55 Water Street

CASE STUDY

Challenge

Beginning in 2013, 55 Water Street undertook an initiative to strategically replace several large components of their existing chiller plant. The driving forces behind this project were: a) improve cooling system efficiency; b) reduce building electric demand; c) improve system resiliency; d) simplify building operations; and e) reduce the building's carbon footprint.

After the success of the chiller plant upgrade, in 2016, New Water Street Corporation (owners of 55 water Street) embarked on a second phase of improvements targeting additional energy conservation measures that involved leveraging existing assets, which would continue to modernize the building infrastructure and improve operating efficiencies.

Solution

Chiller Plant Modernization
To meet the client's goals, Trane retrofitted 55 Water Street's chiller plant by upgrading the existing standard-duty chillers, one elective drive and one steam turbine, totaling 6,000 tons of refrigeration (TR). The retrofit included high-efficiency chiller replacements, the installation of a thermal energy storage system, and the implementation of a building automation system:

Chiller Replacement
The building's existing chillers were replaced with three new high-efficiency Trane CenTraVac® water-cooled duplex centrifugal chillers: two "Day" chillers at 3,250 TR each (0.557 kW/ton), and one dual-duty chiller for charging thermal storage tanks at night and as a back-up cooling source, if needed, during the day.

Thermal Energy Storage
A thermal energy storage system, consisting of 134 CALMAC® Ice Bank® ice tanks (16,800 ton-hours of stored cooling capacity), was installed to offset the building's peak electricity demand. The system includes three glycol pumps and three plate-and-frame heat exchangers, built on an 11,000 square foot slab on grade, in a mechanical room 14 stories below the building's main central plant. The dual-duty chiller connected to this system is the largest ice-producing chiller in the world.

Reducing energy use

- Energy Savings: 2 GWh/year
- Summer Peak Demand Reduction: 2.1 MW
- Carbon Footprint Offset: 36 million lbs. CO2e
- Building Operational Cost Savings: $2.5 million/year
- Internal Rate of Return: 12.8%
- Awarded $942,000 in incentives from the NYSERDA Existing Facilities Program
- Received the 2016 Energy Project of the Year Award from the New York Association of Energy Engineers
- Received the 2017 Energy Project of the Year Award from the National Association of Energy Engineers

55 Water Street
New York, NY

PROJECT HIGHLIGHTS

CHALLENGE

Improve Cooling System Efficiency

Reduce Building Electric Demand

Improve System Resiliency

Simplify Building Operations

Reduce the Building's Carbon Footprint

SOLUTION

Chiller Plant Modernization

Emergency Generator Emissions Upgrades

Transfer Switch Upgrades

RESULTS

Energy Savings: 2GWh/yr

Carbon Footprint Offset: 36 million lbs. CO2e

Building Operational Cost Savings: $2.5M/yr

Internal Rate of Return: 12.8%

Combined Summer Peak Demand Reduction: 7.1 MW

55 Water Street

CASE STUDY

Emergency Generator Emissions Upgrades and Controls

The second phase of the project first focused on upgrading the building's diesel generators with clean emissions technology and retrofitting/replacing the building's existing Automated Transfer Switch System.

Diesel Generator Upgrades

Four (1750kW) diesel generators were equipped with Selective Catalytic Reduction (SCR) systems. SCR systems are used to reduce the nitrous oxide emissions (NOx) that result when diesel engines are used. 55 Water Street uses these engines for emergency operation and to participate in the New York's various emergency demand response programs. The New York Independent System Operators and the New York utilities offer programs that pay businesses, such as New Water Street Corporation, for using less energy and reducing demand when the grid is stressed. 55 Water participates in these programs by using their generators to help reduce demand on the local grid. Upgrading these engines with SCR systems was strongly aligned with building's ongoing commitment to sustainability and their desire to meet the most stringent emissions standards.

Impact:

Summer Peak Demand Reduction: 5.0 MW130,000 CCF of natural gas

Approximately $1M annual revenue from participating in Emergency Demand Response programs

Awarded $4.25M in incentives from Con Edison's Demand Management Program

Transfer Switch Upgrades

The second component of the project involved a combination of new and the retrofitting of approximately 30 of the building's existing Automated Transfer Switch (ATS) systems that primarily serve non-tenant, non-elevator, building controlled air and water side systems. These new transfer switch systems were provided to make the transition from normal to emergency power less complicated, more predictable and fast acting. In addition to the ATS retrofit/replacement, Trane also installed a new ASCO Critical Power Management System that enables remote monitoring of all new and existing critical power management devices.

"We invested in the chiller plant upgrade and thermal storage system to meet our ongoing commitment to our tenants and the community to reduce the building's impact on the environment, provide resiliency and create value. It was only natural for us to continue our commitment to sustainability and operational efficiency by upgrading our emergency generators with the latest emission reduction technology and by participating in emergency demand response programs. The performance of these infrastructure changes has exceeded our expectations in reducing our ongoing energy usage and we have contributed to improving the reliability of the electricity grid locally."

- **Dan Palino,** Executive Vice President and Chief Operating Officer, Building Management Office, New Water Street Corporation.

About 55 Water Street

55 Water Street stands today as one of New York City's premier Class-A commercial office structures. At over 3.5 million sq. ft., the building serves as one of the largest privately owned office buildings in New York City, large enough to need to its own zip code. Over the last five years, the infrastructure at 55 Water Street has been transformed as a result of significant investment in energy modernization upgrades.

Unique Project Characteristics:

55 Water Street has 51 floors of rentable commercial office space where thousands of people go to work each and every day. The chiller plant modernization and the emergency generator upgrade projects were executed when the building was near full occupancy.

While the chiller plant upgrade was being implemented a significant effort was put into the project plan to keep the building's daily cooling operation intact and not to impact tenant comfort and/or the critical systems that the central plant serves. The three new chillers – each weighing 53 tons – had to be rigged into the facade of 55 Water during the nighttime hours, hoisted over the adjacent Vietnam Veterans Memorial park.

To add further complication to an already difficult task, Superstorm Sandy struck New York City in the middle of the chiller rigging and thermal storage tank installation process. The storm surge flooded all of the below-grade levels of the building, including the newly constructed ice tank room, and almost all power was lost to the building for three months. It was over a month after the storm before construction was able to resume, while the building was still operating exclusively on generator power. Even with the impact of the storm, the new high-efficiency chillers were able to be made operational for the start of 2013's early cooling season. The thermal storage system was brought online for the start of the 2014 cooling season.

The installation of the SCR presented slightly different challenges, since the building does not have elevator service beyond the 52nd floor and the plan called for the installation of the system components on the 52, 54 and 55 floors of the building. As a result, the SCR systems had to be dissembled and rigged to the roof with each piece lowered into a hatch between the 52nd and 54th floors. Once the components were inside the building, the systems were installed and ready to operate.

TRANE

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CASE-SLX555-EN
11/03/2020