

ACHIEVING 80x50

Reducing Energy Use, Creating Jobs,
and Phasing Out Carbon Emissions
in New York City's Buildings

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A background image of a cityscape rendered in a wireframe style, showing the outlines of buildings and streets in a dark gray color against a lighter gray background.

THE PLAN FOR ACHIEVING 80X50

In September 2014, Mayor de Blasio committed New York City to a long-term 80 percent greenhouse gas emissions reduction by the year 2050.


In order to meet the 80x50 goal, the City should update the New York City (NYC) Energy Conservation Code.

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ACKNOWLEDGEMENT

We would like to thank Randolph Croxton and Croxton Collaborative Architects for their insightful reviews, help, and comments on draft versions of this report.



New York City's buildings
are responsible for 71%
of the City's emissions,
and 94% of its total
electricity consumption.

INTRODUCTION

New York City's iconic skyline is made up of over one million buildings that are our homes, our offices, our schools, and our places of worship. However, these very buildings that give New York City its unique character are the primary cause of the City's carbon emissions. New York City's buildings are responsible for 71% of the City's emissions, and 94% of its total electricity consumption. In order to achieve New York City's commitment to reducing carbon emissions 80 percent by 2050 (known as the 80x50 plan), we must make substantive changes in our built environment. This report presents a plan to make New York City's one million buildings energy efficient by 2050.

The need for New York City to reduce its emissions is clear. A recent study of 136 major coastal cities found that New York City is the American city most at risk from economic losses from future flooding, and is ranked third globally.¹ For a more tangible example of the financial impact climate change is having on New York City, we need to look no further than during Superstorm Sandy. One third of the office building stock in Lower Manhattan (33.6 million square feet out of 101 million square feet) was out of service for one week or longer, causing significant business interruption and property losses.² Along the East Coast, Superstorm Sandy caused an estimated \$65 billion in economic losses, and only \$30 billion of that was recouped through insurance claims.³ Compounding this problem, sea levels in New York City are estimated to rise an additional 0.9'-1.6' by 2050 and an additional 2.1'-4.2' by 2100.⁴

Climate change will also make New York City's summers hotter and longer. New York City and Chicago will emerge in this century as the two American cities with the highest incidence of heat related deaths as measured by the Humid Heat Stroke Index (HHSI).⁵ Humidity/heat conditions greater than HHSI/95°F, never reached in modern times, will create functionally untenable outdoor conditions for humans. This will disproportionately affect those who work outdoors, including police officers, fire fighters, and construction and infrastructure workers.

These climate conditions will have compounding health impacts on the elderly and disabled persons with limited mobility. Those with the least means to relocate, and whose futures are tied to the viability of New York City, are the ones most at risk.

The United Nations Framework Convention on Climate Change (UNFCCC) conference will convene in Paris in December 2015. The goal is to reach a new agreement to prevent irreversible climate change, applicable to all countries, by keeping global average temperature increases under 2°C compared to preindustrial levels. Meeting this consensus threshold requires phasing out CO2 emissions from worldwide power and industrial sectors by mid-century, and all GHG emissions from energy systems by the second half of the 21st century. While the UNFCCC is working to achieve agreements that meet the science-based targets for emissions reductions, New York City has the opportunity to lead by example by addressing the single most pressing source of its emissions: buildings.

The good news is that we already have the knowledge, technology, and policy reference points to make our buildings energy efficient and address the most devastating outcomes from climate change. This proposal builds on the solid foundation created by Mayor de Blasio's 80x50 goal and sets New York City on the right course to address emissions reductions, create good jobs for New Yorkers, and increase tax revenue for the City.

1 Future flood losses in major coastal cities, World Bank and Organization for Economic Cooperation and Development (OECD), August 2013. Based on the overall cost of potential damage.

2 Global Sustainability Perspective Jones Lang LaSalle, April 2014.

3 Ibid.

4 Risky Business, A Climate Risk Assessment for the United States, Risky Business Project, June 2014.

5 Ibid.

NYC ENERGY CONSERVATION CODE UPDATES

New York City's buildings are responsible for approximately 71% of the city's emissions, and 94% of the city's total electricity consumption. The most simple and direct way to address the disproportionately large percentage of emissions attributed to buildings is to phase-in changes to the City's Energy Conservation Code. These code changes should apply to all new buildings, major building renovations and building purchases in order to reach a critical mass of buildings by 2050.⁶

Phased-In Code Update

January 1, 2016

- Update the NYC Energy Conservation Code to match current national building energy code standards IECC 2015 for residential buildings, and ASHRAE 90.1 2013⁷ for commercial buildings (or equivalent).

