

An Unjust Transition: A Report on the Environmental
Impact of Clean Path NY's High-Voltage Infrastructure
in the South Bronx
July 2021



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Introduction:

Both the Biden Administration and state governments across the U.S. are making a concerted push to reduce Greenhouse Gas (GHG) emissions. Increased hurricane activity and earlier hurricane seasons, along with longer and extreme heat waves are examples of the effects of climate change and the critical importance of reducing the production of greenhouse gases. President Biden has pledged “a federal investment of \$1.7 trillion over the next three years” to bring about a “Clean Energy Revolution” informed by the principles of “Environmental Justice” (Biden and Harris Campaign Website, 2020). With more electric vehicles being introduced, more e-cycles on the streets of major cities, and a renewed emphasis on connecting renewable energy to the existing electrical grid, there is a pressing need for more energy, cleaner sources, and new infrastructure to address this transition.

This transition to a low-carbon future is urgent work that will require intense focus from policymakers, binding GHG reduction commitments throughout the economy, and both public and private investment in clean energy generation and transmission. While we all gain by taking swift action to address climate change, how these new clean energy assets are developed and deployed will determine which communities reap the benefits of this transition and which will bear the principal burdens. Whether or not Environmental Justice principles guide this process will largely determine whether this is a just transition or another in a long history of unjust ones. Black, Indigenous, and other People of Color (BIPOC) Communities are the first to experience the effects of climate change and are the communities that have for decades faced environmental injustices. These climate and environmental injustices have devastated many BIPOC Communities throughout the United States. The South Bronx, for one, is a community that has for many years confronted an array of such injustices. The siting and construction of NYPA peaker plants, waste incinerators, wastewater treatment plants, transfer stations, and a ring of highways that bring over 16,000 truck trips a day through the South Bronx are the undesired uses that have yielded the highest childhood asthma rates in the City of New York. With its ongoing economic neglect and a lack of economic mobility for its residents, the South Bronx also has the highest concentration of shelters in the City.

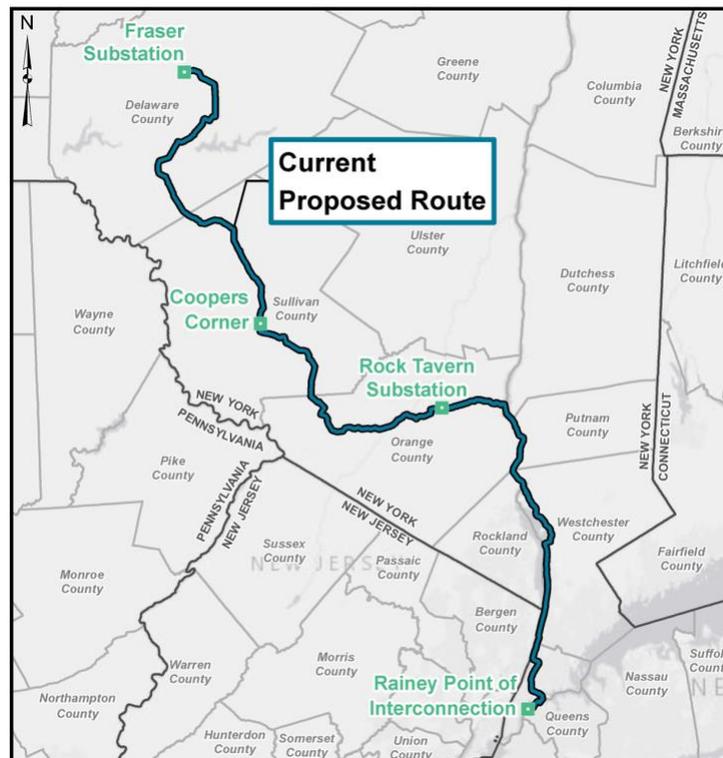
This report looks at one proposed response to the climate change crisis—a response spurred by New York State's Climate Leadership and Community Protection Action (“CLCPA”), which calls for 100% zero-emission electricity generation by 2040. The report examines the proposal's likely impacts on one South Bronx Environmental Justice community along its route-- the adjoining Mott Haven and Port Morris neighborhoods in Bronx Community Board 1. By reviewing and analyzing the proposal and conducting a comprehensive literature review, the report seeks to provide an understanding of the project's likely Environmental Impact and potential Human Effects.

