TABLE OF CONTENTS

LIST OF TABLES

Chapter 18: Energy

A. INTRODUCTION

This chapter describes the effects that the Proposed Action may have on energy consumption in the Project Area. Provided are estimates of energy consumption in the Future With the Proposed Action and Without the Proposed Action, and an assessment of potential impacts on existing and planned energy services available within the Project Area. The energy assessment also considers potential impacts on energy sources and transmission of energy, as well as energy conservation measures of the Proposed Action. The Proposed Action would create an increased demand for electricity, gas, and steam services.

1. Issues

The development stimulated by the rezoning of the Hudson Yards, No. 7 Subway Extension, expansion of the Convention Center, and construction of the Multi-Use Facility would require an increased demand for energy from the energy infrastructure. The available (existing) gas, steam, and electrical utilities serving New York City are provided and maintained by Con Edison.

The *CEQR Technical Manual* recommends an assessment of the impacts of increased energy consumption on the energy sources and transmission, while SEQRA requires a discussion of "the effects of the Proposed Action on the use and conservation of energy, if applicable and significant". Because the Proposed Action would result in increased energy demand, this chapter estimates energy requirements of the Proposed Action, assesses its effects on the energy infrastructure, and identifies conservation measures and improvements needed to mitigate anticipated effects.

Con Edison has provided an assessment of the incremental electrical and gas demand of the Proposed Action. Con Edison's electric forecast and load growth program is typically developed for a 10-year period. For purposes of the electric analysis only, Con Edison conducted an analysis extending the electric forecast and load growth program to 2025, based on the Reasonable Worst Case Development Scenario anticipated in 2010 and 2025 under the Proposed Action. Con Edison's analysis was developed solely for the purposes of the FGEIS assessment.

Any major improvements or modifications to Con Edison's electric distribution system may be reviewed by the New York State Public Service Commission, and the New York Independent System Operator, to ensure the reliability, availability, security, and safety of the electricity provided.

2. Principal Conclusions

The Proposed Action would not result in significant adverse impacts related to energy. Coordination with Con Edison would ensure that adequate electrical, gas and, potentially, steam services would be in place to serve the Proposed Action. Under the Zoning Text Amendments, existing provisions of the Zoning Resolution would continue to allow for electrical utility substations through the following provisions: as-of-right in manufacturing zoning districts; in residential and commercial districts, through a special permit of the Board of Standards and Appeals where there is no conflict with the retail continuity requirements of the Zoning Text Amendments, and by special permit of the City Planning Commission where waiver or modification of the retail continuity requirements is sought (Appendix A.1, Proposed Zoning Text and Map Amendments).

a) Electricity

The full build of the Proposed Action by 2025 would require approximately 309 Megawatts (MW) during peak electrical demand, based on Con Edison's estimates of the identified buildings and facilities that are expected to be in place. Of the four principal project elements, the anticipated

residential and commercial developments allowed under the proposed rezoning would result in the greatest demand for electricity.

A peak event at the Multi-Use Facility would require approximately 10 MW or 34 million British Thermal Units (70 billion BTUs annually); a peak event at the expanded Convention Center would call for approximately 36 MW or 123 million BTUs (341 billion BTUs annually).

Operation of the No. 7 Subway Extension, the Terminal Station (West 34th Street and Eleventh Avenue), Intermediate Station (West 41st Street and Tenth Avenue), and associated systems buildings of the No. 7 Subway Extension would require approximately 21,040 MWh (75 billion BTUs) of electrical consumption annually. Modification of Corona Yard would result in a minimal increase demand for energy services. The modified Corona Yard operation is estimated to require 69 KW for auxiliary power.

During the No. 7 Subway Extension construction, equipment required for excavation and construction of the subway tunnel, stations, and associated facilities would require approximately 12 megawatts (MW) of electricity. The power would be supplied by approximately six, 13.2 Kilovolt feeder cables which would power the Tunnel Boring Machine (TBM), conveyor belt removing spoil, tunnel ventilation fans, and other construction equipment. Coordination with Con Edison to provide the necessary electrical power for construction activities is ongoing.

Con Edison has indicated that improvements to the existing energy distribution system would be required to accommodate the projected demand for energy services generated by the Proposed Action. Con Edison has estimated that one area substation within the Project Area would need to be in operation by 2013 and a second area substation would be needed by 2021. A new transmission substation would be needed by 2013 to service the Project Area and background growth in the surrounding communities. The transmission substation would serve the two new area substations, but would not have to be located within the Project Area. As specific designs for future residential and commercial developments within the Rezoning Area are prepared, coordination with Con Edison will be necessary to identify electric utility upgrades. Under the Zoning Text Amendments, existing provisions of the Zoning Resolution would continue to allow for electrical utility substations through the following provisions: as-of-right in manufacturing zoning districts; in residential and commercial districts, through a special permit of the Board of Standards and Appeals where there is no conflict with the retail continuity requirements of the Zoning Text Amendments, and by special permit of the City Planning Commission where waiver or modification of the retail continuity requirements is sought (see Appendix A.1, Proposed Zoning Text and Map Amendments).

b) Gas

Based on the Reasonable Worst Case Development Scenario within the Rezoning Area, Con Edison has estimated that the incremental gas load is projected to be 4 million cubic feet per hour (CFH) by 2025. The peak natural gas demand for the expanded Convention Center would be approximately 150,000 CFH or 150 million BTUs. The Multi-Use Facility would be approximately 90,000 CFH of natural gas during peak events and approximately 63,000 therms annually.

Con Edison's gas transmission and distribution facilities would be used to deliver natural gas to the Project Area. There would have to be upstream modifications and enhancements to the transmission and distribution system to meet the increased demand. Locally, new gas mains, service lines and metering will need to be constructed to support the new customer load.