2019

- Update the NYC Energy Conservation Code to reflect a 20 percent energy consumption reduction target *below* IECC 2015 for residential buildings and ASHRAE 90.1 2013 for commercial buildings.

2022

- Update the NYC Energy Conservation Code to reflect a 40 percent energy consumption reduction target *below* IECC 2015 for residential buildings and ASHRAE 90.1 2013 for commercial buildings.

By 2030

- Zero-Net-Energy Conservation Code.

Voluntary Stretch Codes⁸

2019

- Create NYC Energy Conservation Stretch Codes to reflect a 40% energy consumption reduction target *below* the updated NYC Energy Conservation Code.

2022

- Increase the Stretch Code to reflect Zero-Net-Energy Conservation Code.

⁶ A major building renovation is defined as an Alteration Type 1 or Type 2 renovation where the cost of the renovation is greater than \$100/square foot of the gross floor area of the entire building.

⁷ ASHRAE 90.1-2013 is approximately 30% more stringent than 90.1-2004 (for whole building energy use; about 40% for regulated loads), so the energy code improvements reasonably accelerate the last decade of NYC energy code changes.

⁸ Stretch codes are optional building energy codes that allow for more energy efficient construction than what is required in the base code.

Incentives

- Provide incentives for meeting the voluntary NYC Energy Conservation Stretch Codes. Possible incentives include Floor Area Ratio (FAR) bonuses, fast track permitting, reduced permitting fees, attractive financing options, rebates, tax credits, and PACE financing.
- Additional NYC tax income from the \$5.8 billion in added annual construction can be used to offset stretch code incentives (see Appendix 3).

Evaluation and Assessment

- After each code update cycle, evaluate code adoption rates, and actual versus expected building energy consumption and emissions reductions. Based on this evaluation, establish targets for further code update cycles to meet an 80% or greater citywide building sector emissions reduction below 2005 levels by 2050.

Compliance Alternatives

- Allow compliance with the proposed building energy conservation code updates using any combination of the following strategies:⁹
 - Constructed energy efficiency improvements (e.g. building envelope improvements, equipment and lighting efficiency upgrades, shading, daylighting, passive heating, cooling and ventilation strategies, etc.)
 - Purchase of third-party verified “white tags” for energy efficiency improvements in other existing buildings
 - On-site generation of renewable energy (solar, wind, biomass, etc.)
 - Purchase of new third-party verified offsite renewable energy (within the metropolitan region or state)
 - Credit for voluntarily operational changes, such as requirements in tenant leases

Financing Alternatives

- This plan should leverage the work of existing energy-efficiency loan programs, specifically the work of the New York City Energy Efficiency Corporation in the multi-family segment (over 50,000 square feet). Other mortgage programs for renovating existing home purchases include the Multifamily Property Improvements to Reduce Energy program (M-PIRE) and the Program for Energy Retrofit Loans (PERL).
- Additionally, the City should seek to establish other financing and reduced rate mortgage programs, e.g. Property Assessed Clean Energy (PACE), On-Bill Repayment, and other options for new and renovated commercial and residential buildings.
- The Initiative could seek to establish reduced rate mortgage programs for new and renovated commercial and residential properties less than 50,000 square feet that meet voluntary NYC Energy Conservation Stretch Codes by working with lending institutions to develop green building mortgage products.

⁹ As a point of reference Con Edison Solutions offers Green Power at an additional cost of \$0.01/kWh for wind+hydro and \$0.025/kWh for wind only. Within the first year after purchase, a new building owner can apply for a building permit for any combination of the options listed to meet the ECC, or enter into a 5-year minimum contract to purchase an amount of Green Power to offset ECC energy reduction requirements. For this option, establish a set of minimum efficiency requirements for existing buildings that do not disrupt building occupancy.

This initiative will create approximately \$5.8 billion dollars in construction each year, and create

82,780
new jobs *annually*.

Construction industry jobs:
32,855

Indirect jobs:
26,232

Induced jobs:
23,693



JOBS FOR NYC

Between 2015 and 2050, if the NYC Energy Conservation Code meets the 2016, 2019, and 2022 update targets and reaches Zero-Net-Energy by 2030, it will create approximately \$5.8 billion dollars in construction each year (2013 dollars), and create 82,780 new jobs *annually* (see Appendix 3) as shown above.¹⁰

¹⁰ **Indirect jobs** are jobs created in industries such as transportation, administrative services, etc.

