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Geothermal heating and cooling and cogeneration in Europe

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Deep geothermal in Europe: market overview

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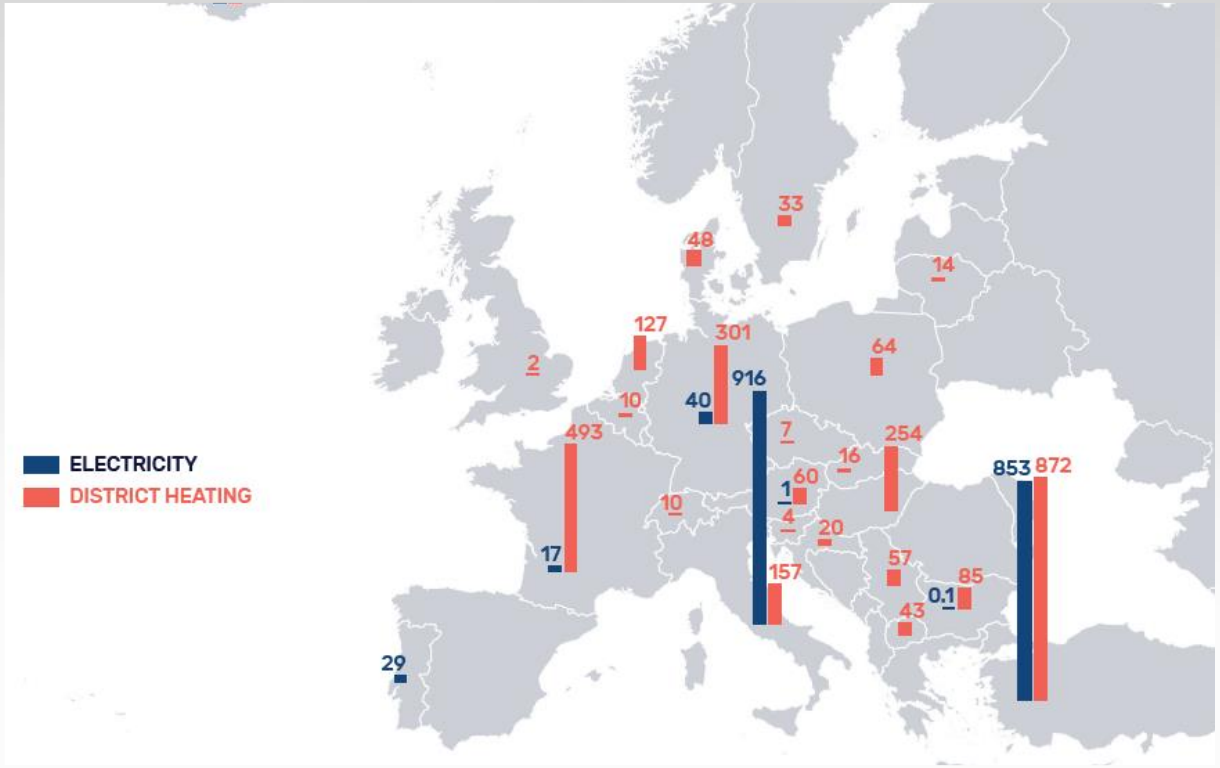
Installed capacity for geothermal electricity & district heating (2016, MW)



Geothermal electricity in EU:

- 1 GWe capacity, 6.6 TWh electricity produced;
- 2% annual growth rate over the last 5 years

Geothermal district heating in EU:

- 1.7 GW capacity, 554 MW developed in 2011-2016.
- 10% annual growth rate over the last 5 years

Regulatory frameworks for geothermal district heating

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- As an underground resource, geothermal is often linked to mining regulations;
- Definition & classification of geothermal affects licensing & authorization;
- A good framework ought to be clear, streamlined and provide businesses certainty for ventures in geothermal.
- Key EU regulations:
  - Environmental Impact Assessment Directive;
  - Strategic Environmental Assessment Directive;
  - Water framework Directive
- Importance of local planning rules for District heating and cogeneration projects

Regulatory frameworks for geothermal district heating

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- National regulatory framework vary greatly, and affect developments:
  - Hungary: permits vary with depth/water extraction, good mapping of resources, no risk mitigation
  - Denmark: Subsoil Act, Heating Act, Risk mitigation scheme
  - Italy: handled at the regional level, exploration & production licensing
- Tools relevant to spur the deployment of Geothermal District Heating:
  - Risk mitigation
  - Investment aid
  - Administrative support

