Chapter 13: Energy

A. INTRODUCTION

This chapter describes the effects of the Proposed Actions on the use and conservation of energy. It estimates the amount of energy that would be consumed during the proposed project's operations within the Proposed Development Area based on project-specific energy modeling provided by NYU.[1] The chapter also describes planned "green measures" to reduce the proposed project's energy consumption, including NYU's planned use of energy generated by its existing cogeneration facility (the "Cogeneration Plant") operating at 251 Mercer Street, as well as other measures to be incorporated in order to achieve at least the LEED Silver certification required by NYU's development policy.[2]

B. PRINCIPAL CONCLUSIONS

The Proposed Actions would not result in significant adverse impacts with respect to the transmission or generation of energy. The proposed project would comply with the New York City Energy Conservation Code (NYCECC) and Energy Conservation Construction Code of New York State (ECCCNYS), incorporating all measures relating to energy efficiency and combined thermal transmittance.

As noted in the *City Environmental Quality Review (CEQR) Technical Manual* (January 2012 Edition), the incremental demand caused by most projects would not create a significant impact on energy supply. Consequently, a detailed assessment of energy impacts is limited to those projects that may significantly affect the transmission or generation of energy. The proposed project would not have such affects. By 2031, full development of the proposed project within the Proposed Development Area is projected to result in a combined 210,255 million British thermal units (Btu) of energy demand annually, drawing an estimated 41,823 million Btu of grid-supplied electricity (20 percent of total demand). The proposed project's total combined energy intensity is 84,961 Btu per square foot. This is substantially lower than the average intensities in New York City:[3] 65 percent lower than average institutional uses, 60 percent lower than average commercial uses, and 30 percent lower than large residential uses. This efficiency would come from design of the proposed buildings as well as the efficient central system, which includes cogeneration of electricity and heat as well as other efficiency features.

[1] The projected development within the Commercial Overlay Area is not included in this analysis because the change in energy consumption would be negligible. The projected amount of development within the Commercial Overlay Area is very small (23,236 sf), and it would replace existing ground-floor uses.

[2] NYU, 2011, *NYU Design Standards and Guidelines* available online at: http://www.nyu.edu/sapd/pdf/design_standards_apr_2011.pdf

[3] *CEQR Technical Manual* Table 15-1.

As described in greater detail in Chapter 16, "Greenhouse Gas Emissions," the proposed project would incorporate a number of measures intended to reduce energy consumption. NYU intends to attain a project score of 80 or higher under the US Environmental Protection Agency (USEPA) *Energy Star*'s Target Finder, and to meet the requirements for the United States Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) Silver certification for all development under the Proposed Actions, requiring a minimum of 10 percent less energy as compared with the baseline building designed to code. In addition, NYU plans to utilize energy produced by the existing Cogeneration Plant operating at 251 Mercer Street, which would service the heating and cooling needs of several project buildings.

C. ENERGY SUPPLY

ENERGY PROVIDER

Electricity within Manhattan is distributed by Con Edison. The electrical energy is supplied from a variety of sources that originate both within and outside New York City. These include non-renewable sources, such as oil, natural gas, coal fuel, and uranium; and renewable sources, such as hydroelectricity and, to a much lesser extent, biomass fuels, solar power, and wind power. New York City's electrical demands are met by a combination of sources, including electricity generated within New York City, at locations across the Northeast, and from places as far away as Canada.

Con Edison distributes power throughout the City. Transmission substations receive electricity from the regional high voltage transmission system and reduce the voltage to a level that can be delivered to area substations. Area substations further reduce the voltage to a level that can be delivered to the distribution system, or street "grid." Within the grid, voltage is further reduced for delivery to customers. Each area substation serves one or more distinct geographic areas, called networks, which are isolated from the rest of the local distribution system. The purpose of the networks is if one substation goes out of service, the problem can be isolated to that network and not spread to other parts of the City. Substations are designed to have sufficient capacity for the network to grow.

Con Edison provides natural gas service to Manhattan. In addition, Con Edison maintains a district steam system in Manhattan. High-pressure steam is generated in cogeneration plants and conventional plants, and is distributed through an interconnected piping network (with pipe sizes up to 30 inches in diameter) to approximately 1,800 customers in Manhattan for heating, hot water, and air conditioning. Gas mains ranging from 4 to 24 inches supply natural gas for heating and cooking uses within the study area. Typically, these gas lines are located between 2 and 4 feet below the street.

In 2010 (the latest year for which data are available), annual electricity usage totaled approximately 59 billion kilowatt-hours (KWH), or 200 trillion Btu in Con Edison's delivery area. In addition, Con Edison supplied approximately 124 trillion Btu of natural gas and approximately 23 billion pounds of steam, which is equivalent to approximately 23 trillion Btu. Overall, approximately 347 trillion Btu of energy are consumed within its New York City and Westchester County service area.[1]

[1] Con Edison of New York, *Annual Report*, year ended December 31, 2010.

