# Memorandum

TO: NEW YORKERS FOR CLEAN POWER

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DATE: JULY 10, 2024

RE: ASSESSMENT OF ELECTRIC GRID HEADROOM FOR ACCOMMODATING BUILDING ELECTRIFICATION (REVISED JULY 2024)

## Contents



*Editorial note: the last two pages of the executive summary after Table 2 have been updated to reflect the results in the main document.*

## Introduction and Summary

In 2019, New York State passed the *Climate Leadership and Community Protection Act* (CLCPA). The CLCPA is one of the most ambitious state energy laws. It establishes targets to reduce greenhouse gas emissions 40 percent by 2030 and 85 percent by 2050 relative to 1990 levels, and it mandates a 100 percent zero-emission electric grid by 2040 and a carbon neutral economy by 2050. To meet the CLCPA goals, building electrification will be crucial, as buildings currently account for nearly one-third of the state's greenhouse gas emissions.[1] Following the passage of the CLCPA, the Climate Action Council convened and subsequently released a Scoping Plan in December 2022 aimed at helping the state achieve its stated goals.

In 2019, the building sector was responsible for 32 percent of statewide emissions and is the largest source of greenhouse gas emissions in the New York inventory. Within the building sector, 34 percent of emissions were from residential fuel use, 19 percent from commercial fuel use, 33 percent from out-of-state emissions associated with imported fuels, and 14 percent from hydrofluorocarbons (from refrigerants and HVAC).[2] The Scoping Plan expects 1–2 million homes and 10–20 percent of commercial buildings to have heat pumps installed by 2030.[3] By 2050, the plan anticipates 85 percent of all residential and commercial buildings to be electrified with heat pumps. To meet these goals, 250,000 heat pumps must be installed annually from 2030 onwards.[4] The Scoping Plan proposes numerous policies to support building decarbonization including: zero-emission building codes, energy efficiency benchmarks, and financial incentives that expand access to building decarbonization.[5] The Scoping Plan found that future investments are needed to develop zero-emission heating solutions, grid connectivity and reliability, workforce development, and more.[6]

We expect that the level of building electrification required to meet the CLCPA's goals will eventually increase peak loads substantially, especially in the winter. Meeting the CLCPA's building electrification goals will require an understanding of how much load the current electric distribution grid can handle, and how much additional capacity will be needed to support heat pumps in 85 percent of residential and commercial buildings by 2050. Understanding the timing of necessary grid capacity upgrades is also crucial in the planning and achievement of the CLCPA's targets. Studying headroom capacity will allow the state to anticipate the timing and scale of needed grid investments, and it will allow near-term actions to be taken with consideration of long-term issues.

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[1] DiChristopher, Tom. 2021. "NY climate policy blueprint outlines electrification and phaseout of gas system." *S&P Global Market Intelligence*. Available at: https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/ny-climate-policy-blueprint-outlines-electrification-and-phaseout-of-gas-system-68253987.

[2] New York State Climate Action Council. 2022. "New York State Climate Action Council Scoping Plan." page 49. Available at: https://climate.ny.gov/-/media/project/climate/files/NYS-Climate-Action-Council-Final-Scoping-Plan-2022.pdf.

[3] *Id*. page 179.

[4] *Id*. page 180.

[5] *Id*. page 183.

[6] *Id*. page 180.

This memo provides a summary of our investigation into available distribution capacity (also called distribution headroom) for accommodating future building electrification with a focus on residential space heating electrification. The memo consists of four main sections as follows:

- New York Independent System Operator's (NYISO) electrification load forecasts
- NYISO's heat pump adoption forecasts
- Distribution headroom assessment

Our investigation reveals the following key findings:

- There is adequate distribution headroom to serve additional loads from building electrification, though the available headroom appears to be quite different by utility. A few utilities with higher relative winter loads today may have less winter distribution headroom than others.
- To develop a reasonably accurate picture of distribution, we need to understand both the current winter peak load and grid capacity at the distribution feeder level. However, such data are not readily available. Nevertheless, we were able to achieve a rough sense of the magnitude of distribution headroom by examining the differences between summer and winter peak loads ("summer-winter headroom") today, as well as National Grid's electric vehicle hosting capacity map which provides distribution feeder summer headroom capacity and ratings.
- NYISO projects a significant increase in winter peak loads through 2050, particularly from building electrification. NYISO assumes residential electric heating stocks reach 99 percent of all heating by 2050 in its Policy Scenario that satisfies the climate goals of the CLCPA. The expected loads for the near term are more manageable while still significant: by 2030, NYISO forecasts that the impacts of incremental building electrification grow to about 2,485 megawatts (MW) during the winter (or 10 percent of the total peak load) under the Policy Scenario.
- Conservative summer-winter distribution headroom estimates range from 11 percent (NYS Electric and Gas) to 40 percent (LIPA) above the current summer peak loads, with the statewide average of 26 percent as shown in the table below. When compared to the current winter peak loads, these estimates represent from 12 percent to as high as 66 percent headroom, with a statewide average of 34 percent. Winter peak loads projected by NYISO are expected to exceed these summer-winter-based headroom estimates in 3–11 years with the statewide average of 9 years under NYISO's Policy Scenario.

**Table 1. Grid system headroom up to summer peak loads by utility**

| | Summer Peak 2023 (MW) | Winter Peak 2023-2024 (MW) | Headroom up to summer peak (MW) | Headroom up to summer peak (% of Summer Peak) | Headroom up to summer peak (% growth in winter peak) |
|---|---|---|---|---|---|
| **Central Hudson Gas and Electric** | 971 | 737 | 234 | 24% | 32% |
| **Con Edison** | 11,887 | 8,201 | 3,687 | 31% | 45% |
| **Long Island Power Authority** | 5,051 | 3,043 | 2,008 | 40% | 66% |
| **National Grid** | 6,480 | 5,611 | 868 | 13% | 15% |
| **NYS Electric and Gas** | 2,956 | 2,644 | 312 | 11% | 12% |
| **Orange and Rockland Utilities** | 1,031 | 781 | 250 | 24% | 32% |
| **Rochester Gas and Electric** | 1,424 | 1,140 | 285 | 20% | 25% |
| **Total** | 29,801 | 22,157 | 7,644 | 26% | 34% |

- Feeder-level data from the investor-owned utilities' hosting capacity maps reveal substantial additional distribution capacity beyond the capacity that would be assumed based solely on the gap between today's summer and winter peak loads. The total potential headroom estimates would provide considerable headroom for growth of building electrification ranging from 279 MW (Central Hudson) to as much as 4,477 MW (National Grid), as shown in the table below. When compared to the current winter peak loads, the total headroom estimates range from 29 percent (Con Edison) to as much as 105 percent (National Grid). This capacity is available provided that the new loads are geographically distributed to make maximal advantage of this headroom.

**Table 2. Potential total distribution headroom by utility**

| Utility | Distribution winter peak (MW) | Total estimated winter headroom (MW) | Total headroom (% of rated capacity) | Total headroom (% of winter peak) |
|---|---|---|---|---|
| **National Grid** | 4,276 | 4,477 | 36% | 105% |
| **Central Hudson Gas and Electric** | 796 | 279 | 20% | 35% |
| **NYS Electric & Gas and RGE** | 3,786 | 3,235 | 29% | 85% |
| **Con Edison** | 4,691 | 1,346 | 15% | 29% |
| **Orange and Rockland Utilities** | 1,123 | 1,071 | 31% | 95% |
| **Total** | 14,673 | 10,408 | 28% | 71% |

- With these assumed levels of the total potential headroom, we further estimate that:
    - The current distribution grids could accommodate on average the projected load growth from building electrification through 2033 and as long as 2041 depending on the utility (i.e., for the next 9 to 16 years) under the NYISO Policy Scenario, provided the load is distributed to the locations where the headroom exists; and

- Existing distribution grids could support residential heat pumps reaching roughly 29 percent to 47 percent of the entire heating fuel stock (over the next 9 to 16 years) under the Policy Scenario, with the statewide average of 39 percent (over the next 13 years).

## NYISO Electrification Load Forecasts

### *Scenarios*

NYISO provides load forecasts by NYISO zone in its annual load and capacity data report called the "Gold Book."[7] The most recent forecasts extend to 2054 and incorporate the impacts of electrification from the building and transportation sectors, as well as other demand-side resources such as energy efficiency and solar PV. The Gold Book provides summer and winter load forecasts separately.

NYISO identifies four load forecast scenarios to predict electric load in 2050: Baseline Forecast; Lower Demand Scenario; Higher Demand Scenario; and Policy Scenario. Assumptions that vary between scenarios include population growth, building electrification, EV adoption, economic activity, and more. The Higher Demand and Policy scenarios reflect achievement of the statewide emission reduction targets set by the CLCPA. NYISO's scenarios are meant to represent a range of possible outcomes for energy demand and load management between now and 2054.[8]

The baseline forecast assumes a decline in population to 18 million (or about 90 percent of the current population) by 2050, and a corresponding decline in number of households. The baseline forecast also assumes some energy efficiency improvements, approximately 13,000 MW of newly installed solar PV and 3,000 MW of battery storage by 2050, and over six million EVs on the road by 2040. In the baseline forecast, 76 percent of residential heating will be primarily electric, and 24 percent will be heated primarily with fossil fuels by 2050 (see Table 3 for a further breakdown of heating types). As of 2023, NYISO estimates that residential electric heating and fossil fuel heating account for 14 percent and 86 percent of the total heating demand, respectively.[9]

The Policy Scenario follows the same assumptions as the baseline forecast regarding population decline, solar PV, and battery storage. However, the Policy Scenario assumes a higher level of building electrification, EV adoption, and hydrogen production to achieve state policy targets. This scenario assumes aggressive building electrification which will increase the saturation of residential electric heating to 99 percent by 2050, including 45 percent from full capacity air-source heat pumps (AHSP) and 20 percent from ASHPs with supplemental heating (which are either provided by electric resistance

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[7] NYISO divides the entire state into 11 zones, A-K, as shown in its annual Gold Book reports, available on its website at https://www.nyiso.com/gold-book-resources.

[8] New York Independent System Operator (NYISO). 2024. *Gold Book: Load & Capacity Data*. page 13. Available at: https://www.nyiso.com/documents/20142/2226333/2024-Gold-Book-Public.pdf/170c7717-1e3e-e2fc-0afb-44b75d337ec6.

