

A Vision for Deep Geothermal

Deep geothermal in 2030-2050



ETIP-DG

European Technology & Innovation
Platform on **Deep Geothermal**



Co-funded by the European Union's Horizon 2020 Research and Innovation Programme [GA. N. 773392]

ETIP activities

- Declaration of Intent
- Strategic Thematic Research Priorities for Geothermal Energy in Europe
- Implementation Working Group for the Implementation Plan
- *Vision Document*

- Strategic Research Agenda
- Roadmap

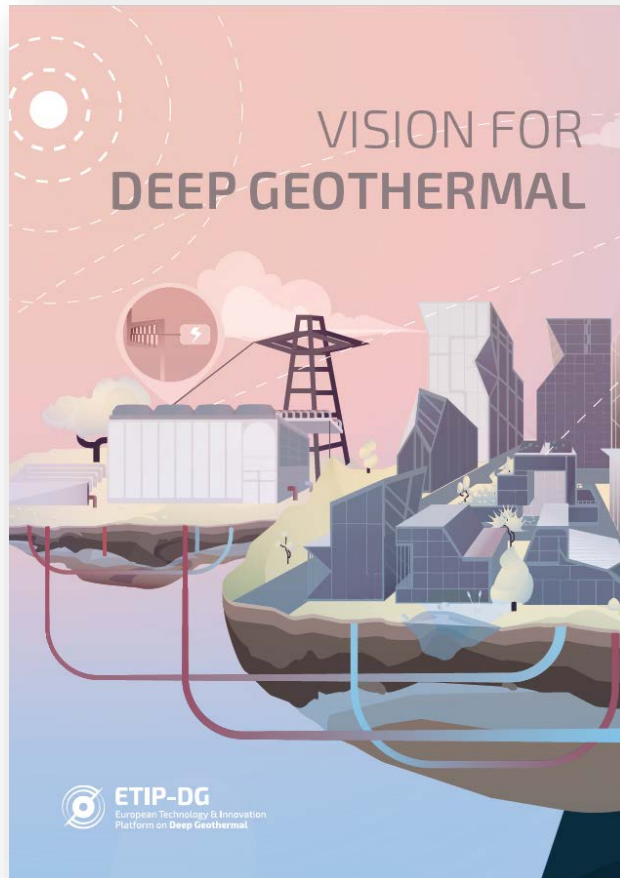
DETAILED PRIORITIES FOR GEOHERMAL ENERGY IN HORIZON 2020 WP 2018-2020

Last modification date: 01-12-2016



Strategic Energy Technology Plan
Implementation Plan
Final Version – 15.01.2018

About the Vision



This VISION looks toward **the future of Deep Geothermal energy development** by 2030, 2040, 2050 and beyond, and highlights the great potential of untapped geothermal resources across Europe. After an **Introduction & Overview** the document briefly describes the **Actual Status of geothermal development** and the VISION's aim for

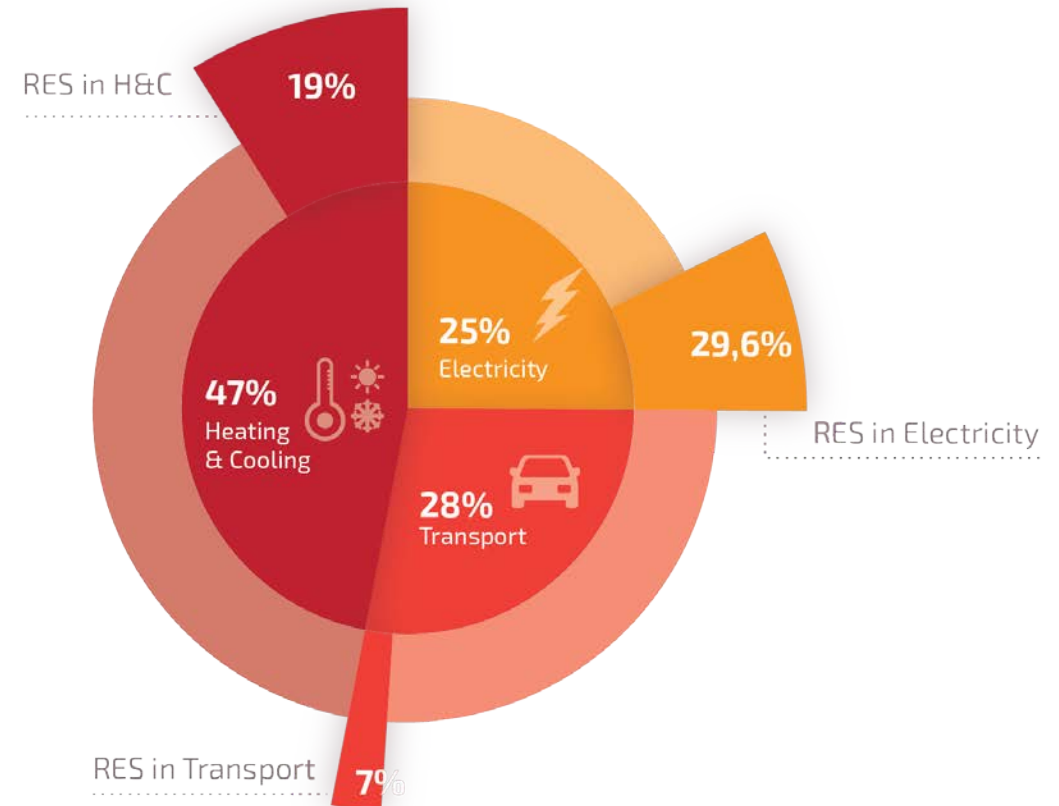
- > **Unlocking geothermal energy**
- > **Increasing the Social welfare in Europe**
- > **Novel technologies for full and responsible deployment of geothermal potential**