The "Clean Path NY" proposal, submitted to the New York State Energy Research and Development Authority ("NYSERDA") under its January 2021 Tier 4 Renewables RFP solicitation, was jointly developed by **the Related Companies**, a global real estate developer with significant holdings in the South Bronx; **Invenergy**, a multinational power generation and energy storage company; and the **New York Power Authority**, operator of 4 fossil-fueled peaker plants in Mott Haven and nearby Port Morris. The goal of NYSEDA's Tier 4 program is to reduce the City's reliance on fossil fuels by increasing the penetration of renewable energy into New York City (Zone J) and by optimizing deliverability of renewable resources throughout New York State in furtherance of the goals of the CLCPA.

The **Clean Path** proposal seeks to develop a high-voltage transmission line and associated infrastructure to bring roughly 1,330 megawatts (mw) of electricity into "Zone J" or New York City (Clean Path NY proposal, 2021). Clean Path will site significant transmission and substation infrastructure in Mott Haven--including a high-voltage DC to AC converter station at one-acre site at Related's **Bronx Terminal Market Mall**--in close proximity to schools, shopping, multi-family housing, a destination park, and the new home of The Bronx Children's Museum. Outstanding questions about the long-term dangers of exposure to high-voltage AC transmission lines aside, policymakers will need to decide whether those frontline communities that already experience disproportionate impacts from public and private infrastructure like highways, waste transfer stations, treatment plants, and fossil-fired peakers, should also shoulder the burden of new high-voltage infrastructure or whether that infrastructure should be more equitably distributed throughout the region. This report makes no representations about preferred alternatives nor does it seek to choose winners and losers in the Tier 4 selection process. It does, however, seek to highlight the perils for frontline communities of a transition process that favors expedience over equity and that seemingly cares as little about fairness and disproportionate impact as the fossil fuel generators it seeks to replace.

Clean Path Proposal: Brief Description

Clean Path NY proposes to build a high voltage transmission line that begins at the Fraser Substation in Delaware County in Central New York and connects to the Rainey Point Interconnection in Queens. The map below displays the proposed route for the transmission line.



The High-Voltage Direct Current (HVDC) technology, which will be utilized for much of the upstate route until it reaches the South Bronx, is touted by Clean Path as the best technology to deliver the 1,330 mw of electricity into New York City (Clean Path NY, 2021). The transmission line will be connected to two Voltage Source Converter stations (VSC) along its route. One VSC is for converting electricity from Alternative Current (AC) to Direct Current (DC). The South Bronx VSC, to be located at the Bronx Terminal Market Mall, converts DC to AC and then a Converter Transformer is used to deliver 345 kv of electricity to the Rainey Substation, Zone J (New York City), in Queens (Figure 1). VSCs represent a newer converter technology and they are gaining popularity compared to more traditional Current Source Converter (CSC) stations (Ali Qaiser, 2014).

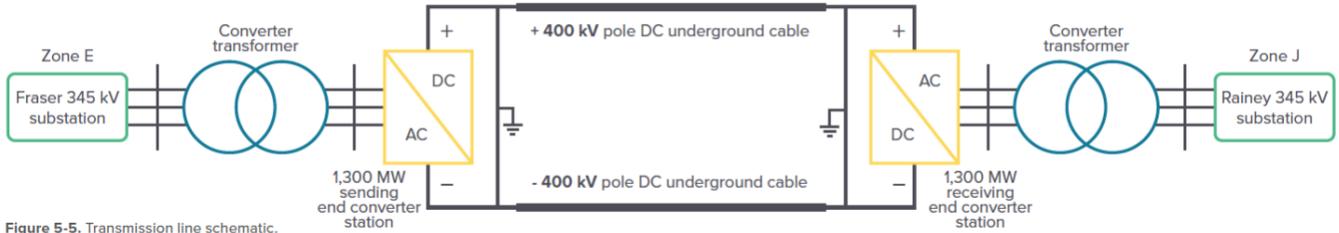


Figure 5-5. Transmission line schematic.