Con Edison's district steam system could potentially provide an alternative source of heating and cooling for the Project Area. Utilization of steam as an alternative could reduce some of the forecasted peak loads for electric and gas mentioned above. The district steam system provides steam for heating and cooling in parts of Manhattan but it is not currently available in virtually all of the Project Area. Con Edison's steam plants and underground distribution piping would be used to

generate and deliver steam to the area. There would have to be modifications and enhancements to these systems, including extending and enhancing distribution mains, service lines and metering stations, to serve additional customers. If all the newly developed properties in the area utilized Con Edison's district steam system for heat and hot water, Con Edison estimated an incremental steam load of approximately 750,000 to 1,000,000 pounds per hour by 2025. Under the steam rate plan recently approved by the New York State Public Service Commission, which was supported by the City of New York and others, a Steam Business Development Task Force will be formed. The Task Force will include representatives from the City and among its assignments will be to examine the potential for steam service in major developments like the Hudson Yards area.

B. EXISTING CONDITIONS

The New York Independent System Operator (NYISO) is the body responsible for overseeing the safe and reliable operation of the electric transmission power distribution system across the state. The recent deregulation of the energy market across New York State has led to the government-regulated utilities to sell their generation business to independently owned energy generators. Con Edison has sold many of its power generating facilities, with the exception of its steam and steam/electric plants, and is now primarily involved in energy distribution.

The NYISO prepares the "Load and Capacity Data" report every year, which provides a 10-year forecast of the summer and winter peak demand, annual energy requirements, and the available generating capacity, including new supplies. The NYISO in 2003 implemented the Initial Planning Process, which on an annual basis will identify the reliability needs for a 10-year planning horizon, and report on the costs of historic congestion. The first Initial Planning Report is expected to be available by the end of 2004. In parallel, the NYISO is also focused on the development of a Comprehensive Planning Process, which will address the Federal Energy Registry Commission (FERC) requirements for ISOs and New York State's resource adequacy and transmission infrastructure needs. The NYISO's Planning Process adheres to the New York State Reliability Council's (NYSRC's) reliability rules, including the statewide installed reserve margin requirement, which currently is set by the NYSRC at 18 percent of the annual peak load. Through its Planning Process, the NYISO also will provide an indication for the market to respond to future needs; for example, load-serving entities could respond by submitting a Request for Proposal (RFP) for the financing and construction of new power facilities to meet their future requirements.

Electrical energy is created from non-renewable sources such as oil, natural gas, coal, nuclear fuel, and renewable sources like hydroelectric, biomass fuels, solar, and wind. New York City's energy is produced within the City, across the Northeast, and from locations as far as Canada. Once electrical energy is generated in the form of high voltage electrical power, a transmission grid provides high-voltage electrical power to and within New York City. The interconnected power grid extending across New York State and the Northeast, allows for power to be imported from other regions as the demand requires. Substations located throughout New York City convert high-voltage electrical to low-voltage electrical power for distribution to end users.

The current peak electrical demand for New York City is approximately 11,000 MW. Con Edison provides the electrical power transmission system for the City through a series of area and transmission substations. Transmission substations receive electricity from the generating stations through the transmission system and reduce the voltage to a level that can be delivered to area substations. Area substations receive electricity from a transmission substation and reduce the voltage to a level that can be delivered into the distribution system in the streets. In the distribution system, the electricity's voltage is reduced further to be delivered 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. Con Edison currently has 34 networks and 24 area substations in Manhattan. The purpose of the networks is that if one substation goes out of service, the problem

would be localized to that network area and would not spread to other parts of the City. Substations are designed to have sufficient capacity for the network to grow. The Project Area is served by two networks, with most of the load in one network.

Electrical conduits, including high-voltage transmission lines and low-voltage distribution lines, are aligned beneath the streets of Manhattan. High-voltage or primary lines are encased in oil conduits to maintain cool temperatures.

In addition to the electrical distribution network serving the City, Con Edison maintains the gas and steam utilities. High pressure steam is generated in cogeneration plants and conventional plants, and is distributed through an interconnected piping network (pipe sizes up to 30 inches in diameter) to approximately 1,800 customers throughout the borough of Manhattan for heating, hot water, and air conditioning. Gas infrastructure, ranging from 4-inch to 24-inch mains, supply natural gas for heating and cooking uses within the Project Area. Typically, these gas lines are located between two to four feet below the street.

1. Recent Energy Conservation Directives

In 2001, New York State began taking measures to address the increasing capacity needs of the metropolitan New York City region. The New York State Independent System Operator (NYISO) implemented the Emergency Demand Response and the Day-Ahead Demand Bidding programs to reduce utility electrical power demand during peak load periods. New York State Governor's Executive Order No. 111 (EO 111), was introduced in June of 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. The NYSERDA and other utilities have implemented programs to encourage businesses to reduce energy usage and increase energy efficiency.

Under EO 111, the following energy efficiency goals have been established to ensure state agencies are more energy efficient and environmentally aware:

- All State agencies shall seek to achieve a reduction in energy consumption by all buildings they own, lease, or operate of 35 percent by 2010 relative to 1990 levels.
- New projects implemented by State agencies shall achieve at least a 20 percent improvement in energy efficiency performance relative to the levels required by the State's Energy Conservation Construction Code.
- At least 20 percent of the total annual energy use by State agencies shall be accounted for by: wind, solar thermal, photovoltaic, sustainable managed biomass, tidal, geothermal, methane gas and fuel cells.

As state entities, the Metropolitan Transportation Authority-New York City Transit (MTA NYCT), Convention Center Development Corporation (CCDC), and Empire State Development Corporation (ESDC) are required to reach these goals and are also responsible for establishing peak electrical demand reduction targets for each state facility by 2005 and 2010. No State-owned buildings will be exempt from these goals except pursuant to criteria to be developed by the NYSERDA. Consideration of EO 111 has been undertaken during the design of each project element and related actions of the Proposed Action sponsored by a state agency: including the No. 7 Subway Extension (MTA NYCT); Convention Center Expansion (CCDC); and the Multi-Use Facility (ESDC).