Rising to the Vision

Our VISION is to cover

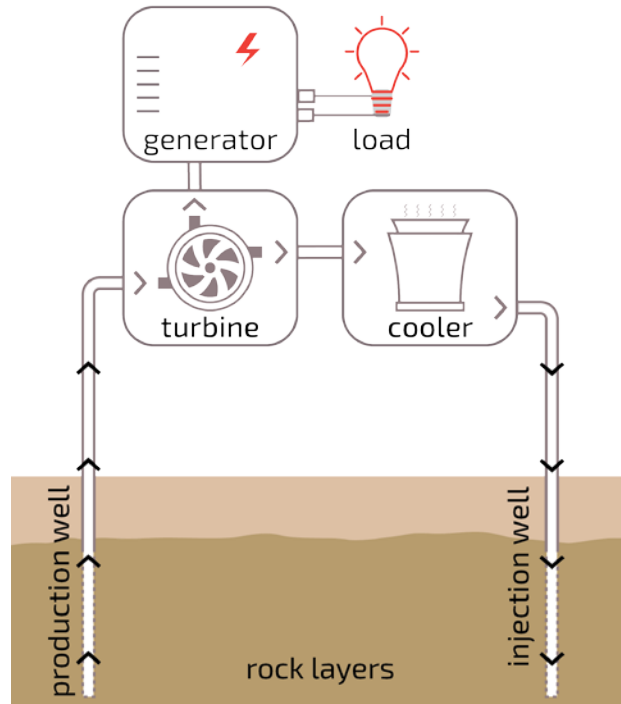
- > A significant part of **domestic heat demand** and
- > a large part of **electrical power demand** in Europe by geothermal energy.

This includes taking the maximum advantage offered by the flexibility of geothermal production, providing large **centralized** as well as domestic and **decentralized** small scale options.