[9] NYISO. 2024. page 15.

heating or fossil fuel heating), as shown in Table 3. The Policy Scenario additionally assumes that there will be seven million EVs on the road by 2040 and significant peak load reductions from managed EV charging and aggressive energy efficiency programs. We use the Policy Scenario as the primary scenario for our analysis in this memo.

The Lower Demand and Higher Demand Scenarios are modeled to show the upper and lower bounds of the state's load forecast. The Lower Demand Scenario assumes slower economic growth, fewer EVs, and greater EV managed charging. Further, Lower Demand Scenario assumes only 64 percent saturation of electric heating and 36 percent from primary fossil fuel heating by 2050 (See Table 3). In contrast, the Higher Demand Scenario assumes greater population and economic growth, the same level of EV adoption and hydrogen production as the Policy Scenario, additional large load projects, less EV managed charging, and 89 percent saturation of electric heating by 2050.[10] The Higher Demand Scenario demonstrates a future with a higher load demand and less peak-mitigation, while the Lower Demand Scenario demonstrates a future with less overall load demand and greater peak-mitigation.

**Table 3. NYISO forecasted residental space heating shares in 2050**

| Heating type | Baseline Forecast | Lower Policy Demand Scenario | Higher Policy Demand Scenario | Policy Scenario |
|---|---|---|---|---|
| Electric heating | 76% | 64% | 89% | 99% |
| Incremental full capacity ASHP* | 35% | 28% | 40% | 45% |
| Incremental ASHP with supplemental heat | 15% | 15% | 20% | 20% |
| Incremental GSHP** | 5% | 2% | 5% | 5% |
| Incremental primary electric resistance heat | 7% | 5% | 10% | 15% |
| Electric heating as of 2023 | 14% | 14% | 14% | 14% |
| Primary fossil fuel heating | 24% | 36% | 11% | 1% |

*Notes: "Incremental" in the table refers to incremental heating fuel-shifting from the current fossil fuel heating stock. *ASHP is air-source heat pump. ** GSHP is ground-source heat pump.*

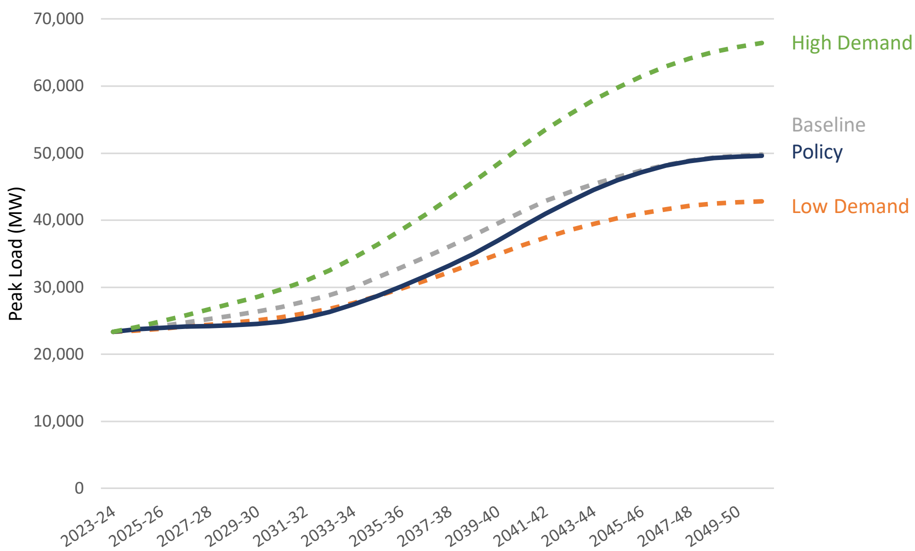
### *Load forecasts by zone and utility service territory*

Figure 1 and Figure 2 compare forecasted winter and summer peak load across all three scenarios. Current peak load across the state is around 23,000 MW in the winter and 31,000 MW in the summer. NYISO's Policy Scenario projects that winter electric peak load will increase by approximately 6.5 percent by 2030 and 112 percent by 2050 (reaching 27,000 MW in 2030 and almost 50,000 MW in 2050). The summer peak load is projected to remain relatively stable through 2030 and increase 21 percent by 2050 (reaching almost 38,000 MW in 2050). NYISO expects that statewide winter peak loads will exceed projected summer peak loads in 2038, and winter peak load will exceed the *current* summer peak loads in 2036.

[10] Ibid.

NYISO's load baseline forecast is similar to the Policy Scenario: a 113 percent increase in winter peak load and a 22 percent increase in summer peak load by 2050.[11] The Lower Demand Scenario forecasts an 83 percent increase in winter peak load and 9 percent increase in summer peak load, and the Higher Demand Scenario forecasts a 182 percent increase in winter peak load and 50 percent increase in summer peak load.[12] NYISO projects that winter peak loads will exceed projected summer peak loads in 2038 under the Lower Demand Policy Scenario and in 2035 in the Higher Demand Policy Scenario.

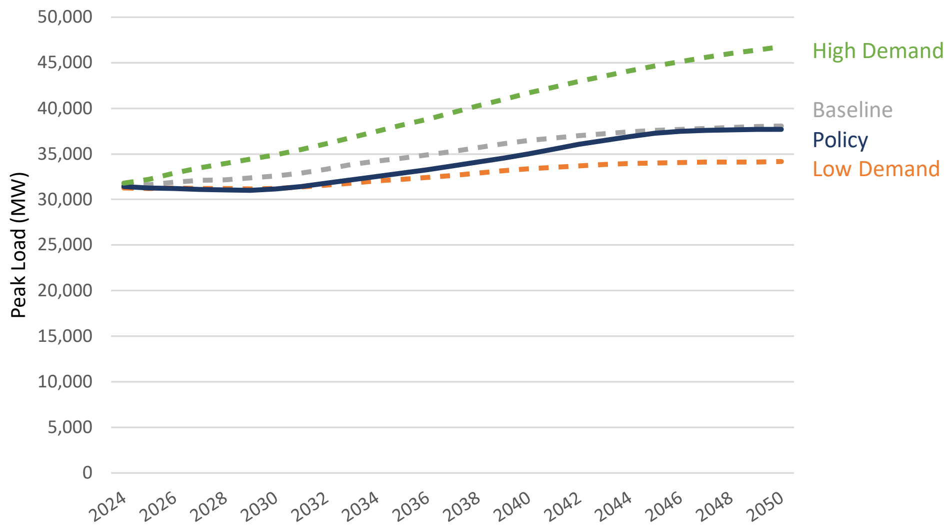
**Figure 1. Winter peak load forecasts by scenario**




[11] The baseline forecast projects an increase in total winter peak load from 23,370 to 49,640 MW and an increase in total summer peak load from 31,288 to 38,080 between 2023 and 2050.

[12] The Low Demand Scenario forecasts an increase in total winter peak load from 23,370 to 42,710 MW and an increase in total summer peak load from 31,288 to 34,140 MW between 2023 and 2050; the High Demand Scenario forecasts an increase in total winter peak load from 23,370 to 65,870 MW and an increase in total summer peak load from 31,288 to 46,760 MW between 2023 and 2050.

**Figure 2. Summer peak load forecast by scenario**



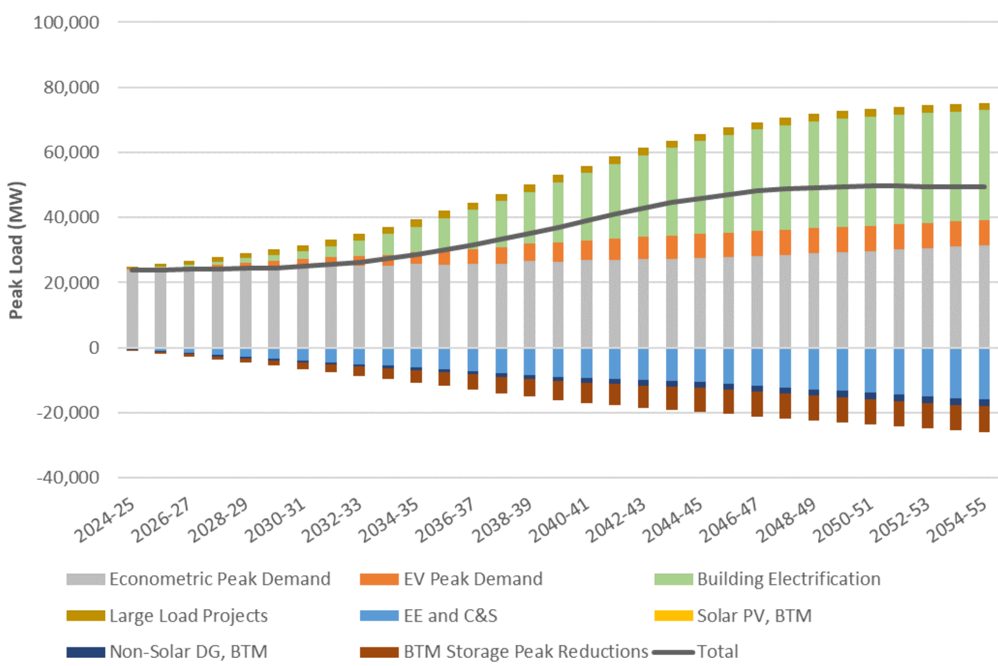

Under the Policy Scenario, NYISO projects that peak load impacts from incremental building electrification (that is, beyond the 2023–2024 winter level of electrification) will increase from 174 MW for the winter of 2024–2025 to about 2,485 MW in the winter of 2030–2031 (accounting for 10 percent of total load) and reaching 33,627 MW in the winter of 2050–2051 (accounting for 68 percent of total load).[13] The impacts of building electrification on summer peak load are substantially smaller compared to winter peak load in 2050. Building electrification is forecasted to contribute around 3,000 MW to summer peak load in 2050, roughly 8 percent of total summer peak load (e.g., due to increased saturations of active cooling associated with heat pump deployment, as well as induction cooking).[14]

Incremental building electrification load is expected to increase dramatically across all scenarios between 2024 and 2050. The light green segment in Figure 3 demonstrates the scale of change due to building electrification forecasted in the Policy Scenario. Building electrification is expected to have the biggest impact on load relative to all other sectors.

[13] NYISO. 2024. Table I-17c.

[14] NYISO. 2024. Table I-17b.