Based on recent findings of the New York State Energy Plan (June 2002), the electrical demand to New York State is projected to grow at an average annual rate of 0.99 percent between 2000 and

2021. Peak demand periods are projected to increase 0.92 percent annually, based on the same study. The near-term (2000-2006) annual growth rate for the New York metropolitan area is projected to be somewhat higher, at 1.14 percent. The independent, non-profit New York State Reliability Council (NYSRC) has determined that generating sources within the City must be capable of providing a minimum of 80 percent of the City's peak load to maintain compliance with the criteria established by the regional and national reliability councils. Presently, there is sufficient capacity within the City to meet this 80 percent local generation capacity requirement. As the energy demand increases over time, additional in-city generation will be needed to satisfy this requirement.

Plans for new electrical power generation facilities have been reviewed by the New York State Board on Electric Generation Siting and the Environment (Siting Board) under Article X of the Public Service Law. Article X, enacted in 1992 and modified in 1998, established a comprehensive permitting process for the siting of electric generating facilities of 80 megawatts of capacity and above. Article X expired on December 31, 2002. Power plant applications that were submitted before the expiration of the law are still eligible for review. Nine projects were certified under Article X before the law expired, including Con Edison's East River repowering project. The NYISO, which manages the safety and reliability of the state's electric transmission system, reported in March 2003 and re-affirmed in May 2004 that the State requires between 5,000 and 7,000 megawatts of new power over the next five years to maintain a reliable supply of electricity. Of that amount, the NYISO estimates 2,000 to 3,000 MWs must be located in New York City. A number of proposals to extend and modify the Article X law were introduced in the State Senate and Assembly during the 2003 legislative session and have been reintroduced in 2004. Currently, a new 250 MW plant was placed in service just prior to the summer this year and three other plants capable of generating about 1,300 MWs are under construction, all of which are anticipated to be operating by 2006. In addition, there are about 1,100 MW and 550 MW of generation and transmission projects, respectively, that have already received regulatory approval to build. Because of these projects that are under construction or have the regulatory approval to build, it is expected there will be adequate electric supplies to meet projected requirements in the New York City metropolitan area for many years to come. It is also anticipated that many more generation and transmission projects will be proposed in the future.

2. Rezoning Area

Con Edison divides its service territory into distribution networks, designed to isolate geographic areas. Each network is supplied by a local area substation. Based on information provided by Con Edison, the Project Area is currently serviced by two networks, with most of the load in one network.

Based on the existing buildings in the Rezoning Area, Con Edison has estimated that the peak energy demand during the summer months is approximately 34 MW. Using the Con Edison estimation of peak electricity demand, the current annual energy consumption within the Rezoning Area is approximately 297,840 MWh per year.

3. Convention Center

The present demand during peak events at the Jacob K. Javits Convention Center is 17 MW (58 million BTUs). The average annual energy consumption has been approximately 43,000 MWhs (147 billion BTUs).

C. 2010 FUTURE WITHOUT THE PROPOSED ACTION

As identified in Chapter 3, "Analytical Framework", a number of residential and commercial projects and development proposals have been identified as likely to be developed by 2010 without the Proposed Action. Based on this projected level of development, Con Edison has estimated that the peak electricity demand would be 44 MW during the summer. Using Con Edison's peak electricity

demand, it is estimated that the Rezoning Area, under the 2010 Future Without the Proposed Action, would have an annual energy consumption of 385,440 MWhs. The size and operations of the Convention Center would remain unchanged and the energy demand would likely remain the same in the 2010 Future Without the Proposed Action condition: peak events would require 17 MWs (58 million BTUs) and the average annual energy consumption would be approximately 43,000 MWhs (147 billion BTUs). Under EO 111, Convention Center operations will also have to demonstrate compliance with the energy efficiency guidelines as set by NYSERDA. Compliance with EO 111 would likely result in a reduction of electricity consumption at the Convention Center. As this energy demand within the Project Area would be similar to the energy usage under existing conditions, significant improvements to energy utility infrastructure are not anticipated.

D. 2010 FUTURE WITH THE PROPOSED ACTION

It is anticipated that the No. 7 Subway Extension, Convention Center Expansion, and the Multi-Use Facility would be complete and operating, and a small portion of the commercial and residential development allowed under the proposed rezoning of the Hudson Yards area would be constructed by 2010. Under the Proposed Action, the Rezoning Area could receive a total of approximately 2.2 million square feet of office use and 91,500 square feet of retail use by 2010. As a result, the Proposed Action would generate increased demand for energy services. However, it would not result in significant adverse impacts to energy.

The projected developments of the Proposed Action would be required to comply with the New York State Conservation Code. This code sets the performance requirements for heating, ventilation, and air conditioning systems, and the materials used in building exteriors. Specifically, the code requires that all new and rehabilitated buildings (both public and private) be designed to incorporate adequate thermal resistance to heat loss and infiltration. In addition to the energy conservations measures, the code determines the design and selection of mechanical, electrical, and illumination systems. As a result, the projected office and residential developments would be substantially more energy-efficient than conventional pre-code buildings. EO 111 would also provide energy efficiency guidelines for those developments sponsored by state agencies: No. 7 Subway Extension, Convention Center Expansion, and the Multi-Use Facility.

The energy demand for the Proposed Action would consist of heating, ventilation, air conditioning, lighting, train operations, and auxiliary equipment (elevators and pumps) uses.

Though there is only a small amount of steam service available within a limited portion of the Project Area, there may be additional opportunities for steam to be utilized as an energy source.

1. No. 7 Subway Extension

The operational energy requirements of the No. 7 Subway Extension would require electrical power to operate the subway supporting systems, such as track and station lighting, signals, switching equipment, computers, and heating, ventilation and air tempering equipment. Currently, the estimated annual energy use would be 8,100 MWh for the Intermediate Station, 11,800 MWh for the Terminal Station, and 1,140 MWh for the associated systems buildings (Table 18-1). To consider a reasonable worst case scenario, it is assumed that the Intermediate Station would be complete by 2010, although it is not anticipated to open until after 2010. The modified Corona Yard operations is estimated to require 69 kWs per year for auxiliary power. The operational power required for the No. 7 Subway Extension would be supplied by Con Edison.

