

Post-Doctorate Proposal

CSTB Department: TIDS **Division** : IIL **Date** : Sept. 18, 2007

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Title: Design and development of applications for designing and dimensioning very low energy buildings and positive energy buildings.

CSTB research program: Buildings and sustainable development

Short description of work envisaged

Summary

The objective is to exploit existing physical models of innovative energetic systems, potentially reusable in the context of low energy building and positive energy buildings. Following a focus of research on dynamic energy simulation tools, the post doctorate will contribute to the design and development of software applications in the building domain, targeting the design and dimensioning of low energy buildings. This work will mainly, but not exclusively, rely on the TRNSYS simulation platform, which is largely used by academic research teams and big consulting companies to model and assess building related energy systems. Particular attention will be given to model validation, model coupling and model assembly.

Context:

This work is motivated by the strong will of French public authorities, and indeed the entire construction sector, to move towards very low energy buildings, or even positive energy buildings, as well as by a lack of usable and reliable tools which include innovative systems used as a starting point in the conception of such buildings.

The research and its application concern both residential (individual houses, apartment blocks, community facilities) and non-residential buildings.

Objective:

This post doctorate will strengthen our research in the fields of dynamic simulation software tools for buildings and associated energy systems, as well as their development and deployment in the form of software applications for commercial consulting companies in the building domain. The applications developed so far concern solar hot water systems (domestic hot water, space heating, pool heating).

The objective is to envision and define applications in the building sector, allowing for the design and dimensioning of very low energy buildings or even positive energy

buildings. This means applying research work on innovative systems, which are the basic bricks of these buildings, in order to make them usable for building professionals.

Achieving this objective will contribute to the larger goal targeted by CSTB's research area on « Buildings and sustainable development », by providing a new generation of dynamic simulation tools for buildings and their systems.

Work plan :

The planned work is based on the following steps:

- Search (bibliography) and selection of innovative systems to be included in the domain applications ;
- analysis of available physical models and their numerical domain of application ;
- transformation of physical models into numerical models, and model validation ;
- integration of the numerical models into a simulation environment such as TRNSYS (or similar) ;
- functional and technical specification of software applications in the building sector ;

Expected results :

The expected results are:

- a library of innovative system models for energy efficiency in buildings ;
- technical and functional software specifications for the building sector well suited to the design and dimensioning of low energy buildings, or even positive energy buildings.