**Figure 3. Policy Scenario winter peak forecast for all sectors**




In 2030, NYISO projects EV-related load to account for 4 to 8 percent of total peak load in the summer and the winter under the Policy Scenario forecast, compared to current levels at which EVs comprise less than 1 percent of total peak load. By 2050 under the Policy Scenario, EV-related load increases to about 16 percent of summer and winter peak load.[15]

In addition to sector-specific load forecasts, NYISO provides load forecasts for each NYISO load zone. NYISO divides the state into 11 geographic zones and provides load data for each zone. A zone may encompass one or more electric utilities. Figure 4 below provides NYISO's Policy Scenario forecast by zone. Zone J, representing New York City, has the largest peak load in the state, accounting for over 30 percent of the state peak load. The second largest zone is Zone K representing Long Island. Figure 5 below shows NYISO's load zone map.

[15] In megawatts, EVs currently contribute 313 MW to winter peak load and 169 MW to summer peak load. Under the Policy Scenario this will increase to 7,855 MW in the winter and 5,976 MW in the summer by 2050.

**Figure 4. Policy Scenario forecast winter peak load by load zone**

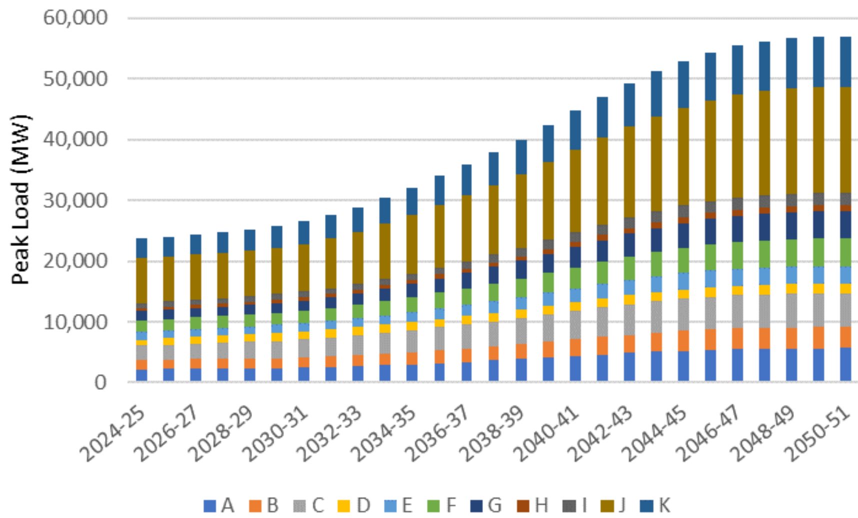
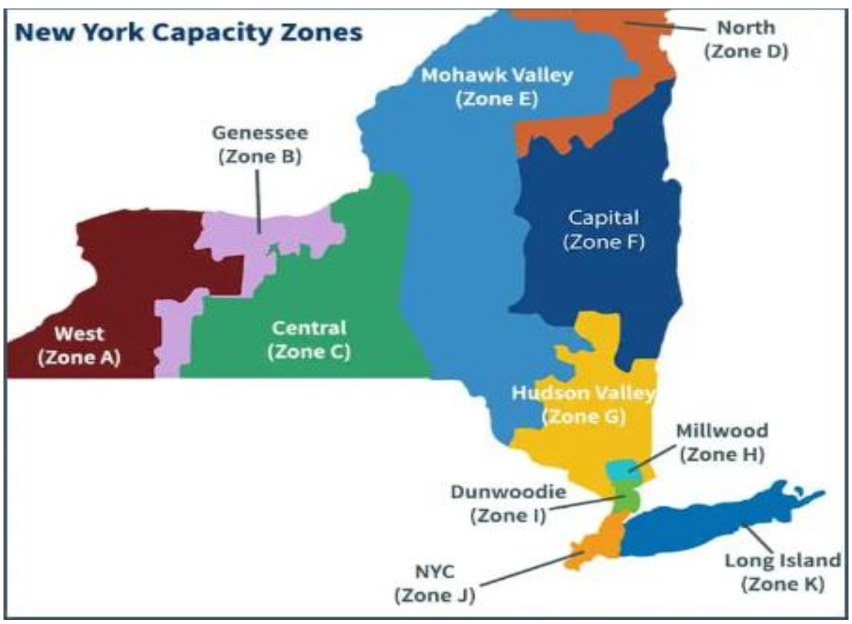



**Figure 5. NYISO load zone map**

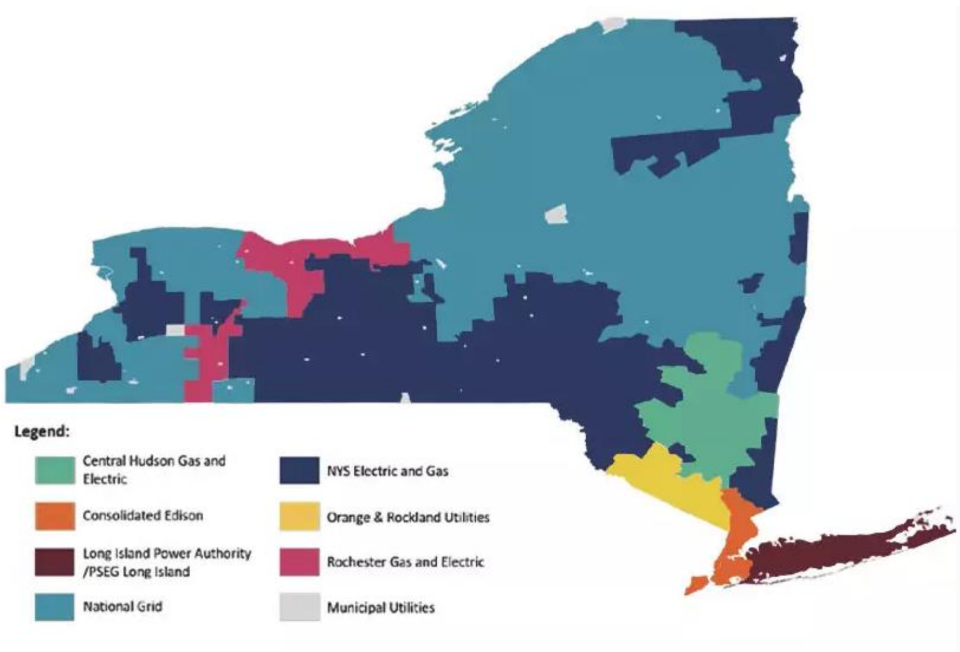



*Source: Best Practice Energy. "NYISO Capacity Zones." Available at:*
*https://bestpracticeenergy.com/2020/04/02/new-york-electricity-supply-price-components/*

Based on NYISO's zonal peak load forecasts and the current share of utility peak load across NYISO zones, we developed a forecast of peak loads by utility service area (See Figure 7). To convert NYISO's zonal data into utility service areas, we used NYISO's estimate of the allocation of the current zonal peak load by utility service area in megawatts and developed what percentage of each zone is allocated to which utility.[16] We applied the percentage allocations to the NYISO forecast data to find each utility's share of total load.

Our analysis focuses on the seven main electric distribution utilities operating in New York: namely Consolidated Edison (Con Edison), Central Hudson, Long Island Power Authority (LIPA), National Grid, New York State Electric & Gas (NYSEG), Orange & Rockland (O&R), and Rochester Gas & Electric (RG&E). Figure 6 provides a map of New York utility service areas. According to the U.S. Energy Information Administration (EIA), these utilities account for roughly 98 percent of the total state electricity load; a handful of municipal utilities account for the remaining 2 percent.[17]

**Figure 6. New York utility service area map**



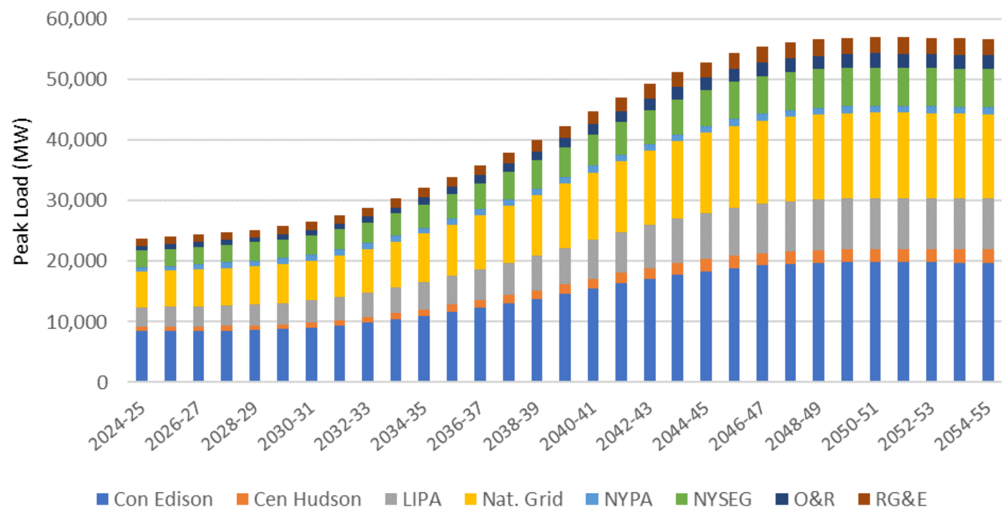

*Source: MyHEABlog. "New York State Energy Efficiency & Rebate Guide." Available at:* *https://blog.myheat.ca/energy-efficiency-in-new-york/*

The figures below show the results of our zone-to-utility conversion, displaying the total winter peak load forecast for each of the three scenarios. Con Edison (serving New York City and Westchester County) serves the largest load in the state, accounting for over 35 percent of the total load in the state. The second largest utility is National Grid that serves about 25 percent of the total load in the state.

[16] Max Schuler. 2023. "2024 ICAP Forecast." Load Forecasting Task Force of NYISO. Slide 23. Available at: https://www.nyiso.com/documents/20142/41827058/01%202024%20ICAP%20Forecast.pdf/5024d1b3-5ab1-0e8c-03e9-4a0bf850f384.

[17] U.S. Energy Information Administration. 2022. "Annual Electric Power Industry Report, Form EIA-861." Available at: https://www.eia.gov/electricity/data/eia861/.

**Figure 7. Policy Scenario forecast winter peak load by utility**




## New York ISO's Heat Pump Adoption Forecasts

While NYISO does not provide heat pump penetration forecasts by utility territory, it provides statewide forecasts and targets for heat pump stocks along with other heating systems for 2050 that NYISO modeled in its load forecasts, as discussed above (see Table 3). We developed a high-level forecast of residential heat pump deployment by utility territory based on NYISO's 2050 space heating system stock targets and the existing space heating stock data provided by NYISO.

