Memo

2054 University Ave, Suite 400
Berkeley, CA 94704
510.217.5000

Date: June 27, 2024

To: Jim Scanlin (City of Newark)

From: Brenda Hom, Natalie Kataoka, Hannah Kornfeld, and Honey Walters (Ascent)

Subject: City of Newark Climate Action Plan Update: Draft Greenhouse Gas Emissions Forecasts and Targets Memorandum

---

INTRODUCTION

The City of Newark (City) is developing *Climate Action Newark* (CAN), an update to the City's 2010 Climate Action Plan (CAP). The goal of CAN is to provide a comprehensive and transformative framework for both mitigating and adapting to climate change while also supporting the City's broader sustainability and resilience goals.

In preparation of CAN, the City first completed a baseline greenhouse gas (GHG) emissions inventory to estimate emissions from the community of Newark in 2022. The next step in the development of CAN is to forecast these GHG emissions and establish reduction targets. This technical memorandum provides the results of these forecasts as well as associated methods, assumptions, emissions factors, and data sources. The GHG emissions forecasts will provide the foundation for the forthcoming steps of the CAN planning process, including the development and quantification of GHG emissions reduction measures and "gap analysis" evaluation (i.e., the calculated gap between the estimated GHG reductions from local action and the established targets).

ORGANIZATION OF THIS MEMORANDUM

This memorandum consists of two main parts:

- **Section 1: Greenhouse Gas Emissions Forecasts** summarizes the forecasted GHG emissions under "business-as-usual" (BAU) and legislative-adjusted BAU scenarios for years 2030, 2035, 2040, and 2045.
- **Section 2: Greenhouse Gas Reduction Targets** establishes GHG emissions reduction targets for sectors relevant to the City's GHG emissions inventory for years 2030, 2035, 2040, and 2045 based on statewide reduction targets.

The memorandum also includes an appendix that details the calculation methodologies behind the forecasts and GHG reduction targets.

1 GREENHOUSE GAS EMISSIONS FORECASTS

The purpose of GHG emissions forecast for a climate action plan prepared by a local agency is to estimate how GHG emissions may evolve in the future given changes in population and housing, economic growth, and how state and federal legislation may help to reduce local emissions. Developing a GHG emissions forecast is an essential step in the climate action planning process, as it provides insight into what future emissions levels may be, and the necessary scale of action that may be needed to reduce emissions within local control for state GHG reduction target alignment.

The GHG emissions forecast prepared for the City is presented as a sector-level assessment of GHG emissions forecasts based on current conditions under two scenarios. The first scenario is a baseline scenario where GHG emissions grow from 2022 levels at the same rates as housing, population, employment, and vehicle travel, which is known as a business-as-usual scenario (BAU) forecast. The BAU forecast serves as a basis for understanding how emissions levels may change with growth. The second scenario considers the local GHG reduction impact of state and federal legislation, which is known as a legislative-adjusted BAU forecast. The legislative-adjusted BAU forecast shows how currently adopted state and federal legislation reduces the city's emissions and the adopted targets, discussed in Section 2, identify the remaining gap that would need to be close for the City to meet its GHG reduction targets.

1.1 GREENHOUSE GAS EMISSIONS FORECASTS

The BAU forecasts provide an assessment of how emissions generated by activities will change over time without further state, federal, regional, or local action. In addition to accounting for the city's population, employment, and land use change(s) under a BAU scenario, a legislative-adjusted BAU forecast was prepared. This forecast includes adopted policies and regulations at the regional, state, and federal levels that would affect emissions without any local action, such as regulatory requirements to improve efficiency in buildings and vehicles. These forecasts provide the City with the information needed to focus efforts on certain emissions sectors and sources that have the greatest opportunities for GHG emissions reductions. It is important to note that the legislative-adjusted BAU forecasts only account for emissions reductions associated with adopted policies and regulations; they do not account for goals established by regional, state, and federal agencies or executive orders outside of adopted legislation and regulations.

The GHG emissions forecasts for 2030, 2035, 2040, and 2045 described in this section are aligned with the state's GHG reduction target years established in key legislation and policies, including Senate Bill (SB) 32 and Assembly Bill (AB) 1279, as well as the City's General Plan.

The adopted statewide GHG reduction targets and goals are:

- 40 percent below 1990 levels by 2030 (SB 32),
- 85 percent below 1990 levels by 2045 (AB 1279), and
- to achieve carbon neutrality no later than 2045 (AB 1279).

1.1.1 Activity Growth Forecast

The GHG emissions forecasts were based on projected changes in city demographics (i.e., population, employment, and service population [residents plus employees]) and land use between 2022 and 2045, based on forecast data provided for the 2050 horizon year. Projected population and housing units for 2050 were sourced from the Metropolitan Transportation Commission (MTC). Household and employment growth factors from MTC's and the Association of Bay Area Governments' *Plan Bay Area 2050* were used to forecast emissions for 2030, 2035, 2040, and 2045 for most sectors. Additional information regarding growth factors used for each sector is included in the following sections.

Vehicle miles traveled (VMT) data was available from MTC's CAPVMT DataPortal 2.0 (MTC 2022). It considered daily VMT in the city and was annualized using a factor of 337.[1] VMT estimates are associated with trips that begin or end in the city. VMT estimates included 100 percent of vehicle trips modeled to both originate from and end in the city (i.e., fully internal trips), 50 percent of trips that either end in or depart from the city (i.e., internal-external, or external-internal trips), and 0 percent of vehicle trips that are passing through the city boundaries (i.e., external-external, or "pass-through," trips). This vehicle trip accounting method is consistent with the Regional Targets Advisory Committee (RTAC) origin-destination method established through SB 375 and California Air Resources Board (CARB) recommendations. VMT estimates were provided for 2022 and forecasted for 2030, 2035, 2040, and 2045. Table 1 shows anticipated growth in the city for the forecast years.

Table 1 Newark Demographic and Vehicle Miles Traveled Forecasts

Forecast Factor	2022	2030	2035	2040	2045
Population	47,150	52,084	55,167	58,251	61,334
Households	15,811	18,884	19,165	18,509	19,727
Employment	24,600	27,555	29,403	31,250	33,097
Annual VMT	404,515,848	451,202,551	458,085,844	447,528,119	443,236,501
Annual VMT per capita	8,579	8,663	8,304	7,683	7,227

Notes: VMT = vehicle miles traveled.

Sources: Data compiled by Ascent in 2024.

1.1.2 Business-as-Usual Scenario Greenhouse Gas Emissions Forecast

For the BAU forecast, the activity growth in each emissions sector was scaled using the appropriate growth scaling factors without considering the local GHG reduction impact of the state and federal legislation. The results of the BAU forecast show that GHG emissions would be expected to grow through 2045, given no further GHG reduction efforts beyond 2022, as shown in Table 2. Emissions are presented in units of metric tons of carbon dioxide equivalent ($MTCO_2e$). While a more realistic scenario for future GHG emissions can be provided with a legislative-adjusted BAU forecast, the BAU provides the basis for understanding the GHG impact of growth in the city. As shown in Table 2, under the BAU forecast scenario, the city's emissions would increase by 25 percent by 2045 from 2022 levels.

Table 2 Newark GHG Emissions Inventory and BAU Forecasts ($MTCO_2e$)

Sector	2022	2030	2035	2045	2045
On-Road Transportation	206,749	227,137	248,200	244,793	242,446
Building Energy	147,607	164,634	173,175	183,009	192,843
Off-Road Vehicles and Equipment	10,974	13,416	15,169	17,079	18,878
Solid Waste	10,255	12,921	13,721	14,521	15,321
Water Supply	1,188	1,319	1,400	1,482	1,564
Wastewater Treatment	552	612	650	686	724
Total	**377,325**	**420,040**	**452,315**	**461,570**	**471,776**
Percent Change from 2022 Levels		11%	20%	22%	25%

Notes: Total may not sum exactly due to independent rounding. BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

[1] This annualization factor comes from an analysis using Caltrans Performance Measurement System (PeMS) that determined the relationship between daily and annual volume for interstates in the Bay Area.

Source: Data modeled by Ascent in 2024.

1.1.3 Legislative-Adjusted Business-as-Usual Scenario Greenhouse Gas Emissions Forecast

Legislative-adjusted BAU emissions forecasts were prepared using the same demographic and VMT data that were used for the BAU forecasts, while also accounting for state and federal policies and regulations that would affect local emissions. For example, growth in residential building electricity consumption was scaled using housing units as the growth scaling factor, and a legislative reduction was applied to incorporate the California Code of Regulations, Title 24, Part 6 building energy efficiency standards for new development. The GHG reductions considered in the legislative-adjusted BAU forecast fall generally into four categories: building energy efficiency standards, fuel efficiency standards, electric vehicle sales requirements, and renewable and zero-carbon electricity requirements. The primary drivers of the emissions reductions are the requirements of SB 100 and SB 1020, as well as increased electric vehicle penetration from the Advanced Clean Cars II (ACC II) regulation. These forecasts provide the City with a more robust understanding of future emissions to assist with the prioritization of emissions reduction measures developed to meet GHG targets. The full list of legislation considered is provided in Table 3.