The design of the subway extension incorporates the energy efficiency directives of the EO 111. MTA NYCT has developed Design for Environment (DfE) Guidelines which outline sustainable design features to be considered in new designs, such as: energy efficiency, material conservation, water and site management, indoor environmental quality and operation and maintenance. In

particular, the design of the Terminal Station, Intermediate Station, associated systems buildings, and subway extension design is evaluating energy demand control, optimizing systems operations, thermal mass (subsurface) for heating and cooling, clean (on-site) local energy production, use of clean energy sources, station daylighting with skylights, natural ventilation systems, and minimizing electrical transmission loss. Further details will be available as the final design is completed. In addition to the DfE Guidelines, the No. 7 Subway Extension designers are considering Leadership in Environment and Energy Design (LEED) rating systems, ISO 14001 guidelines, and case studies of other transit projects.

2. Rezoning Area

a) Electric

A small portion of the projected residential and office developments allowed under the Zoning Amendments would be in place by 2010. Approximately 2.2 million square feet of new office and 2.7 million square feet of residential developments (approximately 2,700 units) would likely occur by 2010. Con Edison has estimated that the incremental electric load for Proposed Action in 2010 would be approximately 77 MW during peak periods (summer). Based on the estimate for the Proposed Action, the estimated electric load for the projected commercial and residential developments would be 48 MW. ~~.~~ Using this peak demand, the estimated annual electricity demand could be approximately 419,328 MWh (Table 18-1). This estimate does not include concurrent normal load growth that will occur in the Rezoning Area and surrounding neighborhoods. At this time, Con Edison's transmission and distribution systems are expected to have sufficient capacity to meet this incremental demand and the concurrent normal load growth. However, the increased load would require a new area substation and a new transmission substation by 2013, which means planning and design for both would have to be underway by 2010. Under the Zoning Text Amendments, existing provisions of the Zoning Resolution would continue to allow for electrical utility substations through the following provisions: as-of-right in manufacturing zoning districts; in residential and commercial districts, through a special permit of the Board of Standards and Appeals where there is no conflict with the retail continuity requirements of the Zoning Text Amendments, and by special permit of the City Planning Commission where waiver or modification of the retail continuity requirements is sought (Appendix A.1: Zoning Text and Map Amendments). The projected commercial and residential development sites may require construction within a tight timetable for delivering energy service to customers throughout the Project Area. Once these projects are further underway, estimates of electricity requirements will be coordinated with Con Edison. Also, given the tight timeframe and number of large-scale projects, there will need to be coordination among several public and private entities for all street level and below-grade projects.

b) Gas

Based on the proposed residential and commercial development assumptions, Con Edison has projected the incremental gas load to be 500,000 cubic feet per hour in 2010. Con Edison's gas transmission and distribution facilities would be used to deliver natural gas to the Project Area. The increased demand would require upstream modifications and enhancements to the transmission and distribution system. Locally, new gas mains, service lines and metering would need to be constructed to support the new customer load.

c) District Steam

Based on the proposed residential and commercial development assumptions, if all newly developed properties utilize Con Edison district steam for heating and hot water, Con Edison has estimated an incremental steam load of approximately 95,000 pounds per hour by 2010. There would have to be modifications and enhancements to these systems, including extending and enhancing distribution mains, service lines and metering stations, to serve additional customers.

3. Convention Center Expansion

To consider the reasonable worst case scenario, it is assumed that Phase II of the Convention Center Expansion would be complete by 2010.

It is anticipated that the incremental increase in electricity demand from the Convention Center Expansion would be 57,000 MWh annually (100,000 MWh total), as shown below on Table 18-1. During peak events, a net increase of approximately 19 MW and a total 36 MW is expected. The designers of the Convention Center have incorporated the following sustainable design measures to ensure efficient energy use and demonstrate compliance with EO 111:

- Heat Island Reduction – To diminish the absorption of heat the installation of high reflectance paving, vegetation and glass skylights will be incorporated into the rooftop. The proposed truck parking will be an enclosed structure to reduce the exposed parking surface area.
- Demand Controlled Ventilation – To reduce cooling, dehumidification, and heating requirements the use of controlled ventilation systems will be implemented to provide a savings of energy during partial occupancy periods.
- Daylighting – To decrease energy use and improve indoor environmental quality various techniques to maximize the effect of natural daylight will be captured and brought into enclosed areas.
- Photovoltaics – The power from the integrated PV panels in the south façade will be used to offset the building power requirements.

a) Potential Energy Conservation Measures

- Cogeneration Plant – An on-site generator would provide electrical power for power, lighting, motors, cooling, etc. The heat that is produced by the engines combustion exhaust and engine block jacket water is recovered and converted into useable energy in the form of hot water. If a cogeneration plant is incorporated into the Convention Center Expansion, an environmental review and related permitting would be required separate from this FGEIS.
- Con Edison District Steam - This high pressure steam can be used for powering turbine-driven chillers to reduce peak air-conditioning electrical demands. This equipment has a demonstrated high-level of reliability and extended (30 years) service life, thereby acting as a long-term demand reduction measure.
- Thermal Storage – To reduce the impact of this development on Con Edison's electrical infrastructure the use of a thermal storage system which reduces peak air conditioning electrical demands and also shifts the daytime peak demand to the nighttime.
- Fuel Cells – Fuel cell technology could offer opportunities to recover heat for space heating and domestic hot water to be feed into the building's power distribution to handle a portion of the load.

The peak natural gas demand for the expanded Convention Center would be approximately 150,000 CFH or 150 million BTUs. Annual gas consumption is estimated to be approximately 1,360,000 BTUs per year.

4. Multi-Use Facility

In 2010, the Multi-Use Facility would be completed and open for sporting events, concerts, conventions, and exhibitions. A sold-out event would require an estimated 10 MW (34 million BTUs). Average annual electricity consumption would be approximately 20,500 MWh. This power

demand would be supplemented by energy conservation and generation features which may include such features as, wind turbines power system, photovoltaic power system, daylighted concourses, radiant heated and cooled concourse slabs (expo floor), a "solar wall" to generate heat needed for domestic hot water, and efficient operations for ice storage. These design measures are consistent with EO 111. In cases of emergency, the Multi-Use Facility would have two diesel fired generators. Each engine would be rated at approximately 2,000 KW per generator.

