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The LL97 Calculator can help you understand your carbon footprint and reduce carbon penalty fees - Mike Sweeney

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Mike Sweeney

NYC's Climate Mobilization Act, Local Law 97, (LL97) is one of the most far-reaching and aggressive pieces of carbon legislation in the nation, and the city will undoubtedly begin to feel the law's mark on its built environment well before the 2024 penalties kick in. As building owners and developers revisit their new and existing building stocks to hedge against carbon penalties, it can be difficult to track the impacts of design and operational changes on utility cost and carbon penalty, which can often be divergent.

AKF Group developed the NYC LL97 Carbon Emissions Calculator in collaboration with the Building Energy Exchange and the NYC Accelerator to help demystify the Climate Mobilization Act and empower the building community to understand and reduce their carbon footprints. The calculator serves as an interface for navigating the law's carbon intensity thresholds. It allows for the input of multiple building occupancy types and square footages, as well as all LL97-regulated fuel sources (electricity, natural gas, steam, fuel oil #2 and fuel oil #4). It also expands on the law by allowing utility rate inputs to help analyze carbon penalties as they relate to total annual building costs. By spending less time manually calculating emissions conversions and CO2 thresholds, building owners can use the Carbon Emissions Calculator to spend more time thinking about the most effective operational and design decisions.

In order to understand the financial nuances of the law, it is helpful to consider the interactivity between utility cost, carbon emissions, and site energy. Depending on a building's utility rates in New York City, electricity can be over six times the cost of natural gas per BTU (site energy). The recent and continuing evolution of high-efficiency electric heat pumps and VRF systems has helped to reduce this cost imbalance. However, as long as the price of natural gas stays low in New York, the disparity will be a persistent challenge to the city's electrification initiative, and gas heating will remain attractive across much of the building stock.

The introduction of LL97 changes the math a bit, highlighting the carbon advantages of high-efficiency electric heating. For the most part, any heat pump-based electric heating with an

annual COP of 1.5 or greater (for context, the code minimum VRF heating COP is 2.25, and annual performance will likely be higher) will be more attractive than natural gas from a carbon perspective.

Keeping this in mind, at what point will the carbon benefits from electric heating outpace the increase in utility cost? And will this relationship change as carbon thresholds become more stringent over the next twenty years? To answer these questions, AKF evaluated a series of energy models for a mid-rise residential building with ground floor retail space. One design alternate used gas-fired condensing boilers as a heating source, while the other used air-to-air heat pumps. The electric alternate performed 5% worse than gas when only considering utility cost, but the inclusion of 2024-2029 penalties resulted in a 1% annual savings for electric. The 2030-2034 penalty rates were even better for electric heat, with a 4% advantage over natural gas. In this example, there was a clear relationship between electric heating and cost savings in the face of steepening carbon penalties.

Providing a simple way to visualize and understand these kinds of unintuitive situations was the primary driver for developing the NYC LL97 Carbon Emissions Calculator. AKF hopes that this calculator will only become more valuable over time as LL97 is refined to reflect changes in electric grid carbon emissions and modified occupancy-group emissions thresholds.

To use the calculator, visit https://be-exchange.org/calculator. For free, personalized advisory services to improve building energy efficiency and lower carbon emission, visit the NYC Accelerator: https://retrofitaccelerator.cityofnewyork.us/

Mike Sweeney is an energy modeling engineer and product development specialist on AKF Group’s Energy + Performance Team, New York, N.Y.