Ideal Regulatory Framework

Available at: www.geodh.eu

New business models for geothermal district heating

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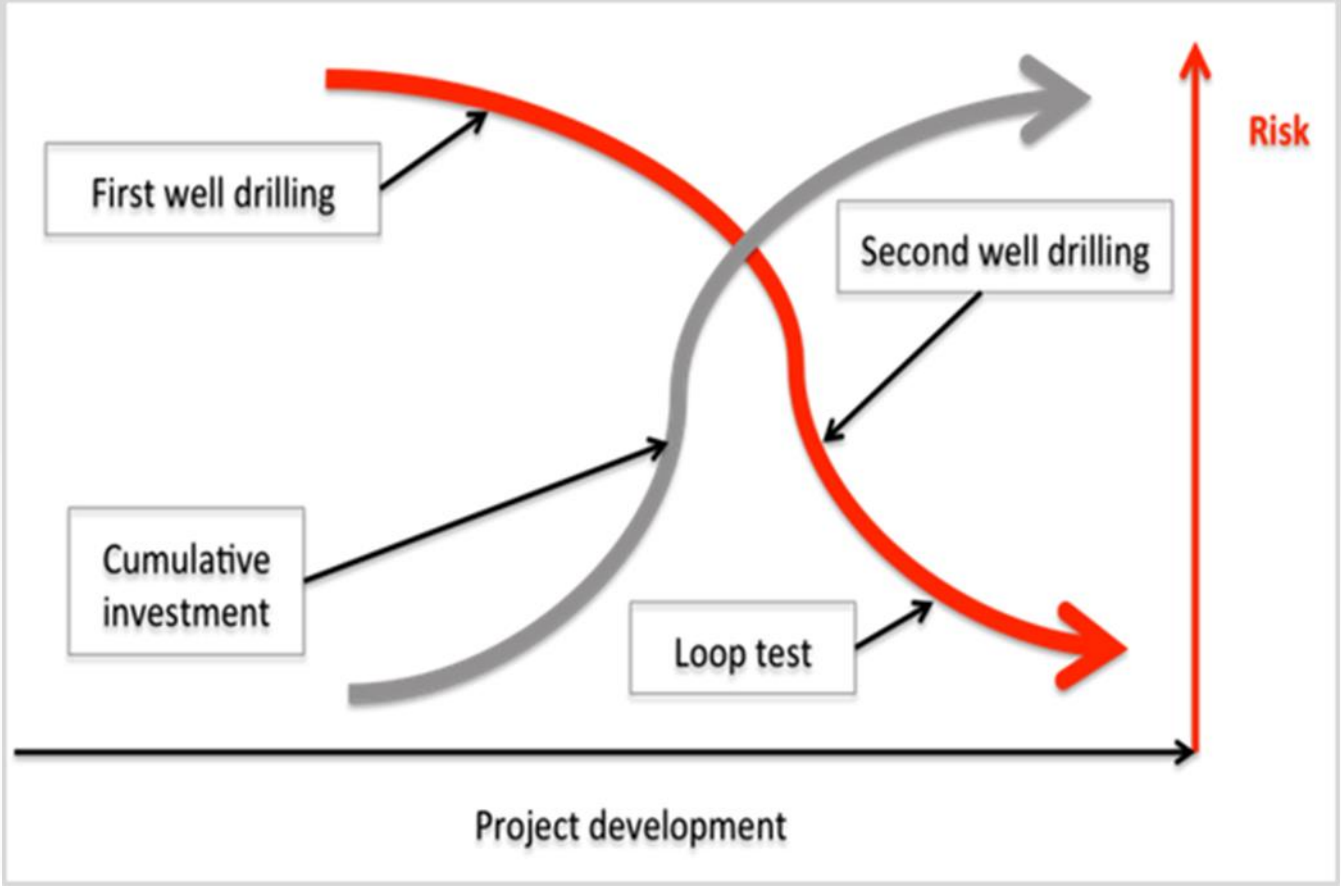
- Investment risk: a key challenge



New business models for geothermal district heating

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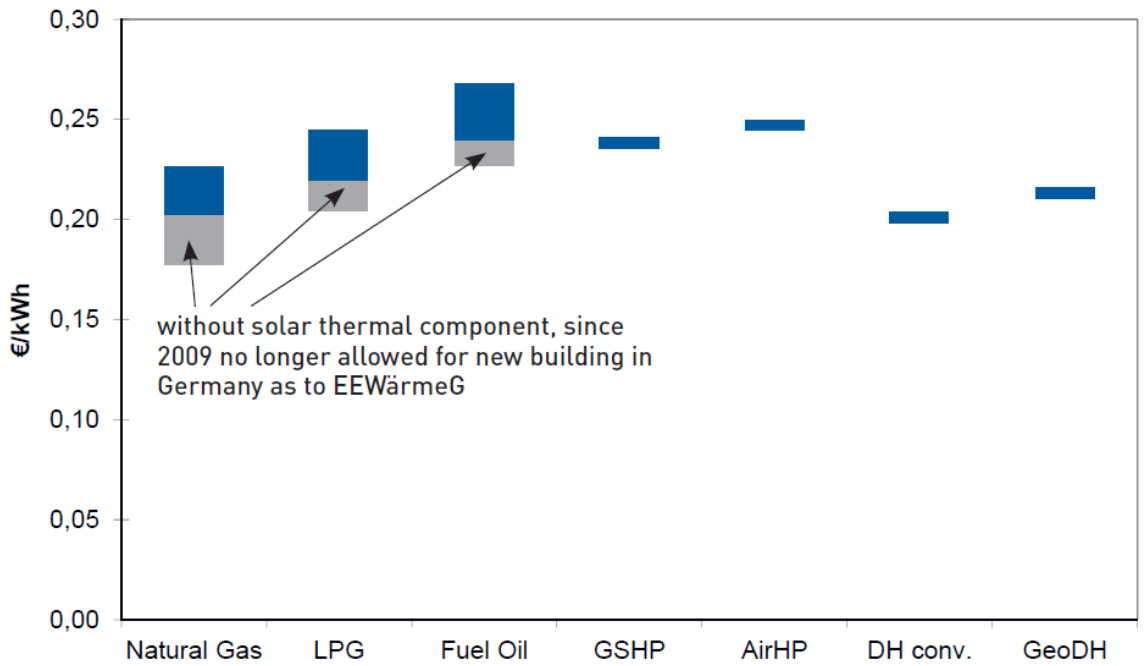
- **A competitive energy source**