NYISO primarily relied on end-use load data from the National Renewable Energy Laboratory (NREL) to develop the current share of space heating stock per utility.[18] Table 4 provide NYISO's estimate of the heating stock share by utility in 2018 in number of households that NYISO developed in 2023 primarily based on NREL's end-use load database. As shown in Table 4, Con Edison has the largest number of households among all utilities, accounting for nearly half of the total households in the state. Con Edison's service area also has the largest number of households with fossil fuel heating, accounting for about half of all households using fossil fuel heating in the state. The next largest utilities by number of households are National Grid, NYS Electric and Gas (NYSEG), and Long Island Power Authority (LIPA). Among these utilities, LIPA has more than twice as many households with fuel oil heating as the households in the other two utilities.

[18] Arthur Maniaci. 2023. "2023 Long Term Preliminary Forecast Assumptions - Heat Pump Electrification." March 3. NYISO. Available at: https://www.nyiso.com/documents/20142/36599444/2023_Heat_Pump_Energy_Analysis_R3_ESPWG.pdf/e54c223e-a26a-a924-44aa-dc1087ce48a6.

**Table 4. NYISO's estimates of heating stock share by utility in 2018 (# of households)**

| | Electricity | Natural Gas | Fuel Oil | Propane | Other Fuel | None | Grand Total |
|---|---|---|---|---|---|---|---|
| **Central Hudson Gas and Electric** | 29,298 | 52,058 | 117,676 | 17,918 | 15,254 | 0 | 232,204 |
| **Con Edison** | 434,625 | 2,365,862 | 857,870 | 47,700 | 46,973 | 52,542 | 3,805,572 |
| **Long Island Power Authority** | 57,143 | 496,853 | 458,838 | 17,191 | 5,085 | 969 | 1,036,079 |
| **National Grid** | 190,557 | 735,594 | 211,865 | 98,547 | 99,274 | 969 | 1,336,806 |
| **NYS Electric and Gas** | 123,971 | 634,383 | 163,923 | 72,881 | 71,187 | 242 | 1,066,587 |
| **Orange and Rockland Utilities** | 21,792 | 164,165 | 47,458 | 6,780 | 3,874 | 0 | 244,069 |
| **Rochester Gas and Electric** | 62,470 | 326,877 | 18,402 | 19,128 | 13,559 | 726 | 441,162 |
| **Total** | 919,856 | 4,775,792 | 1,876,032 | 280,145 | 255,206 | 55,448 | 8,162,479 |

*Source: Arthur Maniaci. 2023. "2023 Long Term Preliminary Forecast Assumptions - Heat Pump Electrification." NYISO. March 3.*

Table 5 shows the heating stock share in percentage of the total household by utility based on Table 4. The share of fossil fuel heating ranges from approximately 80 percent (National Grid and Central Hudson Gas and Electric) to nearly 95 percent (LIPA). Electric heating shares range from 6 percent (LIPA) to as high as 14 percent (Rochester Gas and Electric) with the state average share of 11 percent. According to the EIA's 2020 Residential Energy Consumption Survey (RECS), about 3 percent of the households had central heat pumps across the state. This means that about 8 percent of the state's households (11 percent for all electricity heating minus 3 percent for all electric heat pumps) have electric resistance heating systems.[19] Note that NYISO's latest estimate of electric heating share is 14 percent based on NYISO 2024 Gold Book. For the purpose of our analysis, we assume the electric heating stock share increased from 11 percent in 2022 to 14 percent in 2023.

**Table 5. NYISO's estimates of heating stock share by utility in 2018 (% of households)**

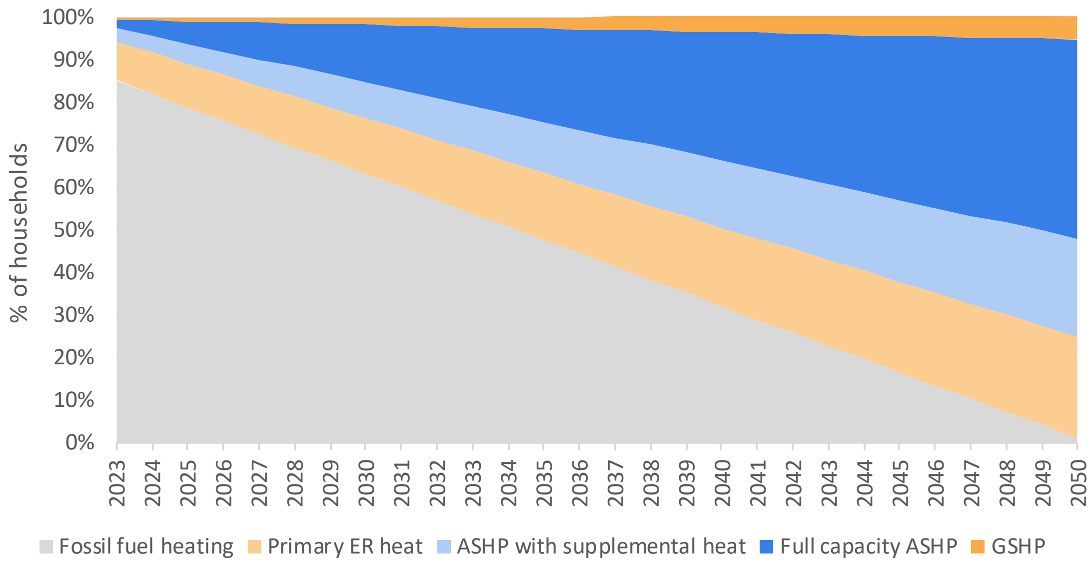
| | Electricity | Fossil fuel | Other Fuel | None |
|---|---|---|---|---|
| **Central Hudson Gas and Electric** | 13% | 81% | 7% | 0% |
| **Con Edison** | 11% | 86% | 1% | 1% |
| **Long Island Power Authority** | 6% | 94% | 0% | 0% |
| **National Grid** | 14% | 78% | 7% | 0% |
| **NYS Electric and Gas** | 12% | 82% | 7% | 0% |
| **Orange and Rockland Utilities** | 9% | 89% | 2% | 0% |
| **Rochester Gas and Electric** | 14% | 83% | 3% | 0% |
| **Total** | 11% | 85% | 3% | 1% |

*Source: Arthur Maniaci. 2023. "2023 Long Term Preliminary Forecast Assumptions - Heat Pump Electrification." NYISO. March 3.*

To develop changes in heating fuel stock share through 2050 for each utility, we first assumed that the heating fuel stocks change linearly at the statewide level towards NYISO's 2050 heating stock targets under the Policy Scenario (shown in Table 3). The resulting stock changes are shown in Figure 8.

[19] U.S. Energy Information Administration. 2023. "Highlights for space heating in U.S. homes by state, 2020" for the 2020 Residential Energy Consumption Survey (RECS). Available at: https://www.eia.gov/consumption/residential/data/2020/state/pdf/State%20Space%20Heating.pdf.

**Figure 8. Statewide residental space heating shares through 2050 –Policy Scenario**




We then made the following changes to the statewide heating stock share to develop utility-specific heating fuel stock shares:

- Increase the share of electric resistance (ER) heating stock from the current shares across all utilities proportionally using NYISO's statewide ER stock share trajectory toward 2050;
- Increase the heat pump stock share for all utilities proportionally using NYISO's statewide heat pump stock share trajectory toward 2050 and slightly adjust the stock share for each utility to make up for the differences in ER heating stock share between each utility and the statewide total;
- Decrease the fossil heating fuel stock share for all utilities proportionally using NYISO's statewide heat pump stock share trajectory toward 2050 and slightly adjust the stock share for each utility to make up for the differences in ER heating stock share between each utility and the statewide total; and
- Adjust the total number of households based on NYISO's population growth rates through 2050.

Table 6 below shows our estimates of the final heating stock share in 2050 by utility under the Policy Scenario.

Table 6. 2050 heating stock share by utility under the Policy Scenario (% of households)

| | Full capacity ASHP | ASHP with supplemental heat | Primary ER heat | GSHP | Fossil fuel heating |
|---|---|---|---|---|---|
| Central Hudson Gas and Electric | 44% | 22% | 28% | 5% | 1% |
| Con Edison | 47% | 23% | 24% | 5% | 1% |
| Long Island Power Authority | 54% | 27% | 11% | 6% | 1% |
| National Grid | 42% | 21% | 32% | 5% | 1% |
| NYS Electric and Gas | 46% | 22% | 26% | 5% | 1% |
| Orange and Rockland Utilities | 50% | 25% | 19% | 6% | 1% |
| Rochester Gas and Electric | 43% | 21% | 30% | 5% | 1% |
| Statewide | 47% | 23% | 24% | 5% | 1% |

Table 7 below shows our estimates of the heating stock share in 2030 by utility under the Policy Scenario. The share of ASHPs reaches approximately 20 percent with 13 to 15 percent provided by full capacity ASHPs (which do not rely on backup or supplementing heating) and 8 to 9 percent by ASHPs with supplemental heating. These shares represent a significant increase in ASHP stocks given the current share of about 3 percent as mentioned above.[20]

Table 7. 2030 heating stock share by utility under the Policy Scenario (% of households)

| | Full capacity ASHP | ASHP with supplemental heat | Primary ER heat | GSHP | Fossil fuel heating |
|---|---|---|---|---|---|
| Central Hudson Gas and Electric | 13% | 8% | 15% | 2% | 62% |
| Con Edison | 14% | 8% | 13% | 2% | 63% |
| Long Island Power Authority | 15% | 9% | 6% | 2% | 68% |
| National Grid | 13% | 8% | 17% | 2% | 60% |
| NYS Electric and Gas | 13% | 8% | 13% | 2% | 63% |
| Orange and Rockland Utilities | 14% | 9% | 10% | 2% | 65% |
| Rochester Gas and Electric | 13% | 8% | 16% | 2% | 61% |
| Statewide | 14% | 8% | 13% | 2% | 64% |

## Distribution Headroom Assessment

### *A summary of data sources*

Estimating the available additional capacity on the distribution grid allows us to estimate how much additional electric load from future building electrification the grid can handle in its current state (and

[20] U.S. Energy Information Administration. 2023.

the corresponding number of newly electrified homes). To assess distribution headroom, we first investigated several available data sources. We provide a brief summary of these data sources below:

- **NYISO zonal peak load data**: NYISO provides summer and winter peak load forecasts for each load zone across the state (i.e., Zones A to K). [21] NYISO's forecasts start with the current zonal peak loads. Thus, we could estimate available headroom up to the summer peak loads by comparing the current summer and winter peak loads. This method assumes that the geographic distribution of winter peak loads within each utility territory is comparable to the distribution of summer peak loads. This is a reasonable assumption because both summer and winter peaks are driven by HVAC loads in the same building stock.

