

Siting for a Cleaner, More Equitable Grid in Massachusetts

HIGHLIGHTS

Siting decisions will be needed for the energy infrastructure required to accelerate the adoption of clean energy, the closure of fossil-fueled power plants, and the electrification of buildings and transportation. This analysis shows how past approaches to siting have resulted in an overconcentration of electricity infrastructure, notably polluting power plants, within or in close proximity to environmental justice neighborhoods. As the state advances changes to its siting process, those decisions must not replicate the failures of our current energy system, thereby overburdening already vulnerable populations. Key recommendations of the analysis address cumulative impacts, representation, and integration of the priorities of public health, environmental justice, and climate for siting decisionmaking.

Last year's record-high temperatures and precipitation in Massachusetts are only two of many recent reminders that decisive action is needed to address the climate crisis (NOAA 2024). The state has taken an important step to reduce its heat-trapping emissions by committing to net zero emissions economywide by 2050 (García 2021). To achieve this target, **the Commonwealth will make critical decisions about where to locate the infrastructure needed to decarbonize and modernize the power grid** and to electrify other sectors of the economy, such as transportation and home heating. Those siting decisions must take into account the disproportionate burden that environmental justice (EJ) communities¹ have borne because of our energy system.

The State's Energy Transition

The Commonwealth is heavily dependent on fossil gas (also known as natural gas), which provides more than 60 percent of in-state electricity generating (EIA 2023). Decarbonizing the grid by 2050 will require moving away from gas investments and reaching 27 gigawatts (GW) of photovoltaic solar and 24 GW of wind resources in and for Massachusetts (EEA 2022c). This means the state's combined solar and wind power capacity is expected to grow to 12 times current levels, from nearly 4 GW—mostly of solar capacity—in 2023 to more than 50 GW by 2050.

This clean-energy transition is beneficial not only for the climate but also for the health of the communities where fossil-fueled power facilities have been located. A 2023 study found that historically redlined² neighborhoods show a higher likelihood of hosting a polluting power



plant and being exposed to its associated air pollutant emissions, such as nitrogen oxides, sulfur dioxide, and fine particulate matter, or soot (Cushing et al. 2023). These air pollutants lead to dangerous health impacts, including worsening lung and heart illnesses, asthma, developmental problems in children, and premature death (State Energy and Environmental Impact Center 2020). In Massachusetts, many of the state’s peaker plants (electricity-generating units capable of ramping up rapidly to meet surges in demand) are disproportionately located in “urban, low-income and minority communities, where vulnerable populations already experience high levels of health and environmental burdens” (PSE Healthy Energy 2020).

The Commonwealth is considering changes to accelerate the siting process of clean energy and grid infrastructure. While clean energy brings many benefits, including decreasing heat-trapping emissions and improving air quality, the siting of the infrastructure is not without impacts. All projects, regardless of the technology, can affect local communities, wildlands, and wildlife where they are sited (The Wilderness Society 2023). For example, more than 5,000 acres of Massachusetts’s natural and working lands have been lost to solar development since 2010, underscoring the need for robust protections to these valuable resources while prioritizing solar deployment in locations like rooftops, parking lots, and low-impact nature and farm sites (Manion et al. 2023). For EJ communities, poorly sited new energy infrastructure in their neighborhoods could represent other risks, including losing already limited space for environmental amenities such as parks and open spaces, which have often been crowded out for industrial land uses.

As the state advances changes to its siting process, it is crucial that it understand the current and potential social and environmental impacts associated with each energy project to avoid or minimize them. Foremost, communities that have suffered a disproportionate legacy burden from decades of energy and industrial infrastructure being sited in or near their neighborhoods should not have to endure additional negative impacts. To inform the development of new siting rules and regulations in support of a cleaner and more just grid, we analyzed and mapped the proximity of existing and proposed electricity infrastructure to EJ neighborhoods.

Proximity Analysis: Mapping for a Smarter, More Just Grid

Using GIS, we identified and mapped existing and proposed utility-scale³ electricity generating units,⁴ existing and proposed substations, and EJ populations⁵ as defined by Massachusetts law (EEA 2022a).

We used S&P Global⁶ data for existing and proposed generation units and Homeland Infrastructure Foundation-Level Data (HIFLD) for existing substations.

