

## Building Energy Modeling Tool for Residential Buildings

Toward Zero Energy Housing in Lebanese Coastel Region

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## **Background**

In 2030 the energy consumption of building in Lebanon is expected to reach 250% the energy consumption in 2010. This fact is exarcerbated by the inadequate existing building performance, such as excessive energy consumption, thermal comfort issues, and insufficient daylighting. These deficiencies are often the result of an inability of the design team to consider a wide variety of design options for all these criteria in an integrated and systematic way during the early design stage.

For this reason, researchers are developing an advancements in computer-based Building Information Modeling (BIM) and energy modeling software that allow architects and engineers to simulate building performance in a virtual environment (Fig.1). The potential of this technology will enhance the early stages of the design process, and have a great impact on the performance of existing and new buildings.

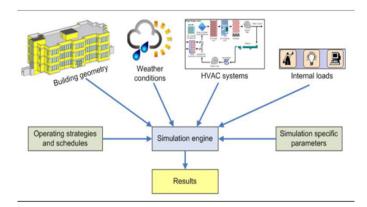


Figure 1: Basic of building performance simulation with different building systems integration

These design tools could be considered as a practical way to apply the latest energy efficient policy and thermal standards in Lebanon (Fig.2).

Despite the proliferation of energy modeling software, no specific applications and software exists that cater specifically for the Lebanese climates and their comfort conditions. In addition, there is a lack of knowledge and database to apply these software in the architectural practice.



Figure 2: The Absence of the Tool to apply the Lebanese EE Standard in the new design.

## **Research Aim**

The research presents a method and decision-support database for Building Energy Modeling that can be used as a proactive guide in the early design stages of residential Net Zero Energy Building design in the Lebanese coastal region.

## **Research Questions and Methodology**

1.What are the fundamental principles to reach a zero energy residential buildings in Lebanon?

- •Literatture review of the Definition and Principles of NZEB
- •Analysis of the Lebanese Energy
  Efficiency Standard

2.How can the Building
Energy modeling be
effective on decision
making in the design process of NZEB?

- •Literature review of the Design process and tools of NZEB •Surveying the NZEB design and
  - modelling in the Lebanese
    Market.

3.What is the appropriate
Building Energy
Modeling tool
to reach Net Zero Energy Residential
Building in Lebanon?

•Comparison between building energy simulation tools

4.What is the fundamental database needed for the development of Lebanese

•Defining Residential energy consumption patterns by Case study Energy Auditing to develop the "Base Case Model".

development of Lebanese
Net Zero Residential Building Benchmark

Benchmark by comparing
the Base Case model and NZEB
principles

Formulation of guidelines for design process for NZEB in Coastal Region of Lebanon