The peak natural gas demand for the facility would be approximately 90,000 CFH. Annual gas consumption is estimated to be approximately 63,000 therms per year.

TABLE 18-1
2010 FUTURE WITH THE PROPOSED ACTION: ENERGY USAGE WITHIN THE PROJECT AREA (MWH USE)

Use	Peak Day (MW)	Annual Energy Consumption (MWh/yr.)
Rezoning Area	**48 MW***	**419,328 MWh***
No. 7 Subway Extension[1]		
Intermediate Station	N/A	8,100 MWh
Terminal Station	N/A	11,800 MWh
Site A (Lay-up Tracks)	N/A	1,140 MWh
Multi-Use Facility	10MW	20,500 MWh
Convention Center Expansion	36 MW	100,000 MWh
Total	**77 MW**	**560,868 MWh**

Sources: DCP, Con Edison, and the designers of the Convention Center Expansion and Multi-Use Facility.
Notes:
* Con Edison peak time (not hourly) estimate based on Reasonable Worst Case Development Scenario provided by DCP.
MWh – Megawatt hours
N/A – Not Available

E. 2025 FUTURE WITHOUT THE PROPOSED ACTION

The projected 2.8 million square feet of office and 1.6 million square feet of residential development within the Rezoning Area anticipated to occur by 2025 Future Without the Proposed Action would require approximately 51 MW during a peak summer demand, based on estimates provided by Con Edison. Using Con Edison's peak demand estimate, the conservative estimate of annual electricity demand would be 446,760 MWh per year. Improvements to electrical and gas utilities serving the Project Area would be necessary to provide adequate energy services for the projected development in the Future Without the Proposed Action. Also, in 2025 Without the Proposed Action, there would be a need for a new area substation and a new transmission substation by 2020, attributable to a combination of the overall load growth of the Project Area and portions of Midtown Manhattan. The new transmission substation required by 2020 in this scenario may not have to be located within the Project Area.

The Convention Center capacity and operations would be conservatively assumed to remain unchanged at 43,000 MWhs per year. Under EO 111, Convention Center operations will also have to demonstrate compliance with the energy efficiency guidelines as determined by NYSERDA.

F. 2025 FUTURE WITH THE PROPOSED ACTION

The majority of the projected residential, office, and retail space development would occur within the Rezoning Area between 2010 and 2025. Con Edison has estimated that the projected 28 million square feet of office development and approximately 12.6 million square feet of residential development, the expanded Convention Center and hotel, the Multi-Use Facility, and No. 7 Subway Extension would create an estimated peak demand of 309 MW. All future building designs would be

required to comply with the New York State Energy Conservation Code, including: energy conservation measures, energy conserving building materials, including meeting the code's requirements related to energy efficiency and combined thermal resistance.

Between 2010 and 2025, there would be no anticipated increased energy demands required by the No. 7 Subway Extension, Convention Center Expansion, and Multi-Use Facility.

1. Electricity

Based on the development of the Proposed Action anticipated by 2025, Con Edison has estimated that the incremental load would be approximately 309 MW during a peak period. This energy projection assumes that the projected development sites within the Rezoning Area would be fully constructed and utilized by 2025 (See Table 18-2). Using this peak demand, the estimated annual electricity demand could be approximately 2,669,424 MWh. The incremental load of 309 MW would be greater than the design capacity of a typical area substation serving Manhattan. In addition, there would be concurrent normal load growth that will occur within the Project Area and surrounding neighborhoods.

Given this development, Con Edison has indicated that two additional area substations would need to be in service prior to 2025 to serve the Project Area. One area substation would need to be in operation by 2013. A second new area substation would be needed by 2021. These area substations should be located within the Project Area. A new transmission substation would be required by 2013 that can serve the Project Area as well as other parts of the West Side. The new transmission substation would serve the Project Area substations, as well as other area substations. The transmission substation would not have to be in the Project Area. Therefore, Proposed Action will require the construction of two area substations and one transmission substation to accommodate projected 2025 With the Proposed Action development and background growth in surrounding area.

Con Edison's facilities are generally located in areas zoned for manufacturing. Under the Zoning Text Amendments, existing provisions of the Zoning Resolution would continue to allow for electrical utility substations through the following provisions: as-of-right in manufacturing zoning districts; in residential and commercial districts, through a special permit of the Board of Standards and Appeals where there is no conflict with the retail continuity requirements of the Zoning Text Amendments, and by special permit of the City Planning Commission where waiver or modification of the retail continuity requirements is sought (see Appendix A.1, Proposed Zoning Text and Map Amendments). Services would be enhanced and expanded and new facilities built as they are needed throughout the period. No significant adverse impacts related to electrical service within the Project Area are anticipated.

In 2025 projected commercial and residential development sites would require substantial modifications to utilities to deliver service to customers throughout the area. Also, given the timeframe and number of large scale projects, there will need to be coordination among several public and private entities for all street level and below-grade projects.

TABLE 18-2
2010 AND 2025 FUTURE WITH AND WITHOUT THE PROPOSED ACTION: INCREMENTAL DEMAND OF ANNUAL ENERGY USAGE(MWH)

Project Element	Existing Conditions (2003)	2010 Without Proposed Action	2010 With Proposed Action	2025 Without Proposed Action	2025 With Proposed Action
Rezoning Area Total	297,840 MWh	385,440 MWh	419,328 MWh	446,760 MWh	2,557,884 MWh
No. 7 Subway Extension	----	----	21,040 MWh		21,040 MWh
Multi-Use Facility	----	----	20,500 MWh	----	20,500 MWh
Convention Center Expansion	43,000 MWh	43,000 MWh	100,000 MWh	43,000 MWh	100,000 MWh
Total	**340,840 MWh**	**428,440 MWh**	**560,868 MWh**	**489,760 MWh**	**2,669,424 MWh**

Sources: DCP, Con Edison, and the designers of the Convention Center Expansion and Multi-Use Facility.

