QCoefficient

Buildings as Batteries™

QCo Technology: Savings without Sacrifice

30% peak reduction achieved.

Reduce energy use, energy expense, and carbon as a byproduct.

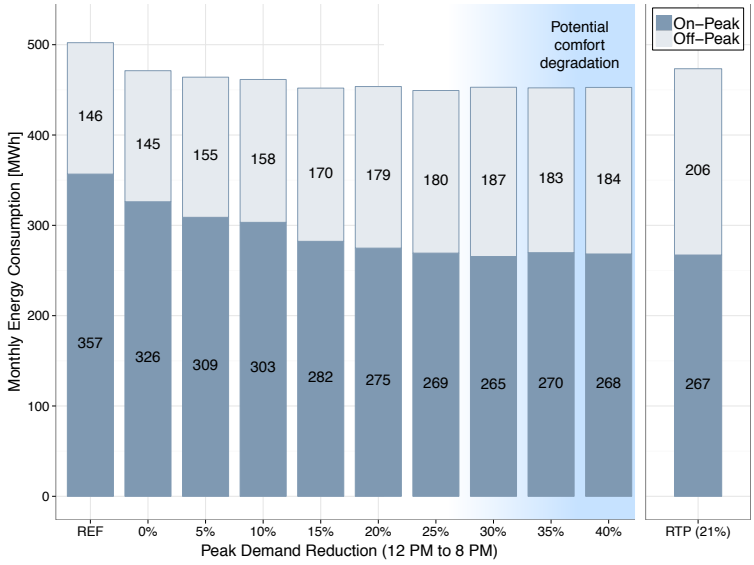
Case Study: Energy Consumption vs. Peak Demand Reduction

WHAT: Afternoon peak demand is reduced by 15%–30%, while saving energy, maintaining occupant thermal comfort, and reducing carbon emissions. Such achievements are possible due to the nature of QCo technology, which utilizes building HVAC systems to thermally charge the mass contained in concrete, drywall, and other materials – effectively harnessing the building itself as a storage medium.

QCo's multi-objective optimization algorithm determines the HVAC operating strategy that best reduces electric expense, use, peak demand, and carbon. For this study, QCo was asked to focus on afternoon peak demand reduction. How much reduction could QCo achieve? What is the impact on energy use?

PERFORMANCE: The results, highlighted in the figure to the right, illustrate that reductions in demand, energy, and carbon are easily and simultaneously achievable. QCo algorithms:

- Reduced monthly peak demand, in each case by recommending increasingly aggressive thermal storage strategies.
- Reduced monthly energy, by reshaping the thermal load profile almost every day, in a manner that achieved more efficient use of the existing HVAC system.
- Reduced carbon, by shifting energy use to off-peak hours and reducing total energy consumption.



In the real-time price (RTP) case, QCo substituted a block & index hourly electric price for the flat electric price, and removed all peak demand charges. Operations were optimized to minimize energy expense, and the building achieved a 21% peak reduction as a byproduct. This is not an unexpected result – QCo algorithms avoided high hourly electric prices, which typically occur during peak demand periods.

HOW: Storage technologies are often characterized by storage efficiency. Due to system losses, the usable output is less than the input. However, QCo's thermal energy storage strategies overcome this drawback. QCo dynamically reshapes daily cooling profiles to more efficiently load chillers during the day; to take advantage of more efficient "low lift" operations at night; and to shift operation to more efficient chillers. QCo creates like value when bundled with other energy efficiency technologies.

Case Study at a Glance

- Washington, D.C. commercial office building, 1M sqft, 1,000 ton chillers – one new high efficiency VFD, and one old and inefficient constant speed.
- 24x7 demand charge; 12-8 pm peak demand charge; flat electric price.
- July 2013 operations, with peak demand target incrementally reduced.

CAVEAT: In this study, peak reductions greater than 30% implicate comfort in select office locations. On the other hand, comfort was uniformally improved in the perimeter offices that otherwise generate hot calls.

MORE OPPORTUNITY: Greater reductions in energy use, expense, and/or carbon are achievable. Peak demand reduction was the objective of this case study; however, the objective is user selectable. Forthcoming material will discuss multi-objective scenarios and prioritization of objectives.