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PIXIL-GEO-URBAN workshop

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Scaling up / Massification of geothermal projects in UE and within the French context

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Outline

- A result-driven policy
- 3 different types for the geothermal energy
  - **Shallow (extended i.e. above 500 kW, simplified « GMI »),**
  - **Low temperature (BT),**
  - **High temperature (HT)**
- French and UE supports
- Conclusion and outlooks

Energy transition law

-40% of greenhouse gas emissions between 1990 and 2030

and **carbon neutrality by 2050**

Decrease the final energy consumption by -50% between 2012 and 2050

And -20% by 2030

-40% of fossil energy consumption by 2030 compared to 2012

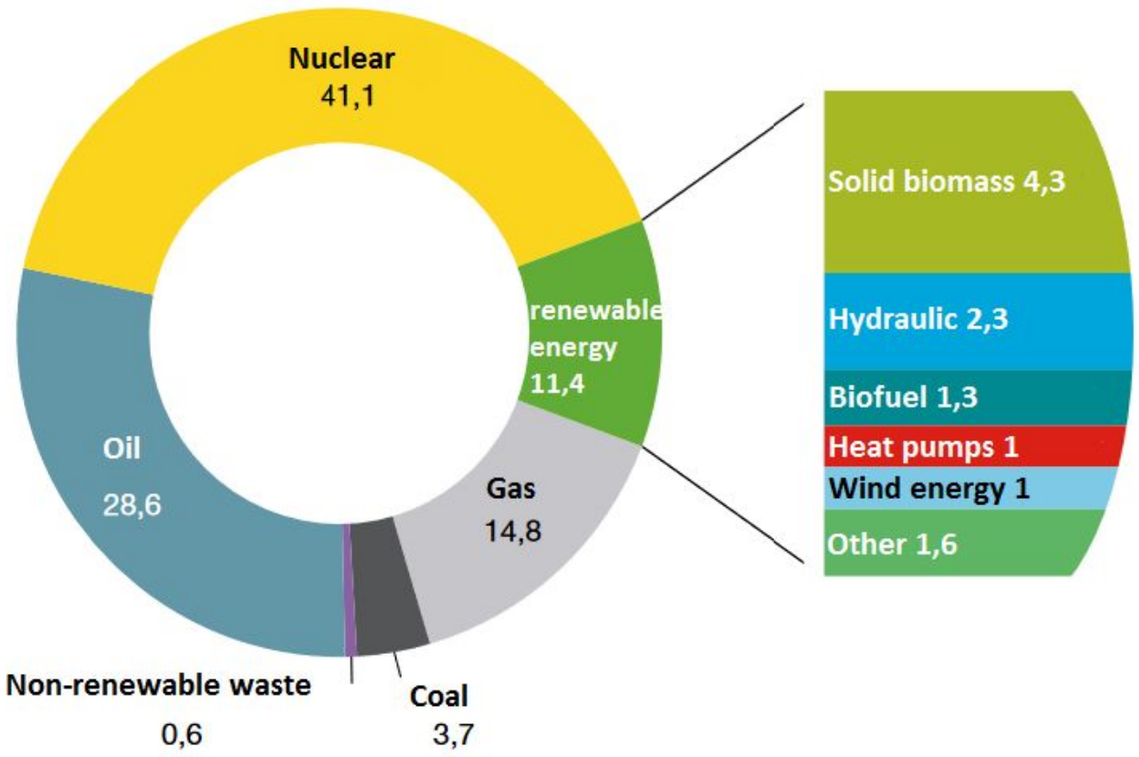
In 2030 : **33% renewable**
In the final energy consumption
40% of the power generation,
38% of final heating consumption;
15% of final fuel consumption
and 10% of final gas consumption

