AVIS DE PRÉSENTATION DE TRAVAUX EN VUE DE L'OBTENTION DE L'HABILITATION A DIRIGER DES RECHERCHES

Monsieur Peter RIEDERER présentera ses travaux intitulés :

« On the use of numerical simulation for the improvement of the conception and operation of energy systems in buildings and communities. »

Spécialité : Génie Civil, Section CNU : 60

Le Jeudi 12 mai 2022
À 10h30

Au Centre Scientifique et Technique du bâtiment
Salle Léonard de Vinci
4, avenue du Recteur Poincaré
75 016 PARIS

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Résumé :

To date, the building sector represents more than 40% of the final energy consumption in France (and also in Europe) and represents thus one of the key responsibles of greenhouse gas emissions.
The ratio of the energy consumption of the building sector is continuously increasing with about 1% per year.
As an example, in the residential sector, energy for heating and the production of domestic hot water represents approximately 85% of the global final energy consumption.
Many research and actions have been carried out on the optimisation of building envelopes and components of energy systems. However, although a great potential of energy reduction has been shown in theory, the topic of energy systems and their control and management is still too much left aside.

A change of this situation has recently started by:
- The start of energy performance contracts of buildings which, by nature, must include energy management in the risk analysis ;
- The initiative of "smart grid" projects that aim in the optimisation of energy fluxes on a building, district level and even community level ;
- In general, the efforts in terms of energy efficiency and REN&R systems have been enlarged from a building level to the neighbourhood, district or even city level.
The research undertaken and presented in this report is completely in line with the objective of the improvement of energy management and the rational use of fossil energy (and thus the increase of REN&R sources) in buildings, districts and cities.
The document presents this work in four main chapters:
- A typology of energy systems and the French building stock as well as statements on the improvement potential of their conception, energy management and control ;
-Tools and methods that have been developed for the conception, test and optimisation of the control and energy management of systems. These tools are a) numerical simulation, b) in-situ or lab evaluation and c) hardware in the loop approaches ;
- Modelling/simulation approaches and suggested modelling choices depending on the simulation objectives ;
- Specific adaptations of these tools for testing control systems and some examples of innovative optimisation algorithms.
This works tends to present an overview on energy systems and particularly the use of numerical simulation to increase energy efficiency at system, building and district level.
In the last paragraph on perspectives, approaches that could be undertaken in the future to ensure better accuracy of numerical simulation are presented.