- **Investor-owned utilities' hosting capacity maps and headroom analysis for building decarbonization**: All of the investor-owned utilities have developed and are maintaining their Electric Vehicle Charging Capacity Maps to comply with the Commission's order on July 16, 2020 in Case 18-E-0138.[22] These maps provide detailed feeder information (such as feeder ratings, peak loads, and EV capacity headroom for each feeder) and color-code feeders to indicate the level of available headroom.[23] The Commission's "Order Directing Energy Efficiency and Building Electrification Proposals" dated on July 20, 2023 in Case No. 18-M-0084) directs the electric utilities, in consultation with Staff, to create "Electrification Load Serving Capacity Maps" within 180 days of the Order that expand upon the already existing EV hosting capacity maps required by Case 18-E-0138.[24] The investor-owned utilities updated their online hosting capacity maps with their headroom analysis of building electrification in January 2024.

### *Approach 1: Summer-winter load analysis*

To get a reasonably accurate picture of distribution headroom for building electrification, we need to understand both the current winter peak load and grid capacity at the distribution-feeder level. An alternative, high-level (and less accurate) conservative approach is to examine the difference between the current summer and winter peak load for utility service territories as a whole. In this section, we first provide our analysis of distribution headroom using this higher-level approach and then identify the years in which projected winter peak loads are projected to exceed the current summer peak loads. [25]

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[21] NYISO. 2024.

[22] Case 18-E-0138. *Electric Vehicle Supply Equipment and Infrastructure*, Order Establishing Electric Vehicle Make-Ready Program and Other Programs. (July 16, 2020). Available at: https://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=18-E-0138&CaseSearch=Search.

[23] The EV hosting capacity maps are available at: https://jointutilitiesofny.org/utility-specific-pages/hosting-capacity.

[24] Case 18-M-0084: Order Directing Energy Efficiency and Building Electrification Proposals (July 20, 2023). Available at: https://documents.dps.ny.gov/public/MatterManagement/MatterFilingItem.aspx?FilingSeq=310211&MatterSeq=55825.

[25] For the purpose of this analysis, we used the current summer peak over projected summer peak load because NYISO forecasts more or less flat summer peak loads over the next decade under the baseline forecast and the Higher Demand Policy Scenario and lower summer peak loads under the Lower Demand Policy Scenario.

As mentioned above, NYISO provides load forecasts at the NYISO load zone level for summer and winter coincident peak load. Using this data, we estimated available additional grid headroom up to the summer peak at the zonal level by comparing the current summer and winter peak loads. However, it is important to note that this represents a very conservative estimate of grid headroom as it excludes additional capacity available above the current summer peak. As shown in Table 8 below, we found that all NYISO load zones have higher peak loads in the summer than in the winter, indicating some headroom in all zones up to the summer peak loads except Zone E[26] and Zone D.[27] The headroom estimates (excluding Zone D and Zone E) range from 10 percent to as high as 40 percent relative to the current summer peaks. These estimates represent 11 percent to as high as 66 percent headroom above the current winter peak loads as shown under the "Headroom up to summer peak (% growth in winter peak)" category in Table 8.

**Table 8. Grid system headroom up to summer peak loads by NYISO load zone**

| NYISO load zone | Summer peak in 2023 (MW) | Winter peak in 2023-24 (MW) | Headroom up to summer peak (MW) | Headroom up to summer peak (% of summer peak) | Headroom up to summer peak (% growth in winter peak) |
|---|---|---|---|---|---|
| **A - West** | 2,492 | 1,988 | 504 | 20% | 25% |
| **B - Genessee** | 1,822 | 1,458 | 364 | 20% | 25% |
| **C - Central** | 2,623 | 2,364 | 259 | 10% | 11% |
| **D - North** | 558 | 822 | -264 | -47% | -32% |
| **E - Mohawk Valley** | 1,186 | 1,294 | -108 | -9% | -8% |
| **F - Capital** | 2,197 | 1,779 | 418 | 19% | 23% |
| **G - Hudson Valley** | 2,017 | 1,528 | 489 | 24% | 32% |
| **H - Millwood** | 664 | 494 | 170 | 26% | 34% |
| **I - Dunwoodie** | 1,239 | 853 | 386 | 31% | 45% |
| **J - NYC** | 10,357 | 7,131 | 3,226 | 31% | 45% |
| **K - Long Island** | 5,051 | 3,043 | 2,008 | 40% | 66% |
| **Total** | 30,206 | 22,754 | 7,452 | 25% | 33% |

We then applied the same zone-to-utility allocation method previously discussed to translate NYISO's zonal load forecast data into a utility load forecast and estimated distribution headroom up to the summer peak load by utility service area, as shown in Table 9.[28] Most utility service areas have plenty of grid headroom up to the current summer peak, ranging from 11 percent (NYS Electric and Gas) to 40

[26] It is likely the relatively higher electric heating share in Zone E is one of the factors contributing to the higher winter peaks in Zone E relative to other zones.

[27] Zone D covers most of the North region, and for which load is served mainly by New York Power Authority (NYPA) and driven by transmission-connected industrial rather than building HVAC uses.

[28] The state total in Table 9 does not match with the state total in Table 8 because Table 9 excludes some loads that New York Power Authority is directly serving in Zone D.

percent (LIPA) of the current summer peaks with the statewide average of 26 percent.[29] These estimates represent 12 percent to as high as 66 percent headroom relative to the current winter peak loads, with a statewide average of 34 percent.

**Table 9. Grid system headroom up to summer peak loads by utility**

| | Summer Peak 2023 (MW) | Winter Peak 2023-2024 (MW) | Headroom up to summer peak (MW) | Headroom up to summer peak (% of Summer Peak) | Headroom up to summer peak (% growth in winter peak) |
|---|---|---|---|---|---|
| **Central Hudson Gas and Electric** | 971 | 737 | 234 | 24% | 32% |
| **Con Edison** | 11,887 | 8,201 | 3,687 | 31% | 45% |
| **Long Island Power Authority** | 5,051 | 3,043 | 2,008 | 40% | 66% |
| **National Grid** | 6,480 | 5,611 | 868 | 13% | 15% |
| **NYS Electric and Gas** | 2,956 | 2,644 | 312 | 11% | 12% |
| **Orange and Rockland Utilities** | 1,031 | 781 | 250 | 24% | 32% |
| **Rochester Gas and Electric** | 1,424 | 1,140 | 285 | 20% | 25% |
| **Total** | 29,801 | 22,157 | 7,644 | 26% | 34% |

We can compare our headroom estimates to the forecasted winter peak load for utilities (shown in Figure 7) to find the expected year in which a utility's winter peak load demand will surpass its current summer peak load. The results of this analysis give us a conservative estimate of the year in which a utility's peak electric demand goes beyond the capacity of today's grid.

Table 10 shows our estimates of when utilities are projected to see winter peak load reaching their summer-winter peak load headroom under the Policy Scenario. National Grid and NYS Electric and Gas exhaust our conservative estimate of their summer-winter headroom in the next four and six years (winter of 2030-2031 and 2028-2029, respectively). Other utilities reach their summer-winter headroom thresholds only after 2033 or later. Overall, winter loads are expected to exceed the current summer peak loads in 4 to 12 years from the current year, with a statewide average of 10 years.

[29] Most of the electricity NYPA manages is purchased from other utilities in the state. The load for NYPA that appears in this table is NYPA's load in Zone D (the North region) which represents the only retail load that NYPA directly serves.

**Table 10. Policy Scenario – summer-winter headroom limits by utility**

| Utility | Headroom up to summer peak (MW) | Headroom up to summer peak (% growth in winter peak) | Year headroom limit is reached |
|---|---|---|---|
| **Central Hudson Gas and Electric** | 234 | 32% | 2033-34 |
| **Con Edison** | 3,687 | 45% | 2036-37 |
| **Long Island Power Authority** | 2,008 | 66% | 2036-37 |
| **National Grid** | 868 | 15% | 2030-31 |
| **NYS Electric and Gas** | 312 | 12% | 2028-29 |
| **Orange and Rockland Utilities** | 250 | 32% | 2033-34 |
| **Rochester Gas and Electric** | 285 | 25% | 2033-34 |
| **Total** | 7,644 | 34% | 2034-35 |

### *Approach 2: Building electrification hosting capacity maps*

Summer and winter peak load differences do not present the full picture of total distribution headroom because the distribution grids have additional capacity beyond the current summer peak loads. Some distribution feeders may have plenty of space if they were recently rebuilt or serve relatively low-load areas. Other feeders may be reaching close to a load-carrying threshold at which utilities may need to start planning for upgrades. Overall, most distribution feeders should have more capacity available to carry additional load beyond the current summer peak loads.

As we mentioned above, New York utilities' analysis of grid headroom for building electrification was released in January 2024.[30] We used the published data to investigate grid headroom for each major utility (National Grid, Central Hudson, Con Edison, Orange & Rockland, and NYS Electric & Gas and RGE) in detail. We extracted the underlying data for summer and winter headroom for three-phase feeders, as published in each utility's electrification hosting capacity map. In their capacity map databases, three utilities (National Grid, Central Hudson, and NYS Electric & Gas/RGE) provide winter and summer headroom, winter and summer peak load, and rated capacity at the feeder level. Two utilities (Con Edison and Orange & Rockland) provide winter and summer headroom at the feeder level, but do not provide any data for winter and summer peak load or rate capacity at the feeder level although they provide substation-level peak load estimates. Calculating available headroom for these two groups of utilities thus required different approaches, described below.

For each utility with feeder-level peak load data, we analyzed the total reported headroom as a percentage of the feeder rating for each of the utility's distribution feeders. Some feeders have nearly

[30] Utility hosting capacity and electrification maps available at: https://jointutilitiesofny.org/utility-specific-pages/hosting-capacity

100 percent capacity available, implying that the feeder is not currently used. In contrast, there may be other feeders that do not have any available headroom. To account for this, we made two adjustments:

- Distribution reserve margin: utilities typically apply a certain reserve capacity margin to the distribution ratings to allow for additional capacity under contingency conditions and/or for lead time until distribution systems need to be upgraded. For the purpose of our analysis of distribution headroom, we assume a 20 percent distribution reserve margin. That is, a feeder that is 80 percent loaded is considered to have no available headroom.