Table 3 Regional, State, and Federal Legislative Reductions Applied under the Legislative-Adjusted BAU Scenario

Source	Legislative Reduction	Description	Sectors Applied
Regional	Zero Nitrogen Oxides (NO_X) Appliance Rule	Limits the sale and installation of appliances in the Bay Area that utilize NO_X. The following appliances must be zero NO_X; water heaters (2027), furnaces (2029), and large commercial water heaters (2031).	Building Energy
State	SB 100 (The 100 Percent Clean Energy Act of 2018)	Requires that 60 percent of retail electricity sold in California must come from renewable or zero-carbon resources by 2030 and 100 percent by 2045.	Building Energy
State	SB 1020 (Clean Energy, Jobs, and Affordability Act of 2022)	Requires that eligible renewable energy resources and zero-carbon resources supply 90 percent of all retail sales of electricity to California end-use customers by December 31, 2035, 95 percent of all retail sales of electricity to California end-use customers by December 31, 2040, 100 percent of all retail sales of electricity to California end-use customers by December 31, 2045, and 100 percent of electricity procured to serve all state agencies by December 31, 2035.	Building Energy
State	California's Building Energy Efficiency Standards (2022 Title 24, Part 6)	Effective January 1, 2023, new residential and nonresidential buildings in California are required to comply with energy efficiency standards established by the California Energy Commission (CEC 2022). The 2022 standards establish energy performance requirements that require energy-efficient approaches to building decarbonization by emphasizing electric heat pumps for space heating and water heating and extending the benefits of photovoltaic and battery storage systems and other demand flexible technology to work in combinations with heat pumps.	Building Energy
State	Advanced Clean Car I Regulations	Establishes GHG emission reduction standards for model years 2017 through 2025 that are more stringent than federal CAFE standards.	On-Road Vehicles
State	Advanced Clean Cars II Regulations	Establishes a target for all new passenger cars, trucks, and SUVs sold in California to be 100 percent zero-emission vehicles by 2035.	On-Road Vehicles
State	Advanced Clean Fleets	Starting in 2036, all medium- and heavy-duty trucks sold in California must be zero emissions with limited exceptions. In addition to this sales mandate, fleet owners must also purchase electric trucks on an accelerated timeline.	Vehicle Fleet

Source	Legislative Reduction	Description	Sectors Applied
State	Truck and Bus Regulation	Requires diesel trucks and buses that operate in California to be upgraded to reduce GHG emissions.	On-Road Vehicles
State	AB 1346 (Small Off-Road Engines)	Requires CARB to develop regulations that prohibit emissions from new small off-road engines by January 1, 2024.	Off-Road Vehicles and Equipment
Federal	Fuel Efficiency Standards for Medium- and Heavy-Duty Vehicles	Establishes fuel efficiency standards for medium- and heavy-duty engines and vehicles.	On-Road Vehicles
Federal	EPA Off-Road Compression-Ignition Engine Standards	Establishes standards for phasing of EPA diesel engine tiers for off-road compression-ignition equipment.	Off-Road Vehicles and Equipment

Notes: CAFE = Corporate Average Fuel Economy; CARB = California Air Resources Board; CEC = California Energy Commission; EPA = US Environmental Protection Agency; GHG = greenhouse gas; SUV = sport utility vehicle; SB = Senate Bill.

Source: Compiled by Ascent in 2024.

The results of the legislative-adjusted BAU forecasts show that emissions are expected to decline by 64 percent from 2022 levels by 2045, as shown in Table 4 and Figure 1.

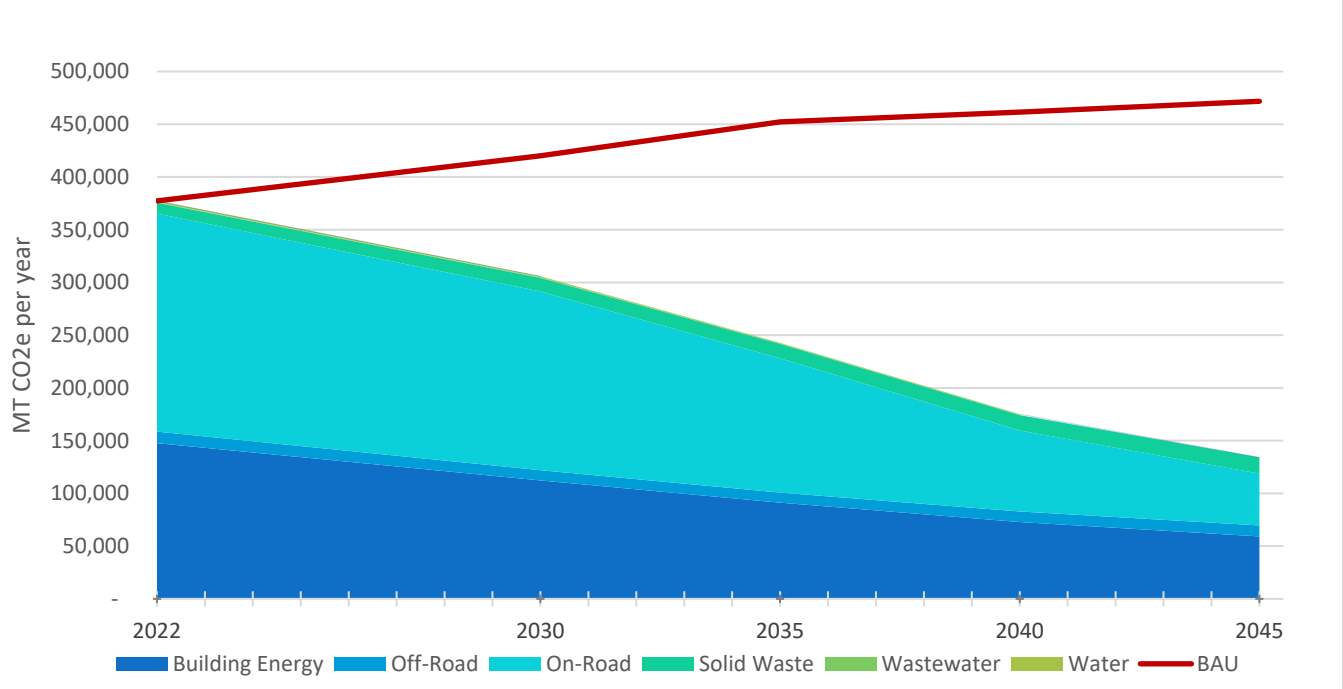
Table 4 Newark GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts ($MTCO_2e$)

Sector	2022	2030	2035	2045	2045
On-Road Transportation	206,749	169,383	127,204	76,829	49,144
Building Energy	147,607	112,281	91,175	72,793	59,194
Off-Road Vehicles and Equipment	10,974	9,720	9,617	9,982	10,403
Solid Waste	10,255	12,921	13,721	14,521	15,321
Water Supply	1,188	860	651	412	0
Wastewater Treatment	552	611	649	685	694
Total	377,325	308,801	245,114	176,412	135,078
Percent Change from 2022 Levels	**NA**	**-18%**	**-35%**	**-53%**	**-64%**

Notes: Total may not sum exactly due to independent rounding. BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not applicable.

Source: Data modeled by Ascent in 2024.

The BAU and legislative-adjusted BAU forecast results presented together demonstrate the impact of the state, federal, and regional legislation on the City's GHG emissions profile over time, as shown in Figure 1.



Source: Prepared by Ascent in 2024.

Figure 1 Newark GHG Emissions Inventory and Forecasts

1.1.4 Discussion

As shown in Table 4 and Figure 1, emissions would decrease by approximately 19 percent between 2022 and 2030 and would see an accelerated decrease after 2030 through 2045 under the legislative-adjusted BAU scenario. This trend is primarily due to the combined implementation schedule of ACC II and the Advanced Clean Fleets regulation (ACF) which require that the sale of new light-, medium-, and heavy-duty vehicles be zero-emissions starting in 2035. Additionally, the forecasted reductions from building energy use under BAAQMD's Zero NO_X appliance rule would substantially reduce building-energy-related emissions in existing homes and businesses starting in 2027 as the only types of appliances currently supporting that rule are electric. Overall, between 2022 and 2045, emissions are expected to decrease by 64 percent. Because the building energy and on-road sectors make up 95 percent of 2022 emissions, the anticipated legislative reductions from these sectors account for most of the reductions in total emissions, respectively declining by 60 and 76 percent between 2022 and 2045. Despite the significant reduction in these sectors, by 2045, building energy and on-road emissions are still anticipated to make up 80 percent of the city's total emissions. Because all electricity would be GHG-free by 2045, building energy emissions would be solely from natural gas combustion. Still, other sectors (e.g., off-road) would make up a greater percentage of total emissions. In all, the reductions would be achieved from several legislative actions including:

- a greater renewable mix in electricity per current trends in Ava and PG&E power mixes and the renewable energy targets SB 100 and SB 1020 (100 percent GHG-free by 2045),
- improved building energy efficiency through compliance with Title 24, Part 6 standards and BAAQMD's Zero NO_X rule,

- reductions in on-road vehicle emissions factors from state vehicle standards as forecasted in EMFAC2021, ACC II, and ACF, and
- reductions in off-road emissions from the electrification of small off-road engines under AB 1346.

Without legislative adjustments, BAU emissions would increase baseline emissions by approximately 12 percent between 2022 and 2030 and 24 percent between 2022 and 2045.

Going forward, regional, state, and federal agencies may adopt new legislative actions that would affect emissions; however, because information regarding these regulatory changes is currently unknown, emissions reductions from future potential legislative actions are not quantified in this memorandum. Where new regulations or actions are imminent and reasonably foreseeable, they can be incorporated as complementary actions to locally based GHG reduction measures.

2 REDUCTION TARGETS

2.1 STATEWIDE GREENHOUSE GAS REDUCTION TARGETS AND GOALS

As directed in SB 32 and AB 1279, the state has established the following GHG emissions reduction targets:

- 40 percent reduction below 1990 levels by 2030,
- 85 percent reduction in anthropogenic emissions below 1990 levels by 2045, and
- carbon neutrality by 2045.

The City aims to reduce GHG emissions in proportion to the state's targets and goals. Emissions levels from 1990 are not available, which is the case for most local jurisdictions in California. Thus, GHG reduction targets for CAN were developed relative to the 2022 emissions inventory, consistent with guidance provided by CARB (CARB 2017). GHG emissions in 2022 were 377,325 $MTCO_2e$. The methodology used to calculate the City's emissions reduction targets is described below.

