat pump systems to include ground side, heat pump, building circuits and building characteristics; multiple input – multiple output control approaches (linking to R&D in ICT)

3) Shallow geothermal system integration in old and inefficient buildings, including historical ones

4) Shallow geothermal systems for infrastructure (e.g. roads, bridges, tunnels, pipelines and other) and to supply low temperature to the industry & services (agro-food, tourism etc.)

3 – New concepts and materials for Shallow Geothermal ground-coupling
1) Materials research on improved materials for borehole heat exchangers (bespoke thermal properties, handling, long-term stability, lower cost etc.)

2) New or improved heat carrier fluids (environmentally friendly, low freezing temperatures, low viscosity, high specific heat, low cost etc.)

3) New and advanced, environmentally friendly grouting material with bespoke thermal and hydraulic properties; inclusion of recycled materials to decrease cost and participate to the circular economy

4) Innovation in heat exchanger configurations and installation methods aimed at reducing capital investment costs, supported by ICT

4 – Combining Shallow Geothermal with Renewable Technologies in District Heating and Cooling Systems

1) Optimized shallow geothermal technologies as part of a combined energy system: heat supply, cold supply, thermal storage

2) Demand load response systems and the integration of ground source heat pumps and underground thermal energy storage (BTES/ATES) to 4th generation district heating/cooling networks

3) Optimum integration of UTES systems in thermal energy supply for DH

5 – Improving and developing technologies to harness the untapped geothermal energy resources for heating and cooling

1) Demonstration sites with a complex (well completion – reservoir engineering – hydrogeology) methodology of 100% brine reinjection, notably into sandstone reservoirs

2) Demonstrate the innovative heat energy optimization of operating balneological systems supplied with thermal water

3) Innovative tools of handling extremely polluted geothermal brines.
6 – Improving energy storage in the underground, Provide flexibility to the energy system

1) Integrated control of UTES systems to include ground side, heat pumps, building or network circuits and characteristics; multiple input – multiple output control approaches, real-time optimization procedures and adaption to weather forecast (linking to R&D in IT)

2) High efficiency CHP & GSHP/UTES systems for small and medium sized heating & cooling networks

3) Demonstrate the practical feasibility, reliability and efficiency as well as economic advantages of wider introduction of UTES for seasonal storage of energy

4) Optimum integration of UTES systems in thermal energy supply for industry and municipalities

7 - Market Uptake support

- Topic a : Modelling on decarbonisation of the heat sector, buildings and industry; Develop methodology to define costs of Renewable H&C technologies and enabling factors, such as storage.

- Topic b : Promotion, training and information activities about small scale RHC installers ; certification of installers

- Topic c : Support Regional and local authorities to optimise the integration of RES H/C through the introduction of incentives and codes and/or obligations affecting the spatial planning of residential, commercial and industrial areas.

- Topic c : Housing associations, owners of large building stocks and consumer cooperatives adopting approaches which enable the large scale uptake of RES heating and cooling systems, together with the energy efficient retrofitting of existing buildings. This could include the initiation of new district heating and cooling networks using RES, and the modernisation and retrofitting of RES in existing networks combined with sound end use management practices.

- Topic d: Developing nearly-zero neighborhoods: the concept of nearly-zero energy buildings is more easily adopted when considering several buildings in an integrated way, exploiting a combination of renewable energy sources, including renewable heating and cooling solutions.