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ECBCS ANNEX 49

Annex 49 is a task-shared international research project initiated within the framework of the International Energy Agency (IEA) programme on Energy Conservation in Buildings and Community Systems (ECBCS).

Annex 49 is a three year project starting in November 2006, following a preparation phase of one year. About 17 research institutes, universities and private companies from 10 countries are currently participating.

For up-to-date date information see:

www.annex49.com

International Energy Agency
Energy Conservation in Buildings and Community Systems Programme
www.ecbcs.org

ECBCS Annex 49

Low Exergy Systems for High-Performance Buildings and Communities

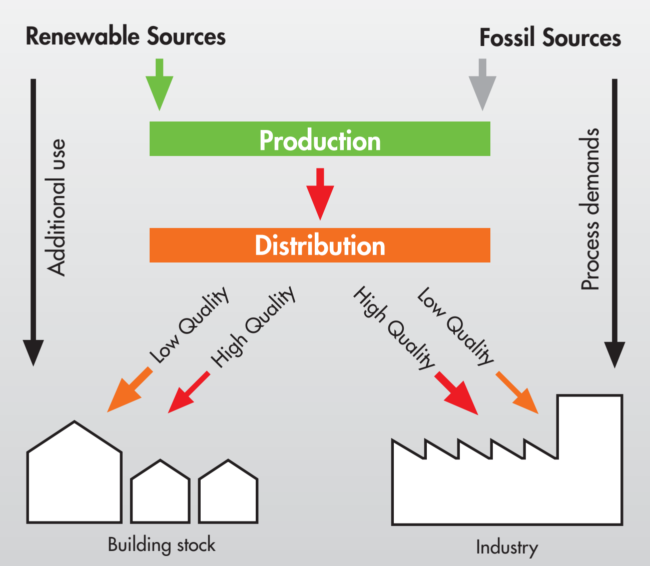
Annex 49
Low Exergy Systems for High-Performance Buildings and Communities

LOW EXERGY SYSTEMS FOR HIGH-PERFORMANCE BUILDINGS AND COMMUNITIES

The main objective of this project is to develop concepts for reducing the exergy demand in the built environment, thus reducing the CO_2-emissions of the building stock and supporting structures for setting up sustainable and secure energy systems for this sector.

Specific objectives are to:

- Use exergy analysis to develop tools, guidelines, recommendations, best-practice examples and background material for designers and decision makers in the fields of building, energy production and politics
- Develop cost-efficient energy/exergy measures for retrofit and new buildings, such as dwellings and commercial/public buildings
- Develop exergy-related performance analysis of the buildings as seen from a community level

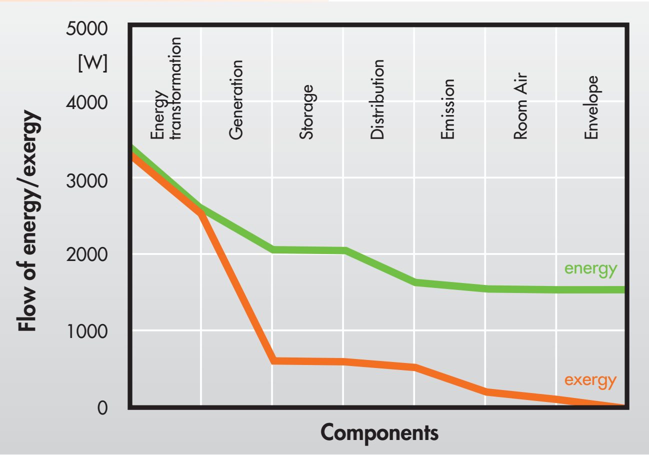


Desirable energy/exergy flow to the building stock and industry

BACKGROUND

Exergy

The exergy content of a given flow of energy depends on the attributes, e.g. the temperature, pressure, and chemical composition, of both the substance carrying the energy (energy carrier), and the surrounding environment. The more different the attributes of the energy carrier and the environment are, the higher the exergy content of the energy carrier is. For example, high-pressure steam required for electrical power generation has a higher exergy content than warm water needed by a dishwasher.