2.2 CALIFORNIA'S 2022 CLIMATE CHANGE SCOPING PLAN AND 2021 GHG INVENTORY

CARB's *2022 Scoping Plan for Achieving Carbon Neutrality* (2022 Scoping Plan) reports statewide GHG emissions for eight sectors: agriculture, residential and commercial, electric power, high global warming potential (GWP) gases, industrial, recycling and waste, transportation, and Cap-and-Trade (CARB 2022). CARB's California GHG Emission Inventory for 2021 also reports statewide GHG emissions for these eight sectors (CARB 2021). For each sector, the 2022 Scoping Plan reports the 1990 emissions levels and ranges of reductions needed by 2030 for the state to achieve the SB 32 target of reducing statewide emissions to 40 percent below 1990 levels, and the AB 1279 target of reducing statewide emissions to 85 percent below 1990 levels. CARB also estimates the GHG emissions anticipated to be reduced through carbon dioxide removal (CDR) technologies and natural and working lands net sinks to achieve carbon neutrality by 2045, pursuant to AB 1279.

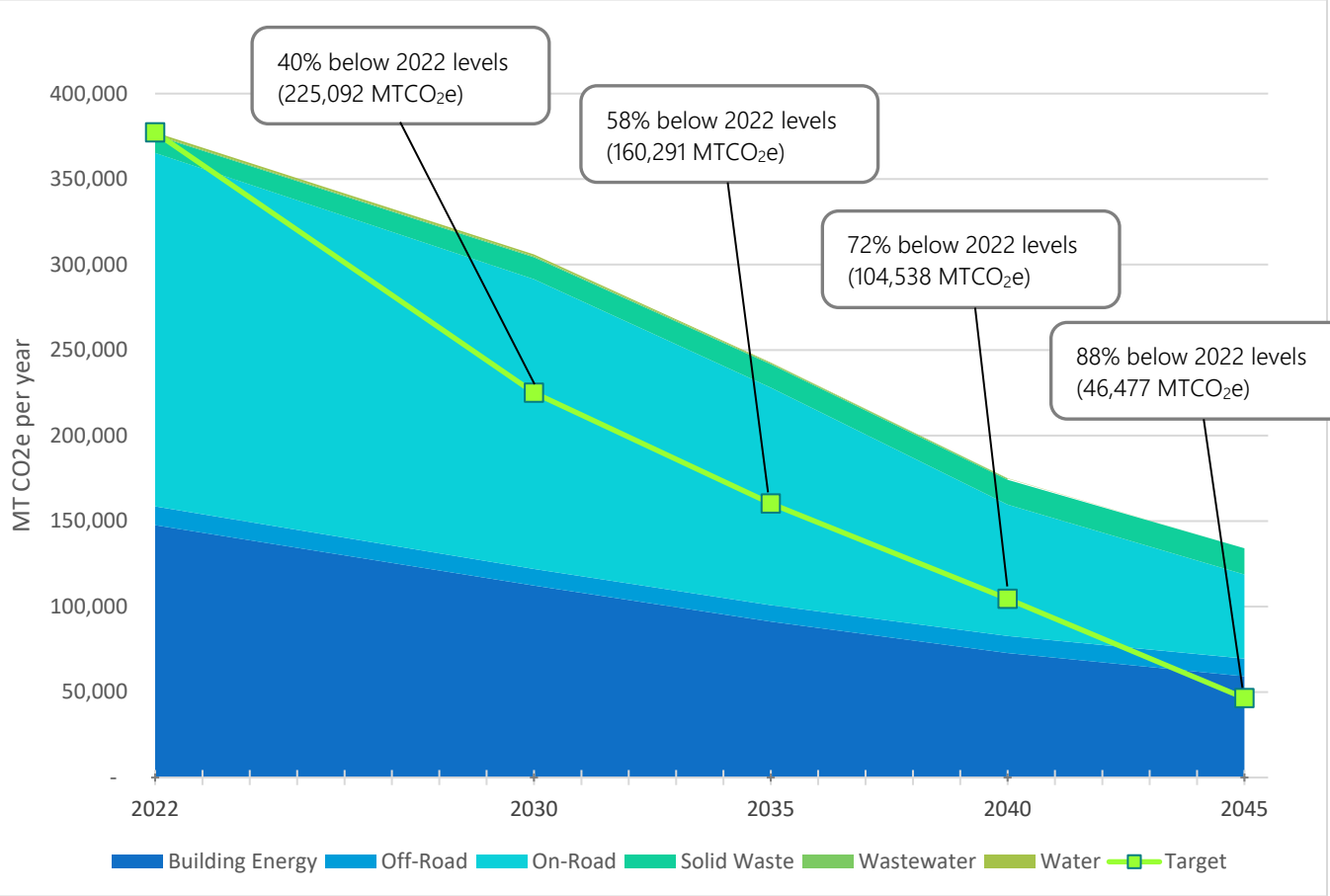
The statewide targets account for all emissions sectors in the state's GHG emissions inventory, statewide population forecasts for 2030 and 2045, and all reductions necessary to achieve the statewide targets under SB 32 and AB 1279 in all sectors. The targets reported in the 2022 Scoping Plan are framed as targets that must be met statewide; however, this does not mean that the statewide sector targets must be applied uniformly to every local jurisdiction.

2.3 GREENHOUSE GAS EMISSIONS REDUCTION TARGETS

Based on a review of the 2022 Scoping Plan and an understanding of activities occurring within the city, the City has direct or indirect jurisdiction over activities that generate emissions and contribute to reductions in five of the eight emissions sectors included in the statewide inventory: residential and commercial, electric power, industrial, recycling and waste, and transportation. The City does not have agricultural land uses and has limited influence over high GWP gases and CDR, categorized by CARB as an emissions sector to account for a wide array of CDR technologies and management (e.g., reforestation and direct air carbon capture and storage). Based on the sectors relevant to the City's inventory, the state's emissions would need to be reduced by 40 percent, by 2030, relative to 2022 levels of 381 $MMTCO_2e$. For 2035, 2040, and 2045, statewide emissions from the sectors relevant to the City's inventory must be reduced by 58, 72, and 88 percent below 2022 levels, respectively. Therefore, consistent with state targets and considering relevant emissions sectors, the City's GHG reduction targets are as follows:

- 2030 target: 40 percent below 2022 levels (225,092 $MTCO_2e$),
- 2035 target: 58 percent below 2022 levels (160,291 $MTCO_2e$),
- 2040 target: 72 percent below 2022 levels (104,538 $MTCO_2e$), and
- 2045 target: 88 percent below 2022 levels (46,477 $MTCO_2e$).

Figure 3 depicts the legislative-adjusted BAU forecasts by sector, as distinguished by colored wedges, and the City's emissions reduction targets relative to the 2022 emissions inventory. The space between the trajectory of the black line (i.e., targets) and the top of the colored wedges (i.e., forecasted emissions) represents the "gap" in emissions that will need to be addressed through local actions for the City to meet its GHG reduction targets. The appendix further discusses how the targets were derived for the City.



Notes: GHG = greenhouse gas emissions; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Prepared by Ascent in 2024.

Figure 2 City of Newark Legislative-Adjusted BAU Forecasts and GHG Emissions Reduction Targets Below 2022 Levels

REFERENCES

California Air Resources Board. 2017. *California's 2017 Climate Change Scoping Plan*. Available: https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/scoping_plan_2017.pdf. Accessed November 11, 2021.

———. 2021. California GHG Emissions for 2000 to 2019 (2021 Edition). Available: https://www.arb.ca.gov/cc/inventory/data/data.htm. Accessed November 11, 2021.

———. 2022 (November 16). *2022 Scoping Plan for Achieving Carbon Neutrality*. https://ww2.arb.ca.gov/sites/default/files/2022-11/2022-sp.pdf. Accessed November 17, 2022.

CARB. *See* California Air Resources Board.

California Energy Commission. 2022. 2022 Building Energy Efficiency Standards. Available at: 2022 Building Energy Efficiency Standards (ca.gov). Accessed January 22, 2024.

CEC. *See* California Energy Commission.

Metropolitan Transportation Commission. 2022. Vehicle Miles Traveled Dataportal. Available: http://capvmt.mtcanalytics.org/data. Accessed April 16, 2024.

MTC. *See* Metropolitan Transportation Commission.

Appendix A

Newark Climate Action Plan Update: Draft Greenhouse Gas Emissions Forecasts and Targets Technical Memorandum

INTRODUCTION

This document is an appendix to the City of Newark Climate Action Plan Update: Draft Greenhouse Gas Emissions Forecasts and Targets Technical Memorandum (hereafter referred to as "Forecasts and Targets Memorandum") to provide technical documentation for the results presented in the memorandum. This document summarizes the City's community emissions forecasts and explains the forecast and target methodologies.

1 GREENHOUSE GAS EMISSIONS FORECASTS METHODOLOGY

For estimating forecast, the 2022 greenhouse gas (GHG) emissions were forecasted for 2030, 2035, 2040, and 2045 based on growth scaling factors and known impacts of currently adopted legislation on GHG emissions (e.g., adopted federal and state regulations, policies, and programs affecting fuels and energy efficiency). The growth scaling factors (i.e., population, housing, employment, and service population[1]) were applied to activity growth factors (e.g., electricity consumption per housing unit and vehicle miles traveled [VMT] per service population).

The following section describes the methodology behind forecasting the business-as-usual (BAU) and legislative-adjusted BAU emissions for each sector. The BAU emissions forecast assesses how emissions generated by activities in the city will change over time without further regional, state, or federal action. The legislative-adjusted BAU emissions forecast includes adopted legislative and regulatory actions at the regional, state, and federal levels that would affect emissions without additional action by the City.

