

## Annex 70 case study

# Case study “GEMA”

GEMA - Assessment of the performance of energy-efficient demonstration buildings, AUSTRIA

**Setting / location:** The project “GEMA” is located in Austria, where nine demonstration buildings have been analyzed.

**Scale / population:** “GEMA” analyses nine different building types in Vorarlberg, Styria, Tyrol, Carinthia, Salzburg and Vienna. The focus is on service buildings – three office buildings, a laboratory, a supermarket, a hotel, a care home, a student residence and a cultural and event center were analyzed.

**Who was involved:** Project leader was DI Martin Beermann from JOANNEUM RESEARCH Forschungsgesellschaft mbH, in Graz, Austria. Project partners were EU DT Energie- u. Umweltdaten Treuhand GmbH and DI E. Sauper Mess-, Regel- und Steuerungstechnik based in Klagenfurt, Austria. JOANNEUM RESEARCH is a non-university research institution, operating both on a national as well as international level. EU DT is an engineering company with competencies in energy monitoring.

**Summary:** The project analyzed the energy consumption of nine commercial and residential buildings in Austria, which include innovative technologies or concepts for minimizing their energy requirements. The results shall serve to realize the optimization potential of buildings in future construction projects in terms of energy, environmental and social indicators. Therefore the energy flows for the supply and distribution of heating, hot water and cooling energy, the object-related electricity consumption and, if available, power generation with PV Systems were recorded during a period of at least twelve months. The collection of the measured data mostly at fifteen-minute intervals and data validation was carried out using a professional web-based hardware and software solution. The primary objective was the evaluation of the measured data based on energy indicators and existing guidelines. Based on the results recommendations for management of domestic service facilities and for measurement analysis of monitoring data as well as control and regulation parameters are made. These are relevant for building operators, building owners, planners of building services and maintenance companies

**Datasets used:** Energy passes for the buildings (energy demand for heating, domestic hot water, cooling, end energy and primary energy) were used. Electric consumptions of the buildings were measured in individual consumer groups (e.g. office equipment) or single consumers of the building services (e.g. heat pump, ventilation). The adjustment of weather-related effects was done by using heating degree days. The conversion of the end energy consumption to primary energy consumption was done with conversion factors of the OIB RL 6, Version 2015.

The data monitored in the GEMA project is energy consumption for heating, domestic hot water, cooling, end energy and primary energy.

**Implementation / Method:** The energy flows for the supply and distribution of heating, hot water and cooling energy, the object-related electricity consumption and, if available, power generation from PV systems of nine service buildings were recorded and analyzed. The recording period was at least twelve months and the collection of the measured data mostly was done at fifteen-minute intervals. Temperature and relative humidity and in some cases the CO<sub>2</sub> content in at least three rooms were also recorded using a professional web-based hardware and software solution. A web-application enables the current access to data and evaluations. A comparison of parameters from the energy pass with real measured values shows the planned demand vs. measured consumption.

All buildings were classified in a sustainability assessment according to the Total Quality Building (TGB-) system, including technical, ecological, economic and social criteria.

**Accessibility:** The used data in the project was partly publicly accessible (e.g. the heating degree days, conversion factors). Energy passes for buildings are not publicly accessible, energy passes were provided by the building management of the nine buildings. Data concerning energy demand and supply was recorded during the project, therefore no data source was needed.

**Strength and opportunities:** The recording and monitoring of the energy demand shall enable a comparison of the planned energy performance and claimed level of sustainability of newly built and renovated low-energy and passive houses with the real energy consumption during usage. Based on this analysis the project gives recommendations for the management of domestic service facilities and for measurement analysis of monitoring data as well as control and regulation parameters.

The monitoring and assessment results shall serve future building projects to fully use the energy-related, ecological and social optimization potential.

**Technical facts:** The recorded and analyzed data of the nine buildings examined is documented in the final report of the project. The measured final energy demands of the buildings were recorded separately by consumption category. The measured data is provided in an Excel file.



Figure 1: Overview of the analyzed buildings