Figure 1. Transmission Line Schematic

The adjoining table lists the communities the Clean Path transmission line will pass through. It describes the installation types for each segment -- i.e. public roadway or marine. Accompanying text sets forth the route from Central New York to the Bronx Terminal Market Mall:

"Clean Path New York's proposed New Transmission route originates at the existing Fraser Substation in Delaware County, NY and continues south within the existing New York Power Authority (NYPA) right-of-way (ROW) for approximately 105 miles underground" (Clean Path NY, 2021). The South Bronx segment begins at the Harlem River and E. 151st Street, where the transmission line crosses over to land and ties into a new VSC converter station located at the Bronx Terminal Market Mall.

Transmission line segment	Length (miles)	General description of proposed action	Work within existing ROW	Work setting
Fraser Substation to Rock Tavern Substation	105	New underground construction	Yes	Terrestrial; existing transmission line ROW
Rock Tavern Substation to Hudson River (Town of New Windsor)	11	New underground construction	Yes	Terrestrial; public roadways and ROWs
Hudson River (Town of New Windsor) to Buchanan Substation	17	New underground construction	No	Submarine; Hudson River
Buchanan Substation to Hudson River (Village of Ossining)	11	New underground construction	Yes	Terrestrial; public roadways and ROWs
Hudson River (Village of Ossining) to Harlem River	20	New underground construction	No	Submarine; Hudson River
Harlem River to Rainey Substation	11	New underground construction	Mixed	Submarine: Harlem River, East River; Terrestrial: public roadways and ROWs
Total	±175 miles			

Table 11-3. Transmission line segments.



Example of an HVDC converter station // ABB

(Image from <https://electrical-engineering-portal.com/hvdc-vsc-technology-for-offshore-wind-farm-applications#2>)

As noted above, such converters transform high voltage direct current (DC) to alternating current (AC), often at or near the terminus of DC transmission lines. VSC converters, like the one Clean Path proposes for the Bronx Terminal Market Mall, require less space than a Current Source Converter (CSC), which typically require more land area. Converters that serve DC transmission lines are, however, appreciably larger than those serving high voltage AC lines. According to Figueroa-Acevedo, Czahor, & John “the converter station for an HVDC network requires a larger footprint than that of HVAC. A converter station for a 1,000 MW power line at a voltage rating of +/-400 kV would require a plot of land 320 m x 270 m, which is considerably larger than the substation for an AC configuration” (Figueroa-Acevedo, Czahor, & John, 2015).

Clean Path and the South Bronx

Based on its May 2021 submission to the NYSEDA solicitation, the proposed Clean Path transmission line will site its high-voltage VSC converter station at Related's Bronx Terminal Market Mall in Mott Haven and use local roadways in Mott Haven and nearby Port Morris to route the transmission line to the East River and then Queens. On p. 143 of the Clean Path submission, the converter station is characterized as a "VSC converter" and additional detail about capacity and operating voltage is provided:

"The New Transmission line will utilize state-of-the-art technology based on an HVDC voltage source converter (VSC) with the capability of delivering a capacity of 1,300 MW. A +/- 400 kV operating voltage was selected as the optimal voltage to maximize capacity" (Clean Path NY, 2021). While the footprint of such VSC converter stations can vary, the average size of a VSC station is 360' x 180' x 60' high, which would completely occupy a space of at least 1 acre (National Grid, 2013). The Clean Path proposal acknowledges as much and references a "1 acre site" at the mall.

Clean Path also explicitly acknowledges that the new VSC converter station design will be required because the station will be operated amidst a dense population center:

"Discussions with an HVDC converter OEM (Original Equipment Manufacturer) have confirmed that such configuration is commercially available and technically viable. This configuration optimizes the use of space and efficiently addresses the challenge of building in *dense urban settings*" (Clean Path NY, 2021).