1.1 GREENHOUSE GAS EMISSIONS FORECASTS

1.1.1 Business-as-Usual Forecast

The BAU forecasted emissions were estimated by scaling the 2022 baseline emissions by forecasted VMT data from the Metropolitan Transportation Commission for the on-road transportation sector and, for other sectors, three growth scaling factors: population, employment, and service population in the city. These scaling factors were used as a basis for the activity forecasts for all sectors except for on-road transportation. These scaling factors were assigned to different emissions sector and sub-sector activities depending on how each sector or sub-sector is affected. These assignments are shown in Table 1. For example, the activity for both the residential building energy sector and the nonresidential building energy sector is in kilowatt-hours (kWh) of electricity and therms of natural gas. Increases in residential building energy (in kWh and therms) were assumed to be proportional to the growth in population. In contrast, increases in nonresidential building energy (also in kWh and therms) were assumed to be proportional to the growth in employment. These projections in the activities were then translated to emissions using 2022 emission factors to represent the BAU scenario. Under the BAU scenario, baseline emission factors were assumed to remain unchanged. The resulting scaled activity growth factors are shown in Table 2.

Note that the building energy sector includes two subsectors, backup generators and industrial sources, whose emissions were not calculated from activity data, but were provided by the Bay Area Air Quality Management District (BAAQMD) through a public records request. Ascent requested BAAQMD to provide emissions and fuel use data from stationary sources permitted in the city. This was done to capture building energy emissions sources that would not be captured through natural gas and electricity usage estimates. Of the data provided by BAAQMD, backup generators and industrial flaring were the only emissions sources not assumed to be related to natural gas combustion or the PABCO Gypsum facility, which is excluded from the City's GHG inventory. Backup generators generate electricity during power outages and often use diesel, stored natural gas, or propane as a fuel source. The

[1] Service population is the sum of population and employment in the city.

industrial sources noted by BAAQMD include the flaring of used oil. BAAQMD's response to the public records request did not provide fuel usage. (pers. comm., Henderson 2024).

Table 1 BAU Growth Scaling Methods by Emissions Sector for Forecast

Sector	Subsector	Activity Growth Method
On-Road	Passenger	Estimated VMT forecast
	Commercial	Estimated VMT forecast
Building Energy	Nonresidential	Employment
	Residential	Population
	Backup Generators[1]	Employment
	Industrial Processes[1]	Employment
Off-Road	Construction Equipment	Service Population
	Industrial	Employment
	Lawn and Garden Equipment	Population
	Light Commercial Equipment	Employment
	Portable Equipment	Employment
	Recreational Equipment	Population
	Transport Refrigeration Units	Service Population
Solid Waste	Waste Generation	Service Population
Wastewater Treatment	NA	Service Population
Water Supply	NA	Service Population

Notes: BAU = business-as-usual; kWh = kilowatt-hours; NA = not applicable; VMT = vehicle miles traveled.

[1] The backup generators and industrial processes subsectors are associated with nonresidential uses and are scaled as such but are categorized separately from the nonresidential subsector. "Nonresidential" refers to electricity and natural gas used in nonresidential land uses, whereas emissions from backup generators and industrial processes may be from a different variety of fuels (e.g., diesel, natural gas not supplied by PG&E, industrial processes).

Source: Compiled by Ascent in 2024.

Table 2 BAU Activity Data Forecast by Emissions Sector

Sector	Source	Quantity Type	Quantity Units	Quantity				
				2022	2030	2035	2040	2045
On-Road Transportation	On-Road Passenger Transportation	Annual VMT	miles	334,300,980	376,103,237	365,534,571	354,965,906	351,561,922
	On-Road Commercial Transportation	Annual VMT	miles	70,214,868	75,099,314	92,551,273	92,562,214	91,674,578
	Total	Annual VMT	miles	404,515,848	451,202,551	458,085,844	447,528,119	443,236,501
Building Energy	Residential	Electricity	kWh	73,933	81,669	86,505	91,340	96,175
	Nonresidential	Electricity	kWh	295,561	331,069	346,042	365,457	384,873
	Electricity Total		kWh	*369,494*	*412,739*	*432,546*	*456,797*	*481,048*
	Residential	Natural Gas	therms	5,577,023	6,160,586	6,525,312	6,890,038	7,254,765
	Nonresidential	Natural Gas	therms	8,510,638	9,533,100	10,046,115	10,636,684	11,227,252
	Natural Gas Total		therms	*14,087,661*	*15,693,686*	*16,571,427*	*17,526,722*	*18,482,017*
	Backup Generators[1]	Other	$MTCO_2$	426	477	498	526	554
	Industrial Processes[1]	Other	$MTCO_2$	4	5	5	5	5
Off-Road Vehicles and Equipment [1]	NA	NA	NA	NA	NA	NA	NA	NA
Solid Waste	Community-Generated Solid Waste	Waste	tons	42,446	47,113	50,030	52,947	55,864
	Compost	Waste	tons	4,622	5,131	5,448	5,766	6,084
	Total	Waste	tons	47,068	52,243	55,478	58,713	61,947
Water Supply	State Water Project	Electricity	MWh	2,898	5,277	5,604	5,931	6,257
	San Francisco PUC (Hetch Hetchy)	Electricity	MWh	2,998	1,645	1,747	1,849	1,951
	Alameda Creek Watershed Runoff	Electricity	MWh	2,998	3,217	3,416	3,615	3,814
	Total	Electricity	MWh	9,135	10,139	10,767	11,395	12,023
Wastewater Treatment [1]	NA	NA	NA	NA	NA	NA	NA	NA

Notes: BAAQMD = Bay Area Air Quality Management District; BAU = business-as-usual; gal = gallon; kWh = kilowatt-hours; $MTCO_2$ = metric tons of carbon dioxide; MWh = megawatt-hours; NA = not applicable; PUC = Public Utilities Commission; VMT = vehicle miles traveled.

[1] The backup generators and industrial processes subsectors are associated with nonresidential uses and are scaled as such but are categorized separately from the nonresidential subsector. "Nonresidential" refers to electricity and natural gas used in nonresidential land uses, whereas emissions from backup generators and industrial processes may be from a different variety of fuels (e.g., diesel, natural gas not supplied by PG&E, industrial processes). See discussion in text.

Source: Compiled by Ascent in 2024.

1.1.2 Legislative-Adjusted Business-as-Usual Forecast

The legislative-adjusted BAU scenario accounts for the effect of adopted legislative and regulatory actions at the regional, state, and federal levels on local emissions without additional action by the City. For on-road transportation and water supply sectors, legislative reductions affect emissions factors only. For the building energy sector, legislative reductions affect energy use through energy efficiency standards and electricity emission factors to account for increased zero-carbon requirements for the electricity sector. These were applied to all building energy sub-sectors, including backup generators, which supply electricity to buildings during power outages but excluded industrial processes. For the off-road sector, the legislative-adjusted BAU forecast accounts for growth and legislative adjustments built into the OFFROAD 2021 model and additional off-model adjustments to account for Assembly Bill (AB) 1346. For solid waste and wastewater treatment, the legislative-adjusted BAU forecast is equivalent to the BAU forecast. Although legislation exists that would affect these sectors (e.g., Senate Bill [SB] 1383 would impact the solid waste sector), there was insufficient information to quantify the legislative reductions from these sectors. As such, any additional GHG reductions in these sectors would be factored as part of local actions as part of *Climate Action Newark*'s (CAN's) GHG reduction measures and not as part of the forecasts.

Table 3 in the Forecast Memorandum summarizes the legislative adjustments applied to the activity data and emissions factors by sector under the legislative-adjusted BAU scenario. Table 3 below lists the forecast sectors where activity data is affected by legislative reductions. A detailed discussion of each sector is provided in Section 1.1.3.

Table 3 Legislative-Adjusted BAU Activity Data Forecast by Emissions Sector Affected by Legislative Reductions

Sector	Source	Quantity Type	Quantity Units	Quantity				
				2022	2030	2035	2040	2045
Building Energy	Residential	Electricity	kWh	73,933	85,325	93,204	100,459	110,052
	Nonresidential	Electricity	kWh	295,561	338,870	365,312	391,517	427,064
	Electricity Total		kWh	*369,494*	*424,195*	*458,516*	*491,976*	*537,116*
	Residential	therms	therms	5,503,090	3,637,536	2,723,229	1,851,097	1,576,451
	Nonresidential	therms	therms	8,215,077	5,738,328	4,671,798	3,603,151	3,426,438
	Natural Gas Total		therms	*13,718,167*	*9,375,864*	*7,395,027*	*5,454,247*	*5,002,890*
	Backup Generators[1]	Other	$MTCO_2$	426	466	501	530	559
	Industrial Processes[1]	Other	$MTCO_2$	4	5	5	5	6

Notes: BAU = business-as-usual; kWh = kilowatt-hours; $MTCO_2$ = metric tons of carbon dioxide; NA = not applicable.

[1] The backup generators and industrial processes subsectors are associated with nonresidential uses and are scaled as such but are categorized separately from the nonresidential subsector. "Nonresidential" refers to electricity and natural gas used in nonresidential land uses, whereas emissions from backup generators and industrial processes may be from a different variety of fuels (e.g., diesel, natural gas not supplied by PG&E, industrial processes). See discussion in text.

Source: Analysis conducted by Ascent in 2024.

1.1.3 Forecast Details by Emissions Sector

ON-ROAD TRANSPORTATION

The emissions projections associated with the on-road transportation sector were calculated by multiplying the projected annual VMT and the vehicle emission factors by vehicle category. VMT projections were developed using the Metropolitan Transportation Commission's VMT data and EMFAC2021, using the Regional Transportation Advisory Committee origin-destination method, consistent with SB 375 and California Air Resources Board's (CARB's) recommendations. For the BAU forecast, the applied future emission factors were based on 2022 emission factors. For the legislative-adjusted BAU forecast, the future vehicle emission factors were based on those from the CARB EMFAC2021 webtool, which includes legislative adjustments from state and federal policies and regulations including

the Pavley Clean Car Standards, Advanced Clean Car I (ACC I) regulation, and fuel efficiency standards for medium- and heavy-duty vehicles. It should be noted that the Low Carbon Fuel Standard was excluded in EMFAC2021 forecasts because the emissions benefits originate from upstream fuel production and do not directly reduce vehicle tailpipe emissions that affect the city's GHG emissions forecasts. Additionally, the effects of the Advanced Clean Cars II (ACC II) and Advanced Clean Fleets (ACF) regulations were incorporated in this forecast through off-model calculations. For ACC II, sales of electric vehicles were adjusted upwards from the default EMFAC values to be consistent with the state's target, where 100 percent of new passenger vehicle sales are plug-in hybrids or battery electric vehicles by 2035 (CARB 2022). The effects of ACCII and ACF were translated as adjustments to the average vehicle emissions factor by vehicle type. The total estimated VMT and corresponding legislative-adjusted BAU emission factors and emissions from on-road transportation for each forecast year are given in Tables 4, 5, and 6.

