MASSACHUSETTS ELECTRIC COMPANY

NANTUCKET ELECTRIC COMPANY

2023 to 2050 Electric Peak (MW) Forecast

May 2023

Rev 3, 05/02/2023

Economics and Load Forecasting
Load Forecasting & Analytics

nationalgrid

REVISION HISTORY & GENERAL NOTES

Revision History

Version	Date	Changes
Original	11/21/2022	- ORIGINAL
Rev 1	03/01/2023	- added study area forecast - updated power supply area forecast
Rev 2	03/15/2023	- updated forecasts with updated EH profile
Rev 3	05/02/2023	- updated study area and power supply area forecasts

General Notes:

- Hourly load data through August 2022; projections from 2022 winter forward.
- Economic data is from Moody's vintage August 2022.
- Energy Efficiency, electric heating, solar, energy storge and demand response is internal data vintage August 2022.
- Electric Vehicle data is POLK data vintage June 2022 with actual to the end of 2021.
- Peak MW and Energy GWH source the ISO-NE/MDS meter-reconciled data (Jan. 2003 to Apr. 2022); internal unreconciled **preliminary** data (May 2022 to Aug. 2022).
- Peak load data is metered zonal load, without ISO bulk system losses.
- References to "Zones" refers to ISO-NE designations; all data is National Grid's service territory information within these zones.
- New this year:
    - Extending forecast horizon to 2050
    - Providing a managed light-duty electric vehicle charging scenario
    - Differentiating electric heat pump by full and partial

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Summary

National Grid's US electric system is comprised of three companies serving over 3 million customers in Massachusetts and upstate New York. The three electric companies are: Massachusetts Electric Company and Nantucket Electric Company, serving 1.35 million customers in Massachusetts; and Niagara Mohawk Power Company, serving 1.7 million customers in upstate New York. Figure 1[1][2] shows the Company's service territory in the U.S.

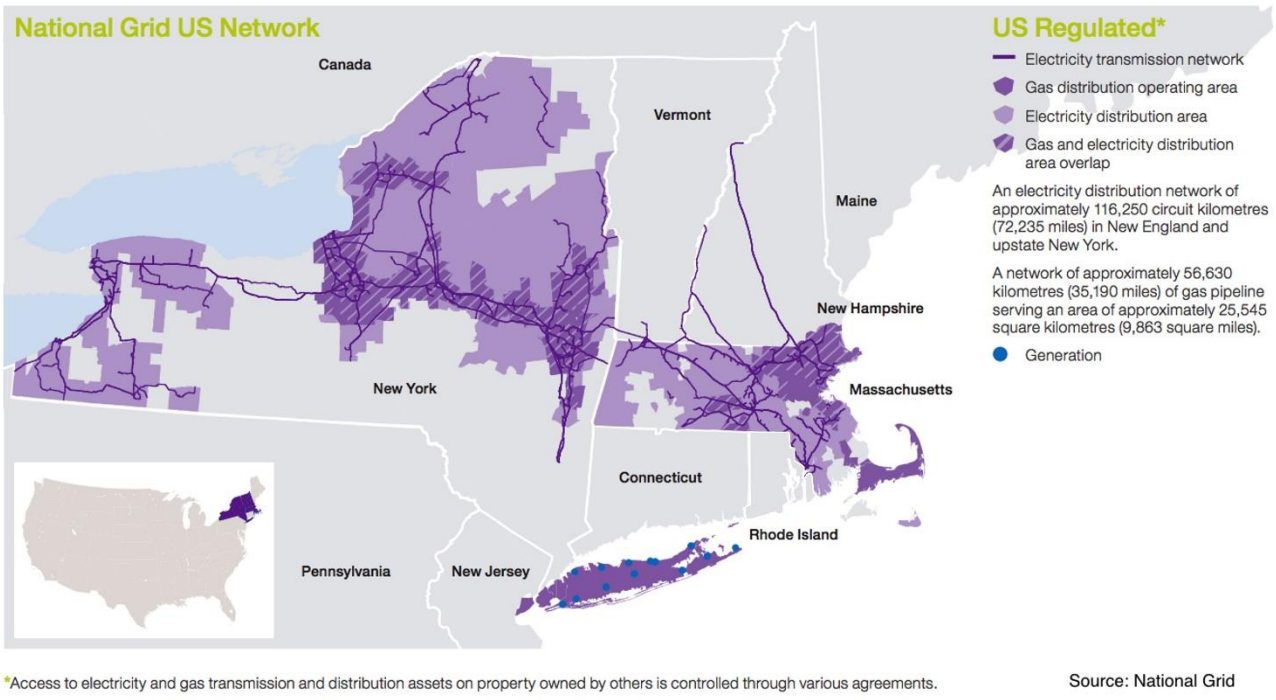


Figure 1: National Grid U.S. Service Territory

Forecasting peak electric load is important to the Company's capital planning process because it enables the Company to assess the reliability of its electric infrastructure, enables timely procurement and installation of required facilities, and it provides system planning with information to prioritize and focus their efforts.

Massachusetts Electric Company (MECO)

MECO's peak demand in 2022 was 4,657.4 MW[3], on Monday, August 8 at hour-ending 18. This 2022 peak was 9.6% below the company's all-time high of 5,152 MW reached on Wednesday, August 2, 2006.

[1] National Grid also serves gas customers in these same states which are also shown on this map.
[2] As of May 22, 2022, National Grid has completed the sale of The Narragansett Electric Company ("NECO") to PPL Rhode Island Holdings, LLC. Thus, Rhode Island is not part of National Grid's U.S. electric distribution system after the completion of the sale.
[3] Meter Data Service's system level PRELIMINARY and subject to change.

This summer's weather for MECO's peak[4] was considered hotter than average (or 'normal'). The peak weather fell in the 88th percentile of peak weather over the last 20 years. This means that 88% of summers had peak weather that was cooler and only 12% of summers had peak weather that was warmer. This year's peak is considered 95.0 MW higher than the peak the company would have experienced under normal weather conditions. Thus, on a weather adjusted "normal" basis this year's peak was estimated to be 4,562.5 MW, an increase of 1.2% compared to last year's weather-adjusted 'normal' peak.

MECO expects slightly growing post-DER peak values – i.e., on average, 0.7% per year, from its 2022 level in the next five years. The system remains summer peaking through the year 2035. However, the peak hour is expected to shift from late afternoon/early evening to later in the evening. During these later hours, EV charging demand increases and PV savings becomes less or not available.
Starting in 2036, MECO is expected to become a winter peaking system. This change is mainly driven by the increasing beneficial electrification in the transportation[5] and building sectors. Figure 2 shows the projected annual peak (solid blue line) and the summer peak (dashed blue line) under the normal weather, as well as the annual peak under two extreme weather assumptions, namely 90-10 and 95-5. Through the forecast horizon, MECO expects an annual growth rate of 3.0% on post-DERs peak under the normal weather assumption.

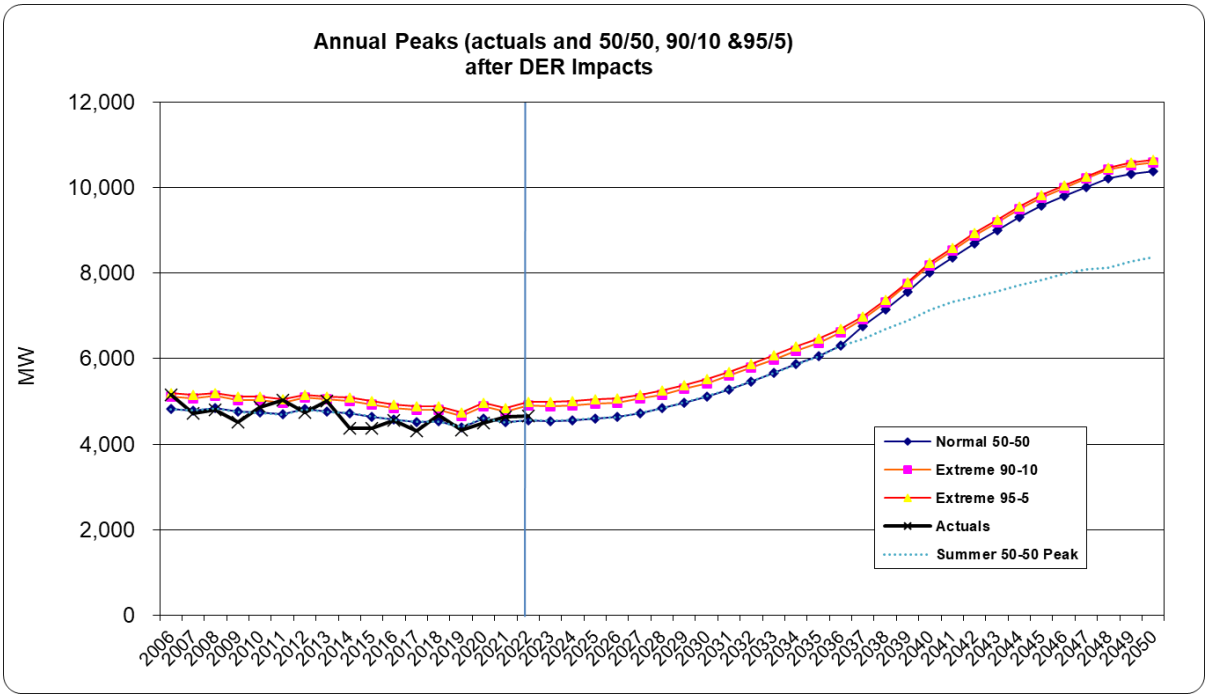


Figure 2: MECO Historical (actual & weather-adjusted) and Projected Peaks

[4] Peaks days, times and weather can vary across the zones which do not always match the same as for the Company.
[5] Managed charging is not considered in the base EV case. A managed charging scenario is considered in the low EV case.

Nantucket Electric Company (NANT)

Nantucket's peak demand in 2022 was 58.2 MW[6], on Saturday, August 6 at hour-ending 18. This set a new record for its highest historical peak.

This summer's weather for Nantucket's peak was considered much hotter than average (or 'normal'). The peak weather fell in the 76th percentile of peak weather over the last 20 years. This means that 76% of summers had peak weather that was cooler and only 14% of summers had peak weather that was warmer. This year's peak is considered 6.3 MW above the peak the company would have experienced under normal weather conditions. On a weather adjusted "normal" basis this year's peak was estimated to be 51.8 MW, an increase of 1.0% compared to last year's weather-adjusted 'normal' peak.

Nantucket's summer peak load is expected to remain to be a summer peaking system through the forecast horizon. A 1.8% annual growth rate is expected for Nantucket's post-DER peak load through the year 2050. Its peak hour is expected to shift to later of the day when EV charging demand increases, and PV saving is less available. Figure 3 shows the forecasts graphically.

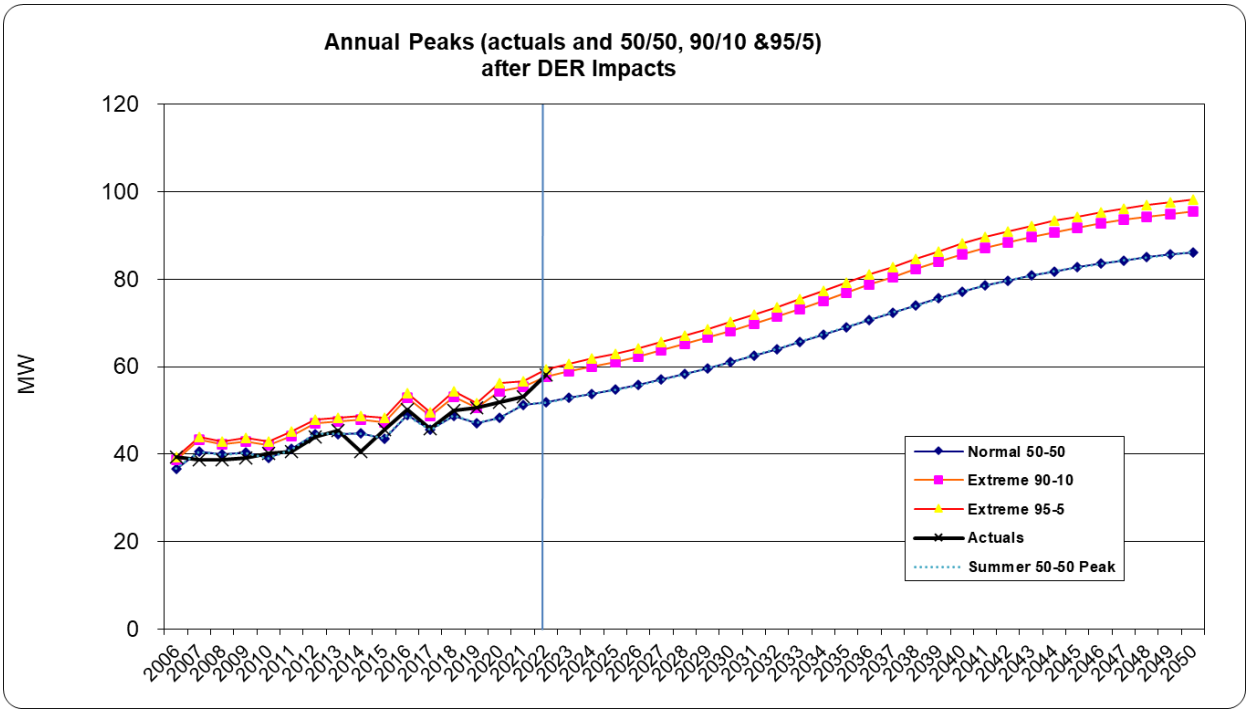


Figure 3: Nantucket Historical (actual & weather-adjusted) and Projected Peaks

[6] Meter Data Service's system level PRELIMINARY and subject to change.

Forecast Methodology

National Grid in Massachusetts forecasts its peak MW demands for the two Companies and the three ISO-NE zones that make up its service territory in the state. Each Company's total as well as the "independent" (or non-coincident) peaks for each zone are developed. The independent peak is the demand that each zone experiences, regardless of whether that demand is also the same day and time as the company's peak. The two Companies and the three zonal forecasts are:

- Massachusetts Electric Company (MECO)
- Nantucket Electric Company (Nantucket)
- Northeast Massachusetts Region: comprised of the portions of the ISO-NE load zone NEMA served by MECO; includes, among others the North shore and Merrimack areas
- Southeast Massachusetts Region: comprised of the portions of the ISO-NE load zone SEMA served by MECO and Nantucket; includes, among others, the South shore, Attleboro, Uxbridge and Fall River areas as well as Nantucket Island
- West Central Massachusetts Region: comprised of the portions of the ISO-NE load zone WCMA served by the MECO; includes, among others, the Worcester, central and western areas

The overall approach to the peak forecast is to relate (or regress) peak load to aggregate system energy. For each zone, if energy alone is not a good statistical fit (because, for instance, that zone is growing more or less than the system-level energy), then other indicators such as zonal specific economics are applied. This method allows the peak MW forecasts to grow along with energy growth rates for each zone, however, it also allows the peak to adjust to individual economic influences in each zone.

Each of these models is developed based on a "reconstructed" model of past load. That is, claimed energy efficiency, installed solar PV, demand response, and energy storage impacts are added back to the historical data set before the models are run. Electric vehicle and electric heat pump impacts are removed from the historical data set. The statistical forecasts are made based on the "reconstructed" data set. Then, the future cumulative estimates of savings or additions for these DERs are taken out or added to the statistical forecasts to arrive at the final forecast. Hourly profiles for the DERs are applied to the hourly profiles for the loads to determine the annual peaks. These final loads are also referred to as "Net" loads.

The results of this forecast are used as input into various system planning studies. The forecast is presented for three weather scenarios. The transmission planning group uses the extreme 90/10 weather scenario for its planning purposes. Up until year 2019, distribution planning used the 95/5. The 50/50, or weather-normal scenario is used for various items including strategic scenarios and incentive mechanisms.

Weather Assumptions

Weather data is collected from the relevant weather stations located within the Company's New England service territory and used to weather-adjust peak demands. The relevant weather stations are Boston, Worcester, Providence, Nantucket, and Albany (due to its proximity to the western Massachusetts region). These most closely represent the Company's territory.

The weather variables used in the model include heating degree days for the colder winter months and temperature-humidity indexes (THIs)[7] for the warmer summer months. Other variables such as maximum or minimum temperature on the peak day are also evaluated. These weather variables are from the actual days that each peak occurred in each season over the historical period. Summer THI uses a weighted three-day index (WTHI)[8] to capture the effects of prolonged heat waves that drive summer peaks. Weather adjusted peaks are derived for a normal (50/50) weather scenario and extreme weather scenarios (90/10 and 95/5)[9]. A normal distribution is assumed to derive the extreme weather scenarios.