For prospective substations, the state’s largest utilities have proposed hundreds of new and upgraded electricity infrastructure projects—including electrical substations—in their Electric Sector Modernization Plans (ESMPs) (Eversource 2024; National Grid 2024). Data in these plans name likely locations—within a city or two—for new substations but lack specific coordinates for these projects. To further refine these data to identify specific mapping coordinates, we examined the proposed new substations included in Eversource’s latest rate case, the utilities’ Local System Plans (LSPs), and information from additional online research.

In addition, we assessed the proximity of electricity infrastructure to EJ neighborhoods⁷ using three categories of distance: within an EJ neighborhood, within one mile of an EJ neighborhood, and within five miles of an EJ neighborhood.

See the technical appendix at www.ucsusa.org/resources/equitable-grid-siting-massachusetts for additional information about the study methodology.

The Findings: Trends in Siting of Electricity Infrastructure and Environmental Justice

Existing Siting Process Has Resulted in a High Concentration of Polluting Electricity Generating Units in and near EJ Neighborhoods

A variety of energy resources are used to generate electricity in Massachusetts, including oil- and gas-burning power plants, hydroelectric dams, wind turbines, and solar panels (EIA 2023). The size, location (with respect to end users), and relative impact of these electricity generating facilities vary widely across the Commonwealth. Fossil-fueled power plants emit air pollutants, including sulfur dioxide, nitrogen oxides, particulate matter, and toxic emissions like mercury, which are all harmful, particularly for the communities living near the facilities. These power plants can also have impacts many miles away, however, meaning that poor air quality conditions in a community can be due to both distant and nearby energy sources (EPA 2024).

In Massachusetts, the Energy Facilities Siting Board (EFSB) is the independent entity that approves proposals for large energy projects (EEA 2024). Our analysis shows that to date, infrastructure siting has put a disproportionate burden on EJ communities across the Commonwealth. While close to 50 percent of Massachusetts's neighborhoods (2,604 of 4,985 block groups) classify as an EJ neighborhood, more than 80 percent of existing polluting electricity generating units—with their associated health risks—are located in or within one mile of an EJ neighborhood (see Table 1) (EEA 2022b).

Table 1. Proximity of Electricity Generating Units to Environmental Justice Neighborhoods

	Emitting Sources				Non-Emitting Sources			
	Gas	Other Fossil Fuels	Waste	Biomass	Solar	Wind	Hydro	Storage
Units within an EJ neighborhood	60	56	6	1	122	12	57	26
Units within 1 mile of an EJ neighborhood	33	11	11	5	189	6	14	28
Total units in state	114	77	17	9	598	35	98	96
Percentage within or within 1 mile of an EJ neighborhood	82%	87%	100%	67%	52%	51%	72%	56%

Emitting electricity generating units are located disproportionately near EJ neighborhoods: 84 percent are in or within one mile of EJ neighborhoods, which make up only 52 percent of the census block groups in the state. Fifty-five percent of non-emitting sources are located in or next to EJ neighborhoods.

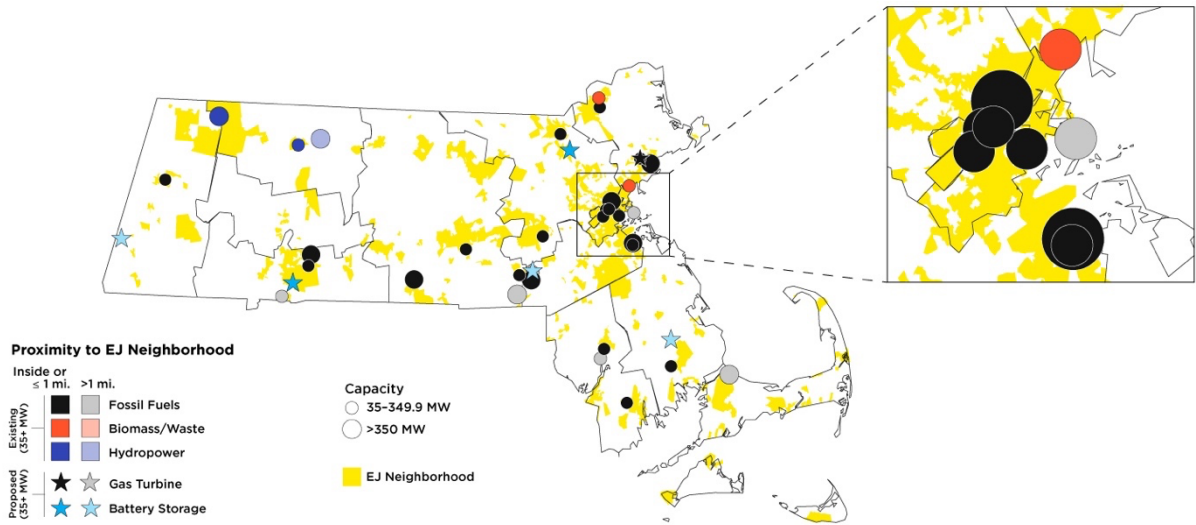
Note: Waste includes landfill gas and municipal solid waste. Biomass includes wood and wood processing waste, agricultural crops and waste materials, and animal manure and human sewage for producing biogas.