Table 4 On-Road Transportation Total Estimated VMT per year

Vehicle Type	2022	2030	2035	2040	2045
Passenger	334,300,980	376,103,237	365,534,571	354,965,906	351,561,922
Commercial	70,214,868	75,099,314	92,551,273	92,562,214	91,674,578
Total	**404,515,848**	**451,202,551**	**458,085,844**	**447,528,119**	**443,236,501**

Notes: VMT= vehicle miles traveled.

Source: Compiled by Ascent in 2024.

Table 5 On-Road Transportation Emission Factors (g CO_2e/mi)

Vehicle Type	2022	2030	2035	2040	2045
Passenger	324	230	148	81	42
Commercial	1,403	1,105	791	520	373
Weighted Average	511	375	278	172	111

Notes: g CO_2e = grams of carbon dioxide equivalent; mi = mile.

Source: Compiled by Ascent in 2024.

Table 6 On-Road Transportation GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts ($MTCO_2e$)

Vehicle Type	2022	2030	2035	2040	2045
Passenger	108,236	86,409	53,961	28,656	14,922
Commercial	98,513	82,974	73,243	48,173	34,222
Total	**206,749**	**169,383**	**127,204**	**76,829**	**49,144**

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Analysis conducted by Ascent in 2024.

BUILDING ENERGY

Building Energy Assumptions

Building energy emissions in the city result directly from onsite combustion of natural gas and indirectly from electricity consumption. This section presents the methodology of forecasting the energy consumption for residential and nonresidential sources and estimating future emission factors. BAU forecasted energy consumption for residential building energy was estimated by scaling 2022 energy consumption using population. For nonresidential sources, including backup generators and industrial operations, BAU forecasted energy consumption was estimated by scaling 2022 energy consumption using employment. The BAU forecast uses the GHG emissions factors used to calculate emissions in the 2022 inventory for all forecast years.

The legislative-adjusted BAU forecast considers the effects of legislation on energy use in new residential and nonresidential buildings pursuant to California's Building Energy Efficiency Standards (California Code of Regulations Title 24 Part 6, hereafter referred to as "Title 24") as well as Bay Area Air Quality Management District's (BAAQMD's) zero nitrogen oxides (NO_X) appliance rule on existing buildings. The legislative-adjusted BAU forecast also considers changes to the carbon intensity of electricity generation under SB 100 and SB 1020 that would affect future electricity emission factors. Emissions were calculated by multiplying the annual projected building energy use by the respective emission factors. Detailed calculations are described below.

Emission Factor Forecasts

Electricity

Ava Community Energy (Ava) supplies a majority of the city's electricity, with the rest provided by the Pacific Gas & Electric Company (PG&E). Under BAU forecasts, Ava and PG&E's electricity supply emissions factor was assumed to remain unchanged through 2045 because the BAU forecast does not account for the effects of SB 1020 and SB 100 beyond the inventory year (2022). According to Power Content Labels (PCLs) published by the California Energy Commission (CEC), the electricity emission factor for Ava's Bright Choice option was 496 pounds of carbon dioxide equivalent per megawatt-hour (lb CO_2e/MWh) and represented a 72 percent carbon-free electricity mix, meaning that 72 percent of the electricity generated by Ava choosing the Bright Choice option in 2022 was generated by sources that emit no GHG emissions. Ava offers other 100 percent carbon-free options under their Renewable 100 and Brilliant 100 service plans, which have no emissions. PG&E's electricity emission factor was 56 lb CO_2e/MWh and represented a 95 percent carbon-free electricity mix. (CEC 2022a, 2022b).

Under the legislative-adjusted BAU forecasts, Ava and PG&E's carbon-free mix for 2030 through 2045 was set to align with the mandates outlined in SB 1020 and SB 100. Thus, under the legislative-adjusted BAU forecast, the emissions factors align with the California Public Utilities Commission's Renewables Portfolio Standard (RPS) which are set through SB 1020 and SB 100. Through SB 100, RPS requires that "all electricity providers procure a minimum 60% eligible renewable energy by 2030" (State of California 2023a). And through SB 1020, RPS requires that "eligible renewable energy resources and zero-carbon resources supply 90% of electricity to end-use customers by 2035, 95% by 2040, and 100% by 2045" (State of California 2023b). To calculate future emission factors, Ava's electricity emissions factor was adjusted to reflect the additional carbon-free electricity mix percentage to meet the minimum RPS standards. As a result, the legislative-adjusted BAU emission factors for all future years were estimated by incorporating Ava's 2022 carbon-free electricity mix for each forecast year and carbon-free mix set by RPS standard.

For PG&E, future emission factors were based on the assumption that there were no publicly available documents that state PG&E will be 100 percent carbon-free from 2023 onwards. However, based on the linear regression slope of PG&E emission factors between 2005 and 2023, PG&E is projected to have an emission factor of 0 by the years 2030 and 2045.

PG&E's CO_2 emissions factors for each forecast year were calculated by first estimating the non-renewable portion of the 2022 emission factors (56 pounds [lb] of CO_2/megawatt-hour [MWh]) available from PG&E's 2022 PCL (CEC 2022b). PG&E's 2022 PCL also indicated that its energy mix was 95 percent GHG-free, or from zero-carbon sources (e.g., hydroelectric, nuclear, solar). For future years, it was assumed that PG&E would continue to have the same emissions factor as in 2022 because they are already meeting their requirements under SB 1020 to achieve a 90 percent zero-carbon electricity rate by 2035. For 2045, PG&E emission factors were assumed to have zero carbon emissions, per SB 100. Additionally, because PG&E's 2022 emission factors are provided in carbon dioxide equivalents, it was assumed that PG&E's emission factors include methane (CH_4) and nitrous oxide (N_2O) emission factors.

The GHG emissions factors and carbon-free mix of electricity for the legislative-adjusted BAU forecast are presented in Table 7 and Table 8.

Table 7 Electricity Emission Factors (lb CO_2e/MWh)

Provider	2022	2030	2035	2040	2045
Ava	496	298	174	87	0
PG&E	56	56	56	56	0

Notes: Ava = Ava Community Energy; lb CO_2e/MWh = pounds of carbon dioxide equivalent per megawatt-hour; PG&E = Pacific Gas & Electric Company.

Source: Compiled by Ascent in 2024.

Table 8 Carbon-Free Electricity Mix (%)

Provider	2022	2030	2035	2040	2045
Ava	72	83	90	95	100
PG&E	95	95	95	95	100

Notes: Ava = Ava Community Energy; PG&E = Pacific Gas & Electric Company.

Source: Compiled by Ascent in 2024.

Natural Gas

Natural gas in the city is provided by PG&E, but its emissions factors are assumed to be constant regardless of the utility. According to The Climate Registry, 11.73 lb CO_2e is released for every therm of natural gas combusted (TCR 2023). This was assumed to apply to all years. Emissions factors associated with natural gas combustion were not anticipated to change over time, as there are no legislative actions that would reduce the carbon intensity of natural gas.

Other Fuel

Emissions from backup generators and industrial processes including flaring emissions were obtained via a public data request from BAAQMD. Other sources of emissions (e.g., natural gas combustion in boilers) were provided by BAAQMD however these sources are accounted for by the natural gas data from PG&E. Emissions factors were not used as fuel use was not provided.

ENERGY USE FORECASTS

For existing buildings, energy intensity factors were adjusted to account for the turnover of natural gas appliances to electric under BAAQMD's NO_X emission standards, which were amended in 2023, to require zero-emission appliances starting in 2027. For new construction, energy intensity factors were adjusted to reflect increased stringency under Title 24. The efficiency gains under the 2022 Title 24 standards were assumed to apply to projects constructed after January 1, 2023. The 2025 Title 24 standards are currently being developed by the CEC and the details related to their impact on future building construction are not yet available.

Existing Buildings

The BAAQMD zero NO_X emission standards would effectively stop the installation and sale of natural gas water heaters, furnaces, and large commercial water heaters and replace them with electric equivalents by 2027, 2029, and 2031, respectively (BAAQMD 2023a). This rule applies to all BAAQMD jurisdictions, including Newark. It would gradually result in the electrification of most natural gas use in existing buildings as eligible appliances are replaced with electric counterparts over time. According to BAAQMD's emissions inventory, space and water heating account for 81 percent of natural gas use across residential and commercial buildings in the Bay Area (Henderson, pers. comm., 2024).

To account for this new rule in the legislative-adjusted forecast, estimates of natural gas reduction and corresponding increases in electricity use compared to baseline levels, adjusted for Newark's 2022 inventory year, were used to approximate a scaling factor to adjust the electricity and natural gas use in existing buildings in future years. These estimates were derived from BAAQMD's staff report and supporting appendices that evaluate the impact of the zero NO_X standard on electricity demand and NO_X emissions. Because NO_X emissions from these appliances are primarily a result of natural gas combustion, it was assumed that changes in NO_X under the rule would be proportional to changes in natural gas use. Consistent with the assumptions used in BAAQMD's modeling, these reductions were only assumed to apply to the existing building stock. (E3 2022:12, BAAQMD 2023b:22-23).

