

# HESMOS

ICT Platform for Holistic Energy-Efficient Simulation and Lifecycle Management of Public Use Facilities

FP7 Project No. 26088

## PROJECT SUMMARY

HESMOS (2011-2013) was a 40-month European FP7 industry-driven project particularly directed to the demand of PPP and BOT providers for an integrative view of energy efficiency and cost balance over the building lifecycle, bringing together, via integrated IT tools and a collaboration environment, architects, building services engineers, facility operators, public authorities, tenants and owners.

In the context of the thematic priority programme “ICT for energy-efficient buildings and spaces of public use”, HESMOS anticipated that especially public use facilities developed as PPP projects can play a leading role in energy efficiency and sustainability as they provide the advantage that design, construction and operation can be seen as a whole thereby leading to much stronger industry interest in integrated solutions and more reliable decision-making than practiced today.

In accordance with that, the **major objectives** of the project were:

- To provide advanced simulation capabilities to decision makers in the whole life-cycle of buildings, taking into account energy savings, investment and life-cycle costs
- To connect CAD, FM and eeTools (energy efficiency tools) in order to enhance building industry actor's ee-competences
- To close the gap between Building Information Modelling (BIM) and Building Automation Systems (BAS) so that decisions can be made economically (energy and cost related) in all life-cycle phases
- To integrate various information resources thereby extending current Building Information Modelling (BIM) to an energy extended multi-model framework (eeBIM)
- To provide a new methodology for energy and emissions saving in BOT and PPP projects of public use facilities using BIM-based methods of working, and evaluate the developed methodology in performed real-life pilot projects.

The **VISION** of HESMOS was that each architect and each facility manager should be able to do in depth energy analyse and profound energy life cycle cost estimation of any of his buildings on the basis of IFC-BIM.

The **MISSION** of HESMOS was to design and develop a holistic ICT platform with a sound BIM interoperability method to provide integration of any BIM compliant CAD, energy analysis tools and sensor networks and using appropriate mapping algorithms, filter functions and visual representation techniques.

The **PRODUCTS** of HESMOS are:

- (1) An open platform supporting flexible simulation and design cycles featuring life-cycle energy simulation and management services, web-based BIM navigation, and result evaluation via eKPIs to enable more efficient team decision-making
- (2) Multi-model methodology and tools extending standard BIM (ISO 16739) to a multi-model energy-extended BIM framework, eeBIM
- (3) A novel semantic and intelligent Virtual Energy Lab, IVEL, which is fully based IFC-BIM and the developed eeBIM interoperability framework including BIM/BAS interoperability and FM / Energy Simulation Tools integration
- (4) IDM / MVD improvement by a developed by HESMOS easier to use guideline for practice.

Additionally, HESMOS enables the presentation of sensor data on the virtual building model and compares them to thermal simulation results to identify optimization potentials.

**In summary,**

**HESMOS provides an open Integrated Virtual Energy Lab platform (IVEL)** with standardized interfaces, a BIM-based energy related data management basis for exchangeable energy calculation, CAD, monitoring and FM tools, a building and energy life cycle information management repository, and a sustainable Simulation and Monitoring Lab,

**but HESMOS is NOT** an accumulation of some selected CAD and energy analysis tools and NOT just another energy calculation application

The project was performed by a **Consortium** featuring a mix of six partners from 5 European countries covering the key areas of research and development relevant to the project goals. They represented 4 types of market segments, namely:

- End-users (Royal BAM Group, The Netherlands and Obermeyer Planen + Beraten, Germany)
- BIM-based software developers (Nemetschek Slovakia and Granlund, Finland)
- A BIM expert (AEC3 Ltd.)
- Academia (TU Dresden, Germany, with the three institutes Construction Informatics, Building Climatology and Technical Information Systems).

**Coordinator** of the project was the Institute of Construction Informatics at the TU Dresden.

**After project end, the developed IVEL is continuously extended in three directions:**

- (1) By several important services in the FP7 project ISES, including Cloud technology for massive parallel computations needed for CFD flow analysis, sensitivity and stochastic evaluations, or semi-automatic parameter variations for alternative investigation
- (2) In broader scope in the FP7 IP eeEmbedded, including the various energy systems of a modern building and its embedding in the energetic neighbourhood and neighbourhood systems and a full multi-model and multi-user holistic design collaboration platform
- (3) Towards a semantic-based intelligent Virtual Engineering Lab in the EU project SE-Lab (to develop and prove the usability of the approach for sophisticated structural engineering analysis including stochastic investigations using Grid/Cloud technology) and the EU project BridgeCloud (where the IVEL is extended for an in depth design and sophisticated engineering investigation of bridges).

Two tools developed in HESMOS have already reached **Technology Readiness Level (TLR) 7** or higher. These tools are: Granlund Manager Metrix, exploiting BIM-based HESMOS methods for performance management metrics, and WebRoomEx, the eeBIM based Facility Management application developed in the frames of the project. Both tools are available directly from Granlund or via Granlund, in conjunction with HESMOS IVEL freeware.