- Normal 50/50 weather is the average weather on the past 20 annual peak days.
- Extreme 90/10 weather is such that it is expected that 90% of the time it should not be exceeded. It is similarly inferred that it should occur no more than one time in a ten-year period on average.
- Extreme 95/5 weather is such that it is expected that 95% of the time it should not be exceeded. It is similarly inferred that it should occur no more than one time in a twenty-year period on average.

These "normal" and "extremes" are used to derive the weather-adjusted historical and forecasted values for each of the normal and extreme cases.

Figures 4 and 5 show the historical, weather-normal, and weather-extreme WTHI values for MECO and Nantucket, respectively.

[7] THI is calculated as (0.55 * dry bulb temperature) + (0.20 dew point) + 17.5. Maximum values for each of the 24 hours in a day are calculated and the maximum value is used in the WTHI formula.
[8] WTHI is weighted 70% day of peak, 20% one day prior and 10% two days prior.
[9] Normal distribution is assumed to derive the extreme weather scenarios. This "probabilistic" approach employs "Z-values" and standard deviations to calculate the extreme weather scenarios. As a result, the more spread out the numbers on peak days over the historical period, the more the 90/10 and 95/5 values will be above the mean (or the normal).

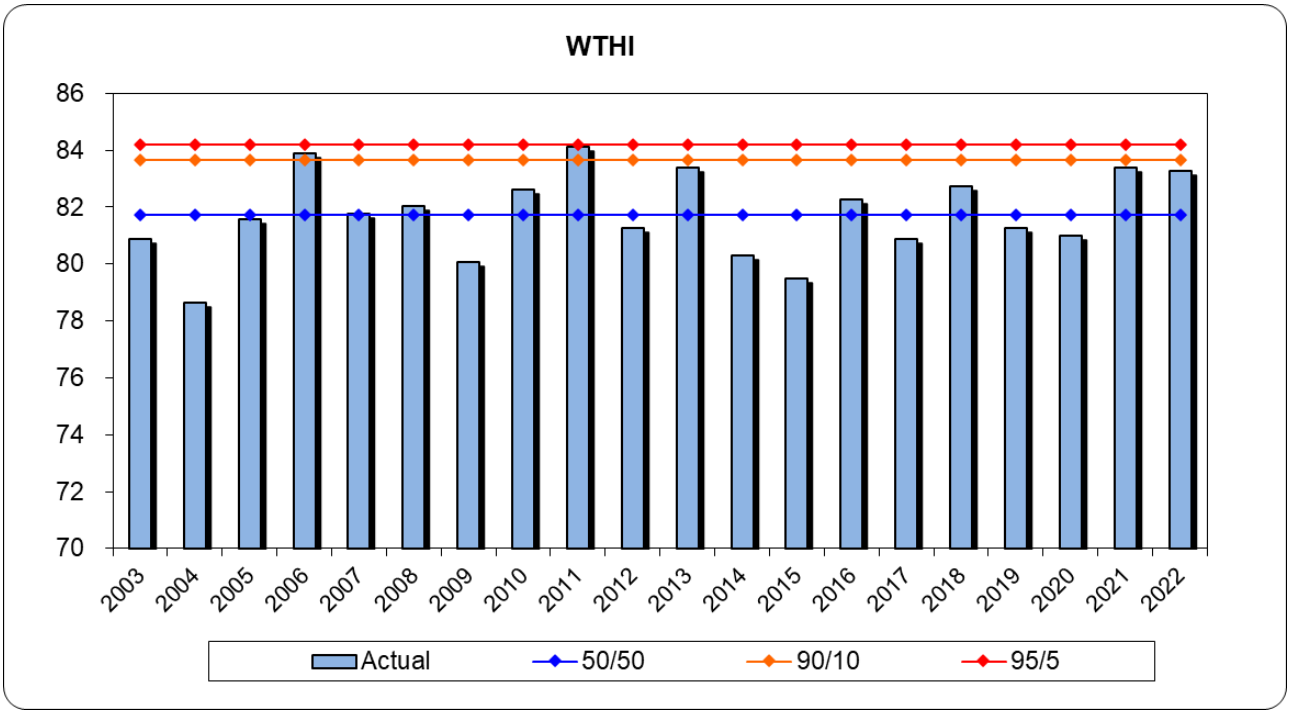


Figure 4: Actual, normal and extreme WTHI for MECO

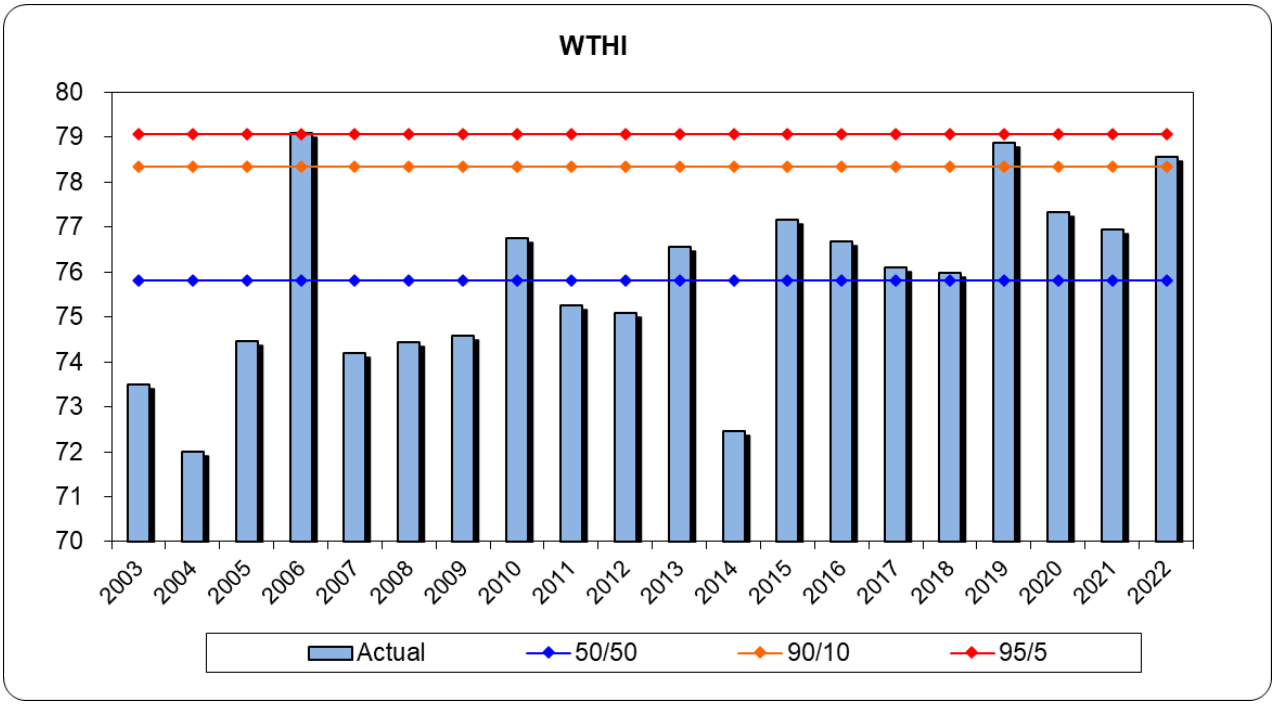


Figure 5: Actual, normal and extreme WTHI for Nantucket

Distributed Energy Resources (DERs)

In New England, there are policies, programs, and technologies that impact customer loads. These include but are not limited to energy efficiency (EE), solar photovoltaics (PV), electric vehicles (EV), demand response (DR), electric heat pumps (EH), and energy storage (ES). These collectively are termed distributed energy resources (DERs) because they impact the loads at the customer level, as opposed to traditional, centralized power supplies.

A base case forecast is developed for each of the DERs and is part of the official forecast. For each of the DERs, a higher case and a lower case than the base case are developed, as appropriate. The inclusion of multiple cases for each DER, as well as the different combinations of them, provides system and strategic planners with additional information to make informed decisions. The discussion below is based on the base case.

Figure 6 shows MECO's forecasted annual peak load. The annual peak is expected to occur in the summer between 2023 and 2035. The peak hour will shift from late afternoon to the evening hours. The reconstituted (pre-DER) load is generally lower in the evening than the afternoon, resulting in a decrease in the pre-DER load. Figure 6 shows a drop in year 2024 and year 2027 in the reconstituted load, when the peak hour shifts to later of the evening. After the DER impacts, MECO's peak is forecasted to grow, 2.2% per year on average through 2035. Starting in 2036, MECO's winter peak is expected to become the annual peak mainly driven by the increasing load from electric heating and electric vehicle charging. This shows as a step-down of pre-DER load from 2035 to 2036. However, the post-DER load is forecasted to grow through the end of the forecast horizon.

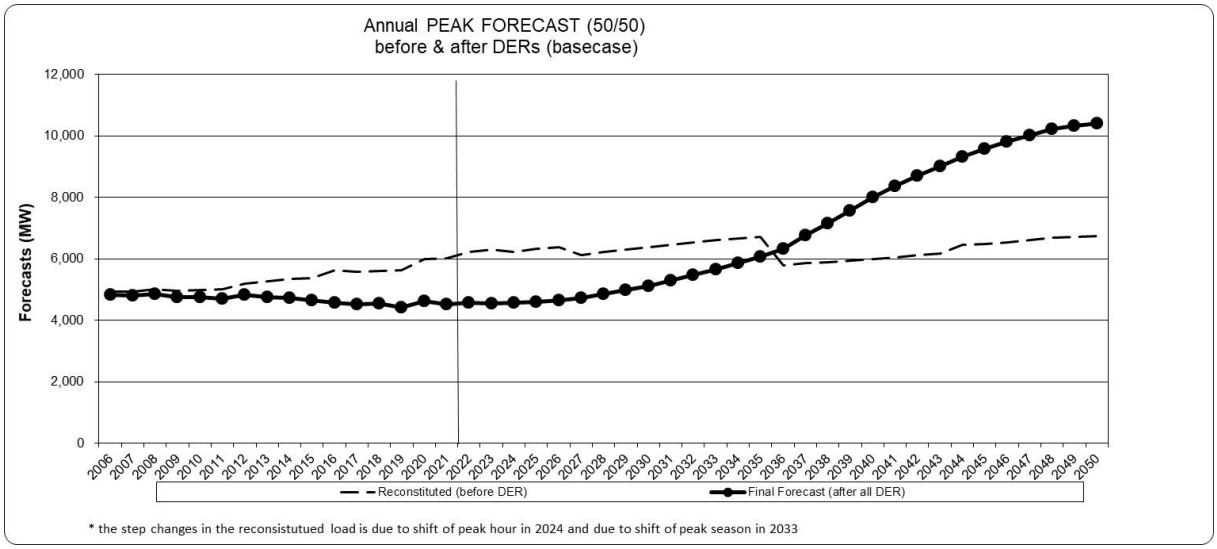


Figure 6: Annual loads before and after the impacts of DERs for MECO

Figure 7 shows the impacts for the DERs each year. The peak hour is expected to shift from hour-ending 18 to hour-ending 19 in 2024 and then to hour-ending 21 in 2027, lower or no PV impact is expected as less or no irradiation is available at this later hour. The EV and electric heat pump impacts

grow faster in later years of the forecast horizon, which leads to a winter peak starting 2036 when the total net DER impacts become positive (i.e., adding load).

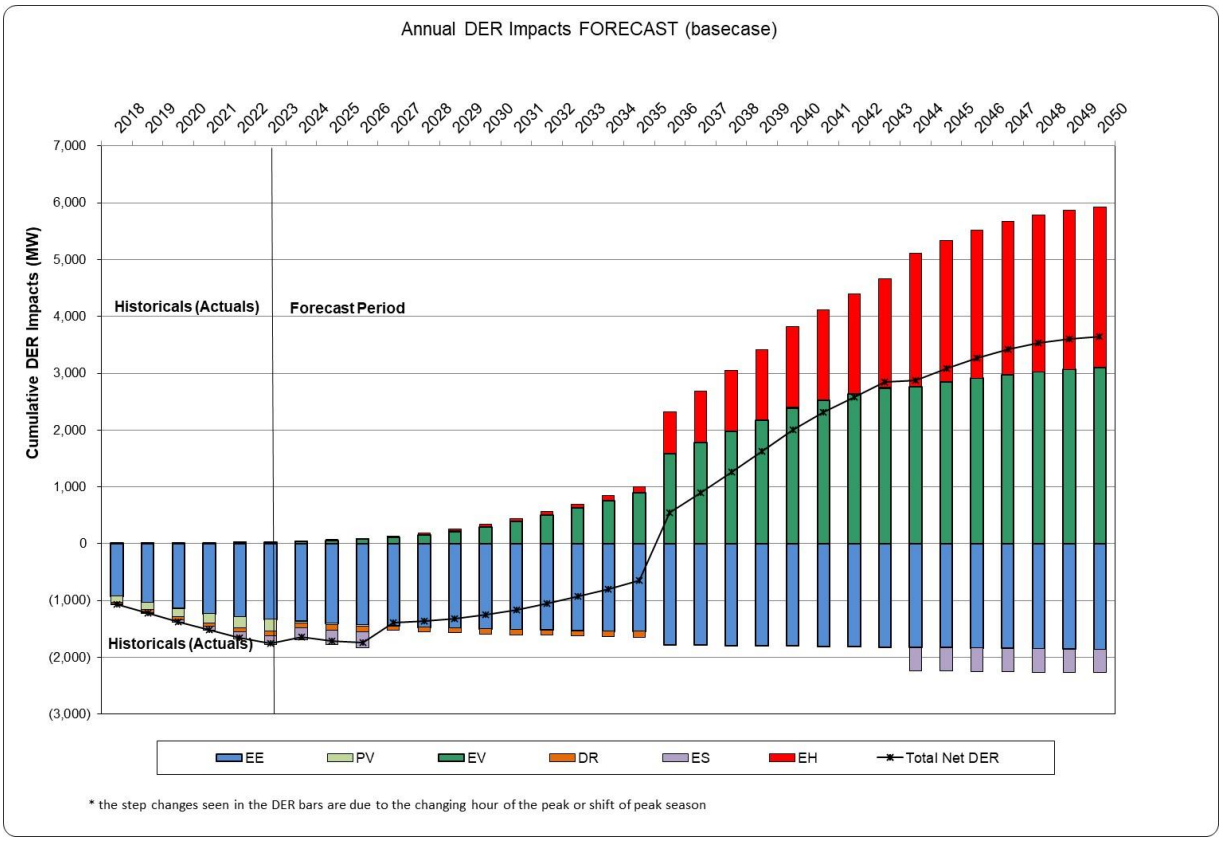


Figure 7: Annual Impact of DERs for MECO

Figure 8 shows Nantucket's expected loads and impacts for the DERs each year. The net DER impact is expected to decline with increasing adoptions of EVs and electric heat pumps.

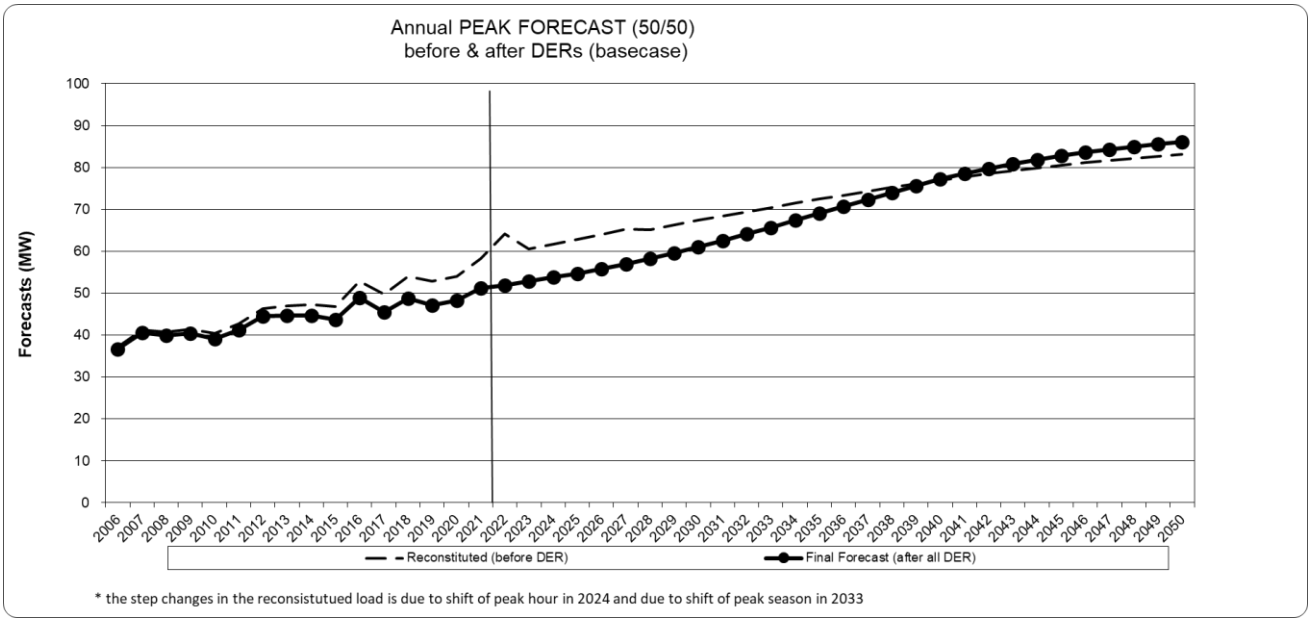


Figure 8: Annual loads before and after the impacts of DERs for Nantucket

Figure 9 shows the impacts for the DERs each year. The summer peak hour is also projected to shift to later of the day, when the PV saving is less.