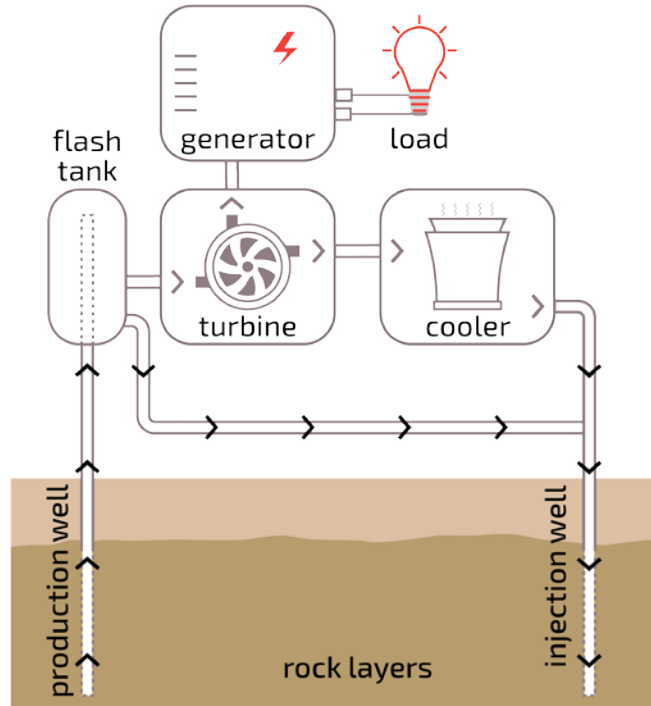
Technologies for electricity production

Dry steam power plants



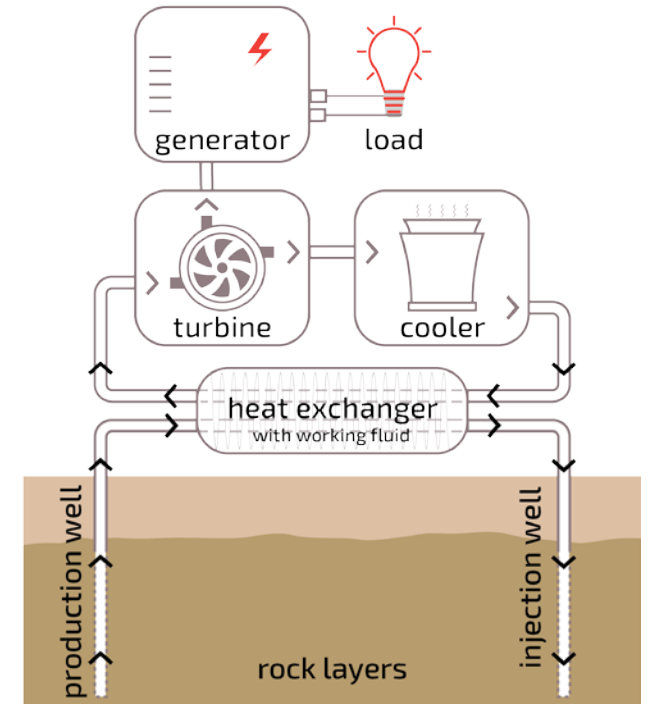
Highly cost competitive but geographically limited