Decrease
the share of nuclear to -50% of the power generation
by 2035

The French Energy Mix

Primary energy consumption in 2018

249 MTep

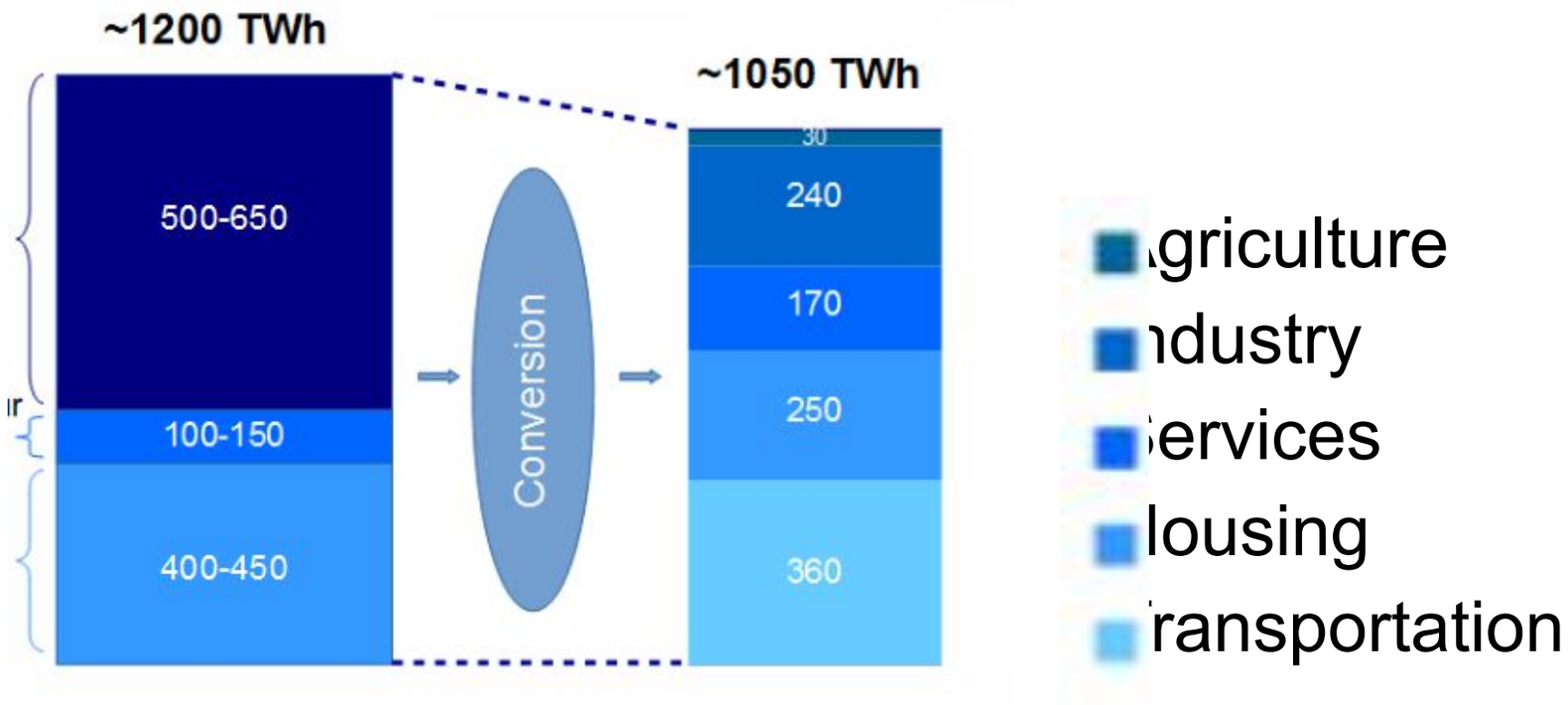


Carbon neutrality implies carbon-free energy resources by 2050

•Production of electricity
•(530TWh in 2017)