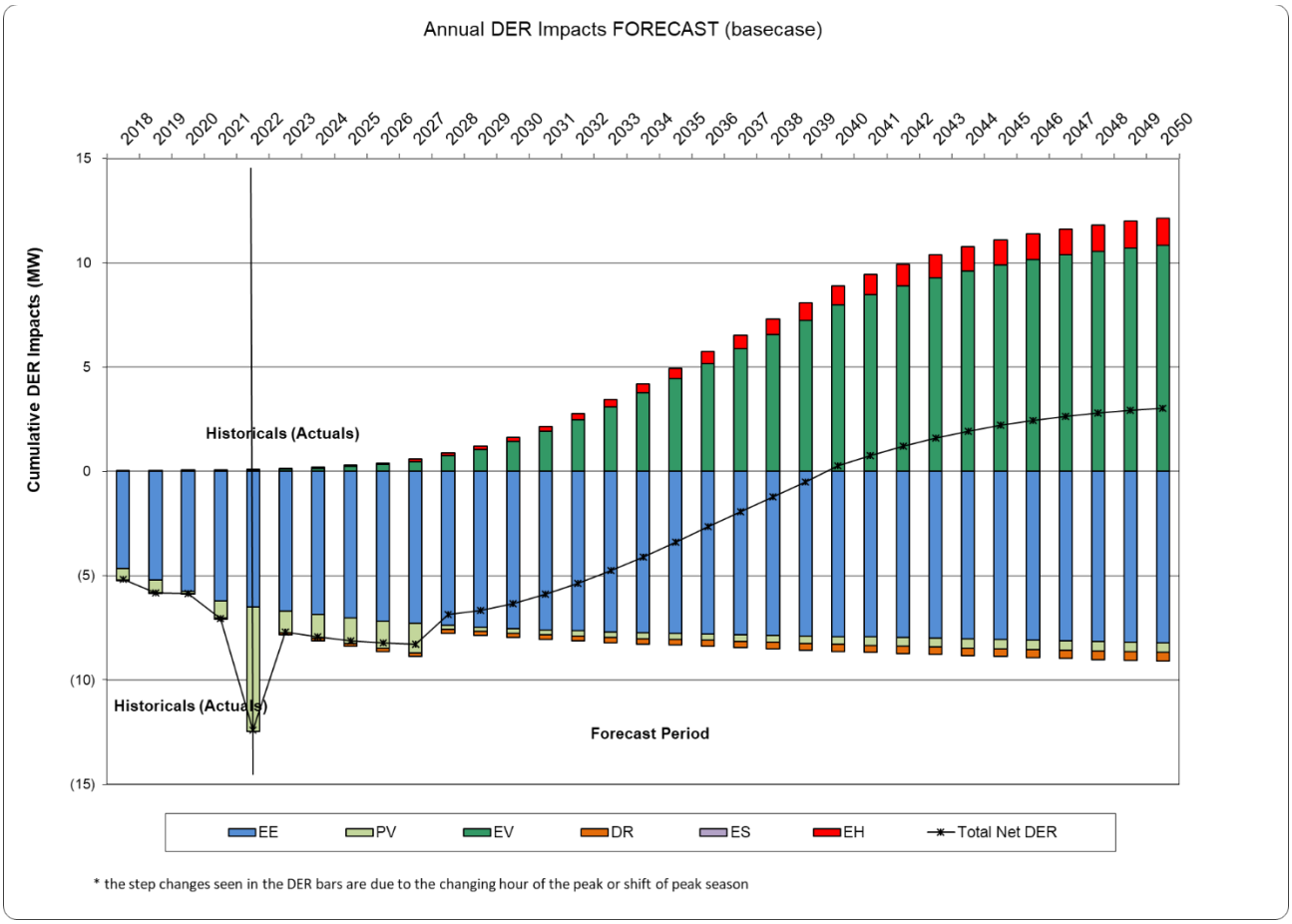


Figure 9: Annual Impact of DERs for Nantucket

Each of the DERs is discussed next.

Energy Efficiency (EE)

National Grid has had EE programs in its Massachusetts jurisdiction for many years and will continue to do so for the foreseeable future. In the short-term (one to three years), EE targets are based on Company annual plan from the Subject Matter Experts (SMEs) through 2024. Beyond 2024, the cumulative value of persistent EE savings is still expected to continue to grow but at a slower rate each year.

For MECO, as of 2022, compared to the counterfactual with no EE programs, it is estimated that these EE programs have reduced the summer peak load, which is also the annual peak load, by 1,292 MW, or 20.8% of what load would have been had these programs not been implemented. By 2050, it is expected that this reduction to the summer peak will grow to 1,633 MW or 21.1%. For winter peak load, as of 2021, it is estimated that these EE programs have reduced the winter peak load by 1,496 MW or 29.6% and are expected to grow to 1862 MW of 27.6% by 2050.

For Nantucket, as of 2022, compared to the counterfactual with no EE programs, it is estimated that these EE programs have reduced the load by 6 MW, or 11.0% of what load would have been had these programs not been implemented. The EE impacts will continue to grow to 8 MW, or 9.9% of the gross load by the year 2050.

Figure 10 &11 present the annual incremental (left-axis) and cumulative (right-axis) summer EE MW and winter EE MW for National Grid's Massachusetts jurisdiction, respectively. The value is allocated to MECO and Nantucket based on their load shares in the jurisdiction.

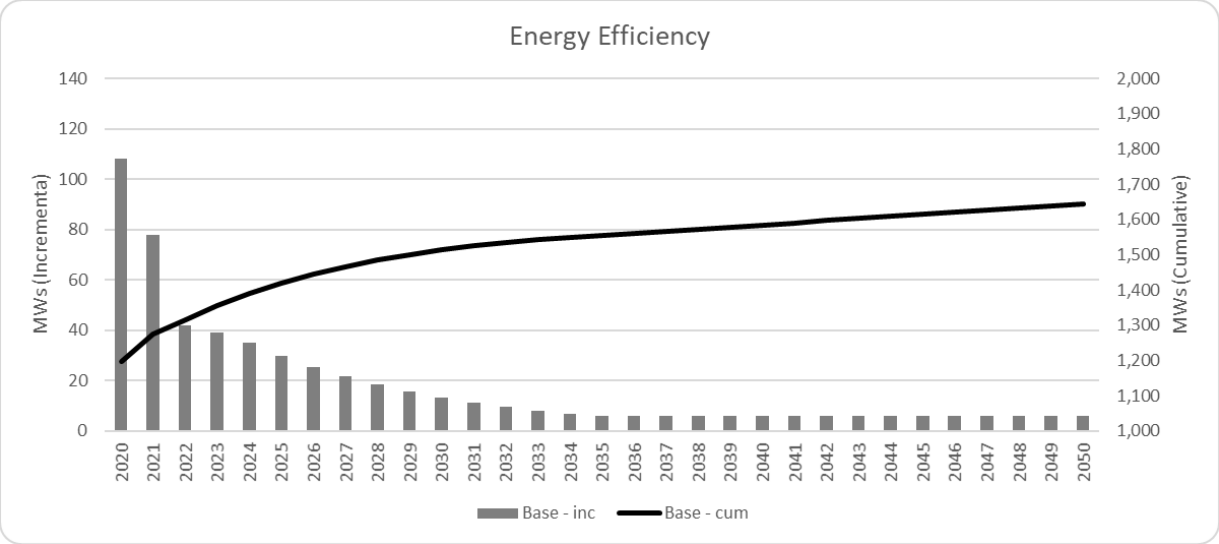


Figure 10: Energy Efficiency summer MW by year

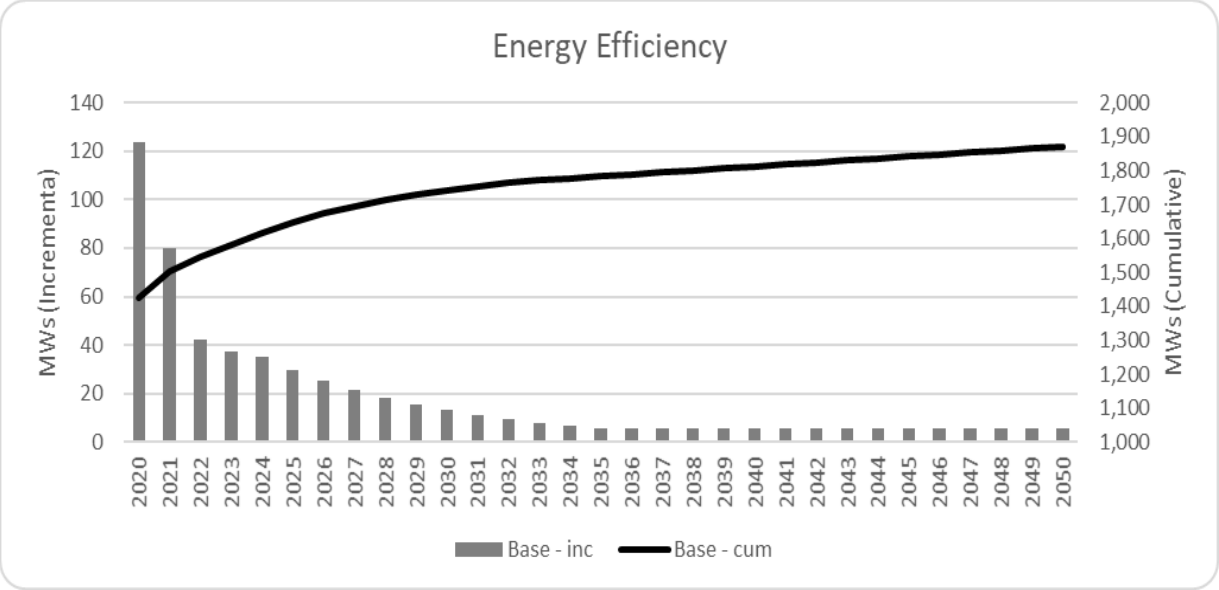


Figure 11: Energy Efficiency winter MW by year

Solar-Photovoltaic (PV)[10]

There has been a rapid increase in the adoption of PV throughout the state. The actual installed PV is tracked by the Company and used for the historical values. The near-term (2023-2027) predictions leveraged the information on the projects in the Company's queue and the insights from PV subject matter experts at the Company, and also assumes National Grid fills its share (45%[11]) of the State's existing solar standards of 3.2 GW[12] by mid 2020s. In the longer-term, continuous growth is projected in order to achieve the National Grid's share (45%) of the State policy target under the All Options scenario as stated in its 2050 decarbonization roadmap[13]. The All Options scenario targets a 6.99 GW of behind-the-meter (BTM) PV connection and a 16.2 GW of ground-mounted PV connection by 2050 for the State of Massachusetts. In this base case, it is assumed that all the BTM PV and 50% of the ground-mounted PV will be on the distribution system. It is then assumed that the Company will take its share of these. Thus, about 3.1 GW (6.9 GW * 100% * 45%) of BTM PV and 3.6 GW (16.2 GW * 50% * 45%) of ground-mounted PV are projected to be on the Company's distribution system by 2050.

Figure 12 shows the projected incremental (left-axis) and cumulative (right-axis) connected PV installations of National Grid's Massachusetts jurisdiction. The value is allocated to MECO and Nantucket based on their load shares in the jurisdiction. As of 2022, it is estimated about 1,745 MW will have been connected, growing to almost 6,716 MW by 2050.

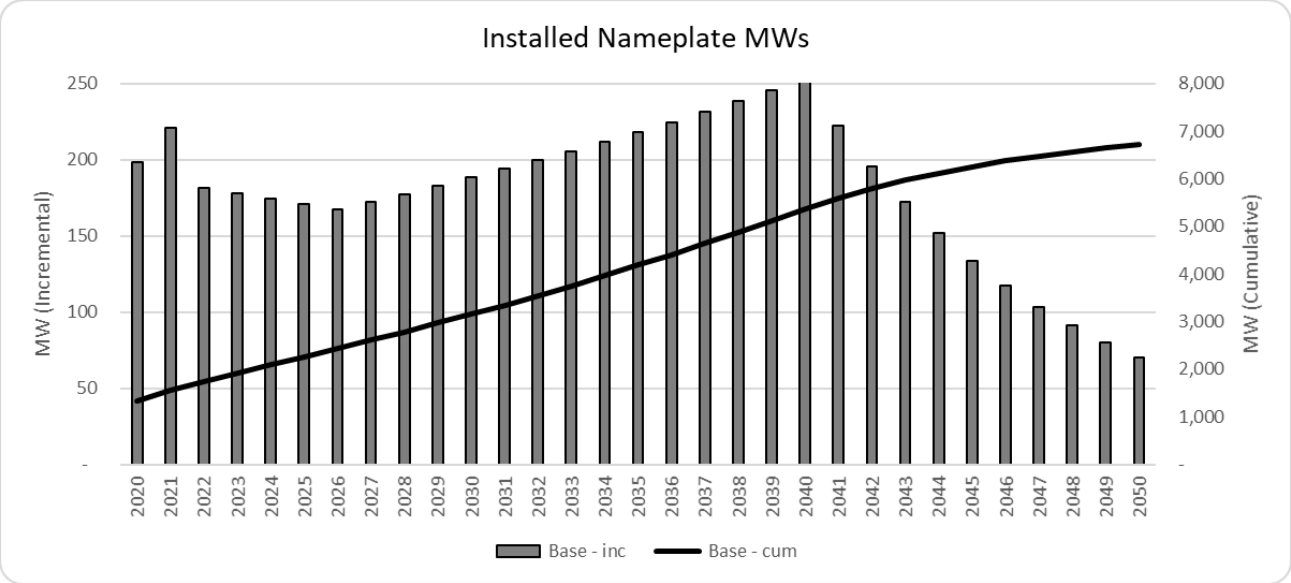


Figure 12: Solar-PV connected nameplate (AC) MW by year

While installed PV continues to grow, suppressing peak load, its impact drops off considerably as the peak hour shifts later in the day when there is less daylight. For MECO, its winter peak is expected to

[10] This discussion is limited to PV which expected to reduce loads and would not include those PV installations considered as 'supply' by the ISO-NE. This can include both 'behind-the-meter" and in "front-of-the-meter" for those installations like community solar which are allocated back to customers.

[11] 45% was the share for National Grid when the SMART program opened. It was the percentage of customers National Grid serves in the State of Massachusetts compared with Eversource and Unitil. This same share is assumed for calculating National Grid share of the State's existing and planned solar goals.

[12] *MA Clean Energy and Climate Plan for 2030*, page 68, June 2022.

[13] *Massachusetts 2050 Decarbonization Roadmap*, December 2020

exceed the summer peak and become the annual peak in later years – 2036 through 2050, PV saving is not available or much less available during the projected winter peak hour.

Electric Vehicles (EV)

EVs increase peak load over time. The EVs considered are those that plug-in to the electric system and include "plug-in hybrid electric vehicles" (PHEVs) and "plug-in battery-only electric vehicles" (BEVs). These two types are those that have impacts on the electric network. In addition to light-duty EVs that the Company has been tracking and considering in its electric load forecasts, this year, the Company expand the scope from light-duty EVs only to include light-duty, medium-duty, heavy-duty EVs and electric buses, and consider the EV adoptions of BEVs and PHEVs in these four different vehicle types.