While the VSC converter station is relatively small compared to standard converter sites, even the new VSC configurations typically feature large buildings to house equipment. These buildings can range in height from 50' to 80' high, depending on the size of the service. According to National Grid's HVDC Converter Station Fact Sheet, "DC equipment attracts pollution/particles from the atmosphere and so the valves and therefore DC switching arrangements, and often smoothing reactors, are housed in large Climate Controlled buildings, normally 22 meters (72 feet) high" (Nationalgrid, 2013). Where this building and the converter station are to be located, along with the transmission line route through the South Bronx are plainly spelled out in the NYPA-Related proposal:

"Once in the Hudson River, the transmission line will be installed in the riverbed, where it travels 16.2 miles south, making landfall again on the east side of the river in the Village of Buchanan (Westchester County) to avoid environmentally sensitive areas in the Hudson around Haverstraw Bay. Once in Buchanan, the line is again buried underground in DOT rights-of-way, including Route 9 and Route 9A, as it travels south to Ossining, where it re-enters the Hudson River and travels south for another 20.1 miles" (Clean Path NY, 2021).

At this point, the line enters the Harlem River between Manhattan and the Bronx. **The line is in the Harlem River for four miles before making landfall in the Bronx Terminal Market, the proposed Zone J converter site location.** The project is then interconnected to the Rainey Substation via an AC generator lead line coming off the converter station and running **along East 151st Street and East 138th Street to make a landfall at the East River**, in the South Bronx." (Clean Path NY, 2021).

In a subsequent section, the Clean Path proposal specifies an **Exterior Street** location and once again cites a "1 acre" property at the mall designated for the converter station:

"Clean Path New York has site control for the Zone J converter station location in the Bronx on Exterior Street, evidence of site control can be provided upon request. For the Zone J converter station, Clean Path New York has adopted an innovative design for land-based HVDC compact design converter station that leverages emerging technology currently used in offshore wind applications like the BorWin2 project in Germany. **This approach consolidates all station components into a modular compact and multilevel footprint that will fit well within the one-acre site secured by Clean Path New York in the Bronx"** (Clean Path NY, 2021).

HIGH VOLTAGE AC TRANSMISSION

The Clean Path proposal calls for the routing of new high voltage AC transmission lines from the Terminal Market Mall converter station through the streets of Mott Haven and Port Morris to the line's terminus in Queens:

“At the end of the NYPA ROW (“right-of-way”), the proposed route will enter public roads in Orange County, after which the route will transition into the Hudson River **through the Harlem River to connect to the receiving-end converter station in the Bronx. High-voltage AC cables will then be routed through public street ROWs and East River to connect from Zone J converter station to the Rainey Substation**” (Clean Path NY, 2021).

As cited in the introduction, the proposed route south of the South Bronx converter station runs from Related’s Terminal Market Mall “along East 151st Street and East 138th Street to make a landfall at the East River, in the South Bronx.” Based on this description, multi-family developments, schools, daycare facilities, an emergency shelter, and the new borough’s new Children’s Museum are all well within the route’s probable exposure zone.

Study Area and Probable Impact Zone

The Clean Path Proposal was carefully reviewed and analyzed to determine the likely route of the high voltage transmission line, the probable location for the high voltage converter station, and possible impacts on human health and the environment within a ¼ mile of the high voltage infrastructure.

The City Environmental Quality Review (CEQR) typically uses a ¼ mile buffer to analyze environmental impact. For the purposes of this report, a ¼ mile buffer was used for the area of impact near the likely converter station location and along the route of the proposed transmission line. This analysis makes one key assumption about the proposed route. As stated in the Clean Path proposal, **“The line is in the Harlem River for four miles before making landfall in the Bronx Terminal Market, the proposed Zone J converter site location. The project is then interconnected to the Rainey Substation via an AC generator lead line coming off the converter station and running along East 151st Street and East 138th Street to make a landfall at the East River, in the South Bronx”** (Clean Path NY, 2021).

Based on this description, the transmission line will connect E. 151st Street and E. 138th Street on a north-south axis. An examination of the available widths of the principal north-south corridors in the area-- River Avenue, Walton Avenue, the Grand Concourse, and Gerard Avenue—reveals that River, Walton, and Gerard have narrower roadbeds compared to the Grand Concourse. Based on this analysis, the Grand Concourse is assumed to be the principal north-south axis for the Related-NYPA high voltage AC lead line as it approaches the East River.