Based on BAAQMD's documentation, the rule is estimated to increase the Bay Area's electricity use by up to 13 percent by 2045 and decrease natural gas use by up to 90 percent by 2045 compared to 2022. These reductions could not be

disaggregated between residential and nonresidential land uses. Thus, final forecast results were aggregated across these land use types. Table 9 shows the estimated future adjustment factors for existing buildings in future years per BAAQMD's zero NO_X standard. Detailed calculations of these factors are available in Attachment 1 to this appendix.

Table 9 Percent Change in Building Energy Use in Existing Buildings under BAAQMD's Zero NO_X Appliance Standards by Fuel Type (Percent change from 2022)

Fuel Type	2030	2035	2040	2045
Electricity	4%	8%	11%	17%
Natural Gas	-40%	-61%	-80%	-89%

Notes: BAAQMD = Bay Area Air Quality Management District; NO_X = nitrogen oxides.

Source: Compiled by Ascent in 2024.

New Construction

Future energy use was adjusted to reflect increased emissions-intensity stringency under Title 24, which applies to new residential and nonresidential construction. The 2022 Title 24 standards apply to projects constructed after January 1, 2023, and the 2025 Title 24 standards will apply after January 1, 2026.

Adjustment factors were calculated using data from the CEC developed for the 2022 Title 24 standards. Two separate methodologies for residential and nonresidential land uses were used due to the difference in the availability of energy efficiency data between the two land use types. For residential land uses, to estimate adjusted future energy consumption resulting from Title 24 requirements in new construction, electricity- and natural-gas-specific adjustment factors were calculated using the difference in the average energy use in residential buildings between existing buildings and those built to 2022 Title 24 standards. CEC's data included estimated annual energy use per housing unit by climate zone (Zone 3 for Newark) and by residential land use type (i.e., multifamily and single-family) under the 2022 Title 24 standards. Using the housing data from the City's 2023-2031 Housing Element, the current distribution of multifamily and single-family units in each jurisdiction in the region was used to develop jurisdiction-specific adjustment factors for new residential building energy use (City of Newark 2023).

For nonresidential buildings, electricity- and natural-gas-specific adjustment factors were calculated using the difference in the average energy use in nonresidential buildings between those built to 2019 Title 24 standards and those built to 2022 Title 24 standards. Unlike the detailed approach for residential buildings, CEC only provided total statewide energy use under the 2019 and 2022 standards. Additionally, climate zone-specific data for nonresidential buildings were unavailable; therefore, nonresidential adjustment factors relied on statewide averages. The lack of comparison to existing factors for nonresidential buildings is expected to result in a slightly conservative forecast because existing nonresidential buildings are likely less efficient than those built to 2019 standards.

The resulting adjustment factors (specific to both land use type and energy type) were applied to the BAU growth in energy use to estimate the energy consumption. They associated GHG emissions of future development with legislative adjustments. The adjustment factors are shown in Table 10. They are presented either in terms of the percent change in energy use for buildings compliant with the 2022 Title 24 standards compared to existing buildings for residential land uses or compared to those built to meet the 2019 Title 24 standards, for nonresidential land uses. Positive values indicate an anticipated increase in energy use, while negative values indicate an anticipated decrease. It is important to note that although average electricity use in new residential buildings is anticipated to rise (due to an increase in electrical demand associated with electric appliances installed instead of natural gas appliances), emissions from new nonresidential buildings are expected to be lower than they would be under existing or 2019 Title 24 conditions as a result of overall lower building emissions intensities (due to lower emissions factors associated with electricity compared to natural gas).

Table 10 Title 24 Building Energy Adjustment Factors for 2022 Standards Compared to 2019 Standards

Building Type	Electricity	Natural Gas
Residential Buildings	5%	-41%
Nonresidential Buildings	-9.5%	-11%

Source: Compiled by Ascent in 2024.

Based on this analysis, it was estimated that, across the city, new residential buildings would use about five percent more electricity and 41 percent less natural gas than existing residential buildings, and new nonresidential buildings would use 9.5 percent less electricity and 11 percent less natural gas than existing nonresidential buildings.

BUILDING ENERGY RESULTS

Based on the building energy legislative reductions for new buildings and the expected net growth in the city's housing and employment, Table 11 shows the legislative-adjusted BAU forecast results for building energy. Under the BAU scenario, the 2022 emission factors would remain unchanged through 2045.

Table 11 Building Energy GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts ($MTCO_2e$)

Energy Type	2022	2030	2035	2040	2045
Electricity	74,014	61,806	51,230	43,168	31,948
Natural Gas	73,162	50,004	39,440	29,089	26,682
Other[1]	430	471	506	535	565
Total	**147,607**	**112,281**	**91,175**	**72,793**	**59,194**

Notes: Totals may not sum exactly due to independent rounding. BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

[1] Other sources refer to emergency generators and industrial process emissions directly provided by BAAQMD. It was assumed that the legislative reductions applicable to electricity also apply to emergency generators which provide electricity to buildings during blackouts. Industrial process emissions were assumed to be unchanged.

Source: Analysis conducted by Ascent in 2024.

OFF-ROAD VEHICLES AND EQUIPMENT

BAU emissions for different sources under the off-road vehicles and equipment sector were estimated by scaling 2022 inventory emissions by growth factors listed in Table 12. This approach was used instead of CARB's OFFROAD2021 model to account for the growth in various emission sources by the various scaling methods (for example, employment growth). For the legislative adjustments, the modeling incorporated regulatory actions such as reformulated fuels and more stringent emissions standards, as forecasted by OFFROAD2021. It also reduced emissions from small off-road engines as per AB 1346, which prohibits emissions from new fossil-fueled small off-road equipment starting in 2024. This effectively phases out fossil-fuel-powered off-road equipment in favor of zero-emission alternatives, such as electric or battery-operated equipment. The county-level emissions forecasts from off-road vehicles and equipment were scaled to the city using changes in the forecast scaling factor. Table 12 summarizes the scaling factors and legislative reductions used to forecast off-road vehicle and equipment emissions.

Table 12 Off-Road Vehicles and Equipment Forecast Methods by Source

Source	Forecast Methods	
	Scale Factor	Applied Legislative Reductions
Industrial Equipment	Employment	OFFROAD2021 emissions factor considerations include Off-Road Diesel Regulations and the implementation schedule of the EPA off-road compression-ignition engine standards. Additional off-
Light Commercial Equipment	Employment	
Portable Equipment	Employment	
Transport Refrigeration Units	Service Population	

Construction Equipment[1]	Service Population	model adjustments were made to account for AB 1346.
Lawn and Garden Equipment	Population	
Recreational Equipment	Population	

Notes: AB = Assembly Bill; EPA = US Environmental Protection Agency; OFFROAD2021 = California Air Resources Board's OFFROAD2021 model.

[1] This is part of the "construction and mining" combined category in CARB's OFFROAD model. Mining does not occur within the city, therefore this subsector is used to represent the construction-related emissions in the city.

Source: Compiled by Ascent in 2024.

Table 13 shows the 2022 inventory and legislative-adjusted BAU forecasted emissions from the off-road vehicles and equipment sector for 2030 and 2045.

Table 13 Off-Road Vehicles and Equipment GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts ($MTCO_2e$)

Source	2022	2030	2035	2040	2045
Industrial Equipment	2,431	2,699	2,880	3,077	3,102
Light Commercial Equipment	2,037	1,092	685	552	514
Portable Equipment	2,031	2,431	2,714	3,026	3,371
Transport Refrigeration Units	1,501	1,449	1,552	1,669	1,796
Construction Equipment	1,484	1,418	1,406	1,381	1,366
Lawn and Garden Equipment	1,290	416	152	37	0
Recreational Equipment	199	216	227	240	253
Total	**10,974**	**9,720**	**9,617**	**9,982**	**10,403**

Notes: Totals may not sum exactly due to independent rounding. BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Analysis conducted by Ascent in 2024.

SOLID WASTE

Solid waste sector emissions are associated primarily with the decomposition of mixed municipal solid waste generated in landfills by community activities, while a smaller proportion of emissions are produced by the decomposition of composted yard trimmings. No legislative reductions could be applied to this sector. Although SB 1383 requires the reduction of organic waste disposal by 75 percent from the baseline year of 2014 by 2025, no existing local plans address this target. As a result, legislative-adjusted BAU emissions are equivalent to BAU emissions, which were scaled by service population growth within the city. Table 14 shows the 2022 inventory and legislative-adjusted BAU forecasted emissions from the solid waste sector for 2030, 2035, 2040, and 2045.

Table 14 Solid Waste GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts ($MTCO_2e$)

Source	2022	2030	2035	2040	2045
Community-Generated Solid Waste	9,924	12,554	13,331	14,109	14,886
Compost	331	367	390	413	435
Total	**10,255**	**12,921**	**13,721**	**14,521**	**15,321**

Notes: Totals may not sum exactly due to independent rounding. BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Analysis conducted by Ascent in 2024.

WATER SUPPLY

Water supply emissions occur indirectly from the consumption of electricity associated with extracting, conveying, treating, and distributing imported water to the city. The Alameda County Water District sources 40, 20, and 40 percent of its water from the Alameda Creek Watershed, Hetch Hetchy Reservoir, and the State Water Project, respectively (Alameda County Water District 2024). Electricity is used to extract, convey, treat, and distribute this water to Newark residents. Energy consumption for future years was estimated by scaling 2022 energy consumption using population. The BAU forecast uses the GHG emissions factors used to calculate emissions in the 2022 inventory for all forecast years. Under the legislative-adjusted BAU forecast, the emissions factors align with RPS, consistent with the requirements of SB 1020 and SB 100. The emission factor for electricity consumption from Hetch Hetchy and Alameda Creek Watershed was based on PG&E as they are both local water sources. As the State Water Project includes the transport of water across the state, the emissions factor was based on the EPA's eGRID tool which provides an average for the California west-Pacific region.