Proposed Large Projects Are Driven by Energy Storage and Offshore Wind, but the Sole Polluting Project Is Sited in an EJ Neighborhood

Among the 12 planned large-scale (35 MW⁸ or greater) power projects, one is a peaker plant powered by the fossil fuels gas and diesel (see Figure 1). This peaker not only goes against the state climate goals but also is being proposed for siting in an EJ neighborhood adjacent to two existing gas- and oil-fired peaking power plants, adding to the long overconcentration of polluting power facilities already harming the health and well-being of EJ communities (Wasser 2022).

Of the other planned large-scale projects, four are offshore wind farms and six are battery energy storage systems. Two of the large battery storage projects are being proposed for siting within EJ neighborhoods, with one of these being built to replace an old fossil-fueled power plant that closed in 2022 in West Springfield. This project shows how a transition from dirty fossil-fueled power plants could look at the local level. The other energy storage project is being proposed for siting within an EJ neighborhood in Billerica.

Figure 1. Proximity of Existing and Proposed Electricity Generating Projects to Environmental Justice Neighborhoods



While EJ neighborhoods and power plants are located across the state, the largest emitting electricity generating units are disproportionately in or beside EJ neighborhoods. Of the proposed power projects larger than 35 MW, the one emitting power plant (gas-fueled) would be located in an EJ neighborhood, as would one-third of the proposed energy storage projects (two of six).

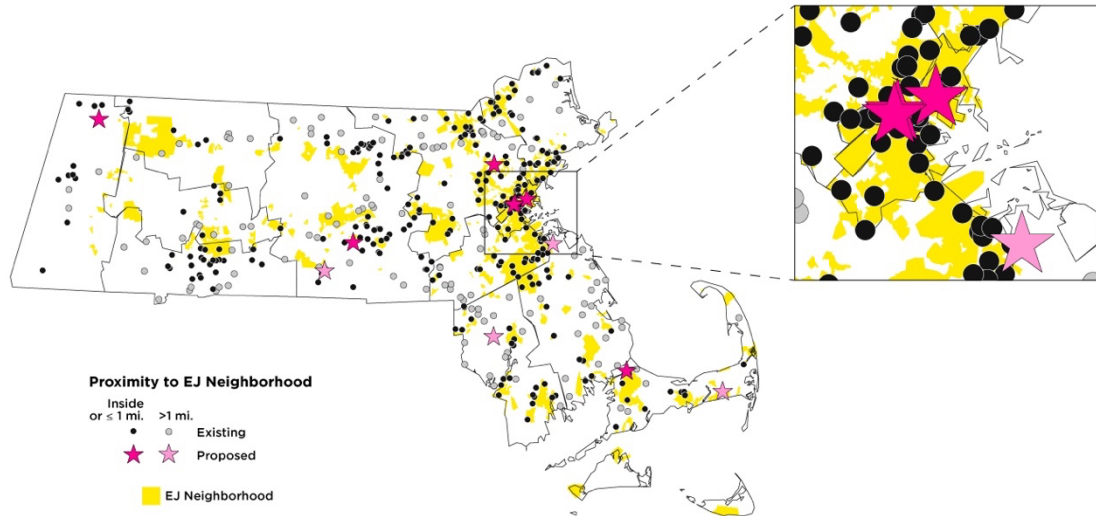
Note: Circles represent power capacity per site aggregated by fuel/technology. Not included are the state’s four proposed offshore wind projects and one associated battery storage project.