Energy and Exergy flows through a building

The LowEx Approach

The Low Exergy (LowEx) approach entails matching the quality levels of exergy supply and demand, in order to streamline the utilisation of high-value energy resources and minimise the irreversible dissipation of low-value energy into the environment. The exergy content required to satisfy the demands for the heating and cooling of buildings is very low, since a room temperature level of about 20°C is very close to the ambient conditions. Nevertheless, high quality energy sources like fossil fuels are commonly used to satisfy these small demands for exergy. From an economical and environmental point of view, exergy should mainly be used in industry to allow for the production of high quality products.

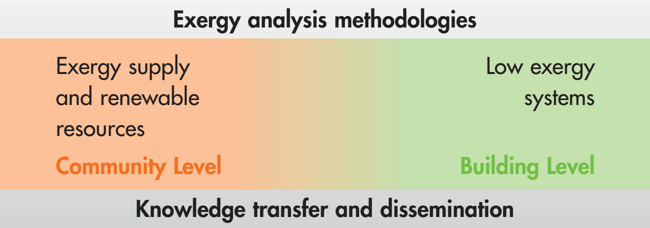
BENEFITS

The total energy use in buildings accounts for more than one third of the world's primary energy demand. There is, however, a substantial saving potential in the building stock.

- Exergy analyses show new potentials of increasing the overall energy chain efficiency.
- Exergy analysis supports the development and selection of new forms of technologies and concepts with potential for lowering exergy consumption in built environments and quantifies this potential.
- The strategies developed for a better and exergy optimised building design will help pinpoint specific actions to provide clean, clever and competitive energy use.
- The exergy concept allows the total CO_2 emissions of the building stock to be substantially reduced due to more efficient energy conversion processes.

THE ANNEX 49 PROJECT

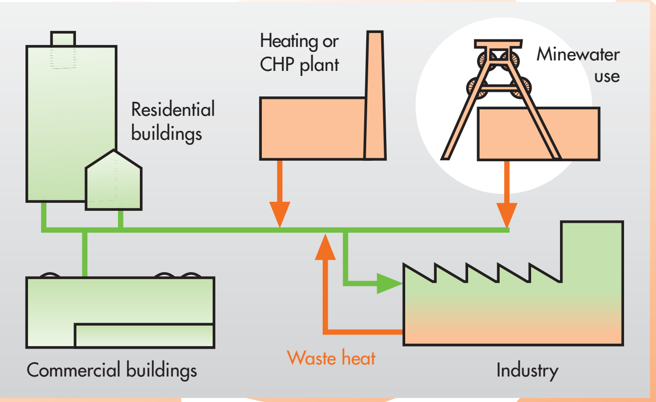
Annex 49 is based on an integral approach which includes not only the analysis and optimisation of the exergy demand in the heating and cooling systems but also all other processes where energy/exergy is used within the building stock. In order to reach this aim, the project works with the underlying basics, i.e. the **exergy analysis methodologies**. These work items are aimed at development, assessment and analysis methodologies, including a tool development for the design and performance analysis of the regarded systems. With this basis, the work on **exergy efficient community supply systems** focuses on the development of exergy distribution, generation and storage system concepts. For the course of the project, the generation and supply is as interesting as the use of energy/exergy. As a result, the development of **exergy efficient building technology** depends on the reduction of exergy demand for the heating, cooling and ventilation of buildings. Finally, all results of Annex 49 are to be made public information. The **knowledge transfer and dissemination** activities concentrate on the collection and spreading of information on ongoing and finished work.



Structure of the ECBCS Annex 49

RESULTS

- Guidebook on advanced LowEx technology in the built environment at a community level and how to optimise supply structures to ensure low exergy demand while providing good thermal comfort
- Design guidelines regarding exergy metrics for performance and sustainability
- Open-platform exergy software for building design and performance assessment
- Best practice examples for new and retrofit buildings and Communities
- Demonstration projects
- Policy measures and pre-normative work



The integration of energy sources from our environment, e.g. the use of water from abandoned mines for heating or cooling of buildings, requires exergy efficient supply systems at the community level and adapted building service systems.