Study Area of Analysis

The maps on pages 7 and 8 present the likely locations of the converter and the transmission line route, along with a ¼ buffer distance to capture the land uses within the probable exposure zone. Land uses in the zone are indicated by letters referencing Commercial uses (labeled “C”), Residential (labeled “R”), and Manufacturing (labeled “M”). The depiction and scale of these zones is based on safe distance metrics established in the 2005 UK Childhood Cancer Research Group study as well as Clean Path's own description of its proposed route and high-voltage converter location.

Impact Zone for Possible Converter Location: 1/4 Miles from Location



Legend

— Streets

 1/4 Mile from Possible Converter Location

Possible Converter Location

Building Footprints Bronx

Lots

Borough Boundary

River

Impact Area Zoning

Zoning District

- C4-4
- C6-3D
- C8-3
- M1-1
- M1-2
- M1-4/R8A

- M2-1
- PARK
- R6
- R7-2
- R7A
- R7D
- R8



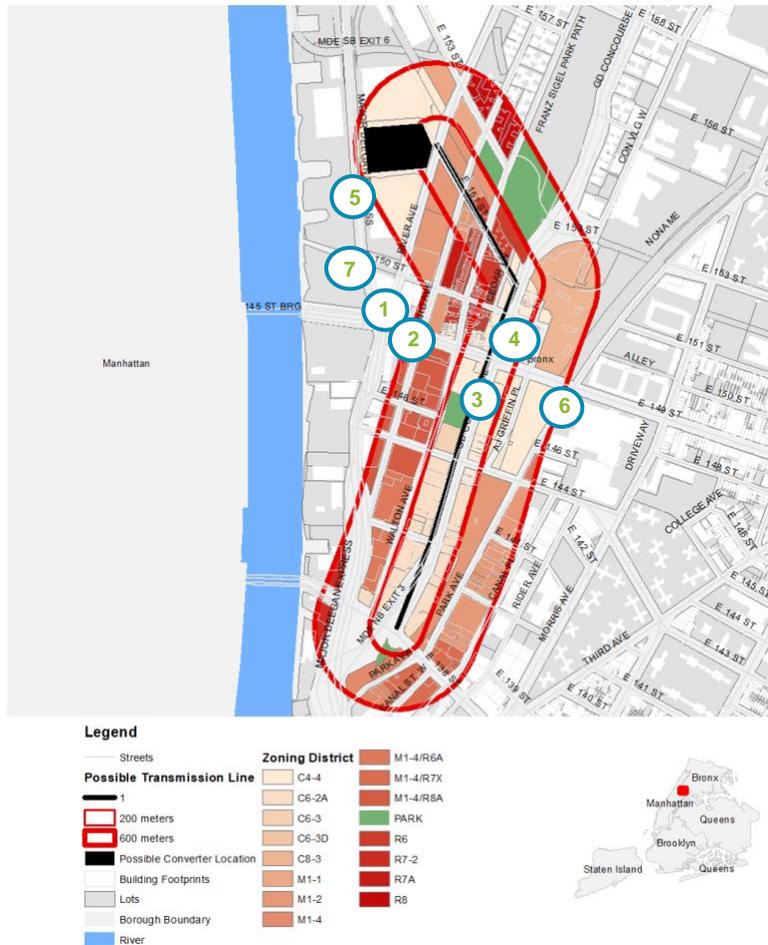
NEIGHBORHOOD CONTEXT NEAR POSSIBLE CONVERTER STATION LOCATION



1. Parking garage entrance near 151st Street and River Avenue **2.** Hotel and Emergency Family Shelter on 151st Street and Gerard Avenue **3.** Housing on 151st Street and Walton Avenue **4.** Bronx Children's Museum at 725 Exterior Street

The neighborhood surrounding the likely converter station location has a mix of housing, manufacturing, and commercial uses. The Bronx Terminal Market is a main shopping destination for most South Bronx residents. Food Bazaar, Target, Home Depot, and Burlington Coat Factory are some of these commercial spaces where residents' shop. A hotel and a citywide emergency family shelter is located a block away from the possible location. On 151st Street and Walton Avenue, one can see row houses that have been there for many generations. Three public parks and the new home for the Bronx Children's Museum are also within the area of impact.