The light-duty EV base case is developed around California's Advanced Clean Car II (ACC-II)[14] rules, which are expected to be adopted by Massachusetts. In the near-term, the zero-emission vehicle share of light-duty vehicle (LDV) sales is created based on the techno-economic potential and current market trends. In the medium-term (2026-2030), the ACC-II rules have a range of possible outcomes, so the zero-emission vehicle sales share rises in line with the "flexibilities[15]" (or lower-bound) of what the ACC-II rules require, reaching 59.5% in 2030. In the longer term (2031 and onward), zero emission vehicle sales match the ACC-II rules and reach 100% zero emissions vehicles in 2035 (and assume no more than 20% plug-in hybrid electric vehicles). Vehicle scrap is assumed based upon market data to develop the net EV in-operation numbers. The adoptions of medium-duty EV (MDEV) and heavy-duty EV (HDEV) and E-buses are based on the California's Advanced Clean Trucks (ACT)[16] rules through 2035 which have been adopted by the state. In the base case, the sales shares for MDEV, HDEV, and E-buses are estimated to be about 63%, 40%, and 75% of MDV, HDV, and buses, respectively, by the end of 2035. To extend the forecast until 2050, a similar growth rate is considered from 2036 to 2040, and after that 3% growth in sales share is assumed through 2050. That leads to 100%, 80%, and 100% sales shares for MDEV, HDEV, and E-Buses by the end of the forecast horizon, respectively.

Figure 13 shows the historical and estimated number of EVs in the National Grid's Massachusetts jurisdiction. As of the end of 2022, it is estimated that about 32,000 EVs, including light-duty, medium-duty, heavy-duty and buses, will be on the roads in MECO's service territory, growing to about 2,655,000 by the end of the forecast horizon.

[14] https://ww2.arb.ca.gov/rulemaking/2022/advanced-clean-cars-ii, retrieved September 2022

[15] Flexibilities include provisions to transfer ZEV "sales values" across all states that have adopted the regulations (e.g., a manufacturer can overachieve in California and underachieve elsewhere), provisions to sell affordable EVs in environmental justice areas, and using historical ZEV sales credits to meet the annual ZEV sales targets. All of the flexibilities provided in the rules expire by or before 2031.

[16] https://ww2.arb.ca.gov/our-work/programs/advanced-clean-trucks, retrieved September 2022

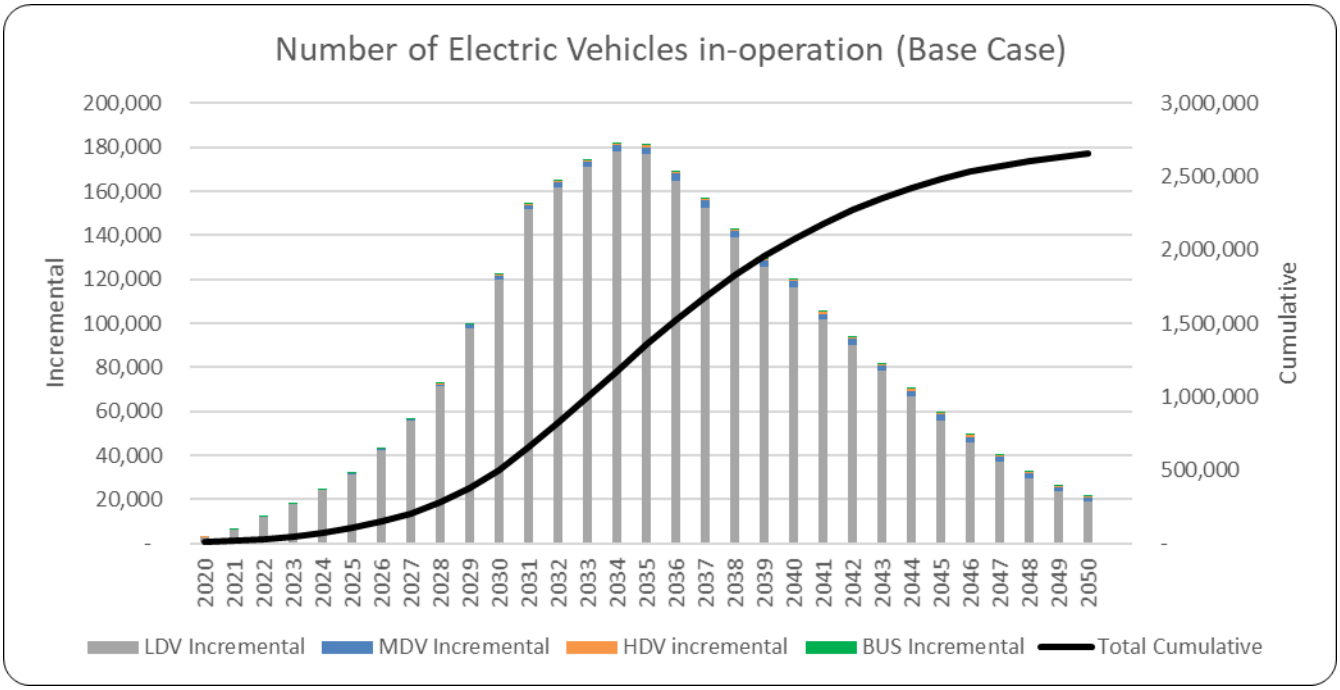


Figure 13: Number of Incremental and Cumulative EVs in National Grid's Massachusetts Service Territory

EV charging impacts are estimated for light-duty, medium-duty, heavy-duty, and electric buses separately, and vary by different season of the year too. In general, EV charging load is higher during cold weather seasons. Managed charging is not considered yet in base EV case but a managed charging scenario is provided in the low EV case to offer a view on how managed charging may impact the load. It is estimated that these electric vehicles may have increased MECO's cumulative summer peak loads by about 11.8 MW as of 2022, increasing to about 2,176 MW of cumulative summer peak load increase in the year 2050. For winter peak loads, its impact is estimated to be 11.1 MW as of 2021, increasing to about 3,099 of cumulative winter peak load increase in the year 2050. For Nantucket, the increase of summer peak load is negligible as of 2022 but is expected to grow to 10.9 MW by 2050. While EVs do add to both peak and energy loads over time, they are considered 'beneficial'[17] electrification.

Electric Heat Pumps (EH)

The base case is based on the Company's heat pump targets through 2024. Post 2024, the Company assumes that Company's pro rata shares of CECP phased pathway's target in 2050[18] will be met. Thus, about 1.34 million of units will be installed by 2050 and about 80% of those will be installed as full applications. A full application is defined as a heat pump unit that will serve the all the heating and cooling in the home or building. A partial heat pump is defined as a unit that will supplement existing heating system, as well as cool the home or building during the summer season. Penetration rates are expected to be about 86% of residential homes and 58% of commercial space heating capacity by 2050.

[17] Beneficial electrification is based on an overall portfolio of lowered carbon emissions from the transportation sector coupled with lower/carbon free generation of electricity in the power sector to support the charging of the EVs.
[18] *Massachusetts Clean Energy and Climate Plan for 2025 and 2030*, June 2022

Figure 14 shows the projected heat pump adoptions through the forecast horizon.

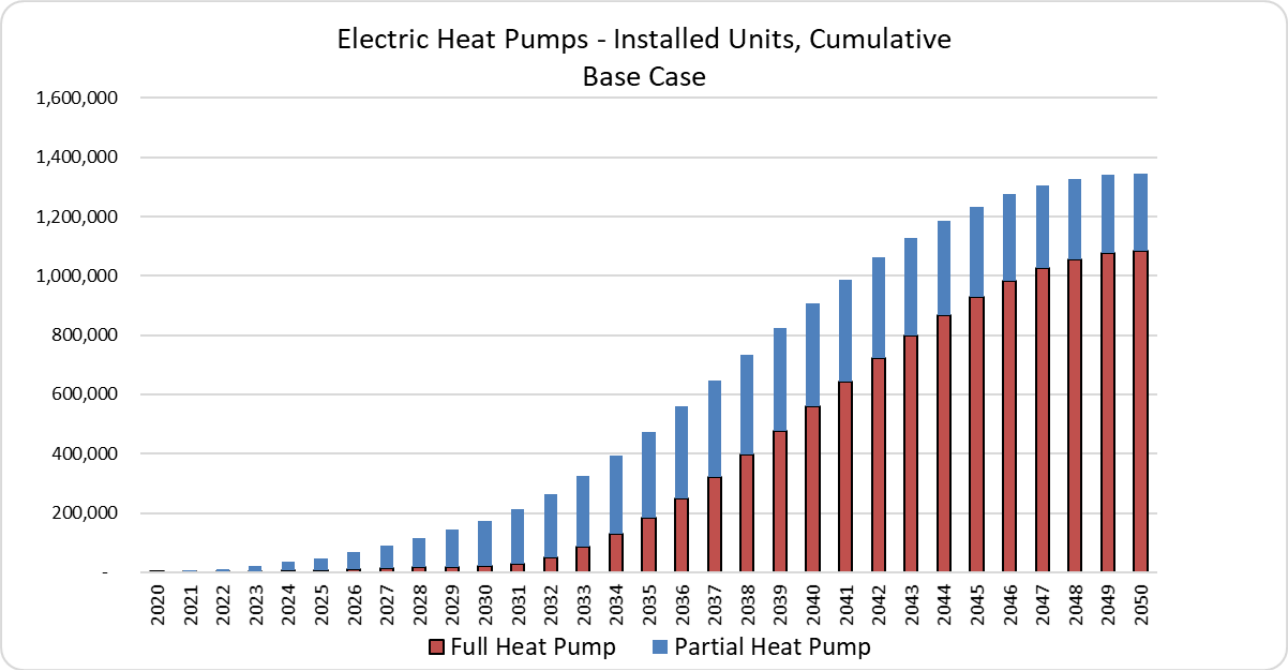


Figure 14: Cumulative Number of Electric Heat Pumps

Demand Response (DR)

DR programs actively target reductions to peak demand during hours of high expected demand and/or reliability problems. These resources must be dispatched, unlike the more passive energy efficiency programs that provide savings throughout the year. The DR programs enable utilities and operating areas, such as the New England Independent System Operator (ISO-NE) to act in response to a system reliability concern or economic (pricing) signal. During these events, customers can actively participate by either cutting their load or by turning on a generator to displace load from behind the customer's meter.

In general, there are two categories of Demand Response programs in Massachusetts. These are ISO-NE programs and Company retail level programs.

The ISO-NE programs, referred here as "wholesale DR", have been active for several years and were periodically activated. There were no ISO-NE DR events this year, and there has not been one since 2016. The company's policy has been to add-back reductions from these DR events to its reported system peak numbers. This is because the Company is not in control of the dispatch days or times and thus there is no guarantee that these ISO-NE events would be at the times of company peaks. Therefore, the Company must plan to assume they are not dispatched.

The Company recently began to run its own DR program at the retail customer level. In contrast to the wholesale level DR programs implemented by the ISO-NE, these programs are activated by the Company. The company counts the impact of DR resources enrolled in the retail program as load reductions.

In 2022, for MECO, the estimated impact on summer peak was 101 MW (in the retail program only) and is expected to grow to about 222 MW the year 2050. The hours of dispatch for DR are assumed to move over time to capture the hours of the peak, however, as the hours of the peak move outside of normal commercial sector activity, it is expected that DR impacts would be harder or impossible to achieve during peak hour(s). No DR program is expected for winter at this point.

Energy Storage (ES)

For the base case targets, it is assumed that the Company would make a share of the statewide energy storage policy goals. In Massachusetts, the state policy is 1000 MWh by 2025[19]. For summer peak impacts this is first converted to a MW equivalent using a four to one charging to peak output factor. Thus, the 1000 MWh target is about 250 MW. Only a portion of these is at the distribution level and will lower the load forecast (the remainder being considered supply by the ISO-NE and not considered in this load forecast). Based on the amount of energy storage installed in the state as of 2021, about 37% is considered distribution level and thus load reducing. Based on this the storage targets considered load reducing are lowered to 92.5 MWs (37% * 250) by year 2025. The Company's share of storage as in the state as of this year is about 78%. This is assumed to persist through year 2025. Thus, it is assumed that the year 2025 target for the Company is 72.15 MW (78% * 150). Not all energy storage will help to reduce the Company's summer peaks. A number of customers may use their storage to serve their own needs and times. It is assumed that only 85% of the installed energy storage amounts will impact the peak load. Thus, the final year 2025 target for peak reducing storage is 61.3 MW (85% * 102).

Massachusetts does not currently have explicit energy storage targets beyond year 2025. However, the State has published two studies, one the Clean Energy and Climate Plan for 2030 (CECP) and two the "Energy Pathways to Deep Decarbonization 2050". In the 2050 document, there are several scenarios that can guide the state to meeting its year 2050 long-term Climate goals. For example, by the year 2050, the "All options" scenario implies about 3,000 MW of large-scale energy storage (generation), "100% Renewable" scenario implies about 4,000 MW and the "No thermal" scenario implies 12,000 MW[20]. The Company used those inferred long-run energy storage capacity to provide a context to its long-term forecast at the distribution level. In order to do that, the company made two assumptions in the long run: (a) the company 'share of energy storage in the state will approximate the company's load share in the state (45%) and (b) more energy storage will move towards the supply side and less new storage as distribution level load reductions. The longer-term distribution share is assumed to drop to 20% (vs. 37% now). By using these assumptions, the current company's long term energy storage installed capacity forecast in 2050 will relate to the different pathways from "Energy Pathways to Deep Decarbonization 2050 as follows: the base case forecast of 516 MW will be between "All Options" and "100% renewable" scenarios. Finally, it is assumed the long-term peak reducing estimate will remain at 85% (85% is based on similar findings in New York which have significant pricing signals during peak hours). For the base case scenario, this lowers the final target to 439 MW by year 2050 (85% * 516).

The actual projections for installed energy storage are as follows. As of the end of year 2021 there was about 111 MW installed in the Company's service territory, about 58 MW of which was installed in

[19] https://www.mass.gov/info-details/esi-goals-storage-target, retrieved November 2022

[20] *Energy Pathways to Deep Decarbonization. A Technical Report of the Massachusetts 2050 Decarbonization RoadMap*, page 61, December 2020

the year 2021 alone. The base case assumes a continuation of this 58 MW per for the next three years, before assuming some saturation. Saturation is assumed to be 20% less per year for each subsequent year forward. This puts the Company on a path to easily surpass both the year 2025 and year 2050 targets determined above. Thus, it can be said that the Company is on-target for the CECP 2030 goals for this DER.

All prior discussion on load & DERs above is limited to the base case. Additional higher and lower scenarios are provided later in this section (see 'DER scenarios') and in the Appendices.

Peak Day 24 Hourly Curves

While the single peak values discussed so far are of major importance, the estimated impacts due to DERs on an hourly basis on these peak days is also important. For the two companies and for each of the zones, a 24-hour peak day load profile is provided. This allows the companies to look beyond the traditional approach of predicting only the 'single' highest seasonal system peak each year. The process now looks at the hourly load shape of all 24 hours of each peak day for each year of the planning horizon to determine the load and impact of DERs. This is useful to show the changing hours of the peaks as more DERs are added. For example, as more and more solar PV is placed on the system, the concept is that the summer peak hour will shift away from afternoon hours where solar irradiation is highest to evening hours as the solar reductions taper off. And as more electric vehicles chargers are installed, evening and nighttime loads can go up.

Figure 16 shows the "24 hour" peak summer day for selected years over the planning horizon for the base case DERs for MECO. "Gross" refers to loads before DER impacts and "Net' refers to loads after DER. The selected years are 2022, 2027, 2032, 2040, and 2050. The figure clearly shows how the expected DERs lower the load during middle of the day and add load from electrifications, which leads to the shift of the peak hour from afternoon to evening and night. Figure 17 shows the impact of the "24 hour" peak summer day under the DER scenario of managed light-duty electric vehicle charging and base cases for all other DER technologies. Under this scenario, the EV charging load is shifted from traditional peak hours of afternoon and early evening to late of the night, and the magnitude of the peak load is also lower than the scenario that EV charging is unmanaged.