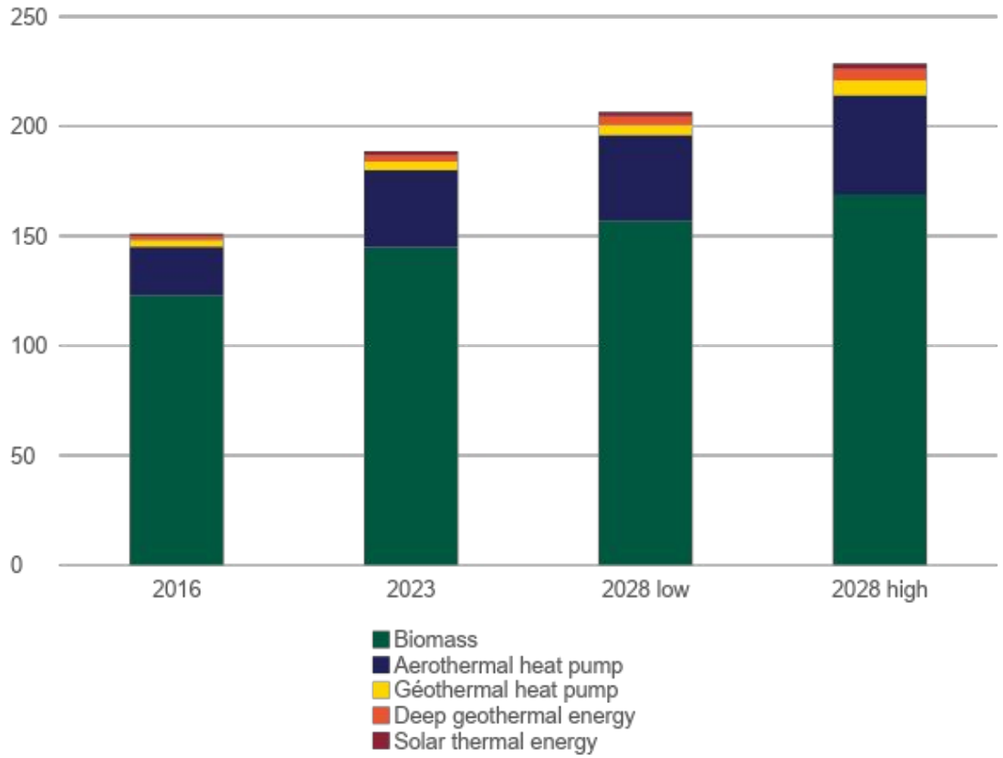
•Geothermal, heat pumps, solar heating (x3 to 4)

•Use of biomass
•(x3)



To achieve carbon neutrality means to decrease energy consumption and to use carbon-free energy sources. That will raise the power consumption

Renewable heat is a corner stone towards the end of carbon



Evolution of final renewable heat production per source (TWh)

2020

Mandatory requirement of a minimum rate of renewable in buildings

2016	2023	Low target 2028	High target 2028
155 TWh	196 TWh	218 TWh	247 TWh
Evolution /2016	+25%	+40%	+59%

350 millions €

Heat fund budget in 2020

Avoluntaristp

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Geothermal energy in FRANCE	2018	2023
Shallow / low temperature (GMI) (GWth)	25,58	32,56
ktep	2200	2800
Heat production (BT and HT) (GWth)	2,32	4,65
ktep	200	400
Electricity (MWe)	8	53

- **Simplification of the legal framework for GMI**
- **Evolution of the reglementary framework for HT**
- **Aid schemes for investment**
  - **Financial support for R&I projects,**
  - **Insurance for the geological risk for HT projects,**
  - **Feed-in tarif for electricity production.**

Three contexts

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▪SHALLOW (GMI)

- from 10 to 30°C
- lower than 200m depth, capacity < 500 kW
- heat pumps for private or collective use

▪ DEEP LOW TEMPERATURE (BT)

- below 150°C
- between 400 and 2000m depth
- district heating systems

▪DEEP HIGH TEMPERATURE (HT)

- greater than 150°C
- depth depends on the geological context
- for cogeneration and electricity production

Known / poorly known geological context => Requires more time to develop projects (exploration)

