POWER QUALITY INTERNATIONAL

# CASE STUDY

**Cornell Tech**
**Roosevelt Island**
**New York, NY**

## Facility Description

Cornell Tech is a revolutionary model for graduate education that fuses technology with business and creative thinking. Cornell Tech brings together like-minded faculty, business leaders, technical entrepreneurs and students in a catalytic environment to produce visionary ideas grounded in significant needs that will reinvent the way we live.

Cornell Tech embodies the academic partnership between Cornell University and the Technion–Israel Institute of Technology.

Scheduled to open in 2017, the new high performance academic learning facility was designed to be among the largest 'net-zero' energy buildings in the U.S.

## Challenge

The First Academic Building at Cornell Tech was designed to be a functional example of ultimate building performance, energy efficiency and overall sustainability. The facility includes many energy saving technologies including photovoltaic power generation and geothermal heating and cooling systems.

Driven by the efficiency goals set forth, the electrical design engineers capitalized on an often-missed opportunity. They wanted to ensure the electricity generated on-site was being distributed efficiently throughout the building. To do so, the engineers had to make sure that the distribution system was 100% compatible with the nonlinear loads it would be supplying.

Aware of Power Quality International's industry leading expertise in electrical distribution system optimization, the engineers tasked PQI with developing a comprehensive plan that would guarantee a high level of system and load efficiency and compatibility. To accomplish this, PQI had to mitigate the load-generated harmonic currents and their effects. Power quality improvement was the goal.

## Solution

PQI's engineering team examined the engineers' proposed distribution system design and its loads' characteristics. Following a detailed analysis of the anticipated power quality issues, PQI proposed several harmonic mitigation strategies for the design engineers' consideration. A PQI solution was chosen and included in the project's specifications and on drawings.

PQI's solution included the application of its ultra-efficient harmonic mitigating transformers, which exceeded US DOE 2016 linear load energy efficiency requirements, even under nonlinear loading.

Three different primary-to-secondary phase shifts were selected so that groups of six-pulse nonlinear loads would appear as eighteen-pulse loads at their common 480-volt risers. This design feature accomplished the maximum possible level of harmonic mitigation.

## Impact

PQI's harmonic mitigation strategies and proprietary transformer designs provide the highest possible power system optimization and efficiency improvement in the industry. The six- to eighteen-pulse load conversions virtually eliminated harmonic currents up to the 31$^{st}$ and their $I^2R$ losses on the 480-volt systems. This outcome, with the reduction of zero-sequence impedances in the 208/120-volt subsystems, reduced voltage distortion at the 120-volt loads, which greatly improved their efficiencies. The distribution system efficiency and load compatibility goals were achieved.