- Backup feeders: Based on our experience reviewing distribution feeder data, some feeders with plenty of available capacity are reserved as backup to support adjacent feeders in case of emergencies. For the purpose of determining such feeders, we assumed that any feeders that are currently used only at or less than 15 percent of their capacity ratings (meaning 85 percent or more of the total capacity is available) are used as backup feeders and won't be available for serving additional load.

We estimated available distribution capacity/distribution headroom after excluding the two types of distribution feeders mentioned above.

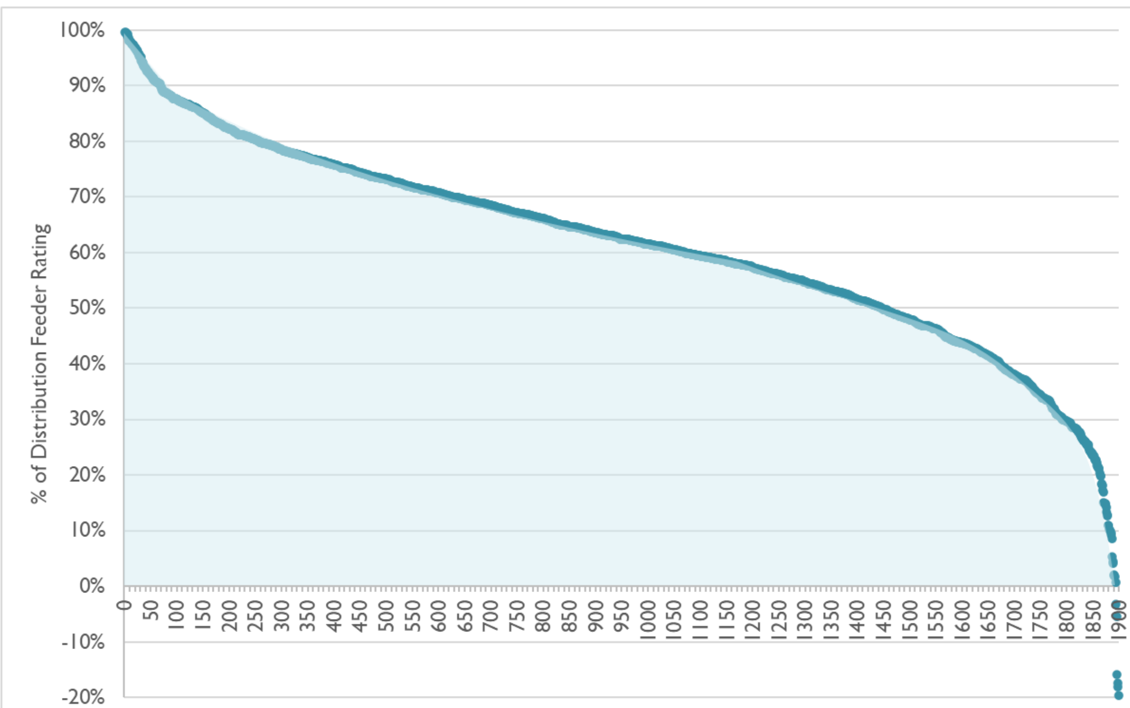
Finally, we attempted to estimate a weighted average distribution headroom across all available feeders. The first, simple approach was to simply sum the available headroom (leaving a 20 percent margin on each available feeder) across all feeders. However, this approach risks overloading substations. Substations are built with the expectation that the loads on the different feeders served by the substation will not all peak at the same time. This load diversity allows the capacity of substations to be lower than the sum of the expected or rated peaks on each of their feeders. It also means that a coincident winter peak on all feeders at once might overload the substation. To account for this, we aggregated the feeder peak loads by the associated substation and assessed whether each substation has headroom by comparing this aggregated feeder-level peak load with the substation bank rating. We then re-calculated the total headroom to only include headroom for feeders on substation banks that have available headroom.

We took a different approach for Con Edison and Orange & Rockland because these utilities do not provide feeder-specific peak load data in their hosting capacity maps. Because we didn't have feeder-level peak load or feeder rating, we could not screen out backup feeders or adjust the headroom to account for the distribution reserve margin. Instead, we aggregated the feeder-level headroom for these utilities by substation, to estimate headroom as a percent of total substation peak load and substation rated capacity. Below, we describe the results and methodology for each utility in further detail.

### *National Grid*

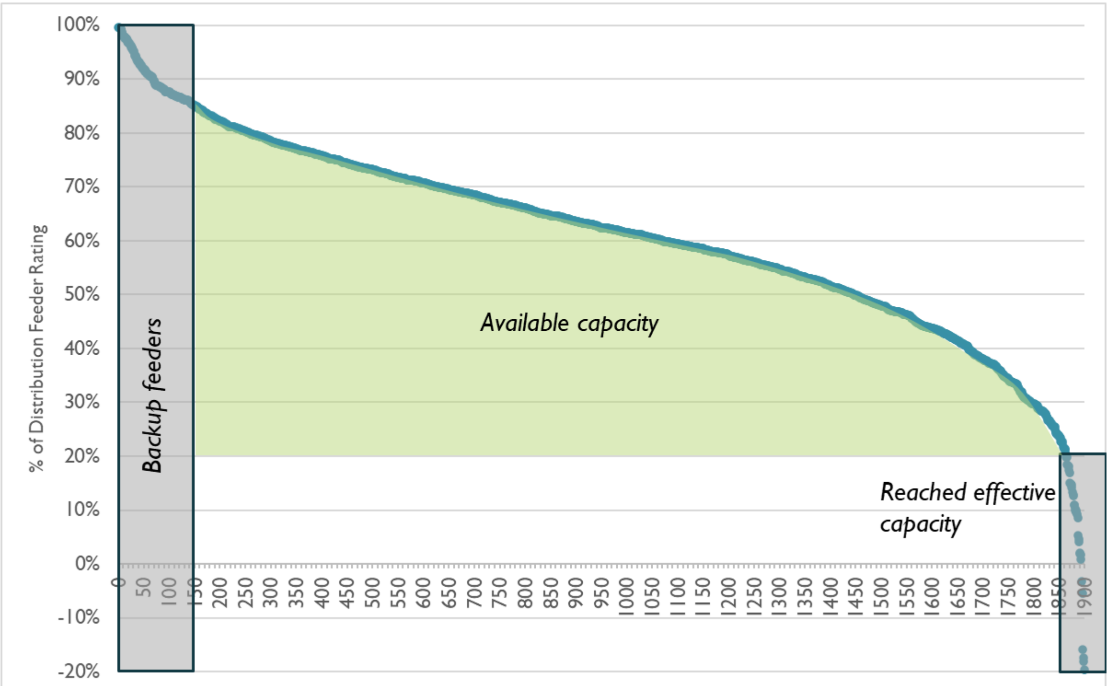
Our investigation of National Grid's electrification hosting capacity revealed that there is plenty of available distribution capacity across the utility's distribution feeders.[31] Figure 9 below shows the total available headroom as percentage of the feeder rating for each of the distribution feeders (approximately 1,900 feeders) operated by National Grid. One feeder (the feeder #1 in Figure 9) has 100 percent capacity availability, implying that the feeder is not currently used. There are several feeders on the far-right side of Figure 9 that do not have any headroom. Overall, approximately 98 percent of all feeders (about 1,863 feeders) have plenty of "unused" capacity above a typical distribution reserve margin of 20 percent of the total feeder capacity. Figure 10 shows available distribution capacity/distribution headroom excluding a 20 percent reserve margin from all feeders and all feeders that likely serve as backup feeders as mentioned above. In sum, approximately 90 percent of the feeders have distribution headroom ranging from above 20 percent to 85 percent of the total distribution ratings.

**Figure 9. National Grid distribution headroom**




[31] National Grid. n.d. "National Grid New York System Data Portal," "Electrification Capacity" tab, available at: https://systemdataportal.nationalgrid.com/NY/.

Figure 10. National Grid distribution headroom, excluding certain feeder categories




We calculated a weighted average distribution headroom across all feeders in two ways, as described above. By summing the available headroom, we found that approximately 48 percent of the rated capacity is available for increased load on average across all feeders, or approximately 4.8 GW of headroom available. This means that winter peak loads up to 92 percent higher than current summer peak loads could be accommodated by the feeders, based on their rated capacity.

However, this approach risks overloading substations. As mentioned above, substations are built with the expectation that the loads on the different feeders served by the substation will not all peak at the same time. This load diversity allows the capacity of substations to be lower than the sum of the expected or rated peaks on each of their feeders. It also means that a coincident winter peak on all feeders at once might overload the substation. To account for this, we used the substation transformer data presented in National Grid's electrification hosting capacity map to estimate the headroom on each substation transformer bank. We then re-calculated the headroom using the smaller of the feeder and substation headroom. Using this approach, we calculated that up to 36 percent of the rated capacity (or 105 percent of the current winter peak load) could be accommodated on today's feeders and substation banks.