2. Gas

Based on the projected residential and commercial development assumed in 2025, Con Edison has projected that the incremental gas load would be 4 million CFH. Con Edison's gas transmission and distribution facilities would be used to deliver natural gas to the Project Area. There would have to be upstream modifications and enhancements to the gas transmission and distribution system to meet the increased demand. Locally, new gas mains, service lines and metering will need to be constructed to support the new customer load. Coordination of street level and below-grade projects among several public and private entities and Con Edison would be required to implement the necessary gas utilities upgrades needed to support the Proposed Action. With these upgrades, no significant adverse impacts to gas service are anticipated.

3. District Steam

The projected electrical and gas demands and consumptions for Project elements noted above may be reduced based on the utilization of the Con Edison district steam system within the Project Area. If all the newly developed properties in the area utilized Con Edison's district steam system for heat and hot water, Con Edison estimated an incremental steam load of approximately 750,000 to 1,000,000 pounds per hour by 2025. There would have to be modifications and enhancements to these systems, including extending and enhancing distribution mains, service lines and metering stations, to serve additional customers.

G. CONCLUSION

As specific designs for the residential and commercial developments within the Rezoning Area are prepared, coordination with Con Edison will be necessary to identify electric, gas and steam utility upgrades. Adequate upgrades to gas and electric utilities will avoid significant adverse impacts related to energy services

Under the Zoning Text Amendments, existing provisions of the Zoning Resolution would continue to allow for electrical utility substations through the following provisions: as-of-right in manufacturing zoning districts; through City Planning Commission special permit, or by special permit of the Board of Standards and Appeals for residential and commercial zoning districts, as long as there is no conflict with the retail continuity requirements set forth by the Zoning Text Amendments (see Appendix A.1: Proposed Zoning Text and Map Amendments). Furthermore, DCP and Con Edison continue to discuss and assess the future needs and necessary zoning requirements.

H. POTENTIAL EFFECTS OF NEW SUBSTATIONS IN THE PROJECT AREA

As a consequence of the Proposed Action, additional electrical substations would be required in the Project Area. These would be designed, constructed, and operated by Con Edison, and would be subject to site-specific review pursuant to Special Permit of the Board of Appeals or the City Planning Commission. They may be constructed either within or adjacent to or near buildings that contain either residential or commercial uses. Substations are key components for reliable operation of electric power transmission and distribution systems. They serve as an interface between transmission lines and distribution lines, converting higher voltage electric power to lower voltage power for distribution to commercial businesses and residences. To perform this function, substations use power transformers, switchgear, capacitor banks, buss ducts, feeder circuits, monitoring equipment, and other related apparatus.

This section addresses three issues associated with any new substations: electric and magnetic fields (EMF) from substation operation; noise generated by substation operation; and chemicals used in the substation. The analyses presented are based upon experience with new Con Edison substations. As discussed below, construction and operation of the substation(s) associated with the Proposed Action would not be expected to have any significant adverse impacts.

1. Electric and Magnetic Fields (EMF)

Because normal construction materials provide adequate shielding from electric fields, electric fields due to substation operation would not result in any potential significant adverse impacts. The discussion below therefore focuses only on the issue of magnetic fields.

a) General Description of Magnetic Fields

Any object with an electric charge on it has a voltage (potential) at its surface and can create an electric field. When electric charges move together (an electric current), they create a magnetic field. Magnetic fields are one of the basic forces of nature. The strength of a magnetic field depends on the magnitude of the current (higher currents create stronger magnetic fields), the configuration/size of the source, spacing between conductors, and distance from the source (magnetic fields grow weaker as the distance from the source increases).

Magnetic flux density is a measure of the strength of a magnetic field over a given area and is typically reported using units of gauss (G). However, it is usually more convenient to report magnetic field using the unit milligauss (mG), which is equal to one-thousandth of a gauss (i.e., 1 mG = 0.001 G).

Magnetic fields can be unchanging in direction or static, as in the case with direct current (DC) or changing or alternating in direction, as in the case of alternating current (AC). As an example, static magnetic fields occur in nature. The earth has a natural static magnetic field of about 550 mG (0.550 G) in the Manhattan area.[1] Some electrical devices operate on a DC system while others operate on an AC system. The magnetic field from AC sources (such as most electrical power lines, electrical equipment, residential wiring, and appliances) differ from DC fields (like the earth) because the field is due to alternating currents (AC) and it changes direction at a rate of 60 cycles per second or 60 Hertz.

The characteristics of magnetic fields can differ depending on the field source. A magnetic field near an appliance decreases rapidly with distance away from the device. A magnetic field also decreases with distance away from line sources, such as power lines, but not as rapidly as it does with appliances. Transmission line magnetic fields attenuate at a rate that is inversely proportional to the distance squared, whereas magnetic fields from appliances attenuate at a rate inversely proportional to the distance cubed. Since the magnetic field is caused by the flow of an electric current, a device must be operated for it to create a magnetic field. The magnetic fields for a large number of typical AC household appliances were measured by the Illinois Institute of Technology Research (IITRI) for the U.S. Navy[2] and by Enertech Consultants[3] for the Electric Power Research Institute (EPRI). Typical values for appliances are presented in Table 18-3. Another EPRI study found that the mean

[1] The Earth's Magnetic Field, International Geophysics Series. Vol. 32. New York: R.T. Merrill and M.W. McElhinny, Academic Press, 1983.

[2] "Household Appliance Magnetic Field Survey",," U.S. Naval Electronic Systems Technical Report No. EO6549-3, Illinois Institute of Technology Research Institute, Chicago, March 1984.

