Dynamic Modeling of Energy Systems Adapted to Low Energy Buildings in Lebanon

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Abstract : Low energy buildings have been developed to achieve global climate commitments in reducing energy consumption. They comprise energy efficient buildings, zero energy buildings, positive buildings and passive house buildings. The reduced energy demands in Low Energy buildings call for advanced building energy modeling that focuses on studying active building systems such as heating, cooling and ventilation, improvement of systems performances, and development of control systems. Modeling and building simulation have expanded to cover different modeling approach i.e.: detailed physical model, dynamic empirical models, and hybrid approaches, which are adopted by various simulation tools. This paper uses DesignBuilder with EnergyPlus simulation engine in order to; First, study the impact of efficiency measures on building energy behavior by comparing Low energy residential model to a conventional one in Beirut-Lebanon. Second, choose the appropriate energy systems for the studied case characterized by an important cooling demand. Third, study dynamic modeling of Variable Refrigerant Flow (VRF) system in EnergyPlus that is chosen due to its advantages over other systems and its availability in the Lebanese market. Finally, simulation of different energy systems models with different modeling approaches is necessary to confront the different modeling approaches and to investigate the interaction between energy systems and building envelope that affects the total energy consumption of Low Energy buildings.