Shallow geothe

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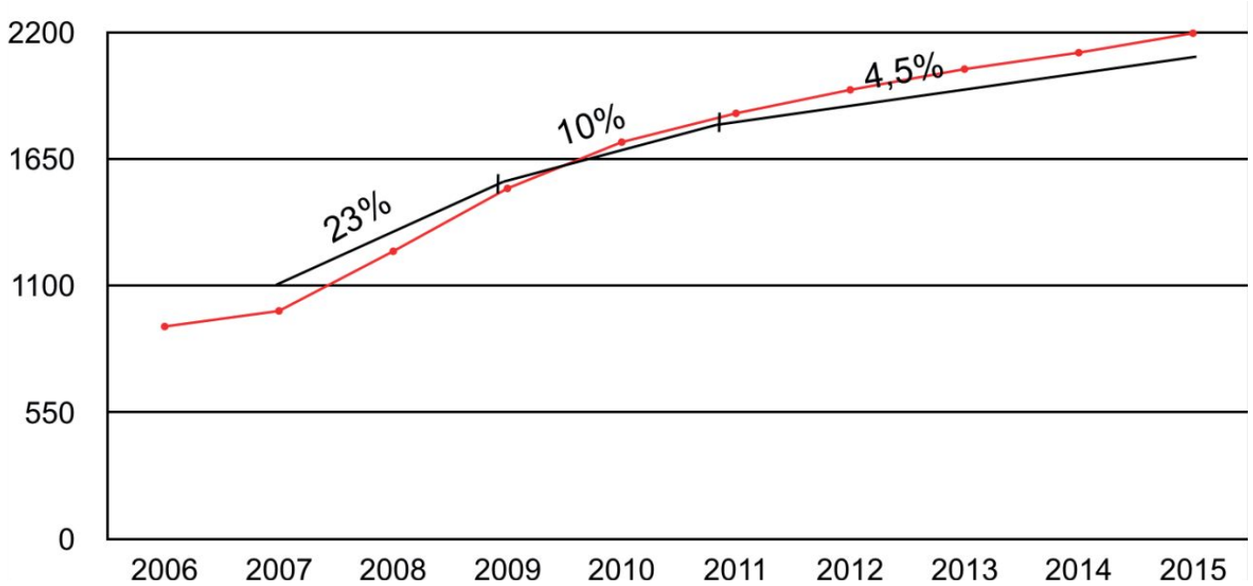
Cumulative installed capacity for heat

(2280 MWth at the end of 2015)



	Perspectives (GWth)			PPE (%)	
	2018	2023	2030	2018	2023
Total	2 640	3355	4 440	%	%

Start of the art

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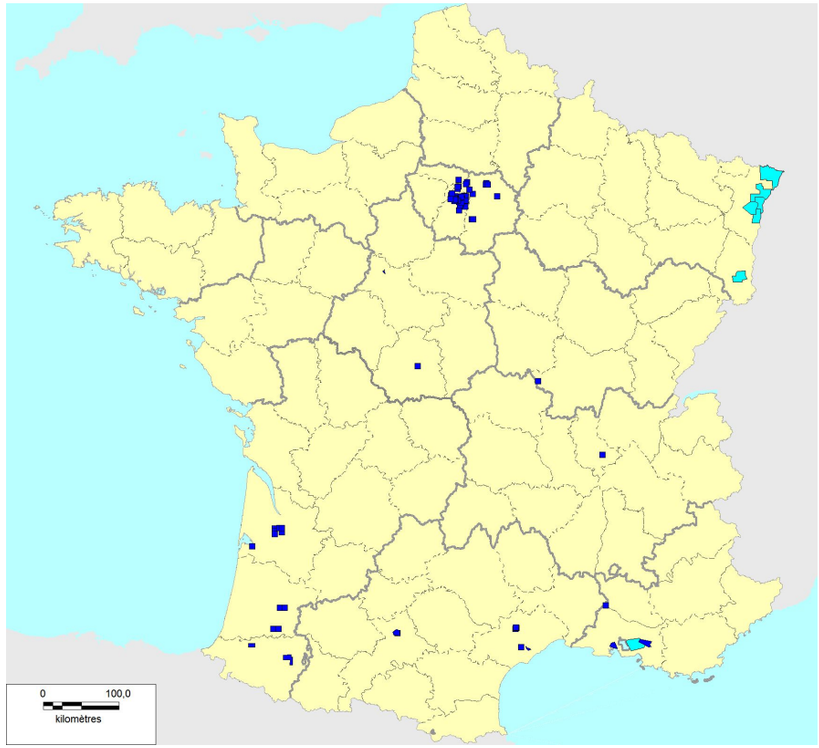
2 major basins (paris and aquitain) for exploitation



The highest number of operating geothermal distric heating systems in Europe
(450 000 people in Ile de France, 49 heating networks in Paris basin)

Since 1980, specific fund to limit the geological risk (from SAF Environment)

10 research licences

73 production licences

Objectives for

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HEAT

Geothermal capacity (MW_{th})		Production (MWh_{th}/year)	PPE (%)	
2015			**2018**	**2023**
Paris basin	441,3	1 149 070		
Aquitain basin	51,3	176 535		
Others	18	45 988		
TOTAL	510,6	1 371 593		

To reach the objectives, different development plans

- « Fonds Chaleur » expansion
- use of new technologies such subhorizontal doublet, multidrain
- valorization of deep aquifers which are less well-known.