The emission factors and carbon-free mix of electricity and associated GHG emissions factors for the legislative-adjusted BAU forecast are presented in Table 15. Emissions are calculated by multiplying the annual projected energy use by the respective emission factors. Table 16 presents projected fuel consumption and Table 17 presents 2022 inventory and legislative-adjusted BAU forecasted emissions from the water supply sector for 2030, 2035, 2040, and 2045.

Table 15 Water-related Electricity Emission Factors and Carbon-Free Electricity Mix

Data Source	Unit	2022	2030	2035	2040	2045
eGRID	lb CO_2e/MWh	499	369	92	46	0
	%	52	60	90	95	100

Notes: lb CO_2e/MWh = pounds of carbon dioxide equivalent per megawatt-hour.

Source: Compiled by Ascent in 2024.

Table 16 Water Supply Electricity Consumption in MWh

Source	2022	2030	2035	2040	2045
State Water Project (40%)	4,754	5,277	5,604	5,931	6,257
San Francisco PUC (Hetch Hetchy) (20%)	1,482	1,645	1,747	1,849	1,951
Alameda Creek Watershed Runoff (40%)	2,898	3,217	3,416	3,615	3,814
Total	**9,135**	**10,139**	**10,767**	**11,395**	**12,023**

Notes: Totals may not sum exactly due to independent rounding. MWh = megawatt-hour; PUC = Public Utilities Commission.

Source: Data modeled by Ascent in 2024.

Table 17 Water Supply GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts ($MTCO_2e$)

Source	2022	2030	2035	2040	2045
State Water Project (40%)	1,077	740	524	277	0
San Francisco PUC (Hetch Hetchy) (20%)	38	41	43	46	0
Alameda Creek Watershed Runoff (40%)	74	79	84	89	0
Total	**1,188**	**860**	**651**	**412**	**0**

Notes: Totals may not sum exactly due to independent rounding. BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; PUC = Public Utilities Commission.

Source: Data modeled by Ascent in 2024.

WASTEWATER TREATMENT

Emissions projections associated with the wastewater treatment sector account for emissions generated from several different sources during the treatment and collection of wastewater. This process is facilitated by the Union Sanitary District (USD), and wastewater is treated at centralized wastewater treatment plants (WWTPs). 2022 emissions were directly scaled to estimate emissions forecast in future years using service population growth within the city. No legislative reductions could be applied to this sector, so legislative-adjusted BAU emissions are equivalent to BAU emissions. Table 18 shows the 2022 inventory and legislative-adjusted BAU forecasted emissions from the wastewater treatment sector for 2030, 2035, 2040, and 2045.

Table 18 Wastewater Treatment GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts ($MTCO_2e$)

Source	2022	2030	2035	2040	2045
WWTP	522	611	649	685	694

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; WWTP = wastewater treatment plant.

Source: Data modeled by Ascent in 2024.

2 REDUCTION TARGETS METHODOLOGY

Based on a review of the 2022 Scoping Plan and an understanding of activities occurring within the city, the City has direct or indirect jurisdiction over activities that generate emissions and contribute to reductions in five of the eight emissions sectors included in the statewide inventory: residential and commercial, electric power, industrial, recycling and waste, and transportation. The city does not have agricultural land uses and has limited influence over high GWP gases and carbon dioxide removal (CDR), categorized by CARB as an emissions sector to account for a wide array of CDR technologies and management (e.g., reforestation and direct air carbon capture and storage). The 2022 Scoping Plan includes estimated changes in net emissions for the natural and working lands sector (i.e., carbon sequestration) and CDR technologies to help achieve carbon neutrality statewide. However, because the City has not conducted a carbon sequestration baseline or forecasts, the carbon neutrality target is not appropriate for the long-term 2045 reduction target. CAN focuses on anthropogenic sources of GHG emissions. Lastly, while facilities regulated under Cap-and-Trade do exist within city boundaries, the state is responsible for achieving emissions reductions from these sources, and the City has limited ability to influence Cap-and-Trade covered entities' GHG emissions. In the 2022 Scoping Plan, CARB combines Cap-and-Trade related emissions in the state with the CDR sector as the Cap-and-Trade program sunsets in 2030 (CARB 2023:268).

By excluding these sectors under this approach, GHG reduction targets have been established in proportion with statewide reductions for all sectors relevant to the City's jurisdiction. This target-setting approach is consistent with the California Supreme Court decision in *Center for Biological Diversity v. California Department of Fish and Wildlife and Newhall Land and Farming* (2015) 62 Cal.4th 204, which determined that the approach of assessing a project's consistency with statewide emissions reduction goals must include a "reasoned explanation based on substantial evidence" that links the project's emissions to the statewide GHG reduction goals.

The first step in determining targets under this approach is to compare the state's GHG inventories for 1990 and 2022 (i.e., the City's baseline inventory year) for the five relevant sectors. All sectors that were included in the statewide inventory are shown below in Table 19 for 1990 and 2022. Table 19 also includes statewide forecasted emissions by sector provided in the 2022 Scoping Plan for 2045. According to the inventory available from CARB, statewide emissions from the relevant sectors were approximately 435 million $MTCO_2e$ ($MMTCO_2e$) in 1990. 2022 data were not yet available from CARB and were estimated using 2021 emissions as a proxy (CARB 2023). Thus, 2022 statewide emissions were approximately 57 $MMTCO_2e$ (13 percent) lower than the 1990 level and the state's 2020 GHG target (i.e., reduce emissions to 1990 levels by 2020).

Table 19 2022 Scoping Plan Estimated Change in Emissions by Sector ($MMTCO_2e$)

GHG Emissions by Sector	1990	2022[1]	2030[2]	2040	2045[3]
Agriculture	26	20	18	17	15
Residential and Commercial	44	27	18	10	4
Electric Power	108	39	31	28	9
High GWP	3	10	10	10	9
Industrial	98	41	29	19	12
Recycling and Waste	7	9	9	8	8
Transportation	152	81	53	27	8
Carbon Dioxide Removal	NA	-7	-35	-63	-75
Total	**438**	220	133	55	-10
Adjusted Total (Excludes Agriculture, High GWP, and Carbon Dioxide Removal Sectors)	*435*	196	140	91	41

Notes: GHG = greenhouse gases; GWP = global warming potential; $MMTCO_2e$ = million metric tons of carbon dioxide equivalent; NA = not applicable.

[1] Calculated by interpolating between the state's 2021 GHG inventory and 2030 forecast. 2022 data was not yet available for California's emissions as of this writing (May 23, 2024).

[2] 2030 emissions by sector are provided in the 2022 Scoping Plan, consistent with the 48% reduction target.

[3] 2045 emissions by sector are provided in the 2022 Scoping Plan, consistent with the 85% reduction in anthropogenic emissions target set forth in AB 1279.

Source: CARB 2022; CARB 2023.

Table 20 shows how the City's targets were derived based on adjusted statewide GHG emissions data and projections and summarizes the City's legislative-adjusted BAU forecasts and targets for 2030, 2035, 2040, and 2045.

Table 20 Statewide and City of Newark Legislative-Adjusted BAU Forecasts and GHG Emissions Reduction Targets Below 2022 Levels

Source	2022	2030[2]	2035[3]	2040[3]	2045[4]
Scoping Plan Emissions Limit ($MMTCO_2e$)	381	220	133	55	-10
Adjusted Scoping Plan Emissions Limit[1] ($MMTCO_2e$)	329	196	140	91	41
Adjusted Statewide Target Percent Reduction from 2022 Levels	NA	40%	58%	72%	88%
City of Newark GHG Emissions and Legislative-Adjusted BAU Forecast ($MTCO_2e$)	377,325	308,801	245,114	176,412	135,078
City of Newark Target Percent Reduction Below 2022 Levels	—	40%	58%	72%	88%
City of Newark Target Annual Emissions ($MTCO_2e$)	—	225,092	160,291	104,538	46,477
Reduction from 2022 Needed to Meet Target ($MTCO_2e$)	—	83,708	84,822	71,875	88,601

Notes: BAU = business-as-usual; GHG = greenhouse gases; $MTCO_2e$ = metric tons of carbon dioxide equivalent; $MMTCO_2e$ = million metric tons of carbon dioxide equivalent; NA = not available; 2022 Scoping Plan = California's 2022 Scoping Plan for Achieving Carbon Neutrality.

[1] Excludes agriculture, high GWP, and carbon dioxide removal sectors because they are not relevant to the City's inventory.

[2] 2030 emissions by sector are provided in the 2022 Scoping Plan, consistent with the 48% reduction target.

[3] 2035 and 2040 emissions by sector are provided in the 2022 Scoping Plan.

[4] 2045 emissions by sector are provided in the 2022 Scoping Plan, consistent with the 85% reduction in anthropogenic emissions target set forth in AB 1279.

Source: CARB 2022; Analysis conducted by Ascent in 2024.

REFERENCES

Alameda County Water District. 2024. ACWD Fact Sheet. Available: https://www.acwd.org/93/Fact-Sheet. Accessed May 23, 2024.

California Air Resources Board. 2022. 2022 Scoping Plan for Achieving Carbon Neutrality. Available: https://ww2.arb.ca.gov/sites/default/files/2022-12/2022-sp_1.pdf. Accessed May 23, 2024.

———. 2023. Current California GHG Emission Inventory Data. Available: https://ww2.arb.ca.gov/ghg-inventory-data. Accessed May 23, 2024.

CARB. *See* California Air Resources Board.

California Energy Commission. 2022a. 2022 Power Content Label: East Bay Community Energy. Available: https://www.energy.ca.gov/filebrowser/download/6031. Accessed May 23, 2024.

———. CEC 2022b. 2022 Power Content Label: Pacific Gas and Electric Company. Available: https://www.energy.ca.gov/filebrowser/download/6048. Accessed May 23, 2024.

CEC. *See* California Energy Commission.

