

Energy Utilisation in Buildings

In the UK, buildings are responsible through their construction and operational lifetime for some 50% of all our carbon emissions into the environment – 30% from homes and 20% from commercial.



UK construction sector figures indicate that on average only 2% of our offices are being replaced per annum with homes at only 1%, in Scotland only one fifth of the total current housing stock is under 30 years old. As a result of inefficiencies over 40% of total UK energy demand is used for heating, cooling, ventilation, lighting and power for electrical appliances in domestic and commercial buildings. There are therefore major opportunities to significantly reduce energy usage and carbon emissions by improving energy efficiency.



As a result of the Scottish Government commissioned Sullivan Report in 2007, staged legislative improvements in building energy standards are set for 2013 with the further aim of net zero carbon buildings (emissions for space heating, hot water, lighting and ventilation) in 2016/17.

To meet these targets both new and existing building stock must have energy performance at the forefront of any new development or refurbishment agenda.

What are the key technology challenges?

- Building Architectural design
- Passive and dynamic energy use reduction technologies such as building fabrics, insulation, materials, integrated energy renewables, lighting, heating and ventilation.
- Construction techniques (off and on site) and the design and use of zero carbon materials and composites.
- Smart buildings and Smart Cities technologies utilising building energy performance management and validation methodologies by way of both software and internet based building control management techniques.
- Decarbonising new and existing construction products and methodologies.



Energy Utilisation in Buildings

Summary of Energy Utilisation in Buildings expertise in ETP

Improving Energy efficiency

ETP is at the forefront of R&D for both energy efficient technologies and construction methodologies for both new build and retrofit of existing building stock.

A huge variety of capabilities are available to industry such as: Knowledge of changing regulatory requirements, Structural engineers (timber, steel and masonry specialists), integration of renewables, acoustic testing to regulatory standards, architect and design specialists, product life cycle analysis, Timber engineering specialists, Modern methods of construction both off and on-site, building energy envelope analysis and improvements, fire risk and risk analysis, impact of climate change on buildings, energy consumption and performance monitoring, human factors-users, fuel poverty, SUDS optimization, smart materials in buildings, building insulation techniques and materials, integrated renewable energy generators, passive building performance analysis and human behavior in buildings.

Modelling and real world performance software

ETP uses state of the art computer modeling tools to analyse and integrate energy efficiency measures alongside other environmental needs. One research project enables the designer to disaggregate energy consumption and resulting CO2 emissions of a specific house type and then apply a variety of different methodologies and technologies to apply effective reduction measures.

Micro-renewables

ETP is working with industry to develop building integrated renewable energy technologies including, Micro-CHP, integrated solar, micro-wind, heat pumps and fuel cells. IT control software systems and Smart buildings are being developed to autonomously monitor and control energy efficient buildings.

Developing new materials and construction techniques

Materials research is also an important aspect of the work being undertaken by ETP. This includes work on both conventional materials such as timber framing and also new methods of insulation.

Traditional construction techniques are heavily dependent upon on-site development with key stages of construction therefore dependent upon weather conditions. New off-site construction methodologies and techniques are being developed that are more efficient and allow new energy saving materials or systems to be integrated into new build designs much more effectively.

The Scottish Energy Laboratory (SEL)

Energy sector test facilities have been brought together under the Scottish Energy Laboratory (SEL) umbrella. Facilities of particular relevance to building and construction include:

- Environmental Test Chamber Hanger 17 BPAC – Building Performance assessment Centre
- BRE Building Innovation Park, Ravenscraig
- The Energy Technology Centre in East Kilbride

For more details visit www.scottishenergylaboratory.com