### *Central Hudson Gas and Electric*

Figure 11 below shows the feeder winter headroom as a percentage of feeder rating for Central Hudson.[32] 81 percent of feeders have available capacity based on the 20 percent distribution reserve

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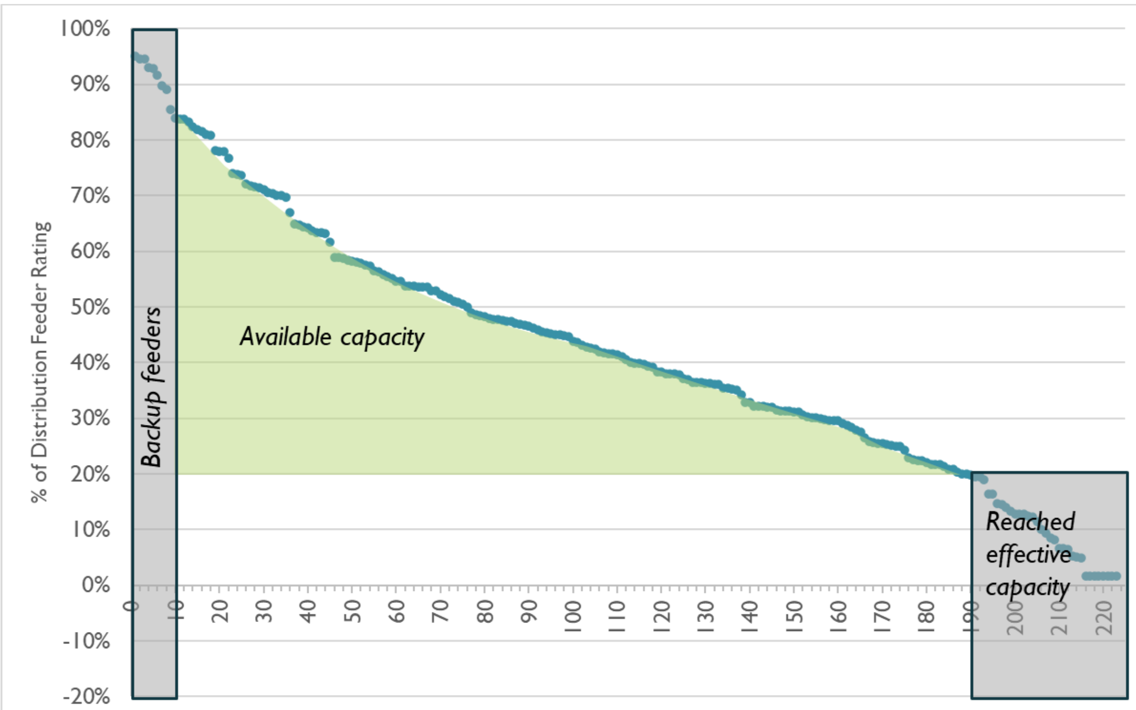
[32] Central Hudson Gas & Electric. n.d. "Electrification Hosting Capacity." Available at: https://gis.cenhud.com/gisportal/apps/webappviewer/index.html?id=5a5e7bce9ebb4e108b85b75de451927d.

margin and backup feeder threshold of 85 percent. Under these constraints, we find that 22 percent of the rated capacity is available for increased winter load on all feeders. If we also account for the available headroom on Central Hudson's substation transformer banks, we find that 20 percent of the rated capacity or 279 MW of winter headroom is available on non-backup distribution feeders where both the feeder and substation have headroom. This means that winter peak loads up to 35 percent higher than current winter peak loads could be accommodated by the feeders.

**Figure 11. Central Hudson distribution headroom, excluding certain feeder categories**




### *NYS Electric & Gas and RGE*

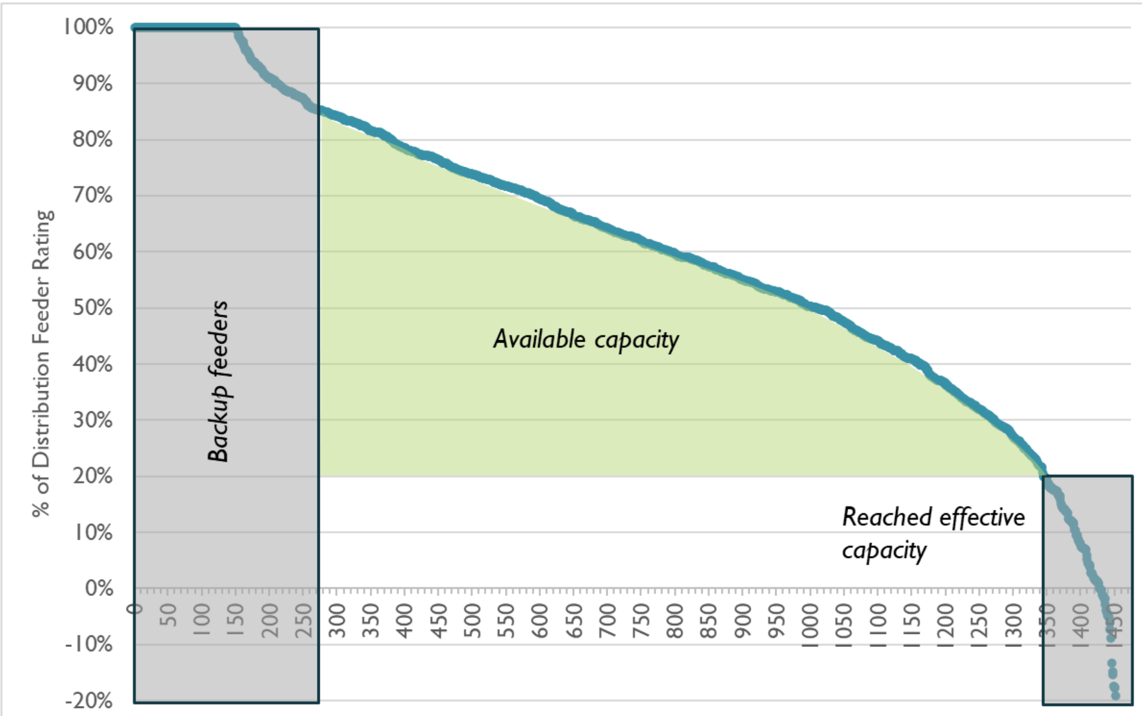
Figure 12 below shows the feeder winter headroom as a percentage of feeder rating based on NYS Electric & Gas' and RGE's electrification hosting capacity map.[33] Because NYS Electric & Gas and RGE provide a single joint electrification hosting capacity map, we estimate headroom for the two utilities together. Overall, we estimate that 73 percent of feeders are not backup feeders and have available headroom above a 20 percent reserve margin.[34] Finally, we estimate the available capacity on substations with remaining headroom. 88 percent of NYS Electric & Gas and RGE substations have remaining headroom. Based on this, we calculate that approximately 29 percent of NYS Electric & Gas and RGE feeder rated capacity is available for increased loads due to electrification. Under these

[33] NYS Electric & Gas and RGE. n.d. "NYSEG/RGE Hosting Capacity Portal," "Electrification Capacity" tab, available at: https://www.arcgis.com/apps/instant/portfolio/index.html?appid=5fc7fc4820af48838cb5bdfd54e5baad.

[34] We note that there were significant data gaps in NYS Electric & Gas' and RGE's electrification hosting capacity map. Nearly a third of the feeder segments identified in the three-phase winter hosting capacity map layer had missing or "null" values and were subsequently not included in this analysis.

constraints, we calculate that there is enough available electrification headroom for winter peak load to increase by 85 percent relative to current winter peak loads.

**Figure 12. NYS Electric & Gas and RGE distribution headroom, excluding certain feeder categories**




***Con Edison***

Figure 13 shows the winter headroom as a percent of substation/bank rating based on Con Edison's electrification hosting capacity map data.[35] As discussed previously, because Con Edison did not provide peak load or capacity rating data at the feeder-level, we did not screen out any feeders and instead aggregated feeder headroom at the substation level. Figure 13 shows only the headroom estimates for the 32 substations included in the online web map. After summing the feeder winter headroom at the substation level, we calculate 1,346 MW of available headroom, which is 15 percent of the total substation/bank rating. By this estimate, there is enough headroom for winter peak loads to increase by 29 percent above the winter peak.[36]

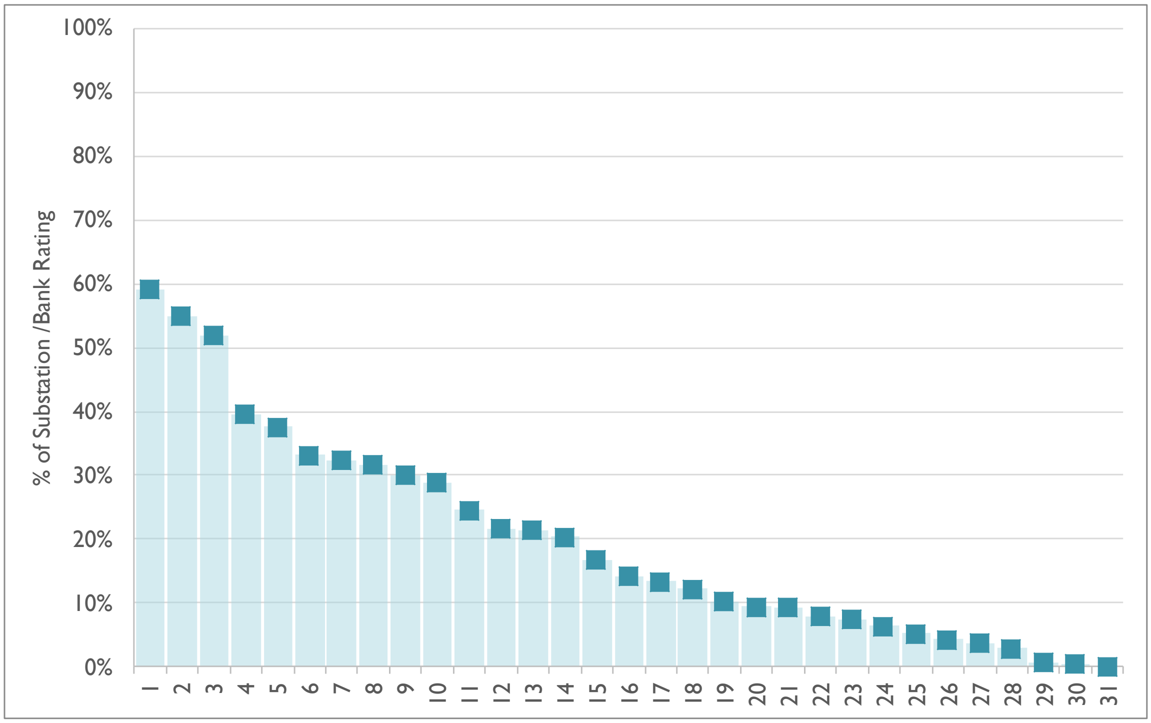
However, we note that the feeder-level headroom data for Con Edison only reports on the radial, non-networked portion of its distribution system. We estimate this may exclude over a third of Con Edison's distribution loads, which are served by networked portions of its system. For the purpose of our

[35] Con Edison. "Con Edison Hosting Capacity Web Application." "Electrification (formerly EV Charging)" Tab. Updated December 18, 2023. Available at: https://coned.maps.arcgis.com/apps/MapSeries/index.html?appid=edce09020bba4f999c06c462e5458ac7

[36] Con Edison did not provide substation-level winter peak estimates. To estimate winter peak, we scaled the summer peak by the ratio between summer and winter peak from the NYISO peak load data for NYISO zones relevant for Con Edison.

analysis, we assume that the percent headroom available above winter peak load for the networked portions of Con Edison's system scales with the headroom percent for the non-networked system.