City of Newark. 2023. City of Newark 2023-2031 Housing Element: HCD Compliant Draft. Available: https://static1.squarespace.com/static/62100a1b28a8c17418e69051/t/65984411622d51649d0d4974/1704477724725/Newark+2023-2031+Housing+Element_compliant_December_2023.pdf. Accessed May 23, 2024. Ala

Bay Area Air Quality Management District. 2023a. Frequently Asked Questions About Air District Appliance Rules. Available: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-9-rule-4-nitrogen-oxides-from-fan-type-residential-central-furnaces/2021-amendments/documents/20230522_faq_appliance-rules_final-pdf.pdf?rev=b425fe938f644fa7839f8d938cad41fd. Accessed May 16, 2024.

———. 2023b. *Proposed Amendments To Building Appliance Rules – Regulation 9, Rule 4: Nitrogen Oxides From Fan Type Residential Central Furnaces And Rule 6: Nitrogen Oxides Emissions From Natural Gas-Fired Boilers And Water Heaters*. Final Staff Report, 22-23. Available: 20230307_fsr_rules0904and0906-pdf.pdf (baaqmd.gov). Accessed May 21, 2024.

BAAQMD. *See* Bay Area Air Quality Management District.

Energy + Environmental Economics. 2022. *Bay Area Air Quality Management District: Electric Infrastructure Impacts from Proposed Zero NO_X Standards*, 12. Available: baaqmd.gov/~/media/dotgov/files/rules/reg-9-rule-6-nitrogen-oxides-emissions-from-natural-gasfired-water-heaters/2021-amendment/documents/20221220_sr_appd_rg09040906-pdf.pdf?rev=a2bb6ef7d29a462d95b3d22bd6e18934. Accessed May 21, 2024.

E3. *See* Energy + Environmental Economics.

Henderson, Rochele. Public Records Officer. Bay Area Air Quality Management District. San Francisco. May 14, 2024—email message to Brenda Hom of Ascent regarding data for Figure 4 of BAAQMD's Zero NO_X Rule Staff Report.

State of California. 2023a. SB 100. Available at: https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180SB100. Accessed December 18, 2023.

———. 2023b. SB 1020. Available at: https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220SB1020. Accessed December 18, 2023.

TCR. *See* The Climate Registry.

The Climate Registry. 2023. *2023 Default Emission Factor Document*. Available: https://theclimateregistry.org/wp-content/uploads/2023/06/2023-Default-Emission-Factors-Final-1.pdf. Accessed August 3, 2023.

Title 24 Building Energy Standard - Legislative Adjustment

	Number of Units in 2022	
	Single Family	Multifamily
Newark	12,497	3,314
Percent	79%	21%

Source: City of Newark 2023-2031 HOUSING ELEMENT
https://static1.squarespace.com/static/62100a1b28a8c17418e69051/t/65984411622d51649d0d4974/1704477724725/Newark+2023-2031+Housing+Element_compliant_December_2023.pdf

All Residential	**Existing Buildings in Newark - Energy per Unit**		**2022 Energy Code (Climate Zone 2) -**		**Percent Change - Per Building**	
Jurisdiction	Therms	kWh	Therms	kWh	Therms	kWh
Newark	348	4,676	205	4,908	-41%	5%
Climate Zone	3					

Single-Family - Heat Pump Standard Design
Prototype: Combined

	Existing Buildings in Newark		**2019 Energy Code - Per Building**		**2022 Energy Code - Per Building**		**Percent Change - Per Building**
Climate Zone			Therms	kWh	Therms	kWh	Therms
1			533.7	4,486.1	397.2	6,132.6	-25.6%
2			371.6	4,493.7	246.9	5,886.2	-33.5%
3			284.1	4,374.6	172.5	5,465.4	-39.3%
4			266.7	4,599.6	164.4	5,605.3	-38.4%
5			258.4	4,357.4	133.2	5,699.2	-48.4%
6			197.6	4,464.2	84.7	5,482.9	-57.1%
7			182.1	4,465.3	69.5	5,463.7	-61.9%
8			176.6	5,046.7	67.5	5,973.1	-61.8%
9			195.3	5,026.0	85.2	5,995.3	-56.4%
10			216.9	5,343.2	155.8	6,013.6	-28.2%
11			339.1	5,888.5	227.5	7,046.6	-32.9%
12			330.4	4,877.3	213.3	6,116.2	**-35.4%**
13			277.1	6,376.0	155.1	7,619.3	-44.0%
14			318.8	5,727.8	160.0	7,594.0	-49.8%
15			141.0	8,947.8	53.4	9,570.4	-62.1%
16			542.2	4,731.6	405.5	6,064.6	-25.2%
Statewide Average			289.5	5,200.4	174.5	6,358.0	-39.7%

Multifamily - Heat Pump Design Standard
Prototype: Combined (LRGS, LRLC, MRMU, HR)

			2019 Energy Code - Per Building		**2022 Energy Code - Per Building**		**Percent Change - Per Building**
Climate Zone			Therms	kWh	Therms	kWh	Therms
1			245.4	4,944.9	207.8	5,334.6	-15.3%
2			199.4	5,314.1	167.8	5,661.9	-15.8%
3			183.5	5,049.2	166.2	5,216.7	-9.4%
4			171.0	5,453.5	156.4	5,581.6	-8.5%
5			180.1	5,103.1	164.8	5,245.5	-8.5%
6			150.5	5,510.3	146.7	5,522.6	-2.5%
7			148.1	5,411.6	145.6	5,407.4	-1.7%
8			146.0	5,775.8	142.7	5,788.3	-2.2%
9			151.0	5,755.0	145.1	5,795.0	-3.9%
10			149.5	5,940.4	139.5	6,038.2	-6.7%
11			181.4	6,085.5	148.9	6,446.3	-17.9%
12			183.1	5,675.5	154.0	5,993.8	-15.9%
13			169.3	6,249.0	145.3	6,525.1	-14.2%
14			174.0	6,068.0	146.9	6,381.2	-15.6%
15			119.1	7,321.1	117.2	7,347.9	-1.6%
16			258.3	5,446.8	242.4	5,606.0	-6.1%
Statewide Average			175.6	5,694.0	158.6	5,868.2	-9.7%

LRGS = 2-story lowrise garden style; 3-story LRLC = lowrise loaded corridor; 5-story MRMU = midrise mixed use; HRMU = 10-story highrise mixed use

Nonresidential - Efficiency Baseline

	2019 Energy Code - Statewide		**2022 Energy Code - Statewide**		**Percent Change - Statewide**	
Climate Zone	Therms	kWh	Therms	kWh	Therms	kWh
Statewide Average	14,761,982	1,125,623,493	13,140,192	1,018,241,991	-10.986%	-9.5%

Note: data by climate zone is unavailable

Source: 2021 CEC. Draft EIR Appendix B - Combined Emissions and Energy Savings
Draft Environmental Impact Report Amendments to the Building Energy Efficiency Standards
https://efiling.energy.ca.gov/GetDocument.aspx?tn=237853&DocumentContentId=71096

BAAQMD Zero NOX Appliance Rule (e.g., all electric appliances)

Regulation 9, Rule 4: Nitrogen Oxides from Fan Type Residential Central Furnaces
Regulation 9, Rule 6: Nitrogen Oxides Emissions from Natural Gas-Fired Boilers and Water Heaters.

Requires zero emission furnaces, boilers, and water heaters

Compliance Timeline

The rule amendments will apply only to new appliances, and do not mandate retrofitting of existing appliances.

2027 – only zero NOx water heaters can be sold or installed in the Bay Area.
2029 – only zero NOx furnaces can be sold or installed in the Bay Area.
2031 – only zero NOx large commercial water heaters can be sold or installed in the Bay Area.

Source: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-9-rule-4-nitrogen-oxides-from-fan-type-residential-central-furnaces/2021-amendments/documents/20230127_factsheet_rg09040906-pdf.pdf?la=en

Legislative Adjustments for Existing Building Energy Use - BAAQMD Zero NOx calculations

	TWh/year use across the Bay area from new electric appliances under rule compared to Low Policy Reference	Percent increase from Baseline	Leg Adjustment
2022	47.46		
2030	49.56	4%	104%
2035	51.36	8%	108%
2040	52.76	11%	111%
2045	55.66	17%	117%

Source: E3 2022. Electric Infrastructure Impacts from Proposed Zero NOx Standards (Page 12) (https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-9-rule-4-nitrogen-oxides-from-fan-type-residential-central-furnaces/2021-amendments/documents/20221220_sr_appd_rg09040906-pdf.pdf?la=en)

Change in Natural Gas Use under BAAQMD Zero NOx rule

Percent of Commericial and Res Space/WH out of all NG Uses in 2018	81%	(BAAQMD 2023: Table 5-1)

	Bay Area NOX emissions from Commercial and Res Space and Water Heating NG combustion (tons per year)	Total BAU Therms/year (Newark)	Total Res/Non-Res BAU Existing land use Therms/year (Newark) (exludes WWTP)	Space and Water Heating Therms/year with Rule from Existing Land Use (Newark)	Therm Reductions under Rule (therms/year)	Percent Reduction from Total BAU Therms	Leg Adjustment
2018	4,267						
2023	3,690						
2022	3,805	13,718,167	13,718,167	11,113,307			
2030	2,816	13,718,167	13,718,167	8,223,945	5,494,222	40%	60%
2035	1,855	13,718,167	13,718,167	5,417,407	8,300,760	61%	39%
2040	930	13,718,167	13,718,167	2,716,005	11,002,162	80%	20%
2045	515	13,718,167	13,718,167	1,504,024	12,214,143	89%	11%

Source: BAAQMD 2023. Final Staff Report. Table 5-3. https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-9-rule-4-nitrogen-oxides-from-fan-type-residential-central-furnaces/2021-amendments/documents/20230307_fsr_rules0904and0906-pdf.pdf?rev=100de6caff2342e6b095b59acf2321d0