Impact Zone for Possible Transmission Line



The neighborhood surrounding the transmission line is also a mix of commercial, residential, institutional and manufacturing uses. River and Gerard Avenue were discounted as possible north-south routes because at E. 149th Street there is either a small road or ramps that lead towards the major Deegan and which complicate construction. The most likely location is assumed to be the Grand Concourse. Hostos Community College and Lincoln Hospital are the educational and healthcare institutions near the area of impact for the transmission lines.



1. 149th Street and River Avenue 2. 149th Street and Gerard Avenue 3. Near 149th and Grand Concourse



4. Renovation of Post Office at East 149th Street and Grand Concourse 5. On 610 Exterior Street is the future Site of the Hip Hop Museum 6. Intersection on 138th Street and Park Avenue

Multiple schools are in the study area and nearby Lincoln Hospital serves the South Bronx Community. The hospital's emergency entrance is at 149th street and Park Avenue.



7. Mill Pond Park



PROPOSED AND CONSTRUCTED MULTI-FAMILY HOUSING IN STUDY AREA

The South Bronx is undergoing a high volume of housing construction that will greatly change the landscape of the community. Below are some examples of the proposed and constructed housing in the Study Area. There will be a dramatic increase in population that will be affected by any potential Environmental impact.



Bronx Point
575 Exterior Street, Bronx, NY 10451

530 Exterior St



New Housing Development in Study Area

<https://www.apartments.com/530-exterior-st-bronx-ny/hxqhxk3/>



425 Grand Concourse

<https://www1.nyc.gov/site/hpd/about/projects-detail.page?project=425%20Grand%20Concourse>

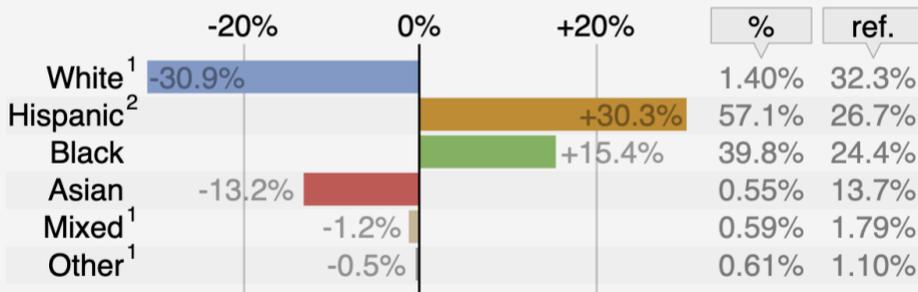
DEMOGRAPHICS

Relative Race and Ethnicity

#2

Race and Hispanic origin in South Bronx as a percentage of the total population, expressed as percentage point difference from New York.

Scope: population of New York and South Bronx



% group's percentage of the total population of South Bronx

ref. group's percentage of the total population of New York

¹ non-Hispanic ² excluding black and Asian Hispanics

Table from <https://statisticalatlas.com/neighborhood/New-York/New-York/South-Bronx/Race-and-Ethnicity>

The South Bronx has a large Black and Hispanic population. The demographics and density of the area will likely change because of the construction of new housing, Parks, the Children's Museum, Hip Hop Museum, and other projects.

Likely Environmental Impact and Human Effects:

While researchers have not reached consensus on acceptable levels of exposure or the likely public health impacts of proximity to high-voltage AC power, such as that carried through the South Bronx by the Clean Path line, a number of studies in the UK and the US have consistently correlated proximity to HVAC transmission lines to childhood leukemia clusters.

- A 2005 study issued by the UK's Childhood Cancer Research Group and underwritten by the United Kingdom Department of Health Radiation Protection found that "there is an association between childhood leukemia and proximity of home address at birth to high voltage power lines, and the apparent risk extends to a greater distance than would have been expected from previous studies" (Draper et al., 2005).
 - Compared with those who lived more than 600 meters from a HVAC line at birth, the study determined that children who lived within 200 meters had a relative risk of leukemia of 1.69; those born between 200 and 600 meters had a relative risk of 1.23. Further, the study identified a significant ($P < 0.01$) trend in risk in relation to the reciprocal of distance from the line (Draper et al., 2005).

