Towards a Minergie®-Standard for Tropical Climates: The Case Study of an Office Building

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Abstract

United Arab Emirates (UAE) is one of the biggest natural gas and oil producers in the world, ranking sixth in the world in proven reserves, however, now is becoming an increasingly relevant consumer too. The rapid economic growth the last years has led to a continuous grow of the UAE's total energy consumption. This is evident from the 34% of increase of the annual electricity net consumption from 2005 to 2008, reaching 70.6 billion kWh, with the whole being produced by conventional thermal energy plants. It is therefore that the country has made a series of commitments for investing in sustainable urban technologies, including towards reducing buidings energy needs. The Minergie®-Standard for tropical climates is a project launched in November 2011 by EPFL Middle East, and is a joint collaboration with the Solar Energy and Building Physics Laboratory of EPFL and the Minergie®-Association. Main objective of the project is to form a new Minergie®-Standard, similar to the already existing one but applied for hot and humid climates, that will be used as a tool for the construction of low energy buildings.

Under this scope, the total energy and water use of an office building, situated in Ras al-Khaimah, are to be estimated with a simplified monthly energy balance method, as well as with the use of a detailed dynamic thermal model based on the building energy simulation program EnergyPlus. The model will then be calibrated and the results of the monthly energy consumption will be compared with data retrieved from measurements. The final task of the project is to test different scenarios with implementing well-known energy saving measures. Thus, with the aim to reduce the energy consumption by a factor of five while maintaining an above average comfort with low cost improvements, different measures will be implemented, including improved thermal insulation, air-tight envelope, adjustable solar shading devices, HVAC systems utilising heat recovery and efficient appliances and lighting. In conclusion, with the aim to set-up a Minergie®-Standard for tropical climates, the results of this case study will be compared and discussed with the similar one undertaken for a private household, a single family dwelling, which is also located in Ras al-Khaimah. The arising differences with the already applied energy label Minergie®, valid for temperature cold climates, will also be examined.