Flash steam power plants



Most dominant in terms of global capacity

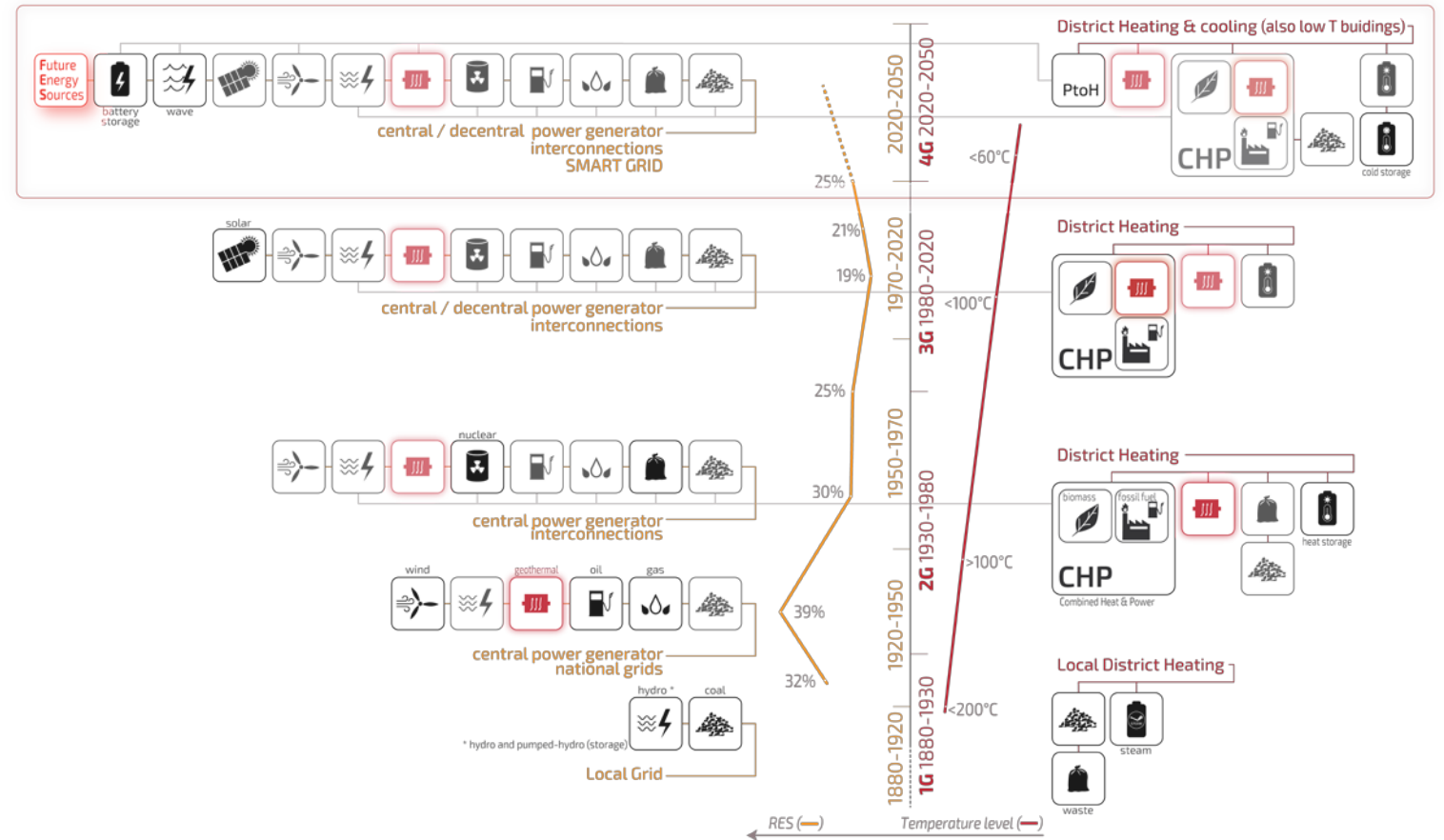
Binary cycle power plants



Useful alongside geothermal heating, hot spring, etc

Unlocking Geothermal Energy: Heat development

- > Operative temperatures of the DHC network can be reduced
- > By demand site management or by thermal energy storage it will be possible to balance heat demand and supply in a DH network.
- > Cascade applications
- > CHP



Evolution of power generation and district heating

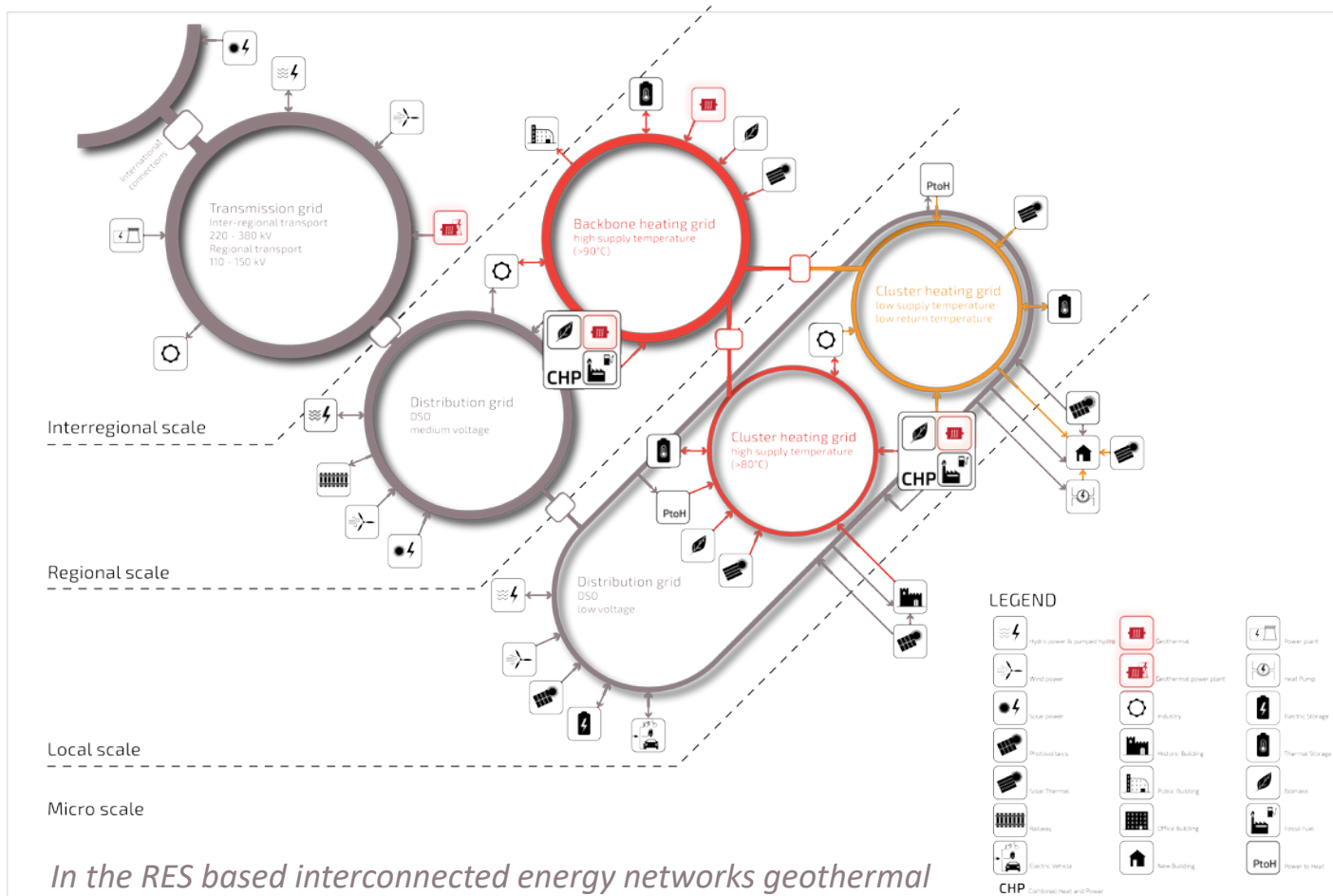
Unlocking Geothermal Energy: Power development