Start of the art

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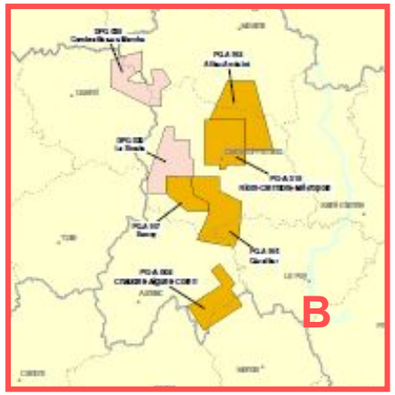
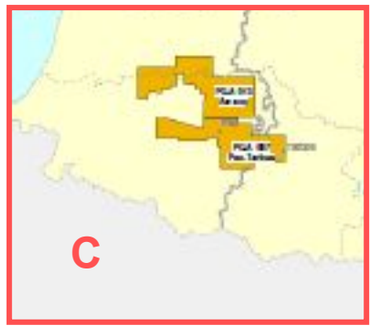
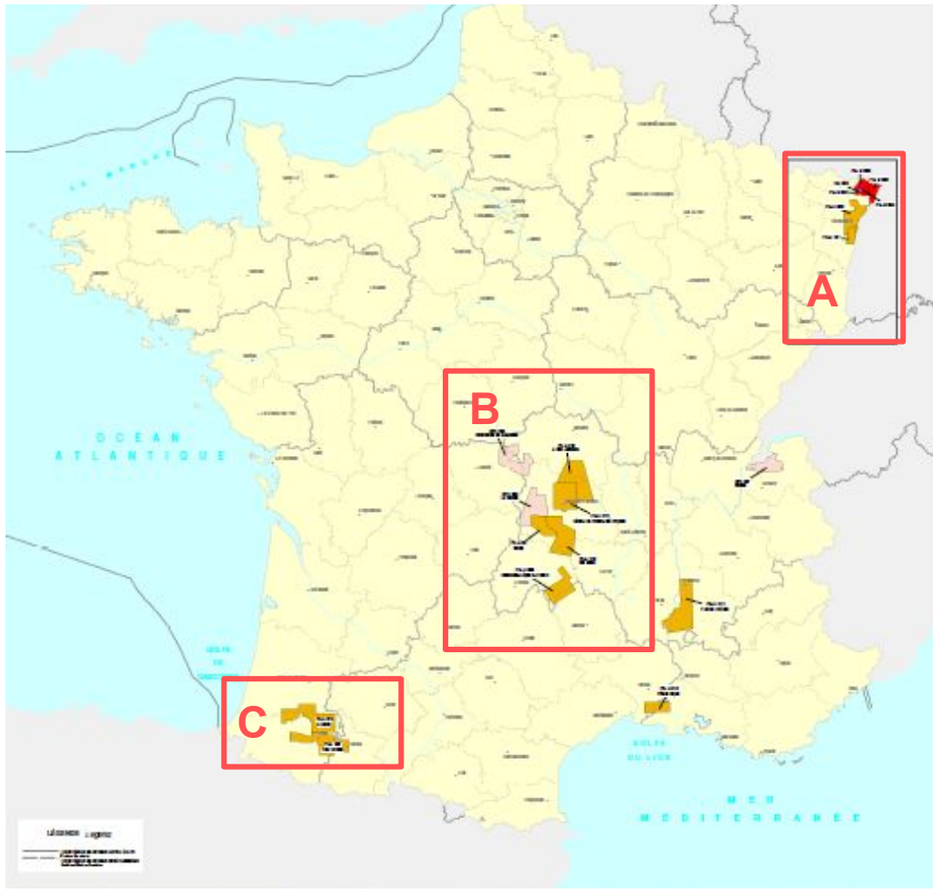
A renewed interest, both in the overseas departments and in mainland France







- In **volcanic context**, with a temperature included between 180 °C and 350°C

- Exploitation licence (since 2009) for the Bouillante plant
  - 15MW_e already installed for a 90 – 100 GWh/year
  - 20 to 40 MW_e third unit: investments between 50 and 100 M€ by 2024 for 300 GWh/year

