# A methodology of building performance analytics within high-performance design

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ABSTRACT: “A methodology of building performance analytics within high-performance design” explores a framework for addressing excessive global energy consumption by synergizing metric-driven analysis with the traditional design process to create a truly sustainable architecture.

Global energy consumption steadily rises each year at the cost of non-renewable resources. Commercial and residential building sectors comprise a large portion of the global energy requirement; therefore the design industry has the opportunity to impact the future of energy consumption rates. A major contributor to the high rates of energy consumption is the desire to condition building spaces for optimum occupant comfort sourced by great amounts of grid-supplied electricity. However, the ability to heat, cool and light spaces can be supplemented with naturally occurring climate conditions which require no electricity. The utilization of solar, wind and precipitation factors into a series of energy saving strategies, such as Passive (requires no energy), Behavioral (requires human effort), Renewable (creates energy from natural sources) and Active (uses energy efficient systems) applications can significantly reduce the current rate of energy consumption within buildings.

Traditionally, these energy saving strategies are applied late in the design process with a basis on theoretical convention. By implementing a methodology of building performance analytics early on, energy saving strategies can be substantiated with metric-driven data to illustrate optimized energy performance. Building performance analytics focus on themes that range from incident solar radiation, shading, daylighting, window flow and conceptual energy analyses. These metric-driven analyses complement the traditional energy modeling process by optimizing form-based and passive aspects of the architecture prior to the analysis of active systems. The data that is derived from these analyses will pair with a comprehensive qualitative analysis in the design process to satisfy both performative and experiential desires.

In order to investigate the potential of integrating building performance analytics within the traditional design process, a case study design was developed for a mixed-use, high-rise building in New York City. New York City is the largest metropolis within the United States, which is the top global ranking country for the worst energy consumption per person. It also shares a similar climate type with approximately 50% of the most populous global cities. Therefore, a case study based in New York City demonstrates the need for improved energy efficient designs and the potential for future deployment and global benefit. The case study was designed and optimized within its particular climate zone, site context and building program through the utilization of sustainable design strategies and tested through a methodology of building performance analytics. The analytics studied both the overall building mass and individual residential units for a multidimensional approach to high-performance design. The product of the study was a schematic building design that ensured exemplary energy performance combined with an illustrious experiential quality. However, the most important outcome was a methodology of building performance analytics that can be fully integrated into an iterative architectural design process with the capability for adjustment depending upon project and programmatic desires.