Combined biomass and geothermal plant in Cornia, Italy

- > Improved efficiency, optimization of material, processes, cycle design
- > Hybrid, proper combination
- > Cutting edge technologies for any kind of resource (super-hot, off-shore, geopressurized) and any place (from remote islands to urban areas)

Unlocking Geothermal Energy: Combined production



> Coupling renewable heat and electricity sectors and markets for an optimal use of geothermal energy

> Consumer-producer-prosumer perspectives

> Thermal storage to help balance and to optimize production

> Cascade, hybrid, synergy (e.g. geothermal-algae-biofuels-transport)

In the RES based interconnected energy networks geothermal and underground thermal storage play an important role



The City of the Future

Increasing social welfare in Europe

- > Achieve lower **environmental footprint**
- > Create **wealth**
- > Strengthen **dissemination, education and outreach**
- > Guarantee **protection and empowerment** of customers



Novel technologies for full and responsible deployment of geothermal potential

> Technologies beyond H2020

> While targeting the EU long-term goal of **reducing costs** and **increase performance** of geothermal technologies and installations, RD&I pursue all opportunities for complete deployment of geothermal resources, aiming at various advancements



RESOURCE POTENTIAL

Geothermal is a widely available energy source, since underground heat is available everywhere

FIT FOR PURPOSE

Geothermal has a large potential of expansion in numerous applications and places

STABILITY & AVAILABILITY

Geothermal energy is available around the clock and has a predictable output

GROWTH

Production from untapped geothermal resources has the potential to become a local economic development booster

KEY MESSAGES

SUSTAINABILITY

The geothermal environmental footprint is much lower than those of other energy sources

COGENERATION & HYBRIDISATION

Geothermal can be combined with other energy sources and technologies to optimise efficiency

FLEXIBILITY

Geothermal operates continuously to meet the minimum level of power demand and may adapt to meet variable levels of energy demand

OPTIMISATION

Geothermal is a versatile energy, whose multiple-applications are optimised by cascading uses of heat at progressively lower temperatures

COOL & APPEALING

Beside cooling the air of our houses, working spaces, malls, and airport geothermal is simply beautiful because it is essentially invisible

MARKET PENETRATION & SOCIAL DIMENSION

Geothermal is a domestic and green resource, secure, stable, clean, and contributes to energy efficiency