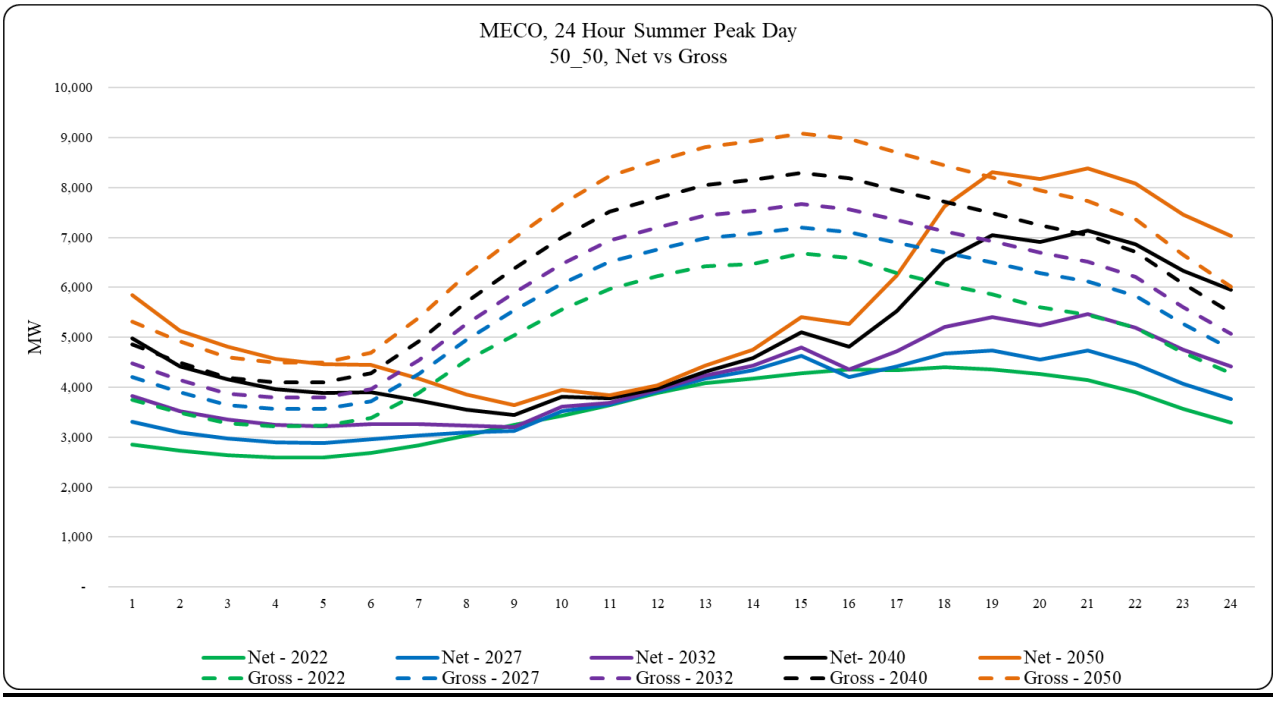


Figure 16: Peak Summer day hourly load, pre and post DERs for MECO

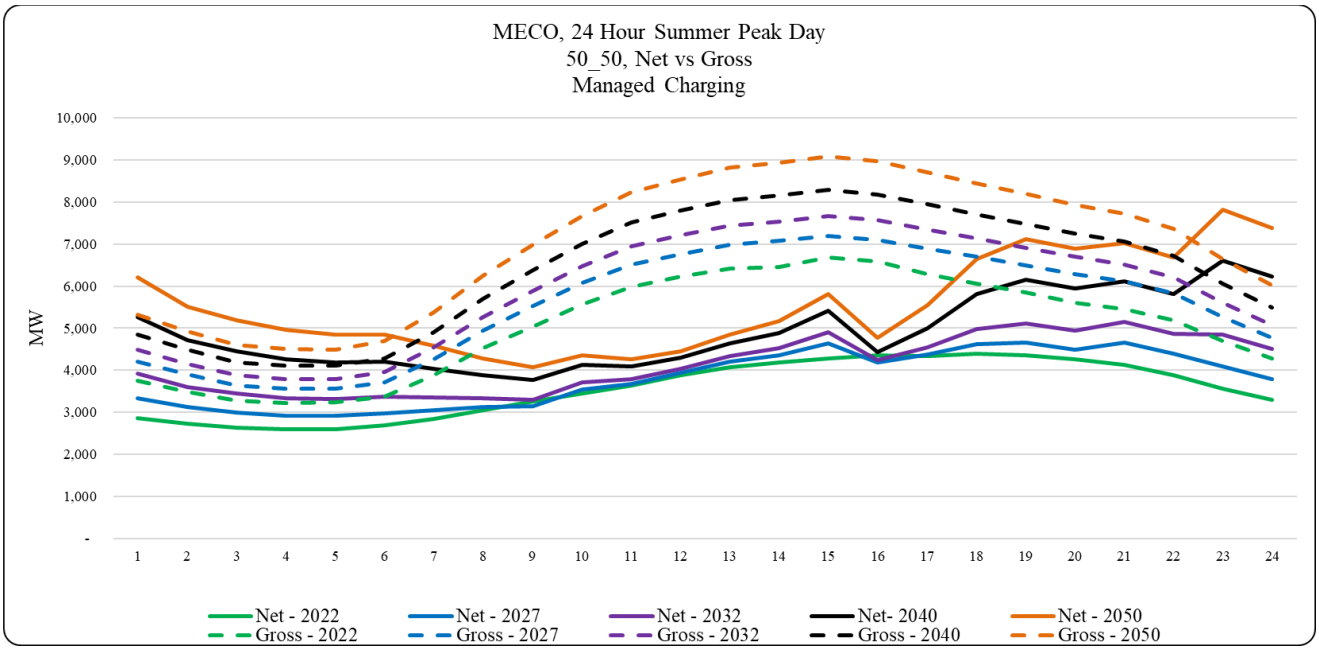


Figure 17: Peak Summer day hourly load, pre and post DERs for MECO under managed light-duty electric vehicle charging scenario

Figure 18 shows the "24 hour" peak winter day for selected years over the planning horizon with the base case DERs. The selected years are 2021, 2026, 2031, 2040 and 2050. The figure shows the dual peaks associated with winter days. The morning and evening/night load quicky ramp-up from the demand of EV charging, and electric heating, as well as the savings from PV becoming less available or unavailable during peak hours. Figure 19 shows the impact of the "24 hour" peak winter day under the DER scenario of managed light-duty electric vehicle charging and base cases for all other DER technologies. Under this scenario, the EV charging load is shifted from traditional peak hours of early evening to late of the night, and the magnitude of the peak load is also lower than the scenario that EV charging is unmanaged. The load of other hours are pushed higher with charging load being shifted to those hours.

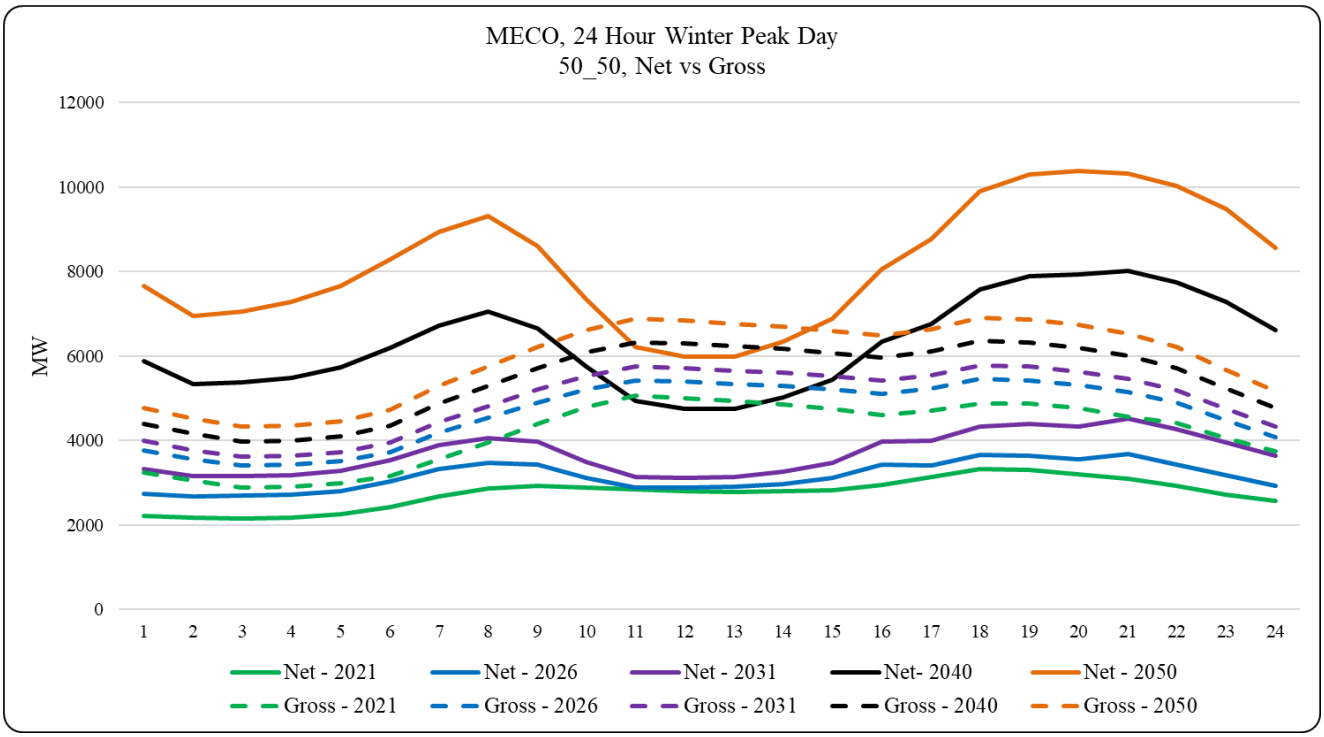


Figure 18: Peak Winter day hourly load, pre and post DERs for MECO

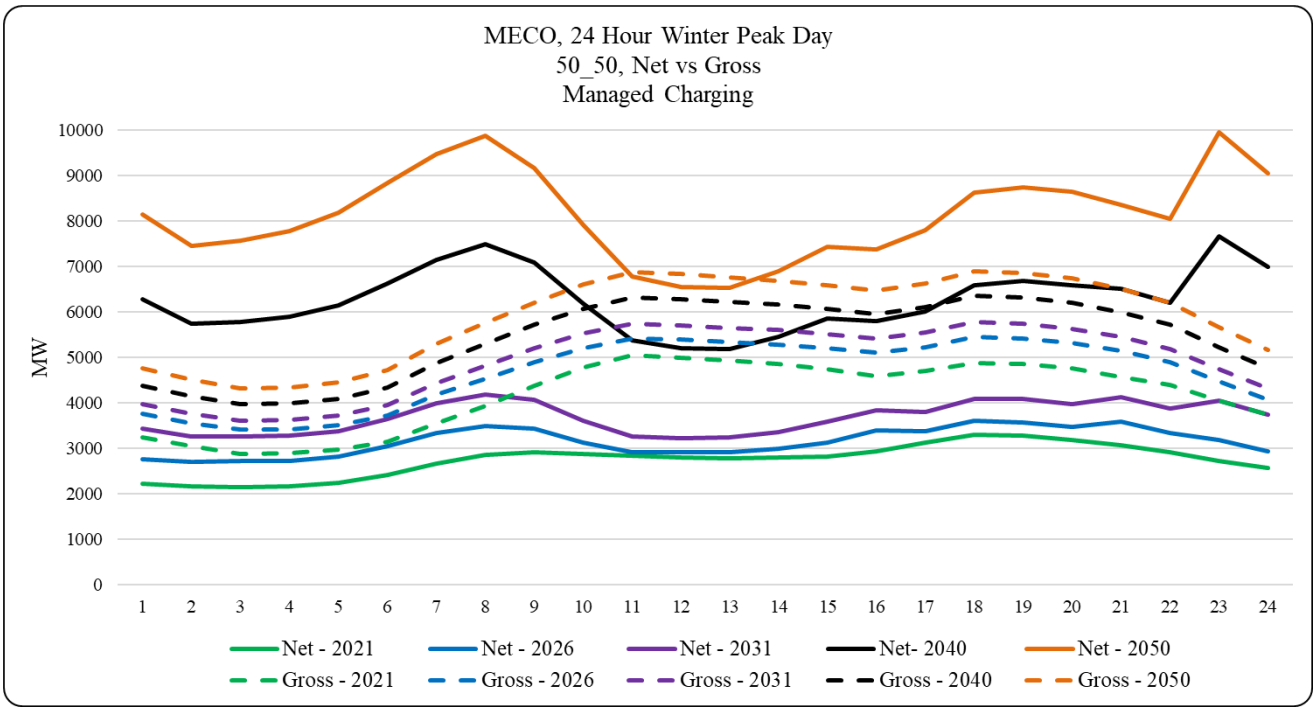


Figure 19: Peak Winter day hourly load, pre and post DERs for MECO under managed light-duty electric vehicle charging scenario

Appendix E contains additional load shapes for other day types including summer, winter and shoulder month average weekdays and weekends. These show the varying seasonal patterns as well as the lower load shoulder months which are mostly comprised of base load with minimal impacts of cooling or heating. Weekend load patterns also provide insight to lower load profiles since there is no weekday business load.

DER Scenarios

The body of this report thus far has shown results for the peak forecast with the base case DERs scenario. The Company has also looked at a number of scenarios where each of the DERs (EE, PV, EV, DR, ES, EH) also has a higher-case and a lower-case scenario, as appropriate. Looking at a range of scenarios can provide planners with additional information on what loads might be under various combinations of DER scenarios[21].

Each of the various combinations of DERs scenarios – base, high and low – were modeled. This creates thousands of combinations. In order to assess the probabilities of any one of these scenarios occurring, each DER technology was assigned a 'probability' level. For example, for the three EE cases, these were assigned 60% likelihood for the base case, 5% for the high case and 35% for the low case. These assignments are based on group consensus with the SMEs for the DER and sum to 100%. This process is repeated for each DER. Table 1 shows the probabilities used in the forecast.

Table 1: Probabilities for each DER case

MA	Low	Base	High
Energy Efficiency	35%	60%	5%
Solar - PV	20%	75%	5%
Electric Vehicles	15%	70%	15%
Demand Response	5%	85%	10%
Energy Storage	10%	80%	10%
Electric Heat Pumps	20%	75%	5%

Figure 20 & 21 shows summer and winter net load under selected DER scenarios – base case (which is the most likely) is blue solid line and the maximum and minimum cases are red solid lines which provide the highest and lowest bounds for planning purposes The base is the scenario with base cases from all DER technologies. The maximum load scenario / minimum DER saving scenario is the scenario with high cases for energy efficiency, solar PV, demand response, and energy storage; and low cases for electric vehicles and electric heat pumps. The minimum load scenario / maximum DER saving scenario is the scenario with low cases for energy efficiency, solar PV, demand response, and energy storage; and high cases for electric vehicles and electric heat pumps. It also shows the other more likely cases besides the base case, and they are shown as black dashed lines.

[21] In this forecast, six DERs, each with three cases – base, higher and lower, creates 729 cases (3^6) for each weather scenario. With three weather scenarios 2,187 scenarios are generated for the Company and the same for each individual zone.

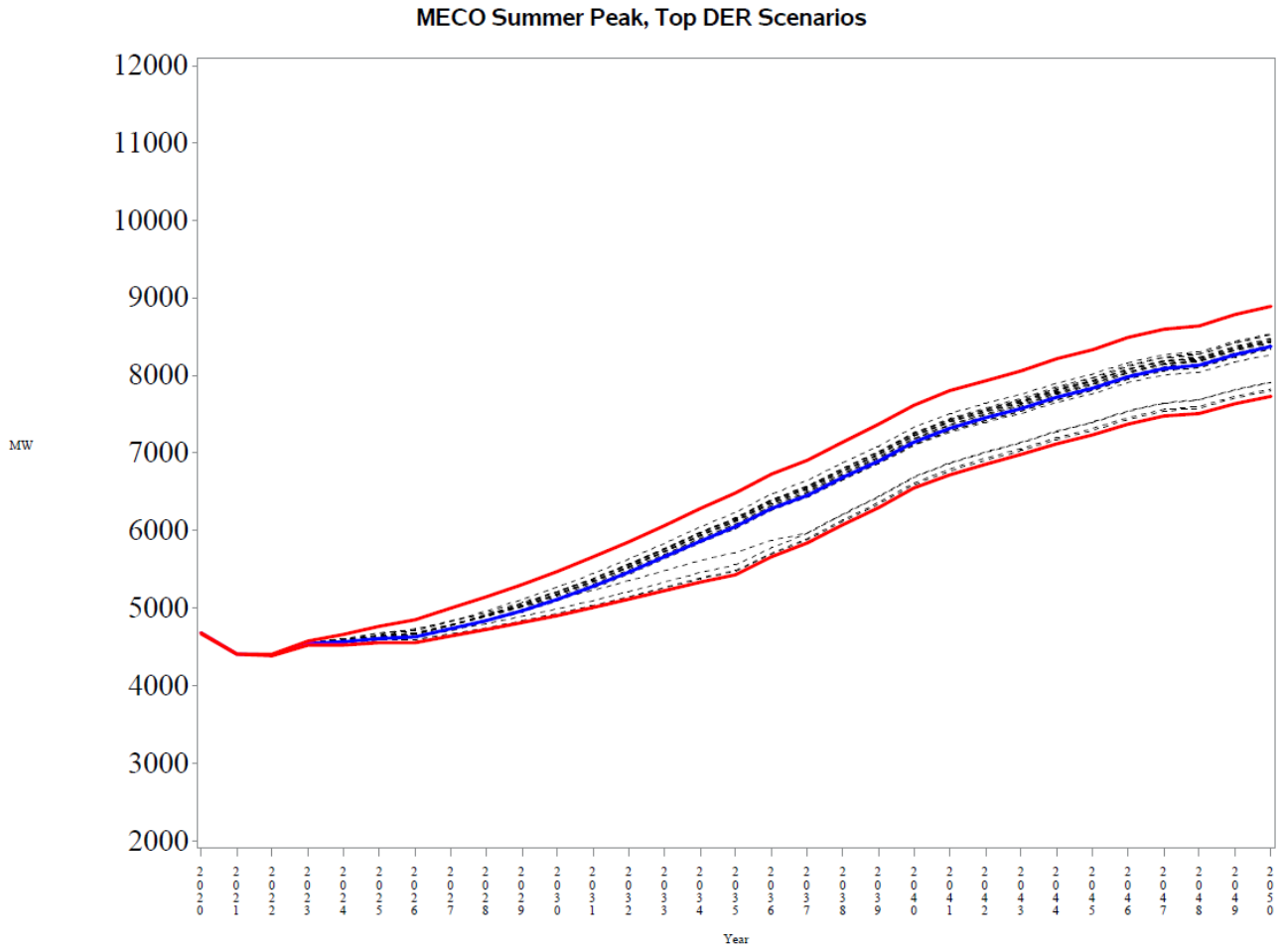


Figure 20: MECO Summer Peaks (50/50), NET, selected DER scenarios

Figure 20 shows that the summer peak load five years from now or in year 2027, ranges from about 4,641 MW to 5,004 MW - a 363 MW spread, with the base case at 4,732 MW. The uncertainty increases over time, so that by year 2050, the range expands to from about 7,732 MW to 8,891 MW, or almost a 1,158 MW spread, with the base case at 8,377 MW.