[3] Silva, J.M., Hummon, N.P., Rutter, D.A., Hooper, H.C., "Power Frequency Magnetic Fields in the Home",," IEEE Transactions on Power Delivery, Vol. PWRD-4, No. 1, pp. 465-478, January, 1989.

resultant AC magnetic field in residential U.S. homes was approximately 0.9 mG (at approximately 1 meter above ground level).[4]

TABLE 18-3
MAGNETIC FIELD FROM HOUSEHOLD APPLIANCES (MG)

Appliance	12 Inches Away	Maximum
Electric Range	3 to 30	100 to 1,200
Electric Oven	2 to 5	10 to 50
Garbage Disposal	10 to 20	850 to 1,250
Refrigerator	0.3 to 3	4 to 15
Clothes Washer	2 to 30	10 to 400
Clothes Dryer	1 to 3	3 to 80
Coffee Maker	0.8 to 1	15 to 250
Toaster	0.6 to 8	70 to 150
Crock Pot	0.8 to 1	15 to 80
Iron	1 to 3	90 to 300
Can Opener	35 to 250	10,000 to 20,000
Mixer	6 to 100	500 to 7,000
Blender, Popper, Processor	6 to 20	250 to 1,050
Vacuum Cleaner	20 to 200	2,000 to 8,000
Portable Heater	1 to 40	100 to 1,100
Fans/blowers	0.4 to 40	20 to 300
Hair Dryer	1 to 70	60 to 20,000
Electric Shaver	1 to 100	150 to 15,000
Color TV	9 to 20	150 to 500
Fluorescent Fixture	2 to 40	140 to 2,000
Fluorescent Desk Lamp	6 to 20	400 to 3,500
Circular Saws	10 to 250	2,000 to 10,000
Electric Drill	25 to 35	4,000 to 8,000

Magnetic fields were also measured by Enertech Consultants during typical walks around Manhattan, once in 1989 and again in 1999. A magnetic field meter was worn at the waist and continuously recorded field levels while a person walked along City streets and sidewalks, rode the subway, shopped in stores, and ate in restaurants. Measured magnetic fields levels are summarized for a variety of locations in Table 18-4.

Field measurements have also been performed by Enertech Consultants at locations adjacent to several existing Con Edison substations in Manhattan to characterize field levels near existing substation facilities. Table 18-5 presents a summary of these field measurements.

In summary, magnetic fields on sidewalks in Manhattan vary from approximately 1 to over 100 mG. This is well within the range (and well below the maximum fields) produced by a number of household appliances. Magnetic fields around substations typically fall within this same range.

[4] "Survey of Residential Magnetic Field Sources",," L.E. Zaffanella, Final Report TR-102759 (2 Volumes), Prepared by the High Voltage Transmission Research Center for the Electric Power Research Institute, 1993.

TABLE 18-4
SUMMARY OF MAGNETIC FIELD MEASUREMENTS DURING WALK-AROUNDS IN MANHATTAN

Year	Activity	Magnetic Field Range
1989	Walking Along 40th Street Sidewalk	1 to 78 mG
	54th Street Apartment Building Lobby	1 to 15 mG
	54th Street Apartment (15th Floor)	0.5 to 62 mG
	Cookie Store (Second Avenue)	8 to 58 mG
	Food Emporium Grocery	0.5 to 7 mG
	Walking Along 51st Street Sidewalk	1 to 49 mG
	Riding Subway	1 to 32 mG
	Riding Bus	1 to 26 mG
1999	Walking Along Wall Street Sidewalk	2 to 115 mG
	Riding Subway (Express)	1 to 43 mG
	Walking Along East 86th Street Sidewalk	1 to 16 mG
	Walking Along East 87th Street Sidewalk	1 to 35 mG
	Walking Along East 88th Street Sidewalk	1 to 16 mG
	Walking Along Park Avenue Sidewalk	1 to 60 mG
	Grocery Store	1 to 30 mG
	Noodle Kidoodle (Childrens Store)	1 to 7 mG
	Walking Along Lexington Avenue Sidewalk	2 to 110 mG
	Pastrami Queen Restaurant (Eat Lunch)	2 to 22 mG
	K & S Market	1 to 17mG
	The Bagel Café	2 to 70 mG
	Newspaper Stand (Near E. 86th Street Subway Entrance)	3 to 338 mG

TABLE 18-5
SUMMARY OF MAGNETIC FIELD MEASUREMENTS NEAR EXISTING CON EDISON SUBSTATION FACILITIES IN MANHATTAN

Year 2001	Magnetic Field Range
East 36th Street Substation Sidewalks	1.0 to 108.5 mG
East 40th Street Substation Sidewalks	0.4 to 62 mG
Seaport Substation Sidewalks	0.9 to 66.9 mG

Magnetic fields around substations are a function of the location of the electric equipment within the substation and the load (current) on the equipment at any particular time. In general, the closer the equipment is to the boundary line of the substation, the higher the magnetic field at the boundary line. Also, substation magnetic fields are dependent on the location and configuration of the electric feeders entering and exiting the substation. The primary sources of external magnetic fields from substations are typically the high-voltage and low-voltage conductors and lines. Magnetic fields around substations typically fall off rapidly with distance, and typically the strength of magnetic fields on sidewalks across the street from substations is not significantly different from values obtained when such substations are not operating. Magnetic fields directly above underground distribution lines are usually less than 20 mG, diminish rapidly with distance and are often undetectable in nearby buildings.[5]

[5] "Electric and Magnetic Field Management Reference Book," 1st Edition, Report TR-114200, Electric Power Research Institute, December 1999.

Shielding can be utilized to reduce the strength of magnetic fields. Most materials (such as those that make up buildings, trees, and the ground) do not shield magnetic fields. Ferromagnetic materials (nickel, iron, and cobalt) are a special group of metals that can provide effective shielding. In some cases the magnetic field can also be shielded with materials that are conductive, like copper or aluminum. In other cases, layers of ferromagnetic and conductive materials are used together to provide shielding. Shielding factors ranging from 2:1 up to 25:1 have been achieved next to capacitor banks, in network protection vaults, switchgear rooms, over busways, and in facilities which are in close proximity to power distribution conductors and equipment.[6]

b) Health Effects

Over the past two decades there has been significant research investigating the potential for exposure to EMF to adversely affect human health. Health concerns have included a variety of diseases and other health endpoints such as reproductive outcomes. Concerns about the possible effect of EMF on human health originally focused on electric fields, but much of the recent research has focused primarily on magnetic fields.