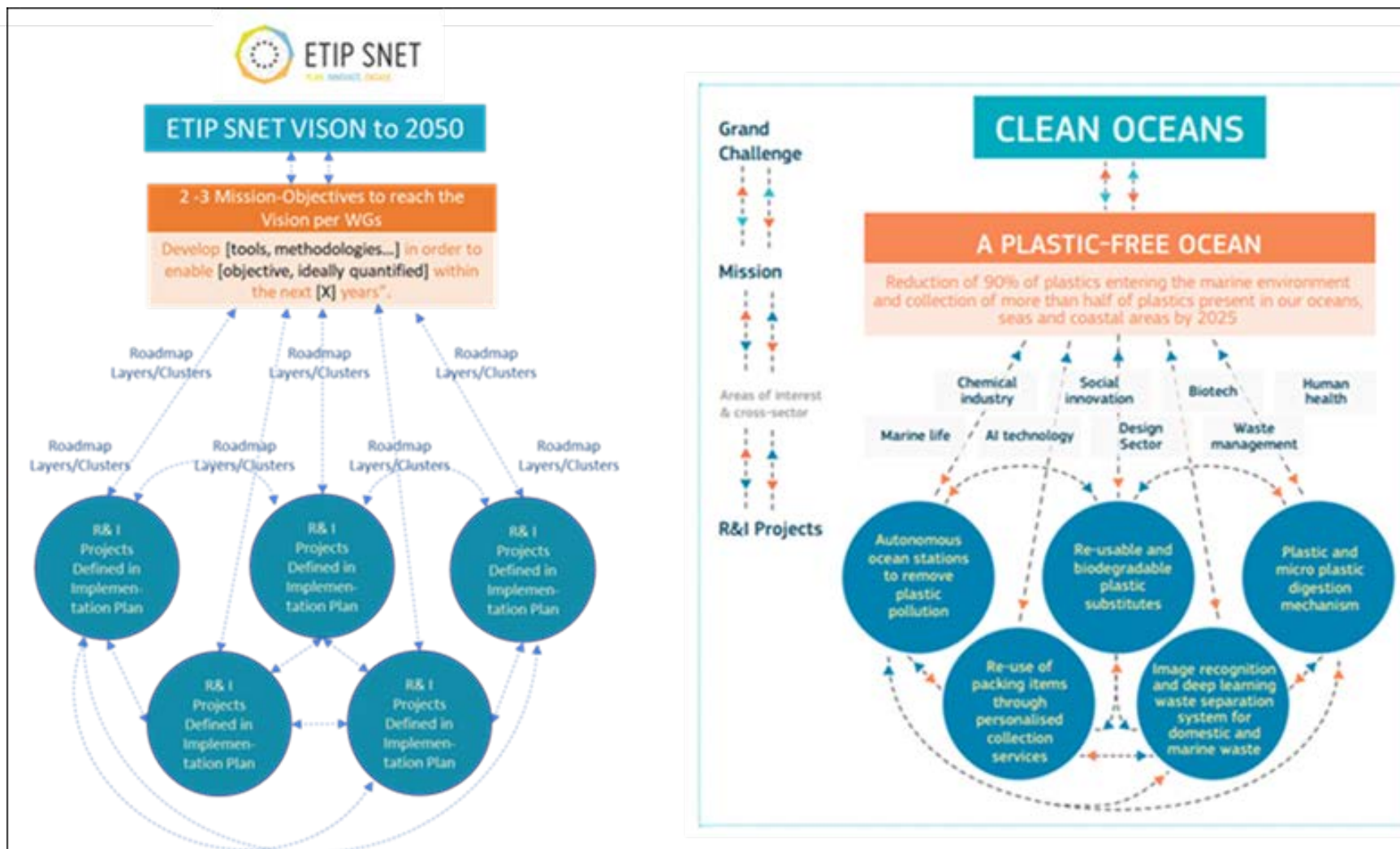


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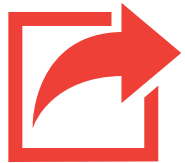
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Towards Mission objectives for Horizon Europe



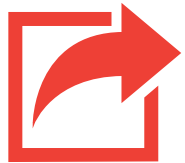


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Key messages

- **Resource potential:** Geothermal is a widely available energy source, since underground heat is available everywhere
- **Fit for purpose:** Geothermal has a large margin of progress in numerous applications and places
- **Stability & availability:** Geothermal energy is available around the clock and has a predictable output
- **Growth:** Geothermal resources are yet to be developed in most parts of the world and are ready to become a local economic development booster
- **Sustainability:** The geothermal environmental footprint is much lower than those of other energy sources



Key messages

- **Cogeneration & hybridization:** Geothermal can be combined with other energy sources and technologies to increase efficiency
- **Flexibility:** Geothermal can be adapted to any type of energy demand, providing base load energy when needed
- **Optimization:** Geothermal is a versatile energy, whose multiple-applications are optimized by cascade uses of heat
- **Cool & appealing:** beside cooling the air of our houses, working spaces, malls, airport... geothermal is simply beautiful because it is essentially invisible
- **Market penetration & social dimension:** Geothermal is a domestic and green resource, secure, stable, clean, and contributes to energy efficiency