Existing Siting Process Has Resulted in a High Concentration of Substations in EJ Neighborhoods

Substations are a critical piece of our electric grid, connecting electricity from where it gets produced to where it gets consumed and reducing the high voltages of the electric transmission lines to the lower voltages used in communities (UCS 2015). When siting these facilities in areas prone to flooding or storm surge, special design considerations (such as elevated structures) are required to avoid damage and outages due to their high vulnerability to these conditions. If certain substations are damaged, their complete replacement can take more than a year and cost millions of dollars (McNamara et al. 2015). While they can bring local benefits, substations also pose risks for communities living in close proximity because of their loud noise—particularly the continuously radiated discrete tones—and risk of fire and explosions, as experienced in recent years in Newton, Lexington, and Waltham (Csanyi 2016; Schulman-Hall 2022; WCVB 2022; Thompson 2022).

Our analysis found that existing substations are heavily concentrated in and near EJ neighborhoods. Of the 419 substations, almost 70 percent are located within or within one mile of an EJ neighborhood (see Figure 2).

Figure 2. Proximity of Existing and Proposed New Substations to Environmental Justice Neighborhoods



Existing substations are located disproportionately near EJ neighborhoods, with close to 70 percent in or within one mile of an EJ neighborhood. Limited available data show that new substations will likely aggravate this historic trend, with 7 of the 11 mapped projects proposed for siting within EJ neighborhoods.

Proposed New Substations Are Heavily Concentrated in EJ Neighborhoods

As part of the state’s effort to modernize its grid, Massachusetts’s two largest electric utilities, Eversource and National Grid, are proposing to build more than 40 new substations to address increases in demand due to the electrification of buildings and transportation and to better integrate clean energy resources, such as wind and solar (Eversource 2024; National Grid 2024; Walton 2023). However, the utilities’ proposals contain little or no information about the needs assessment for each substation relative to the potential for adopting an alternative strategy using distributed energy resources (like rooftop solar and small battery systems), demand flexibility, and energy efficiency that could be cheaper for ratepayers (GMAC 2023). Likewise, the utilities provide insufficient information about the specific site of each new substation, which limits the availability of public data for analysis.

Given this limitation, we focused on data from the most recent Eversource rate case (2022) and the 2023 LSPs from Eversource and National Grid, in which the utilities identify short-to-mid-term planned electricity infrastructure projects, including proposed new substations reflected in their ESMPs (Eversource 2022, 2023; National Grid 2023). We were able to track down the coordinates of only 11 proposed new substations because the utilities do not include specific locations for many of these projects, referring more broadly to a city or two. Without additional information, we were unable to include those in this analysis. Of the 11 projects we were able to map, 7 are located within EJ neighborhoods. This aggravates the historic trend of overconcentration of these facilities in low-income communities or communities of color.

Recommendations: Siting Principles for a Cleaner, More Equitable Grid in Massachusetts

This analysis shows the failures of past approaches to siting, which have resulted in a heavily disproportionate percentage of electricity infrastructure, notably polluting power plants, sited within or in close proximity to EJ neighborhoods. The study also points to the lack of data transparency around energy planning and decisionmaking, which hinders the engagement of informed stakeholders. Siting decisions will be needed for the energy infrastructure required to accelerate the adoption of clean energy, the closure of fossil-fueled power plants, and the electrification of buildings and transportation. Those decisions must not replicate the failures of our current energy system, thereby overburdening already vulnerable populations. To help achieve a just transition, improvements to the siting process should integrate the following guiding principles.

Integrate Cumulative Impacts Assessment

The consideration of cumulative impacts when making siting decisions means assessing and incorporating the historical burdens of pollution and other impacts borne by communities. A cumulative impacts assessment builds a scientific foundation that better assesses the future impact of an action in the context of existing and future conditions and recognizes that “sources of environmental pollution are not evenly spaced and they do not operate in isolation” (Ellickson 2022).

EJ communities are both more likely to be overburdened with pollution (higher vulnerability) and more likely to suffer severe impacts from pollution (higher susceptibility) (Baptista et al. 2022). With this understanding, a 2020 law in New Jersey established that the state would not grant permits to “new/expansions of facilities that cause or contribute to adverse cumulative environmental or public health stressors in the overburdened community that are higher than those borne by other communities within the state, county, or other geographic unit of analysis” (Tishman Environment and Design Center 2022).