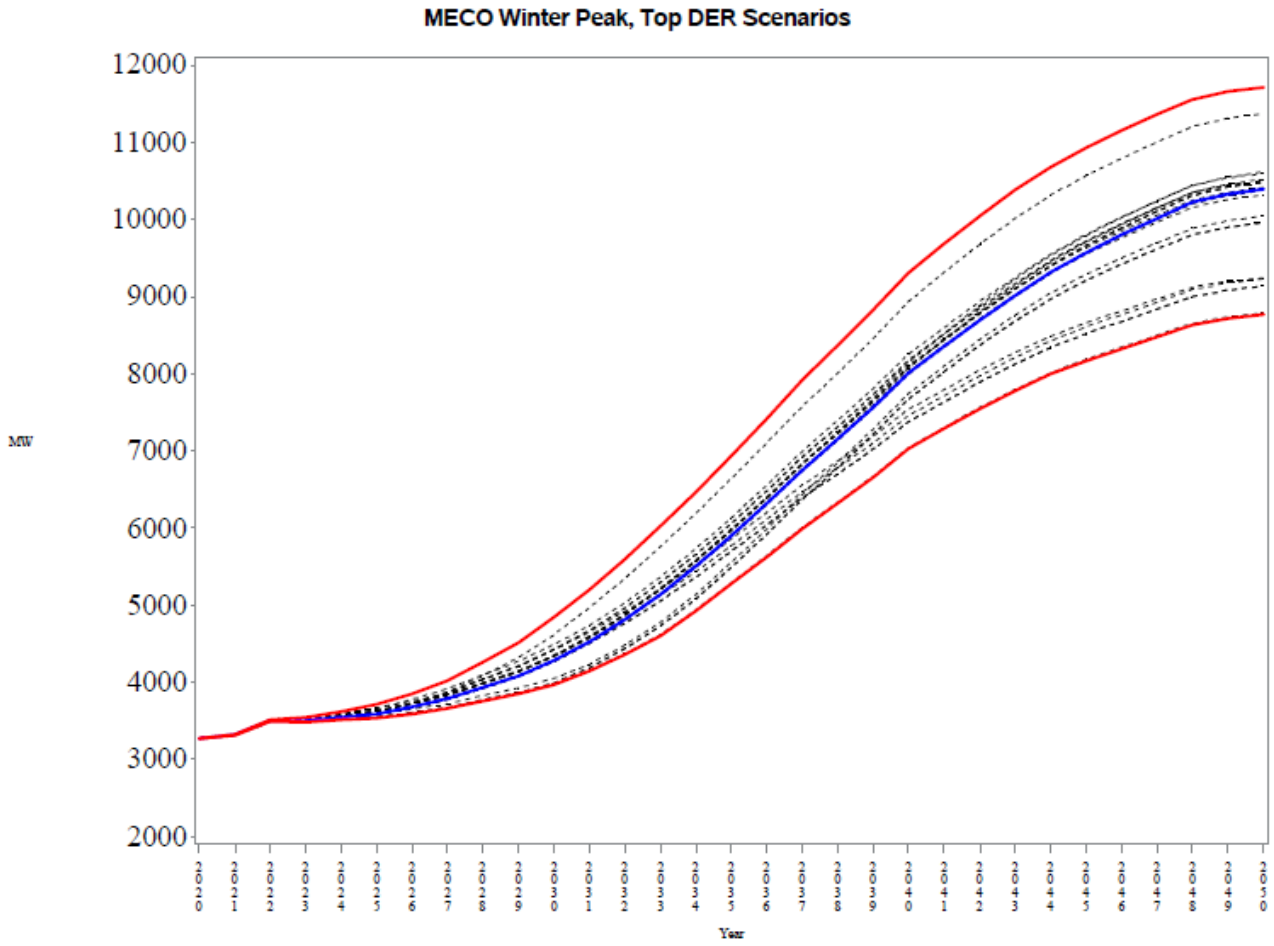


Figure 21: MECO Winter Peaks (50/50), NET, selected DER scenarios

Figure 21 shows that the winter peak load five years from the most recent winter or in year 2026, ranges from about 3,585 MW to 3,846 MW - a 261 MW spread, with the base case at 3,677 MW. The uncertainty increases over time, so that by the year 2050, the range expands to from about 8,769 MW to 11,711 MW, or almost a 2,942 MW spread, with the base case at 10,389 MW.

It is noted that while the maximum and minimum cases are shown to provide bounds for the forecast, those specific scenarios are very, very unlikely.

While Figure 20 & 21 above show what the longer-term annual summer peaks and winter peaks look like, Figures 22, 23, 24, and 25 show what the 24-hour peak day profiles might be for selected years.

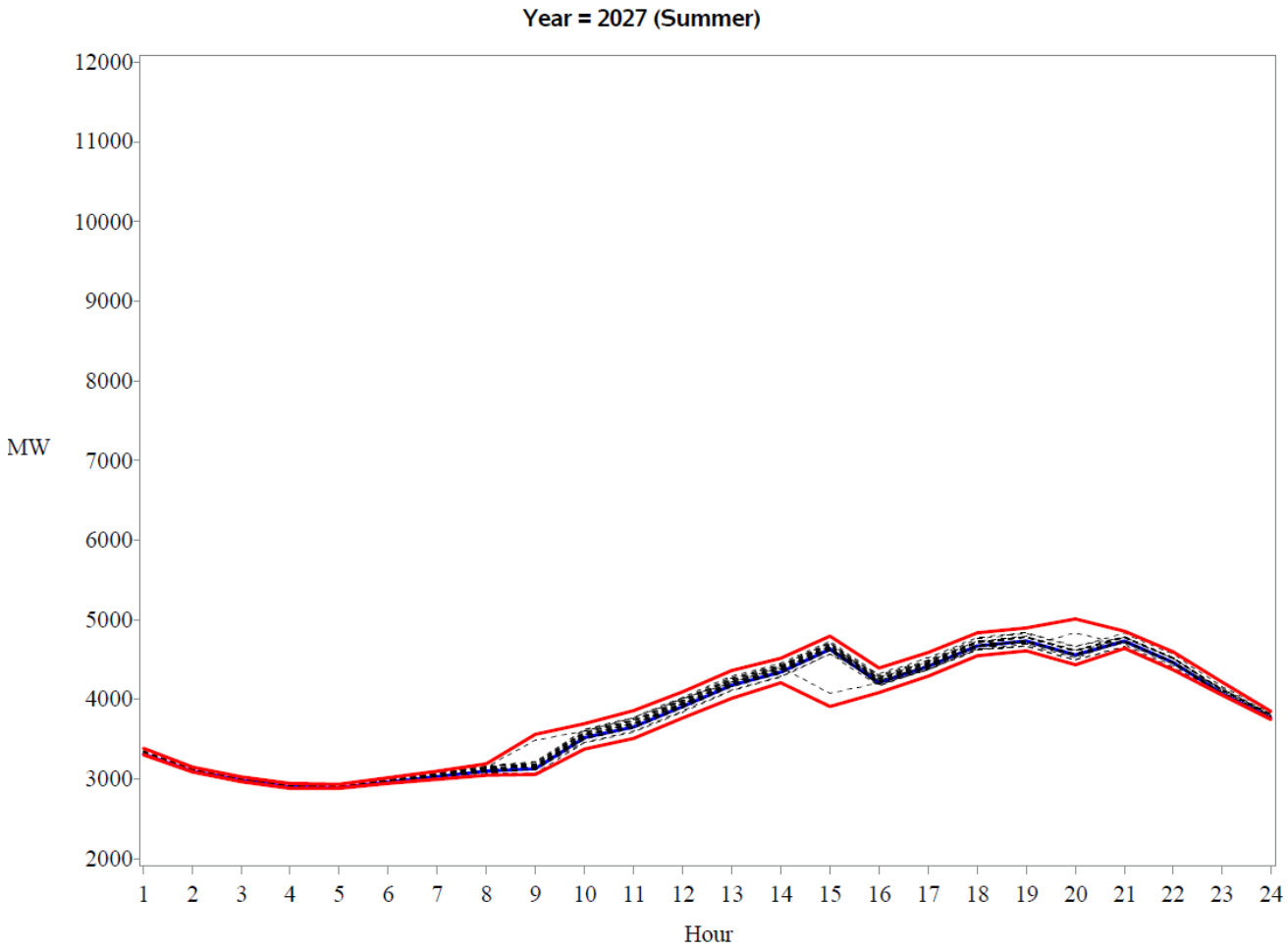


Figure 22: MECO 50/50 case, net summer peak, with range of DER scenarios, year 2027

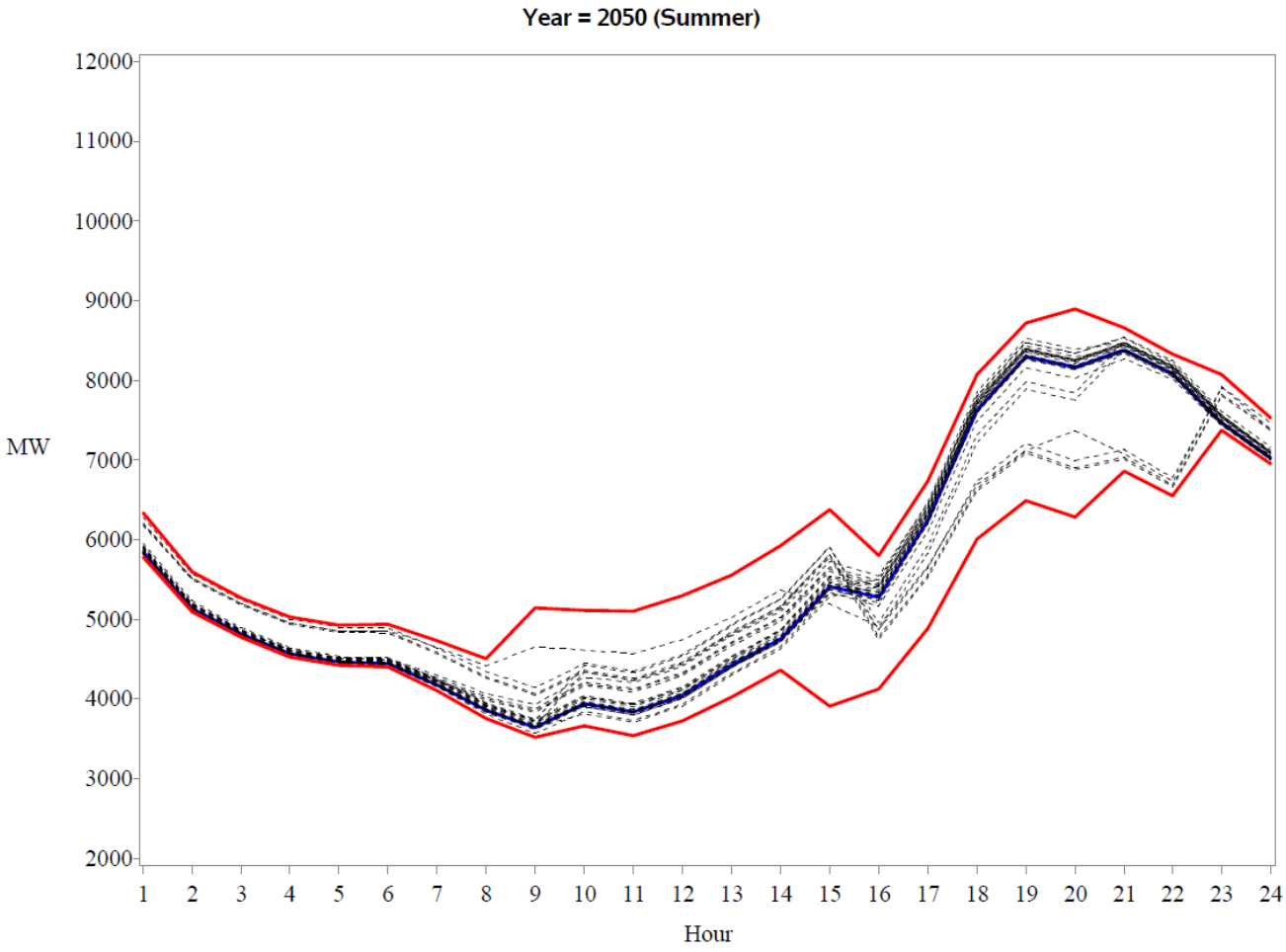


Figure 23: MECO 50/50 case, net summer peak, w/range of DER scenarios, year 2050

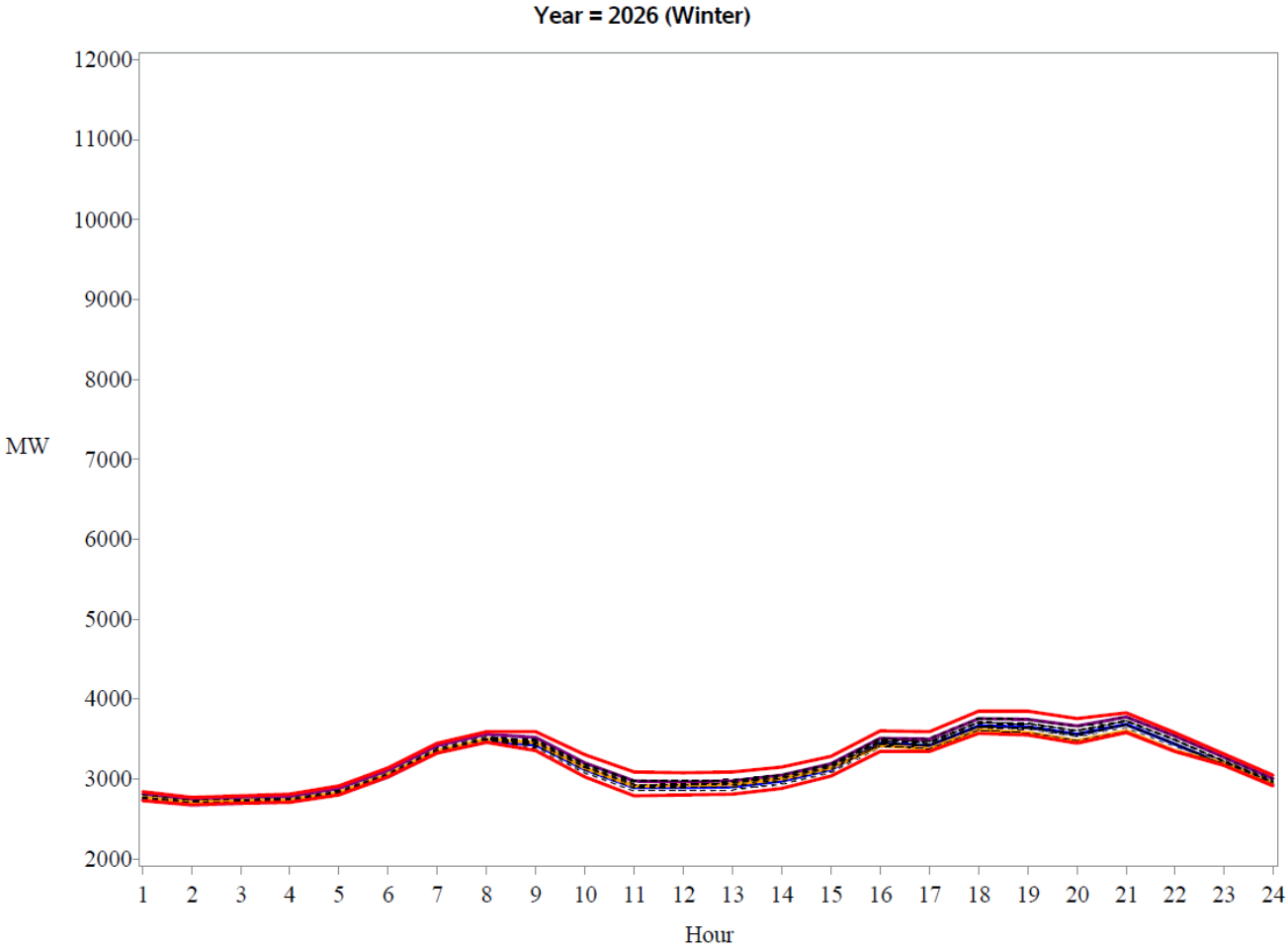


Figure 24: MECO 50/50 case, net winter peak, w/range of DER scenarios, year 2026 (blue = base; red = highest and lowest load scenarios; yellow = managed EV charging; purple = high electrification scenario)