RECENT ENERGY CONSERVATION DIRECTIVES

In 2001, New York State began implementing measures to address the increasing electrical power capacity needs of the New York City region. New York State Governor's Executive Order No. 111 (EO 111) was introduced in June 2001, directing state agencies, state authorities, and other affected entities to address energy efficiency, renewable energy, green building practices, and alternate fuel vehicles. EO 111 identified the New York State Energy Research and Development Authority (NYSERDA) as the organization responsible for coordinating and assisting agencies and other affected entities with their responsibilities. NYSERDA and other utilities have implemented programs to encourage businesses to reduce energy usage and increase energy efficiency.

For 2010-2011, the independent, non-profit New York State Reliability Council (NYSRC) has determined that a minimum of 80 percent of the city's peak load must be provided by generating sources within the city to maintain compliance with the criteria established by the regional and national reliability councils. For 2011-2012, NYSRC recommends that a minimum of 81 percent of the city's peak load be provided by sources within the City. Presently, there is sufficient capacity within the city to meet this 81 percent local energy generation requirement.[1] However, as the energy demand increases over time, additional in-city generation would be needed to satisfy this requirement.

The New York Independent System Operator (NYISO), which manages the safety and reliability of the state's electric transmission system, reported in September 2010 that the state's wholesale electric power system will continue to meet accepted reliability standards through 2020. According to the NYISO's *2010 Reliability Needs Assessment*, the accepted reliability standards will be met because there are two new proposed generating plants totaling 1,060 MW and because there is lower energy demand forecasted since a) the 2009 recession reduced the peak demand forecast for 2011 by 1,400 MW, reducing the projections of peak load in subsequent years; and b) statewide energy efficiency programs seek to lower energy consumption on the electric system by 15 percent, resulting in energy savings of 13,040 GWh by 2018 and 13,684 GWh by 2020.[2] Because of the existing supply and the addition of the proposed NYISO generating plants and the State's planning process to identify potential shortfalls years before they would materialize, it is expected that an adequate generating capacity, which would exceed projected demands, would be available in the New York City metropolitan area through the Proposed Actions' 2031 analysis year.

COGENERATION SYSTEMS AND PLANYC 2030

PlaNYC 2030 encourages the development of clean distributed generation (clean DG), which enables properties to create their own power with higher efficiencies and less environmental impact than central plants. For example, cogeneration systems can achieve high efficiencies by capturing the heat by-product of electricity production and reuse it for heating and cooling, thus reducing GHG emissions. Clean DG systems also help lower peak demand for electricity and improve the reliability of the City's electrical grid.

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[1] New York State Reliability Council, New York Control Area Installed Capacity Requirements for the Period May 2011 through April 2012, December 10, 2010.

[2] New York Independent System Operator, *2010 Reliability Needs Assessment*, September 2010.

D. NYU ENERGY CONSERVATION MEASURES

NYU COGENERATION FACILITY

In 2010, NYU upgraded and replaced a below-grade cogeneration facility underneath the Mercer Plaza Area. The Cogeneration Plant uses compressed natural gas that fuels twin gas turbines. As the turbines operate, their rotation is used to generate 11 megawatts of electricity, and the hot waste exhaust is directed to heat recovery generators, which produce steam. Once 600 pounds of super-heated steam is created in the generators, it is piped to a turbine electrical generator, which produces an additional 2.4 megawatts of electricity. After the steam has passed through the turbine generator, it is used to make hot water for the campus in two high-temperature heat exchangers, and it is used to operate a turbine-driven chiller to produce 2,000 tons of chilled water. Utilization of a mechanical energy turbine, which is turned by steam to run the chiller's compressor, increases the efficiency and energy savings of the Cogeneration Plant.

The replacement project upgraded the former 8,350-kilowatt (kW) cogeneration facility that served 12 buildings on the NYU campus with a new facility that increased available power to 13,400 kW and connects the electrical distribution system to an additional 22 buildings on the NYU campus. The new system also produces heat and hot and chilled water to 37 NYU buildings. The cogeneration project resulted in a net reduction in facility emissions and allowed NYU to provide more extensive service and reliable power to its campus. NYU estimates that the 2010 cogeneration project reduced the greenhouse gas emissions of that facility by approximately 23 percent and reduced air pollutants by about 68 percent.

As part of the centralized heating and cooling system powered by the Cogeneration Plant, duct burners can supply additional heat when more heat is required than that supplied as a byproduct of the cogeneration system. Duct burners supplement the energy output by firing natural gas within the flue gas of the existing cogeneration system. Using duct burner is more efficient than adding additional external boilers to supplement the heat output since duct burners do not require maintaining boiler heat for quick start-up, do not require the use of additional pump since they use the exhaust from the existing system, and do not require the installation of all the additional systems associated with boilers. Duct burners achieve an efficiency of 90 percent as compared to approximately 84 percent achieved by boiler systems.