Induced jobs are jobs created when workers spend their earnings on retail, fuel, food, etc. See Political Economy Research Institute.

TAX REVENUE FOR NYC

Between 2015 and 2050, this NYC plan will create about \$500 million in city tax revenue **annually** (Appendix 5). This is money that can be used for a number of programs including renovating New York City's public housing stock for energy efficiency, funding training programs for workers from disadvantaged communities, and creating incentives for the uptake of stretch codes.

HITTING THE MARK

Incorporating the recommendations in this plan would reduce Building Sector GHG emissions by 91%, or 30.8 MtCO_{2e}, by 2050. Emissions reductions would come from building efficiency gains, and through renewable energy generation both on-site and off-site (see Appendix 4).

New York City contains over one million buildings with an estimated total gross floor area of 5.75 billion square feet. There are a sufficient number of building sales and renovations each year in New York City to assume that nearly all buildings will be required to meet the updated NYC Energy Conservation Code by 2050.

During the past year in New York City there were approximately:

- 68,000 Alteration Type 1 and Type 2 building permits issued,
- 43,000,000 square feet of new building construction,
- 3,700 commercial property sales,
- 22,500 one, two, and three family residence sales.

The total number of residential and commercial building sales anticipated to take place between 2015 and 2050 is slightly less than the current number of buildings citywide (see Appendix 3). If the recommended NYC Energy Conservation Code updates are adopted, over 90% of New York City's future building stock will have been designed, renovated, and constructed to varying degrees of high performance efficiency standards ranging from a 50% improvement to net zero energy.¹¹

Additionally, if the City adopts this plan, it will become a significant source of demand for off-site renewable energy production (e.g. Upstate or Long Island wind farms, NYC installed rooftop solar, offshore wind), generating green jobs and possibly reinvigorating shrinking municipalities throughout New York State.

To meet a citywide 80x50 goal, the City would only need an additional 5.26 MtCO_{2e} reduction below the 2005 baseline from the power, transportation and waste sectors, when combined with the significant emissions reductions in the building sector made possible through this plan.

¹¹ Analysis assumptions: Average building floor area of residential properties sold in 2013 is 2,120 square feet. Average building floor area of commercial properties sold in 2013 is 22,786 square feet. Additional efficiency renovation construction cost for purchased buildings = \$35/square foot of building floor area. Additional efficiency upgrade cost for new code standard compliance = 5% of construction costs. Data Sources: NYC Department of Buildings; NYC Department of Finance.

CONCLUSION

The one million buildings that make up New York City's iconic skyline are also the primary source of the City's carbon emission. New York City can become a global leader in addressing its building stock by making substantive changes in the NYC Energy Conservation Code. The plan presented in this report is a road map to make nearly all of New York City's buildings energy efficient over the next 35 years, and allow the City to achieve its goal of reducing carbon emissions 80 percent by 2050.

80x50

APPENDIX 1: Alteration Costs/New Buildings Square Footage

NEW YORK CITY DEPARTMENT OF BUILDINGS				
Monthly Alteration Type A1 & A2 Estimated Construction Cost / New Buildings Square Footage				
Month	Type A1 + A2 Permits	Total Estimated Construction Cost	New Buildings Applications	New Buildings Sq. Ft.
13-Jun	5,483	\$875,771,812	221	3,127,626
13-Jul	5,834	\$875,384,097	213	4,309,280
13-Aug	5,812	\$925,480,187	215	2,747,074
13-Sep	5,130	\$734,426,710	172	2,871,954
13-Oct	6,049	\$996,399,922	258	5,174,303
13-Nov	5,306	\$741,043,207	166	5,001,316
13-Dec	5,270	\$806,391,319	162	3,356,667
14-Jan	5,328	\$1,056,717,119	184	3,153,270
14-Feb	4,835	\$984,845,975	130	2,318,452
14-Mar	6,232	\$1,187,119,755	235	3,398,517
14-Apr	6,233	\$1,215,193,438	178	3,266,704
14-May	6,109	\$970,881,543	201	3,729,238
TOTAL	67,621	\$11,369,655,084	2,335	42,454,401
New Buildings Annual Construction Cost at \$250 sq ft				\$10,613,600,250
Alteration Type 1 & 2 code compliance @ 5% cost increase		\$568,482,754	New Buildings Code Compliance, 5% cost increase	
Total Alteration Type 1 & 2 + New Buildings Code Compliance				\$1,099,162,767