- In 2002, the International Agency for Research on Cancer (IARC), a division of the World Health Organization, tasked an expert Working Group with reviewing all available evidence on static and extremely low frequency electric and magnetic fields. The Working Group classified ELF-EMFs as “possibly carcinogenic to humans,” based on limited evidence from human studies in relation to childhood leukemia (National Cancer Institute, 2019).
- More recently, a 2020 review of 33 studies on potential public health impacts of extremely low-frequency magnetic fields--including thirty that involved 186,223 participants-- found "significant associations" between incidence of childhood leukemia and exposure to ELF-MFs (extremely low frequency-magnetic fields) like those generated by HVAC transmission lines (Seomun, GyeongAe, Lee, Juneyoung, & Park, Jinkyung, 2020).
 - High voltage AC transmission lines typically do have distance requirements to reduce the effects of magnetic fields (Ahmed & Ahmed, 2017).
 - Beinart MD, PhD & Saman explain that magnetic fields emitting by converter stations like the one proposed, can affect pacemakers and defibrillators.
 - Myung Chan Gye, Chan Jin Park explains the importance of not being overly exposed to EMFs or Electro Magnetic Fields: “To date, many *in vivo* and *in vitro* studies have revealed that EMF exposure can alter cellular homeostasis, endocrine function, reproductive function, and fetal development in animal systems” (Gye Chan & Park Jin, 2001).
- (Ruan, W et al, 2005) and (Hamzehbahmani, H, Haddad, & D., 2015) explain the importance of remediating ground electrodes from various soil structures at converter stations:

“When the uniform soil approximation is no longer valid (e.g., electrodes near a river or the sea) or the ground electrode configuration contains irregularities, such methods may result in unsafe or overdesign grounding systems... or both!

These situations may endanger human life and destroy electrical equipment or lead to unjustified additional costs, particularly in the case of large ground electrodes, or both”

(Ruan, W et al., 2005).

Conclusion

While much of the literature on high voltage infrastructure has ignored likely impacts on nearby communities affected by the implementation of this technology (Hafeez et al., 2013; Kamakshiah & Kamaraju, 2011; Moe, 2019; Reveall, Charpentier, & Sharma, 2000; Wang & Redfern, 2010), there exists a growing body of research correlating the location of high voltage AC transmission lines with childhood cancer clusters (Seomun G, Lee J, Park J, 2021). Moreover, any ongoing exposure to electromagnetic fields and high voltage infrastructure in a dense urban environment should be considered an undue burden and potential public health threat. The visual impacts of a new 5 – 7 story building on a 1 acre site at a busy shopping destination should also not be discounted since they could impact businesses, new housing developments, public parks, and the new Bronx Children’s Museum, across Exterior Street from the proposed converter station. Finally, implementation of the Clean Path proposal may impose an additional community cost on the South Bronx due to the disruptions from construction at both the Bronx Terminal Market Mall and on neighborhood roadways. Impacts may range from increased traffic congestion to loss of business due to temporary road closures along major commercial thoroughfares. Property values for homes near the proposed high voltage converter could also plummet in the blocks adjoining the station and along the route.

The Mott Haven and Port Morris neighborhoods near the Bronx Terminal Market Mall and along the Clean Path transmission route are rapidly changing, becoming more densely populated and attracting more children and families for daily shopping, recreation, and schooling. A larger future population will be faced with the troubling set of potential impacts presented above. Beyond the possible public health and economic burdens imposed on an already vulnerable community, even a cursory equity analysis reveals the disproportionate impact of the Clean Path proposal on one South Bronx Environmental Justice area. Public policies to catalyze a new low-carbon economy do not necessarily require a “just transition” in the energy sector but it is incumbent upon decision-makers to ensure that “unjust outcomes” are avoided, that burdens are balanced, and the costly mistakes of the past never again repeated.

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