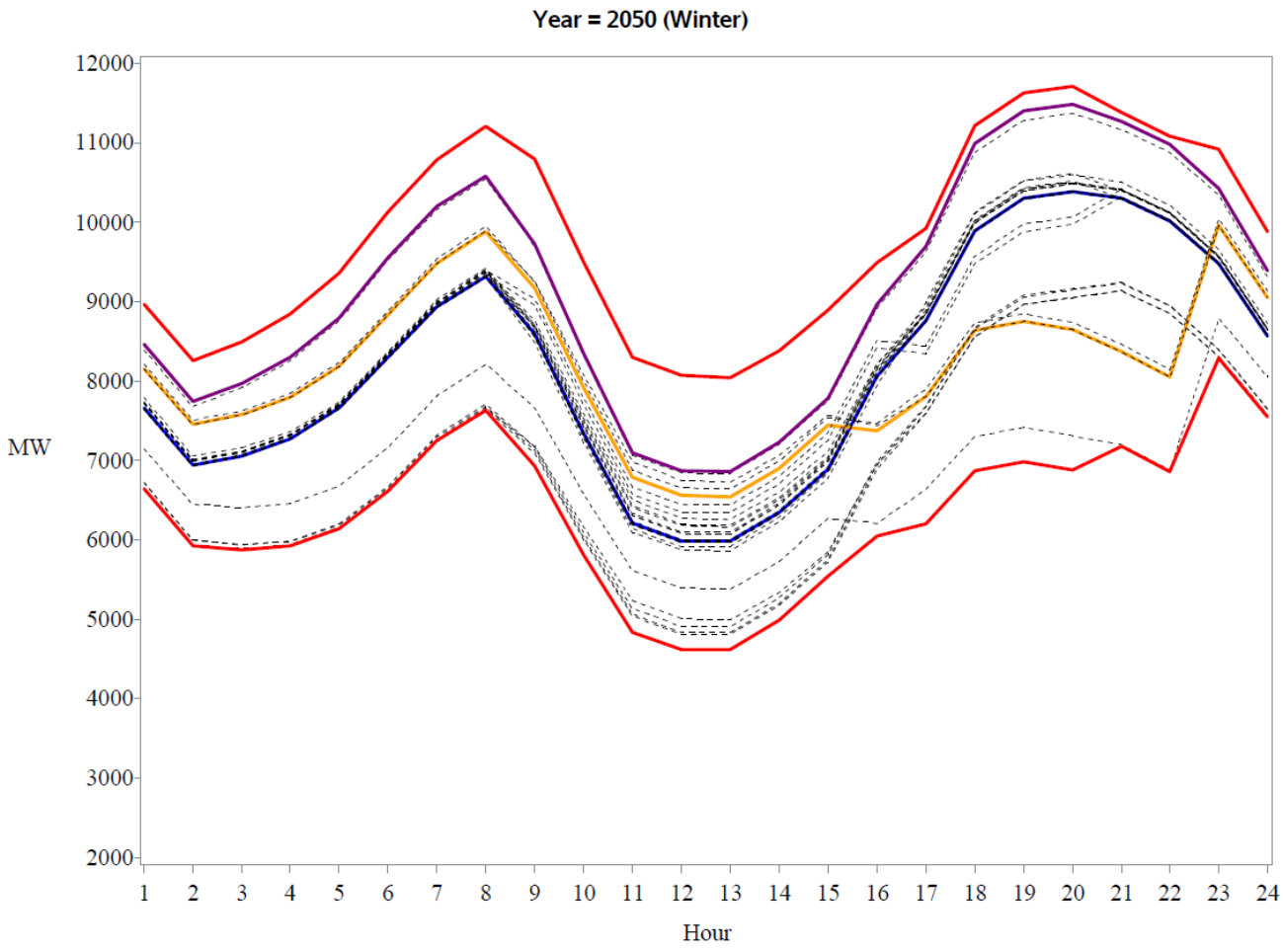


Figure 25: MECO 50/50 case, net winter peak, w/range of DER scenarios, year 2050 (blue = base; red = highest and lowest load scenarios; yellow = managed EV charging; purple = high electrification scenario)

Appendix F and G discuss the DER cases in more detail.

The base case DER projections included in this forecast are based on current trends, approved programs, existing state policy targets, and industrial studies, as appropriate. They are considered the most probable scenario at this time. The higher and lower cases are provided to give additional insights into what loads could look like under different scenarios. These are not meant to be all-inclusive and may or may not capture some of the more ambitious and aspirational type DER scenarios associated with more renewables due to climate and other regional discussions. These can include, among other things, additional electrification of the transportation and heating sectors, and managed EV charging. The Company is actively monitoring these processes and will incorporate, as appropriate, new policies and scenarios as they become more likely.

Climate Scenarios

The Company provides a climate change scenario based on possible changes in weather over time. This scenario shows potential changes to summer peak loads should average temperatures and volatility increase over time. Figure 26 compares the base case, 50/50 summer peak forecast vs. alternative loads with higher average weather values.

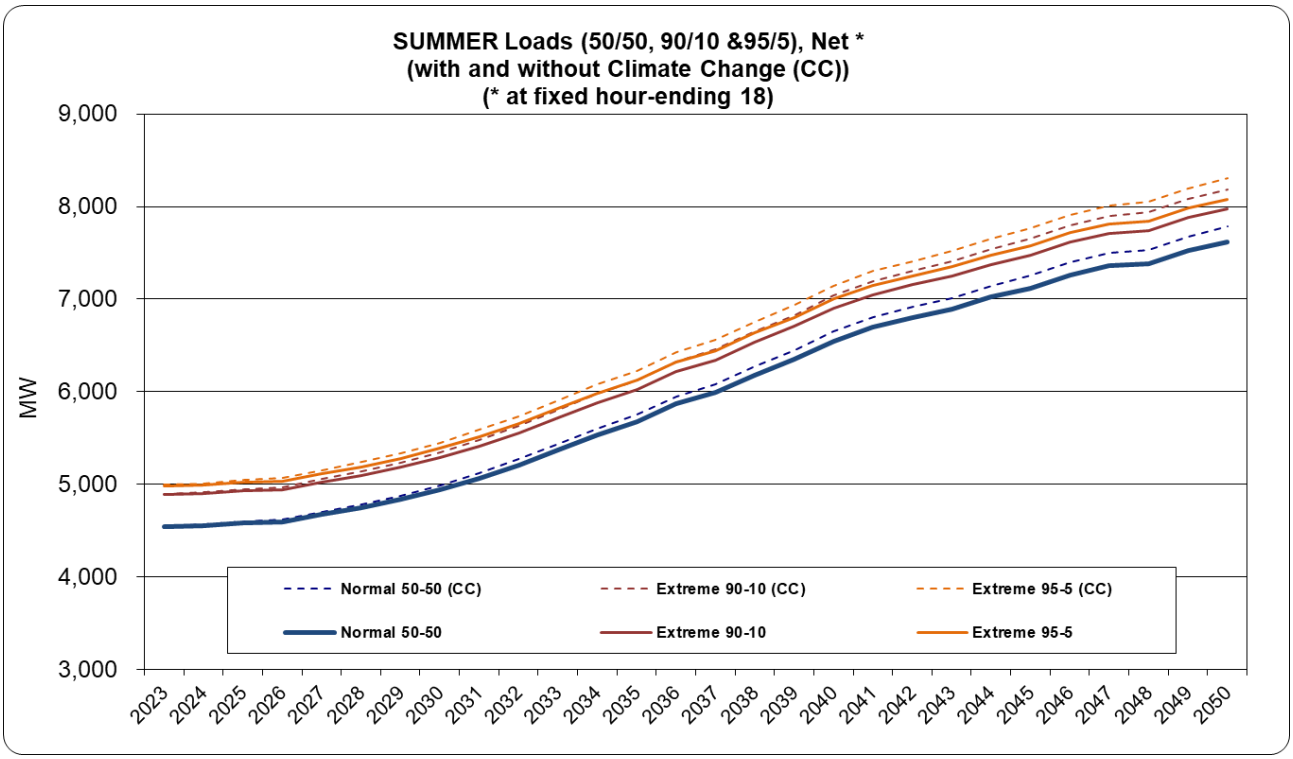


Figure 26 Summer Loads Base case and with Climate Change

The input assumption is a 0.7 degree rise in average temperatures per each ten years and a five percent increase in volatility over that same period. These increases are evenly divided across each year. The temperature increase is selected based on work that the NYISO performed relative to climate change.[22] This is assumed as a proxy for New England. Average temperature is a factor in each of the three weather scenarios. The volatility value of 5% is currently a placeholder. The NYISO report did not assume a value for this, however, since the 90/10 and 95/5 scenarios in this report do include variance in the modeling, a placeholder value was assumed for this exercise.

Table 3 shows the differences between the loads in the base case and the potential higher loads with the climate change assumptions for the three weather scenarios.

[22] *NYISO Climate Change Phase II Study*, page 4, April 2020.

Table 3 Comparison of Summer Loads between Base case and Climate Change Scenario for Year 2050

	50-50		90-10		95-5	
	Base	w/CC	Base	w/CC	Base	w/CC
Year 2050 (MWs)	7,620	7,781	7,978	8,187	8,080	8,302
Delta (MWs)		161		209		223
Delta (%)		2.1%		2.6%		2.8%

Comparison of 2022 Forecast to 2021 Forecast

This year is the first year that the peak forecast is provided for more than 15 years. The comparison to prior year's release can only be done for the next 14 years where the forecast horizon ends in last year's release.

Figure 27 provides a comparison of this year's summer peak forecast to last years and Figure 28 provides a comparison of this year's winter peak forecast to last years

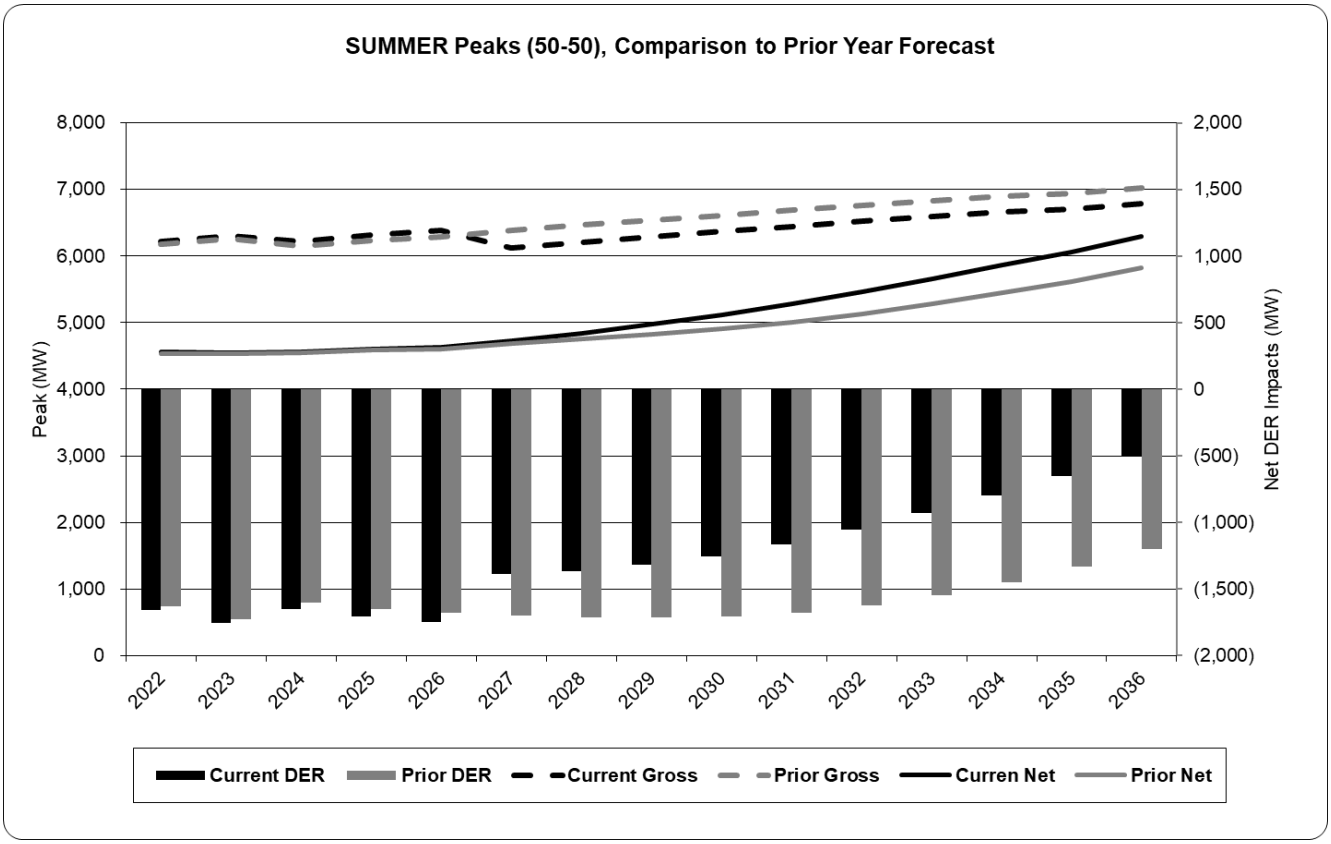


Figure 27 Comparison of current forecast to prior forecast, Gross and Net, Summer 50-50

The "Gross" summer peak load forecast is expected to be similar to the 2021 release for the next four years, and then step down due to the peak hour is expected to shift to later in the evening. The "Net" forecasts are similar in the next five years but becomes higher in later years driven by the lower net DER impacts.