**Figure 13. Con Edison distribution headroom at substations**



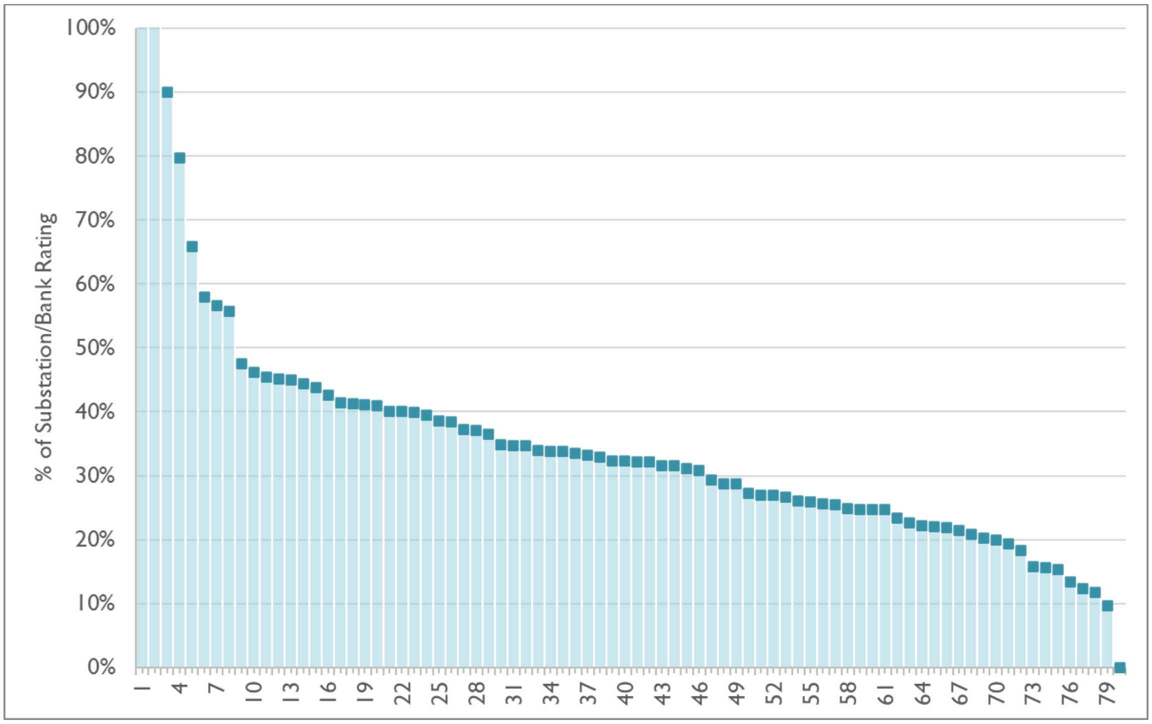

### *Orange & Rockland*

Figure 14 shows the winter headroom as a percent of substation/bank rating based on Orange & Rockland's electrification hosting capacity map data.[37] As with Con Edison, Orange & Rockland only publishes enough data to calculate headroom at the substation-level. We find that there is significant headroom available on Orange & Rockland's distribution system. Across all distribution feeders, we calculate a total of 1,071 MW of winter load capacity headroom on three-phase feeders, which is 31 percent of the total rated substation/bank capacity. This implies that there is enough headroom to support winter peak loads roughly twice as high as current winter peak loads.[38]

[37] Orange & Rockland. "O&R Hosting Capacity Web Application." "Electrification Capacity (formerly Electric Vehicle Charging)" Tab. Updated January 9, 2024. Available at: https://coned.maps.arcgis.com/apps/MapSeries/index.html?appid=8cf1195eedcb4992852c806f3384d62c

[38] As with Con Edison, Orange & Rockland did not provide winter peak estimates in its hosting capacity data, so we scaled the summer peak by the ratio between summer-winter peaks in the NYISO data to calculate winter peak.

Figure 14. Orange & Rockland distribution headroom at substations




***Synthesis: Potential headroom limits for building electrification***

Table 11 summarizes the potential total distribution headroom by utility and for the entire state, based on the utilities' electrification hosting capacity maps. The total potential headroom estimates represent substantial headroom for growth of building electrification ranging from 279 MW (Central Hudson) to as much as 4,477 MW (National Grid) across the utilities. In total, we estimate over 10 GW of winter headroom for winter building electrification and other additional winter loads across the state, which represents 28 percent of rated capacity on average. When compared to the current winter peak loads, the total headroom estimates range from 29 percent (Con Edison) to as much as 105 percent (National Grid). Based on these estimates, on average there is enough available capacity statewide to support winter peak loads 71 percent above current winter peak. This is roughly twice the headroom that would be estimated based solely on the summer-winter gap shown in Table 9.

The availability of this additional distribution grid capacity for meeting winter peak loads is contingent on the geographic distribution of those winter loads. Some new winter electrification loads will fall on feeders without additional capacity, and many feeders serve low-density areas that could fully electrify without bringing loads to a level that would exhaust the feeder capacity (meaning that the additional capacity above full electrification is not useful).

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**Table 11. Potential total distribution headroom by utility based on distribution hosting capacity estimates**

| Utility | Distribution winter peak (MW) | Total estimated winter headroom (MW) | Total headroom (% of rated capacity) | Total headroom (% of winter peak) |
|---|---|---|---|---|
| **National Grid** | 4,276 | 4,477 | 36% | 105% |
| **Central Hudson Gas and Electric** | 796 | 279 | 20% | 35% |
| **NYS Electric & Gas and RGE** | 3,786 | 3,235 | 29% | 85% |
| **Con Edison** | 4,691 | 1,346 | 15% | 29% |
| **Orange and Rockland Utilities** | 1,123 | 1,071 | 31% | 95% |
| **Total** | 14,673 | 10,408 | 28% | 71% |

*Note: The headroom estimates in MW in this table for Con Edison do not account for its distribution area network which primarily serves Manhattan*.

Table 12 compares our estimates of winter headroom based on the two approaches (summer-winter load headroom and distribution headroom based on hosting capacity maps). To better compare the results of the two approaches, we adjusted the distribution headroom estimates. We applied the headroom percent of winter peak calculated from the utility hosting capacity maps to the utility-specific winter peak load (as shown in Table 9). As we can see from the table below, the distribution headroom estimates are much higher (two to six times higher) than the summer-winter headroom, except for Con Edison.[39] NYS Electric & Gas and National Grid have the largest differences in estimated headroom between the two approaches. Across all utilities on average, the distribution headroom is 63 percent higher than the summer-winter load difference.

**Table 12. Potential total system-level and distribution-level headroom by utility**

| | | **Summer-winter peak load estimates** | | **Distribution hosting capacity estimates** | |
|---|---|---|---|---|---|
| Utility | Winter peak 2023-2024 (MW) | Total summer-winter headroom | Total headroom (% of winter peak) | Adjusted total distribution headroom | Total headroom (% of winter peak) |
| **National Grid** | 5,611 | 868 | 15% | 5,892 | 105% |
| **Central Hudson Gas and Electric** | 737 | 234 | 32% | 258 | 35% |
| **Long Island Power Authority** | 3,043 | 2,008 | 66% | n/a | n/a |
| **NYS Electric and Gas** | 2,644 | 312 | 12% | 2,248 | 85% |
| **Rochester Gas and Electric** | 1,140 | 285 | 25% | 969 | 85% |
| **Con Edison** | 8,201 | 3,687 | 45% | 2,378 | 29% |
| **Orange and Rockland Utilities** | 781 | 250 | 32% | 742 | 95% |
| **Total** | 22,157 | 7,644 | 34% | 12,486 | 56% |

[39] Con Edison is the only utility we analyzed in New York for which the hosting capacity headroom estimates were smaller than the summer-winter peak headroom estimates. We have insufficient data to understand this unexpectedly low distribution headroom estimate for Con Edison, relative to its summer-winter peak load differences. Potential reasons include: (a) Con Edison's area network has considerably more grid headroom than its radial system and (b) the ratio of the current winter peak loads to the summer peak on the radial system is lower than the system-wide ratio would indicate.

Table 13 presents years when the assumed total headroom limit is reached for each utility, for the headroom estimates based on the summer-winter gap in NYISO's policy case load forecast compared to the distribution-level headroom based on the electrification hosting capacity maps.[40] We expect that at the utility-territory level, the current headroom will be exceeded by 2028 to 2037 on average (or in the next 4 to 12 years) based on the summer-winter load difference and by 2034 to 2042 (or in the next 10 to 17 years) based on the hosting capacity distribution headroom estimates. In other words, this means that the current distribution grids could accommodate the projected load growth from building electrification through 2027 to 2036 (or for the next 3 to 11 years) based on the summer-winter load difference and through 2033 to 2041 (or for the next 9 to 16 years) based on the hosting capacity distribution headroom estimates.

**Table 13. Total potential distribution headroom limits by utility under each estimation approach**

| | Summer-winter peak load estimates | | Distribution hosting capacity map estimates | |
|---|---|---|---|---|
| | Year headroom limit is exceeded | # of years until exceeding headroom | Year headroom limit is exceeded | # of years until exceeding headroom |
| **National Grid** | 2030-31 | 6 | 2041-42 | 17 |
| **Central Hudson Gas and Electric** | 2033-34 | 9 | 2034-35 | 10 |
| **Long Island Power Authority** | 2036-37 | 12 | n/a | n/a |
| **NYS Electric and Gas** | 2028-29 | 4 | 2039-40 | 15 |
| **Rochester Gas and Electric** | 2033-34 | 9 | 2040-41 | 16 |
| **Con Edison** | 2036-37 | 12 | 2034-35 | 10 |
| **Orange and Rockland Utilities** | 2033-34 | 9 | 2039-40 | 15 |
| **Total** | 2034-35 | 10 | 2038-39 | 14 |

Referring back to our interpretation of NYISO's heat pump projections in Figure 8 in the previous section, we make rough estimates of heat pump penetration rates that the assumed total potential headroom could accommodate: We expect that residential heat pump stocks could reach roughly 29 percent to 47 percent of the entire heating fuel stock (over the next 9 to 16 years) with the current average distribution headroom under the Policy Scenario with the statewide average of 39 percent (over the next 13 years).[41]

[40] As mentioned above, while Con Edison's hosting capacity map does not cover its area network, we assume that the percent headroom for the networked portions of Con Edison's system scales with the headroom percent for the non-networked system.

[41] These estimates are based on the statewide heat pump stock forecasts.