- For information, Island of Dominica in the Caribbean is an area with a potential

  - Project « geothermie Dominique » started in 2005, for a plant with a capacity of 100MW_e, 500 M€ + of investments

French support

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Support at the national level for the **heat** produced

- **« Fonds Chaleur »,** managed by ADEME since 2009, participates in the development of the renewable production of heat. It is intended for the group housing, for the communities and for the companies,

- **« Fonds de garantie géothermie »,** managed by SAF Environment and ADEME to cover the geological risk in the exploration phase => to reinforced and extended to 2030

French support

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Support at the national level for the **electricity (mainland)**

- **« Complément de rémunération »**, for direct contract concluded with EDF in the framework of obligation purchase. Implemented in 2016
- **« Cluster GEODEEP »**, to cover the geological risk in the exploration phase

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National and EU: <u>funds and scheme</u>

Innovation in the energy and low carbon sectors:

- <u>EU level, transition</u>, carbon neutrality:
  - Horizon Europe: Clean energy transition partnership, …
  - **<u>Innovation Fund</u>**: financed by Emission trade scheme

- <u>At the **national level**</u>:
  - Agence nationale de la recherche (**ANR**), **ADEME** recherche, **BPI** (Banque publique d'investissement);
  - Programme des Investissements d'Avenir (**PIA**3)

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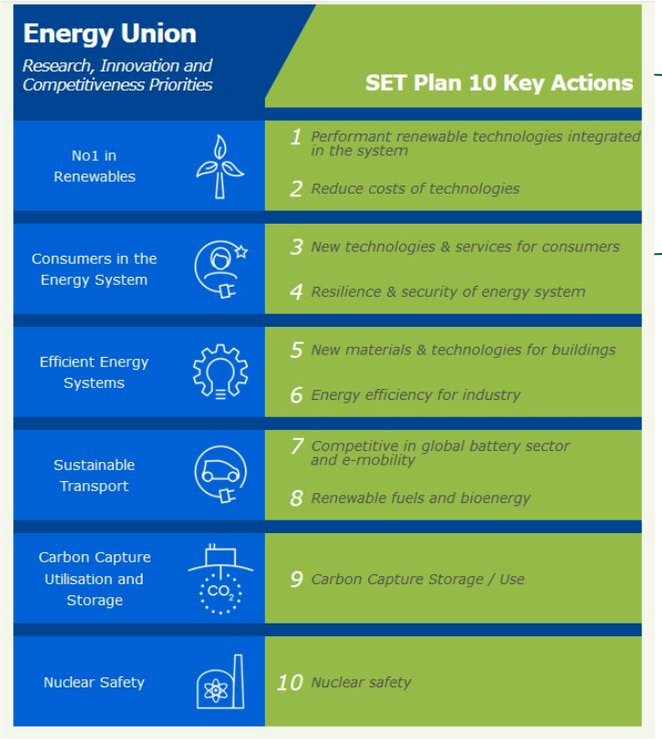
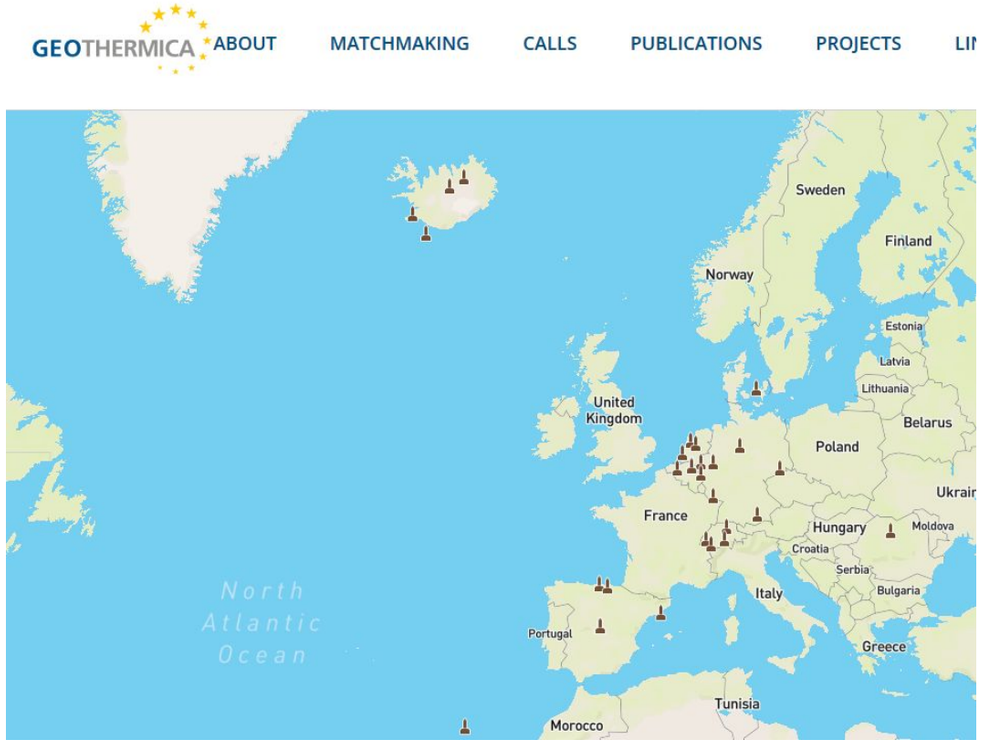
EU SET-Plan