Full heat cost of a residential house in Germany



Graph 6: Heat full cost in a modern residential house with 150 m² floor area in Germany in 2011, including all taxes and comprising the heat distribution in the building, after values from ASUE (see text for details)

New business models for geothermal district heating

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- Towards smaller heat networks;
  - Single consumer (hospitals, universities);
  - Neighbourhood scale…
- Towards innovative uses:
  - Utilising low-enthalpy resources;
  - EGS in cogeneration…
- The challenge of upfront investment costs:
  - Insurance schemes;
  - Better knowledge of resources…

A changing EU regulatory framework: the Clean Energy Package

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- **A new Renewable Energy Directive:**
  - Question of the status of geothermal energy;
  - Future of support schemes;
  - Streamlined administrative procedures: 3year upper limit;
  - Provision of mainstreaming renewables in heating and cooling;
  - Regulatory framework for district heating.
- **Energy Efficiency Directive:**
  - Question of annual rate of savings & building renovations;
  - The primary energy factor

Preliminary EGEC recommendations for the project

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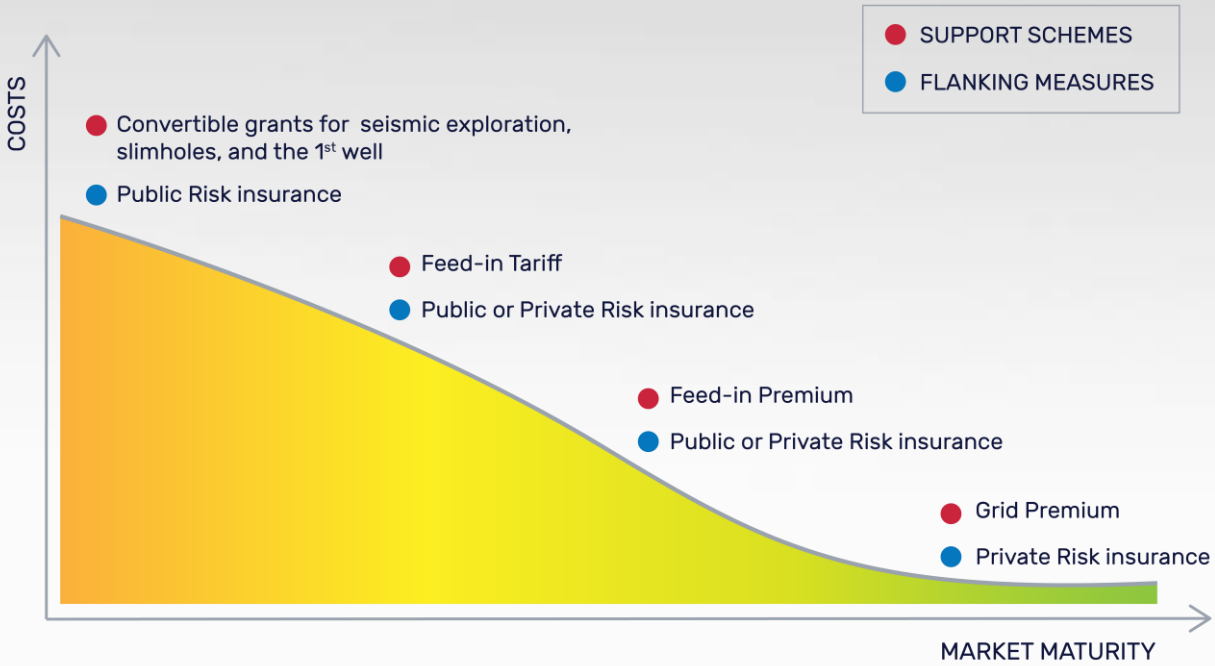
Support schemes for Geothermal adapted to technology maturity



Thank you for your attention!

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