APPENDIX 2: Homes And Commercial Buildings Sales

NEW YORK CITY DEPARTMENT OF BUILDINGS				
All 1, 2, and 3 Family Homes Sales and Floor Areas (From January 1, 2013 to December 31, 2013.)				
Borough	Number Of Sales	Average Area Sq. Ft.	Total Area Sq. Ft.	
Queens	9,279	1,874	17,388,846	
Bronx	2,066	2,323	4,799,318	
Staten Island	3,661	1,905	6,974,205	
Brooklyn	7,319	2,407	17,616,833	
Manhattan	267	4,142	1,105,914	
TOTAL	22,592		47,885,116	
Weighted Average Sq. Ft. 5 Boroughs		2,120		
Commercial Buildings Sales and Floor Areas (From January 1, 2013 to December 31, 2013.)				
Borough	Number Of Sales	Average Area Sq. Ft.	Total Area Sq. Ft.	Total Sales Amount
Queens	857	14,659	12,562,763	\$3,100,264,150
Bronx	664	23,365	15,514,360	\$1,906,563,715
Staten Island	187	8,798	1,645,226	\$246,102,993
Brooklyn	915	15,266	13,968,390	\$4,263,295,282
Manhattan	1,142	36,863	42,097,546	\$28,601,020,123
TOTAL	3,765		85,788,285	38,117,246,263
Weighted Average Sq. Ft.		22,786		
Average Price Sq. Ft. 5 Boroughs				\$444

APPENDIX 3: Additional Annual New York City Jobs

NEW YORK CITY DEPARTMENT OF FINANCE			
2013 Home and Commercial Buildings Sales			
	Sales/year	Total Sq. Ft./year	Renovation Construction \$35/Sq. Ft.
1, 2 and 3 Family Homes Sales	22,500	48,000,000	\$1,680,000,000
Commercial Building Sales	3,700	86,000,000	\$3,010,000,000
TOTAL	26,200	134,000,000	\$4,690,000,000
Alteration Type 1 & 2 + New Buildings Code Compliance (Appendix 1)			\$1,099,162,700
TOTAL CONSTRUCTION SPENDING			\$5,789,162,700
Note: All numbers rounded to the nearest hundred			
Additional Annual New York City Jobs			
	Construction Jobs	Indirect Jobs	Induced Jobs
Residential: New Construction	7,896	8,568	6,552
Residential: Renovation	2,388	2,899	2,217
Commercial: New Construction (added cost)	18,963	12,642	12,642
Commercial: Renovation (added cost)	3,609	2,123	2,282
TOTAL	32,855	26,232	23,693
TOTAL JOBS	82,780		
Job Statistics Source: Political Economy Research Institute (University of Massachusetts, Amherst)			
2012 US nationwide, employment per \$1 billion:			
<ul style="list-style-type: none"> Commercial (new construction): 6,300 direct; 4,200 indirect; 4,200 induced; 14,700 total Commercial Renovation: 6,800 direct; 4,000 indirect; 4,300 induced; 15,100 total New Residential construction (singleV and multiVfamily): 4,700 direct; 5,100 indirect; 3,900 induced; 13,700 total Residential Renovation: 4,200 direct; 3,100 indirect; 2,900 induced; 10,200 total 			

APPENDIX 4: New York City Emissions Reductions

NEW YORK CITY MAYOR'S OFFICE	
Current Emissions	
NYC Gross Building Floor Area (2012)	5.75 Billion SF
2005 NYC Emissions	59.2 MtCO ₂ e
2012 NYC Emissions	47.9 MtCO ₂ e
2012 NYC Buildings Emissions	33.9 MtCO ₂ e
2012 Emissions per SF of Building	0.0000000059 MtCO ₂ e
Projected Emissions Reductions	
2012 - 2050	MtCO ₂ e
New Buildings	0.88
Type 1 & 2 Renovations	-11.77
Building Sales	-25.36
TOTAL	-36.24
TOTAL @ 85% Compliance	-30.81

APPENDIX 5: Annual New York City Tax Revenue

ANNUAL NEW YORK CITY TAX REVENUE			
	Taxes per Worker	Number of Jobs	Tax Revenue
Direct Jobs	\$3,299	32,855	\$108,388,645
Indirect Jobs	\$5,370	26,232	\$140,865,840
Induced Jobs	\$5,370	23,693	\$127,231,410
TOTAL			\$376,485,895
	Construction Hard Costs	City Sales Tax Rate	Tax Revenue
Construction	\$2,894,581,384	0.045	\$130,256,162
TOTAL ANNUAL NYC TAX REVENUE			\$506,742,057
Source: The City of New York, Department of Finance, Office of Tax Policy			
Assumptions: Construction hard costs are estimated at 50% of additional annual construction cost. Sales tax is excluded from the "Tax Per Worker" for Direct construction jobs.			

