

Effects of Global Climate Change on Building Energy Consumption and Its Implications on Building Energy Codes and Policies in Florida

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Florida had the highest number of cooling days among the 48 continental states during the period 1981 to 2010 while Florida also enjoyed the lowest number of heating days among the 48 continental states during the same period. The energy consumption associated with space cooling accounts for a significant proportion of commercial and residential building electricity use in Florida. In addition to the magnitude of cooling days that Florida experiences, the humidity also plays a role in electricity consumption. High temperature coupled with a relatively high humidity level increases customer demand for climate control. Meanwhile global warming trends are shifting Florida's subtropical and tropical climate to a significantly warmer climate, and cause a particularly large impact on building cooling electricity usage. However, many existing building codes in Florida are based on old weather data and do not reflect future climate change. The primary objective of this project is to develop a detailed analysis of building space heating and cooling requirements based on climate change projections. The analysis will provide guidance for needed changes in Florida building codes to address global climate change impact at the building level. Modified hourly weather predictions will be created for the Florida climate zones under Intergovernmental Panel on Climate Change (IPCC) carbon scenarios. Statistical methods will be applied to predict the future weather data based on current weather data. The prototypical building models will be developed by simulation software EnergyPlus which integrates with Sketchup 3D building modeling functions. The project will simulate heating, cooling, lighting, ventilation, other energy flows, and water use for various building prototypes per future weather projection. Impact of climate change on building energy consumption, changing patterns of energy use and peak demands, and building heating and cooling requirements, which are concerned by utility companies and governments, will be analyzed. The study will provide guidance for needed changes in Florida building codes to address global climate change impacts at the building level. It would help policy-makers, utility companies, and other stake-holders to respond to concerns about the impact of climate change on energy production, distribution, and consumption in the building sector.

Key Words: Global Climate Change, Building Energy Consumption, Building Energy Simulation