ENERGY EFFICIENT BUILDINGS

NYU has committed to achieving at least LEED Silver certification for the Proposed Project, as required by the NYU Sustainable Design Standards and Guidelines. NYU also intends to attain an energy performance score of 80 or higher under the USEPA *Energy Star* program—at this level, the buildings would perform better than 80 percent of all similar buildings nationwide, and would qualify for the Energy Star label. LEED certification requires, at a minimum, an energy efficiency level that achieves at least 10 percent lower energy consumption than the baseline building designed to code. Even higher energy efficiency may be achieved. The proposed public school[1] would be designed according to the New York City Green Schools Guide, requiring a minimum of 20 percent less energy as compared with the baseline building designed to code. Some energy efficiency measures were included in the energy modeling and are reflected in the

[1] If by 2025 the New York City School Construction Authority (SCA) does not exercise its option to build the public school, NYU would build and utilize the 100,000-square-foot space for its own academic purposes.

results presented below; however, further efficiency may be achieved due to details not yet designed and additional measures still under consideration. To attain the LEED certification, the designs for the Proposed Project will:

- Provide an energy efficient building envelope to reduce cooling/heating requirements.
- Include high-efficiency HVAC systems, incinerators, or generators.
- Use high-albedo roofing materials.
- Incorporate window glazing to optimize daylighting, heat loss and solar heat gain.
- Incorporate motion sensors and lighting and climate control.
- Use efficient lighting and elevators, and *Energy Star* appliances, if appliances are being installed.

Other measures likely to be part of the design include green roofs, design for maximum interior daylighting, peak shaving or load shifting strategies, super insulation to minimize heat loss, and efficient directed exterior lighting.

NYU will also provide construction and design guidelines to facilitate sustainable design for build-out by tenants, and conduct third party building commissioning to ensure energy performance of the buildings once constructed.

E. OPERATIONAL ENERGY CONSUMPTION

As described above, NYU would develop and operate the proposed project in a manner that maximizes energy efficiency to the extent practicable. These energy conservation measures ensure that NYU's operations consume less energy than comparable New York City facilities. Therefore, the project-specific analysis below takes into account NYU's planned energy conservation measures. Following the guidance of the *CEQR Technical Manual*, conservative estimates of project-specific energy demand by energy source were developed using building energy modeling, and are presented in **Table 13-1.**

Table 13-1
Energy Consumption of Proposed Project Buildings
(MMBtu per year)

Building	Fuel	Electricity	*Total*
Zipper Building (except Hotel Tower)	61,474	6,715	68,189
Zipper Hotel Tower	23,805	13,458	37,263
Bleecker Building	21,713	11,201	32,913
Subtotal Phase 1	*106,992*	*31,374*	*138,365*
Mercer Building	50,833	7,819	58,652
LaGuardia Building	10,607	2,630	13,238
Subtotal Phase 2	*61,440*	*10,450*	*71,890*
Total	***168,432***	***41,823***	***210,255***

Note: The estimated energy consumption for the proposed below-grade space located between the Mercer and LaGuardia Buildings is within the Mercer Building energy consumption estimates, above.
Sources: New York University and AKRF, Inc.

The analysis assumes that the energy systems for the southern-most tower in the Zipper Building (Zipper Hotel Tower) would be independent. If this space were to be used for other purposes, energy consumption may be somewhat lower since the space would be connected to the more efficient central systems described above. The Commercial Overlay Area is not included in this analysis because the projected amount of development within the Commercial Overlay Area is very small (23,236 sf), and because the projected development would replace existing ground-floor uses. Therefore, the change in energy consumption within the Commercial Overlay Area would be negligible.

By 2031, full development of the proposed project within the Proposed Development Area is projected to result in a combined annual energy demand of 210,255 million Btu, drawing an estimated 41,823 million Btu of grid-supplied electricity (20 percent of total demand). The proposed project's total combined energy intensity is 84,961 Btu per square foot. This is substantially lower than the average intensities in New York City:[1] 65 percent lower than average institutional uses, 60 percent lower than average commercial uses, and 30 percent lower than large residential uses. This efficiency would come from design of the proposed buildings as well as the efficient central system, described above, which includes cogeneration of electricity and heat as well as other efficiency features.

The proposed project's energy demand would be modest compared to the approximately 333 trillion Btu of energy consumed within Con Edison's New York City and Westchester County service area, and would be considered a negligible increment. The proposed project would not be an energy intensive facility that would significantly affect the transmission or generation of energy, and would not result in significant adverse impacts to the transmission or generation of energy. ✷

[1] *CEQR Technical Manual* Table 15-1.