The UMONS ENERGY Institute is dedicated to research and development activities related to energy issues. This multidisciplinary theme covers scientific, technological, societal, legislative, economic and political aspects. It therefore requires an integrated approach from a number of disciplines. The Institute draws on the expertise of 125 researchers and more than 30 PhD students, who are involved in 150 annual publications and 50 ongoing projects.

The challenges of the ecological transition



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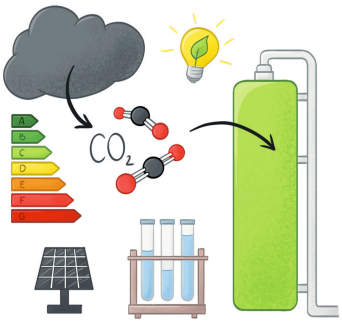
The challenges of the ecological transition are such that medium- and long-term political plans are being drawn up. Such political objectives require new developments in all sectors of society. The issue requires an integrated approach from a number of disciplines and a vision covering different time scales. Within UMONS, the ENERGY Institute is the organisational structure concerned with research and development activities in this area. Its activities are based on its members' skills in the fields of science, applied science, economics, architecture and urban planning. The Institute's mission? To support these different areas of R&D with the societal objective of helping to build the energy system of the future.

Expertise and Research Subjects

The Institute's activities cover the synthesis and characterisation of active materials for energy applications, phenomenological studies (experimental and simulation), technological prototyping, energy monitoring and the development of simulation tools, in the following areas:

- Biofuels and combustion: New combustion techniques, environmental impact, production of biofuels from micro-algae.
- Capture and sequestration of CO2: Purification and capture of CO2 in post-combustion, storage of CO2, electrofuel production.
- Photovoltaic technologies: Development of new generations of photovoltaic cells.

- Energy communities: Zero energy and positive energy buildings, alternative technologies for heat and cold production and their integration in buildings.
- Energy storage: Geological storage of solar thermal energy, inter-seasonal heat storage by thermochemical reactions.
- Materials and processes for energy applications: Materials for the transportation of electrical energy, optimisation of industrial processes, heat recovery.
- Wind energy: Assessment of wind potential, optimisation of wind turbine blade profiles, acoustic and vibration aspects.
- Smart grids: Impact of decentralisation of electricity generation on distribution networks, electricity supply and demand management, IT security for data transfers.
- Geothermal energy: Characterisation of geothermal resources, heat networks.



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Focus on Some of the Institute’s Projects

The Institute develops its activities primarily through collaborative research projects. These research projects are based on interdisciplinarity and prioritise collaborative research and co-development. They are based on a partnership approach with all players in society (industry, services, research centres, local authorities, government institutions, etc.). These projects enable partnerships to be forged at provincial, regional, federal, European and broader international levels.

Here are a few examples of the ENERGY Institute’s projects:

C3E2D

Led by UMONS, the project portfolio of the Centre of Excellence in Energy Efficiency and Sustainable Development aims to create research infrastructures that will be able to create ecosystems favouring innovation, as well as carry out integrated, economic-focused research projects and generic studies.

WAL-E-CITIES

The “Wal-e-Cities” project aims to develop an ecosystem of smart cities in Wallonia, in line with the Smart Region philosophy, in terms of mobility, energy and the environment, governance and living environment. The institute is involved in the energy part of the portfolio with the general objective of proposing innovative solutions for heat production and storage systems for heating buildings, particularly on a neighbourhood scale. The proposed solutions must allow a renewable contribution to the coverage of heat needs.

MOF4AIR

The MOF4AIR project, for which UMONS is the coordinator, aims to develop and demonstrate the performance of CO2 capture technologies by adsorption based on the use of “Metal-Organic-Frameworks (MOFs)” in power plants and energy-intensive industries. MOF4AIR should provide reliable and reproducible TRL-6 technology that meets the needs of end-users, notably by limiting energy penalties by more than 10%.

POPE

The POPE project aims to develop and evaluate a high-fidelity but low-cost modelling chain which, based on weather data and the characteristics of a wind farm site (including surrounding obstacles), can provide the operational characterisation (in terms of power and forces on the blades) of a given machine installed there.

BEOWIND

This project will study and develop innovative aspects of Belgian offshore wind generation: provision of grid support services (e.g., participation in frequency regulation), stability of grids with a high proportion of wind energy, longevity estimation and predictive maintenance of offshore wind fields. To this end, physical and data-driven models will be developed using data collected from Belgian offshore wind farms.

EPOC

Development and implementation of energy system models to support a realistic, sustainable and cost-effective energy future in Belgium while ensuring security of supply. The time horizon of the developed models is 2030 and 2050, the parameters and results of the models will be discussed and validated by a wide and consistent range of Belgian stakeholders.

MOREGEO

The objectives of the MOREGEO project, which is part of the “energy distribution” project

portfolio for which IDEA is lead partner, are to increase the knowledge of the deep geothermal reservoir in the Heart of Hainaut region and, based on this, develop a model to promote the adequate and sustainable development of the deep geothermal resource in this territory.



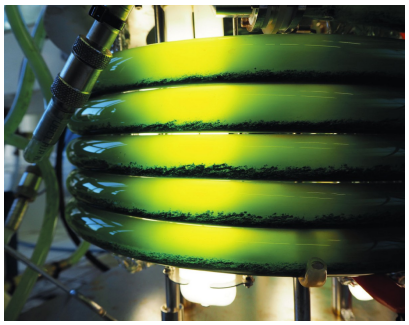
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E-CLOUD

E-Cloud aims to develop and optimise open microgrids in industrial areas. These will allow different companies located in the same area to invest together in renewable energy production and storage capacities and to share the electricity produced in an optimal way by optimising interactions with the grid and the markets.

More information about the ENERGY Institute:

UMONS ENERGY Institute website



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