EU: Implementation working groups (IWG)

=> IWG Deep geothermal

<u>Design future research direction priorities</u>



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ETS Innovation Fund (2020-2030)

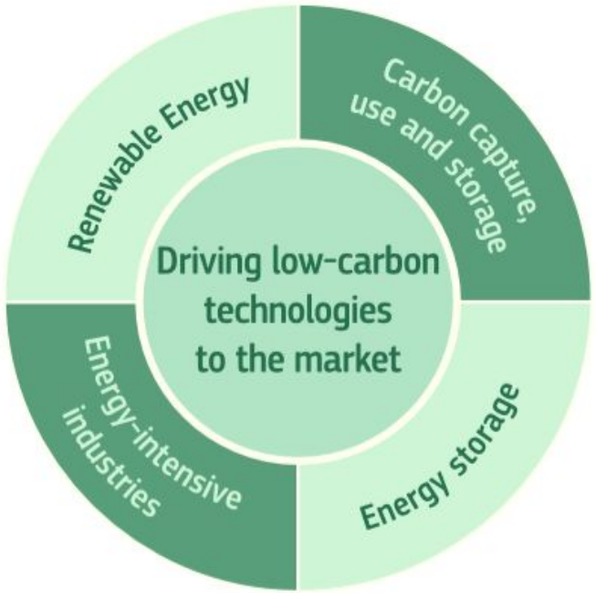
Innovation Fund: Driving low-carbon technologies towards the market

The Innovation Fund is one of the first EU funding instruments tangibly supporting the vision for climate neutral Europe by 2050. It is about unleashing low-carbon investments in all Member States and pressing the fast-forward button in our transition to a climate neutral, competitive and innovative EU economy.

What is it?

The Innovation Fund is one of the world's largest funding programmes for demonstration of innovative low-carbon technologies. It is not a research programme, it is about bringing highly innovative technologies to the market.

The revenues for the Innovation Fund come from the auctioning of 450 million EU Emissions Trading System allowances from 2020 to 2030, as well as any unspent funds coming from the NER300 programme. The Fund may amount to about €10 billion, depending on the carbon price.



Conclusion and

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HOW TO COMMUNICATE ON BENEFITS AND OPPORTUNITIES OF DEEP GEOTHERMAL IN TODAY'S COMPETITING ENERGY ENVIRONMENT ?

- ✔ **ROBUST LEGAL FRAMEWORK,**
- ✔ PUBLIC ACCEPTANCE: **ENGAGEMENT WITH LOCAL COMMUNITIES AND INDUSTRIES** AT AN EARLY STAGE IN THE PROJECT DEVELOPMENT PROCESS,
- ✔ **RISK MITIGATION SCHEMES** TO LIFT UPSTREAM INVESTMENT BARRIERS,
- ✔ **INVESMENT IN R&I TO REDUCE COSTS,** SUPPORTED BY APPROPRIATE NATIONAL AND EUROPEAN SUPPORT SCHEMES,
- ✔ **KNOWLEDGE SHARING AND POOLING** OF COMPETENCES ON AN INTERNATIONAL LEVEL PRIMARY AT A UE + NO + IS LEVEL

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