



Geothermal energy is limitless, ubiquitous and free at the point of use. When combined with the very high energy efficiency of TABS and application range of hybrid systems, it offers huge potential to meet heating and cooling needs in Europe, and reduce CO₂ emissions.

GEOTABS hybrid is an active research project to optimise the predesign and operation of a hybrid combination of geothermal heat pumps (GEO-HP) and thermally activated building systems (TABS). It will design an improved, automated 'Model Predictive Control' (MPC) solution for testing on hybrid supply and emission systems in demonstration buildings such as offices, elderly care homes, schools and apartment blocks. Applying MPC to hybrid GEOTABS optimises the performance and efficiency, making it more economically attractive and increasing take up.

WHAT IS GEOTABS?

An innovative clean technology for energy efficient and healthy buildings is the combination of thermally activated building system (TABS), a ground heat exchanger and heat pump in between both systems (GEOTABS). They have several advantages. The radiant heating and cooling system has proven to be one of the most comfortable ways to condition indoor spaces, especially multi-storey offices.

Comprehensive information on GEOTABS systems is available in the REHVA guidebook 20 "Advanced system design and operation of GEOTABS buildings".

PROJECT OBJECTIVES

- **Improve** the efficiency of heating and cooling of a hybrid MPC GEOTABS system by 25% compared to the existing best practice
- **Develop** a method of choosing appropriate components for hybrid MPC GEOTABS solutions to achieve optimal performance and offer grid flexibility through demand-response
- **Develop** a Smart Grid-ready automated control system based on MPC and provide this as an open source solution
- **Establish** a trade body or association to promote the hybrid GEOTABS concept and best practices
- **Validate** the technology and approach on a virtual validation test-bed and on at least three real, high-visibility buildings





BUILDING AND ENERGY CONCEPT

GEOTABS can be used with a wide spectrum of design, operation and applied control strategies. For example, Solarwind is at the forefront of sustainable construction in Luxembourg, achieving triple environmental certification. The building envelope, solar orientation, materials and triple glazing were designed for energy efficiency.

Heating and cooling is delivered via concrete core activation, coupled with heat pumps in the winter and passive cooling in the summer, optimising energy use and reducing maintenance costs. It is well ventilated (ID2), utilizing a dual heat exchanger and adiabatic cooling. The ventilation flows adapt automatically with air quality sensors that monitor the occupancy flow of the building. Other renewable energy sources used include urban wind turbines, solar photovoltaic & thermal, and biomass wood pellets for hot water production. Other features include rainwater harvesting for adiabatic cooling and toilet flushing, motion detectors and brightness sensors for lighting, a green roof facade and a 'zero bin concept'.

MORE INFORMATION

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PARTNERS

GEOTABS hybrid brings together a transdisciplinary team of SMEs, large industry and research institutes, experienced in research and application of design and control systems in the combined building and energy world.



Photo: Solarwind.

Building data

Building location:	Luxembourg, LU
Building type:	Offices, with integrated restaurant and children day care
Completion date:	August 2012
Certifications:	BREEAM (very good), HQE (exceptional), DGNB (gold) and passive
Conditioned floor area:	10,000m ² (area that is heated and or cooled)

Energy Emission Systems

Energy:	hybrid thermal supply consisting of solely RES technologies
Heating:	<i>Main</i> - TABS and chilled ceiling (5%) <i>Secondary</i> - heating coils behind VAVs <i>Other</i> - floor heating (minimal) and radiators (minimal)
Cooling:	<i>Main</i> - TABS and chilled ceiling (5%) <i>Secondary</i> - Air