To date, there is no sound medical or scientific basis to conclude that EMF causes cancer or any other disease. Neither the medical nor scientific communities have been able to provide any numerical exposure value or foundation upon which Federal or State regulatory bodies could establish a standard or limit for public exposure that is known to be either safe or harmful. There are no Federal or State standards related to the public health effects from electric and magnetic fields to serve as a basis for determining a level of impact. However, the New York State Public Service Commission established an engineering-based magnetic field standard of 200 mG applicable at the edges of new transmission line rights-of-way. The standard was designed to ensure that magnetic field levels around new transmission lines do not exceed magnetic field levels around existing transmission lines.

Although there is no sound medical or scientific basis to conclude that EMF causes cancer or any other disease, Con Edison designs and constructs substations to reduce potential magnetic field impacts in adjacent areas through careful positioning of equipment and use of shielding, as deemed appropriate. By designing substations in this manner, Con Edison has succeeded in limiting magnetic fields from the substations in adjacent areas to levels that are significantly below the PSC standard. Therefore, it can be concluded that the substation(s) associated with the Proposed Action ~~would not~~are not expected to have any significant adverse EMF impacts.

2. Noise

Noise due to operation of any substations would be due principally to operation of mechanical and electrical equipment at the facility. Of particular relevance in considering potential noise impacts due to substation operations is the New York City ambient noise quality criteria contained in NYC Noise Control Code shown in Table 22-1 and CEQR noise exposure guidelines and standards contained in Tables 22-2 and 22-3.

The NYC ambient noise quality criteria contained in the NYC Noise Control Code provide that, for high density residential zoned areas (R4 to R10), noise levels (Leq(1)) due to stationary sources do not exceed 65 dBA during daytime hours (7 AM-10 PM) and not exceed 55 dBA during nighttime hours (10 PM-7 AM) at the property line. The CEQR noise exposure guidelines and in particular the CEQR exterior noise standards were developed to ensure that interior noise levels at sensitive land uses, such as residences, do not exceed 45 dBA. In high density residential zoned areas, conformance

[6] "Proceedings: Substation Magnetic Field Management Workshop," Report TR-101852, Electric Research and Management for the Electric Power Research Institute, April 1993.

with the NYC Noise Control requirement of 55 dBA would produce interior noise levels of 45 dBA (i.e., building attenuation even with an open window condition typically produces 10 dBA attenuation), and would ensure conformance with CEQR requirements.

Noise levels from operation of electrical/mechanical equipment at the substations are based upon studies performed by AKRF, Inc. for various new Con Edison substations located in New York City. These studies used noise data gathered from several sources including manufacturer provided information and measured data from typical equipment at other existing Con Edison facilities.

Site specific noise levels vary depending upon a number of factors including the facility layout, equipment provided, noise attenuation measures employed, etc. However, a substation with noise sensitive uses nearby can be designed to incorporate sufficient noise attenuation to produce noise levels at the property line of 55 dBA or lower.

A substation producing this level of noise would increase ambient noise levels by an imperceptible amount and meet the Noise Code. Noise levels due to substation operation would satisfy all of the requirements of NYC Noise Control Code (including ambient noise quality zone criteria requirements) would produce noise levels that comply with all applicable regulatory noise requirements. Based upon the above, the new substation(s), whether built as separate facilities or incorporated into other facilities would not be expected to result in any significant adverse noise impacts.

3. Chemicals Used in Substation Operations

The operation of a substation involves the use of a wide range of products and chemicals, many of which are common household items. Con Edison has an extensive program of chemical approval, communication of hazards, and training of employees in the use and hazards of chemicals. All chemicals and products used must go through a variety of reviews, including a health and safety review and an environmental review by Con Edison's Environment, Health and Safety Department. The chemical or product can be used only after it is approved for system use. Con Edison also has programs in place to reduce the use and storage of hazardous chemicals, and to deal with spills and other emergencies that may arise. Con Edison also conducts drills on response plan utilization on a periodic basis to assure that employees are familiar with these plans.

The following substances would be used in operation of the substation(s):

- A substation would have a specially designed battery room to provide back-up emergency power for substation equipment. Lead and sulfuric acid would be in the batteries, which are recycled when replacement is required. The battery room is specially designed rooms to contain a spill or release of acid and prevent it from being released into the environment.
- Diesel Fuel would be stored for use in any diesel generators used to provide back-up power in emergency conditions.
- Mercury: The only mercury that would be present at any substation would be low mercury lamps.
- Sulfur Hexafluoride(SF6) gas would be used as an insulating medium in electrical equipment to suppress electric arcing during the switch operation. SF6 is a non-toxic gas, which has been identified as a greenhouse gas. The total amount of SF6 present would depend upon the substation’s size and design but would be below 150 pounds, which is below the reporting quantity for inventory purposes.
- Transformer Dielectric Fluid: Transformers contain dielectric fluid, which is a refined petroleum distillate that removes heat and acts as an electrical insulator within the transformer. Each transformer would contain approximately 15,000 gallons of dielectric fluid.

- Cable Dielectric Fluid: The transmission feeders that would supply the substations would either be solid dielectric or insulated and cooled with dielectric fluid. This fluid is formulated from synthetic chemical compounds, and would be added to the pipes that carry the cables. If cable dielectric fluid is used, it would be stored in approximately 10,000-gallon fluid tanks. Depending upon the size of the substation between one and three tanks may be required.

Other products may be used from time to time for various cleaning, maintenance and repair functions at the substation(s). Such items will be stored only in approved storage cabinets and only to the extent authorized by the New York City Fire Code. In addition, compressed nitrogen (2 cylinders) would be used at the substations to provide an inert gas layer in the dielectric fluid pressurization tank.

In summary, the quantity of hazardous materials or chemicals, that would be used or stored in any substation facility would be expected to be small. As a result, it would be expected that any substation would be listed as a conditionally exempt small quantity generator as defined under RCRA, or a facility that generates less than 220 pounds per month. It is expected that the amount of hazardous waste generated at the substation would be considerably less. All materials used at the substations will be disposed of in accordance with all applicable rules and regulations. ❖