As policymakers in Massachusetts evaluate changes to the siting process, it is imperative that these changes ensure health and safety protections for all residents of the Commonwealth, especially its already overburdened communities.

Meaningful Involvement of Environmental Justice Communities

The environmental justice principles⁹ in Massachusetts law require state agencies to meaningfully engage with communities with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies, including climate change policies (M.G.L. chap. 30, § 62). To advance meaningful involvement around the decisionmaking process for the siting of new electricity infrastructure, we recommend the following:

- The EFSB should be expanded to include **two public members representing environmental justice and Indigenous communities'** perspectives in energy facility siting decisions. Currently, the EFSB has only three public members representing labor, energy, and environmental issues (M.G.L. chap. 30, § 69H).
- Developers and utilities should be held accountable for fostering **early engagement** with communities where projects are being proposed, thus ensuring data transparency and increasing opportunities for community-informed solutions (EPA, n.d.).

- The EFSB should create clear **mechanisms to address concerns** in advance of project approval for cases in which a community identifies an issue or problem with a project being proposed within or in close proximity to their neighborhood.

Integrate Public Health, Climate, and Environmental Justice as Priorities for a Smarter, More Just Grid

The electricity sector has a key role to play in advancing the state’s commitment to reduce its heat-trapping emissions. At the same time, our energy choices have a direct impact on the health and well-being of our communities. The EFSB should be required to integrate public health, climate targets and impacts, and environmental justice as priorities in their decisionmaking process (in addition to costs and reliability). This requirement will enable the state to prioritize a cleaner and more just grid that maximizes a broad range of benefits now and in the future for all its residents.

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Endnotes

1. In Massachusetts, an environmental justice population is a neighborhood where one or more of the following criteria are true: 1) The annual median household income is 65 percent or less of the statewide annual median household income. 2) Minorities make up 40 percent or more of the population. 3) 25 percent or more of households identify as speaking English less than “very well.” 4) Minorities make up 25 percent or more of the population and the annual median household income of the municipality in which the neighborhood is located

does not exceed 150 percent of the statewide annual median household income (EEA 2022a).

2. The term “redlining” has come to mean racial discrimination of any kind in housing, but it comes from government maps that outlined areas where Black residents lived and were therefore deemed risky investments (Krieger et al. 2020).
3. 1 megawatt (MW) or larger.
4. Electricity generating unit is a component of a power plant that produces electricity over time. Some power plants may have multiple units on a single plant site.
5. The law requires the consideration of the following demographic data for the residents of each census block group in the Commonwealth: household income level, English language proficiency, self-identified race, and race plus municipal income level.
6. Source from S&P Global Market Intelligence Capital IQ Pro. © 2024 S&P Global Market Intelligence (and its affiliates, as applicable) (individually and collectively, “S&P”). Reproduction of any information, data or material, including ratings (“Content”) in any form is prohibited except with the prior written permission of S&P. S&P does not guarantee the accuracy, adequacy, completeness, timeliness or availability of any Content and is not responsible for any errors or omissions (negligent or otherwise), regardless of the cause, or for the results obtained from the use of such Content. In no event shall S&P be liable for any damages, costs, expenses, legal fees, or losses (including lost income or lost profit and opportunity costs) in connection with any use of the Content.
7. Census block groups are classified as EJ according to Massachusetts law. Block groups are statistical divisions of census tracts, are generally defined to contain between 600 and 3,000 people, and are used to present data and control block numbering.
8. Our focus was on projects equal to or larger than 35 megawatts (MW) in installed capacity to reflect changes included in state siting reform proposals (H.3187 and S.2113) from this legislative session in Massachusetts. Such proposals would lower the threshold for review by the state’s Energy Facility Siting Board in order to better account for peaker plants and other power projects with installed capacities below the current 65 MW threshold.
9. “Environmental justice principles” support protection from environmental pollution and the ability to live in and enjoy a clean and healthy environment, regardless of race, color, income, class, handicap, gender identity, sexual orientation, national origin, ethnicity or ancestry, religious belief, or English language proficiency, which includes (i) the meaningful involvement of all people with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies, including climate change policies; and (ii) the equitable distribution of energy and environmental benefits and burdens.

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