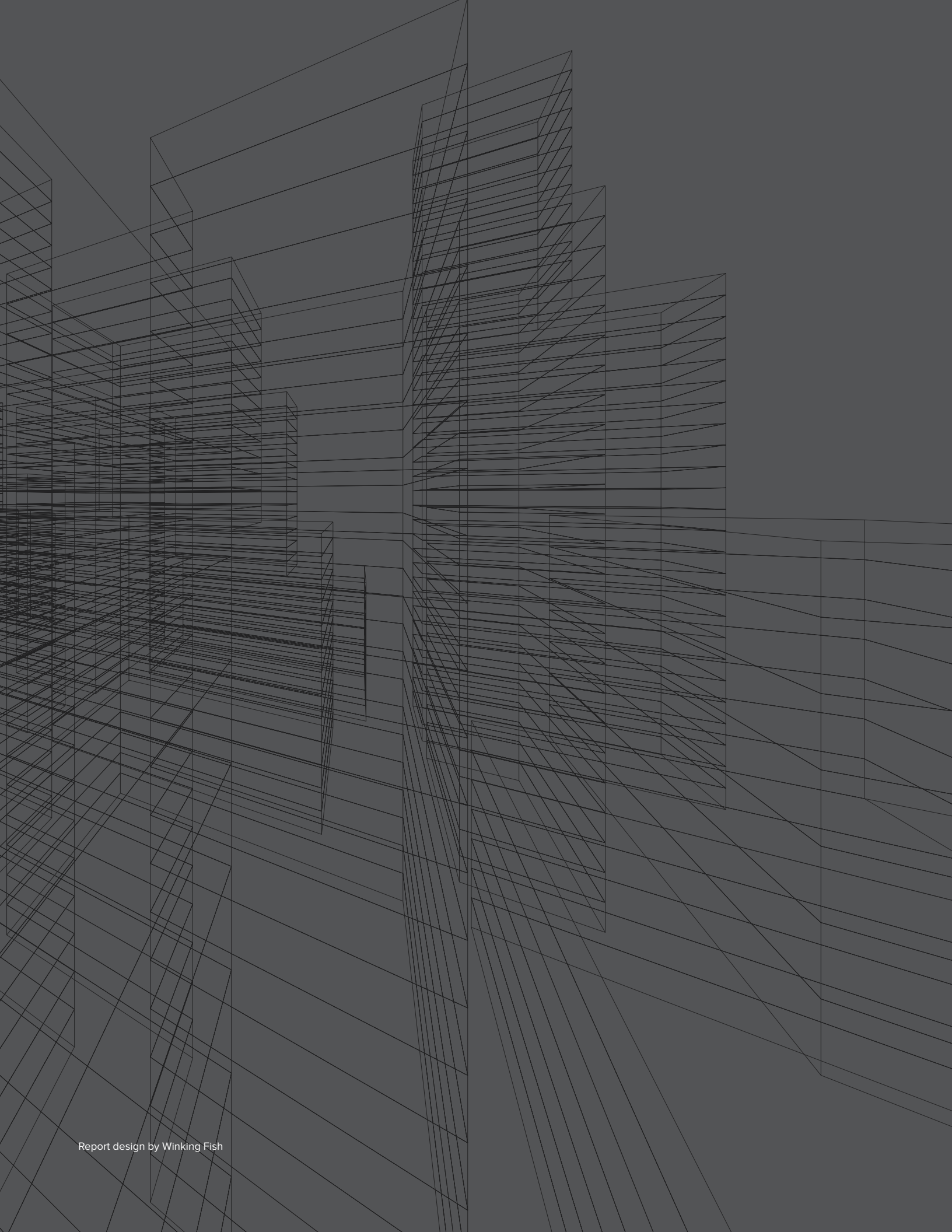
ADDITIONAL INFORMATION

The American Institute of Architects, USGBC, ASHRAE, and most professional organizations and firms, have adopted the updates recommended for the NYC Initiative via the 2030 Challenge: 70% building energy consumption reduction below the regional average for each building type in 2015, incrementally increasing the reduction to zero-net-energy or carbon neutral by 2030.

Note: This report is for information purposes only. The recommendations contained in the report provide one pathway for the NYC building sector to meet the 80% by 2050 greenhouse gas emissions reduction target.

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