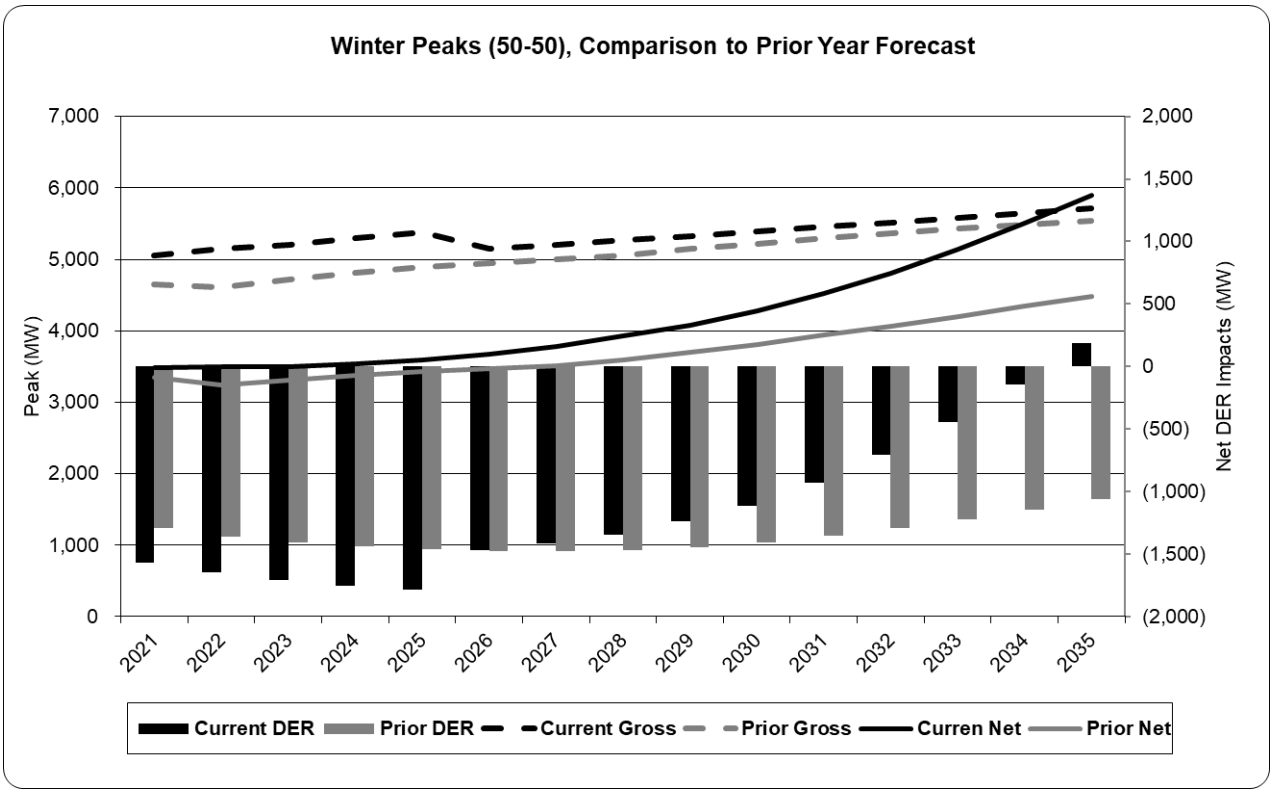


Figure 28 Comparison of current forecast to prior forecast, Gross and Net, Winter 50-50

The "Net" winter peak forecasts are expected to be higher than the 2021 release for the next 14 years. This is because of the joint effect from the higher projected "Gross" load now and lower net DER savings driven by electrifications in the transportation and heating sections.

Appendix A: Forecast Details

MECO (COMPANY)

MECO

Annual Peaks — **AFTER DER Impacts ***

YEAR	Actuals (MW)	Actuals (% Grwth)	Normal 50-50 (MW)	Normal 50-50 (% Grwth)	Extreme 90-10 (MW)	Extreme 90-10 (% Grwth)	Extreme 95-5 (MW)	Extreme 95-5 (% Grwth)	Peak Season (50-50)
2006	5,153		4,824		5,118		5,201		S
2007	4,733	-8.1%	4,791	-0.7%	5,075	-0.9%	5,155	-0.9%	S
2008	4,808	1.6%	4,844	1.1%	5,126	1.0%	5,206	1.0%	S
2009	4,518	-6.0%	4,760	-1.7%	5,040	-1.7%	5,119	-1.7%	S
2010	4,874	7.9%	4,739	-0.4%	5,029	-0.2%	5,111	-0.2%	S
2011	5,042	3.4%	4,694	-1.0%	4,974	-1.1%	5,053	-1.1%	S
2012	4,749	-5.8%	4,818	2.6%	5,089	2.3%	5,166	2.2%	S
2013	5,003	5.4%	4,764	-1.1%	5,043	-0.9%	5,123	-0.8%	S
2014	4,379	-12.5%	4,726	-0.8%	5,013	-0.6%	5,095	-0.5%	S
2015	4,384	0.1%	4,647	-1.7%	4,933	-1.6%	5,014	-1.6%	S
2016	4,556	3.9%	4,580	-1.4%	4,857	-1.5%	4,935	-1.6%	S
2017	4,314	-5.3%	4,518	-1.3%	4,800	-1.2%	4,880	-1.1%	S
2018	4,680	8.5%	4,535	0.4%	4,815	0.3%	4,894	0.3%	S
2019	4,339	-7.3%	4,404	-2.9%	4,671	-3.0%	4,746	-3.0%	S
2020	4,497	3.6%	4,610	4.7%	4,894	4.8%	4,974	4.8%	S
2021	4,643	3.2%	4,508	-2.2%	4,769	-2.5%	4,843	-2.6%	S
2022	4,657	0.3%	4,562	1.2%	4,904	2.8%	5,001	3.3%	S
2023	-	-	4,543	-0.4%	4,885	-0.4%	4,989	-0.2%	S
2024	-	-	4,562	0.4%	4,909	0.5%	5,014	0.5%	S
2025	-	-	4,607	1.0%	4,945	0.7%	5,049	0.7%	S
2026	-	-	4,636	0.6%	4,970	0.5%	5,064	0.3%	S
2027	-	-	4,732	2.1%	5,065	1.9%	5,160	1.9%	S
2028	-	-	4,845	2.4%	5,161	1.9%	5,255	1.8%	S
2029	-	-	4,973	2.6%	5,290	2.5%	5,380	2.4%	S
2030	-	-	5,116	2.9%	5,433	2.7%	5,523	2.7%	S
2031	-	-	5,281	3.2%	5,599	3.1%	5,689	3.0%	S
2032	-	-	5,465	3.5%	5,784	3.3%	5,874	3.2%	S
2033	-	-	5,663	3.6%	5,983	3.4%	6,073	3.4%	S
2034	-	-	5,870	3.6%	6,190	3.5%	6,280	3.4%	S
2035	-	-	6,056	3.2%	6,376	3.0%	6,467	3.0%	S
2036	-	-	6,315	4.3%	6,611	3.7%	6,702	3.6%	W
2037	-	-	6,754	7.0%	6,929	4.8%	6,978	4.1%	W
2038	-		7,150	5.9%	7,325	5.7%	7,375	5.7%	W
2039	-		7,563	5.8%	7,740	5.7%	7,790	5.6%	W
2040	-		8,009	5.9%	8,188	5.8%	8,239	5.8%	W
2041	-		8,357	4.3%	8,537	4.3%	8,588	4.2%	W
2042	-		8,698	4.1%	8,880	4.0%	8,932	4.0%	W
2043	-		9,011	3.6%	9,198	3.6%	9,252	3.6%	W
2044	-		9,314	3.4%	9,506	3.3%	9,560	3.3%	W
2045	-		9,572	2.8%	9,765	2.7%	9,820	2.7%	W
2046	-		9,799	2.4%	9,994	2.3%	10,049	2.3%	W
2047	-		10,014	2.2%	10,211	2.2%	10,266	2.2%	W
2048	-		10,218	2.0%	10,417	2.0%	10,473	2.0%	W
2049	-		10,326	1.1%	10,526	1.0%	10,582	1.0%	W
2050	-		10,389	0.6%	10,589	0.6%	10,646	0.6%	W

	Normal 50-50	Extreme 90-10	Extreme 95-5
Avg. last 15 yrs	-0.3%	-0.2%	-0.2%
Avg. last 10 yrs	-0.5%	-0.4%	-0.3%
Avg. last 5 yrs	0.2%	0.4%	0.5%
Base 2022			
Avg. next 5 yrs	0.7%	0.6%	0.6%
Avg. next 10 yrs	1.8%	1.7%	1.6%
Avg. next 15 yrs	2.6%	2.3%	2.2%
Avg. next 20 yrs	3.3%	3.0%	2.9%
Avg. next 25 yrs	3.2%	3.0%	2.9%

**** impacts include energy efficiency, solar pv, electric vehicles, energy storage, electric heat pumps, and company demand response***

MECO

SUMMER Peaks — **AFTER DER Impacts ***

YEAR	Actuals (MW)	Actuals (% Grwth)	Normal 50-50 (MW)	Normal 50-50 (% Grwth)	Extreme 90-10 (MW)	Extreme 90-10 (% Grwth)	Extreme 95-5 (MW)	Extreme 95-5 (% Grwth)	WTHI ACTUAL
2006	5,153		4,824		5,118		5,201		83.9
2007	4,733	-8.1%	4,791	-0.7%	5,075	-0.9%	5,155	-0.9%	81.8
2008	4,808	1.6%	4,844	1.1%	5,126	1.0%	5,206	1.0%	82.0
2009	4,518	-6.0%	4,760	-1.7%	5,040	-1.7%	5,119	-1.7%	80.1
2010	4,874	7.9%	4,739	-0.4%	5,029	-0.2%	5,111	-0.2%	82.6
2011	5,042	3.4%	4,694	-1.0%	4,974	-1.1%	5,053	-1.1%	84.1
2012	4,749	-5.8%	4,818	2.6%	5,089	2.3%	5,166	2.2%	81.3
2013	5,003	5.4%	4,764	-1.1%	5,043	-0.9%	5,123	-0.8%	83.4
2014	4,379	-12.5%	4,726	-0.8%	5,013	-0.6%	5,095	-0.5%	80.3
2015	4,384	0.1%	4,647	-1.7%	4,933	-1.6%	5,014	-1.6%	79.5
2016	4,556	3.9%	4,580	-1.4%	4,857	-1.5%	4,935	-1.6%	82.3
2017	4,314	-5.3%	4,518	-1.3%	4,800	-1.2%	4,880	-1.1%	80.9
2018	4,680	8.5%	4,535	0.4%	4,815	0.3%	4,894	0.3%	82.7
2019	4,339	-7.3%	4,404	-2.9%	4,671	-3.0%	4,746	-3.0%	81.3
2020	4,497	3.6%	4,610	4.7%	4,894	4.8%	4,974	4.8%	81.0
2021	4,643	3.2%	4,508	-2.2%	4,769	-2.5%	4,843	-2.6%	83.4
2022	4,657	0.3%	4,562	1.2%	4,904	2.8%	5,001	3.3%	83.3
2023	-	-	4,543	-0.4%	4,885	-0.4%	4,989	-0.2%	-
2024	-	-	4,562	0.4%	4,909	0.5%	5,014	0.5%	-
2025	-	-	4,607	1.0%	4,945	0.7%	5,049	0.7%	-
2026	-	-	4,636	0.6%	4,970	0.5%	5,064	0.3%	-
2027	-	-	4,732	2.1%	5,065	1.9%	5,160	1.9%	-
2028	-	-	4,845	2.4%	5,161	1.9%	5,255	1.8%	-
2029	-	-	4,973	2.6%	5,290	2.5%	5,380	2.4%	-
2030	-	-	5,116	2.9%	5,433	2.7%	5,523	2.7%	-
2031	-	-	5,281	3.2%	5,599	3.1%	5,689	3.0%	-
2032	-	-	5,465	3.5%	5,784	3.3%	5,874	3.2%	-
2033	-	-	5,663	3.6%	5,983	3.4%	6,073	3.4%	-
2034	-	-	5,870	3.6%	6,190	3.5%	6,280	3.4%	-
2035	-	-	6,056	3.2%	6,376	3.0%	6,467	3.0%	-
2036	-	-	6,290	3.9%	6,611	3.7%	6,702	3.6%	-
2037	-	-	6,459	2.7%	6,780	2.6%	6,871	2.5%	-
2038	-	-	6,689	3.6%	7,010	3.4%	7,101	3.4%	-
2039	-	-	6,902	3.2%	7,224	3.1%	7,316	3.0%	-
2040	-	-	7,143	3.5%	7,466	3.3%	7,557	3.3%	-
2041	-	-	7,322	2.5%	7,645	2.4%	7,737	2.4%	-
2042	-	-	7,455	1.8%	7,779	1.7%	7,870	1.7%	-
2043	-	-	7,576	1.6%	7,900	1.6%	7,991	1.5%	-
2044	-	-	7,722	1.9%	8,046	1.9%	8,138	1.8%	-
2045	-	-	7,840	1.5%	8,165	1.5%	8,257	1.5%	-
2046	-	-	7,990	1.9%	8,316	1.8%	8,408	1.8%	-
2047	-	-	8,096	1.3%	8,422	1.3%	8,515	1.3%	-
2048	-	-	8,136	0.5%	8,462	0.5%	8,555	0.5%	-
2049	-	-	8,276	1.7%	8,603	1.7%	8,696	1.6%	-
2050	-	-	8,377	1.2%	8,705	1.2%	8,798	1.2%	-

	Normal 50-50	Extreme 90-10	Extreme 95-5
Avg. last 15 yrs	-0.3%	-0.2%	-0.2%
Avg. last 10 yrs	-0.5%	-0.4%	-0.3%
Avg. last 5 yrs	0.2%	0.4%	0.5%
Base 2022			
Avg. next 5 yrs	0.7%	0.6%	0.6%
Avg. next 10 yrs	1.8%	1.7%	1.6%
Avg. next 15 yrs	2.3%	2.2%	2.1%
Avg. next 20 yrs	2.5%	2.3%	2.3%
Avg. next 25 yrs	2.3%	2.2%	2.2%

WTHI	
NORMAL	81.7
EXTREME 90/10	83.6
EXTREME 95/5	84.2

**** impacts include energy efficiency, solar pv, electric vehicles, energy storage, electric heap pumps, and company demand response***

MECO	SUMMER 50/50 Peaks (MW) (before & after DERs)														
	SYSTEM PEAK								DER IMPACTS						
Calendar Year	Reconstituted (before DER)	Forecast w/ EE only	Forecast w/ PV only	Forecast w/ EV only	Forecast w/ DR only	Forecast w/ ES only	Forecast w/ EH only	Final Forecast (after all DER)	EE	PV	EV	DR	ES	EH	DER
2006	4,927	4,825	4,927	4,927	4,927	4,927	4,927	**4,824**	(103)	(0)	0.0	0.0	0.0	0.0	(103)
2007	4,925	4,792	4,924	4,925	4,925	4,925	4,925	**4,791**	(133)	(1)	0.0	0.0	0.0	0.0	(134)
2008	5,010	4,845	5,009	5,010	5,010	5,010	5,010	**4,844**	(164)	(1)	0.0	0.0	0.0	0.0	(165)
2009	4,966	4,763	4,963	4,966	4,966	4,966	4,966	**4,760**	(202)	(3)	0.0	0.0	0.0	0.0	(205)
2010	4,995	4,745	4,989	4,995	4,995	4,995	4,995	**4,739**	(249)	(6)	0.0	0.0	0.0	0.0	(255)
2011	5,007	4,706	4,995	5,007	5,007	5,007	5,007	**4,694**	(301)	(13)	0.0	0.0	0.0	0.0	(314)
2012	5,193	4,835	5,176	5,193	5,193	5,193	5,193	**4,818**	(358)	(17)	0.1	0.0	0.0	0.0	(375)
2013	5,274	4,845	5,192	5,274	5,274	5,274	5,274	**4,764**	(429)	(82)	0.2	0.0	0.0	0.0	(511)
2014	5,355	4,843	5,238	5,356	5,355	5,355	5,355	**4,726**	(512)	(117)	0.4	0.0	0.0	0.0	(629)
2015	5,364	4,759	5,251	5,364	5,364	5,364	5,364	**4,647**	(604)	(113)	0.7	0.0	0.0	0.0	(717)
2016	5,622	4,913	5,288	5,623	5,621	5,622	5,622	**4,580**	(709)	(334)	0.9	(0.3)	0.0	0.0	(1,042)
2017	5,568	4,752	5,340	5,570	5,561	5,568	5,568	**4,518**	(816)	(228)	1.4	(7.3)	(0.2)	0.0	(1,050)
2018	5,601	4,676	5,493	5,604	5,566	5,600	5,601	**4,535**	(925)	(108)	3.0	34.9)	(1.2)	0.0	(1,066)
2019	5,633	4,596	5,511	5,637	5,569	5,621	5,633	**4,404**	(1,037)	(121)	4.2	(63.3)	(11.4)	0.2	(1,228)
2020	5,982	4,837	5,842	5,988	5,921	5,950	5,983	**4,610**	(1,145)	(140)	5.5	(60.8)	(32.1)	0.6	(1,372)
2021	6,027	4,792	5,863	6,035	5,967	5,958	6,028	**4,508**	(1,235)	(164)	7.6	(59.7)	(68.9)	1.1	(1,519)
2022	6,222	4,930	6,036	6,233	6,141	6,107	6,224	**4,562**	(1,292)	(186)	11.8	(80.7)	(114.9)	2.3	(1,659)
2023	6,300	4,969	6,094	6,320	6,217	6,139	6,305	**4,543**	(1,332)	(206)	19.6	(83.0)	(161.0)	4.4	(1,758)
2024	6,212	4,843	6,183	6,248	6,123	6,005	6,219	**4,562**	(1,368)	(29)	36.6	(88.4)	(207.0)	6.8	(1,649)
2025	6,315	4,915	6,284	6,370	6,222	6,068	6,326	**4,607**	(1,400)	(31)	54.4	(93.9)	(247.5)	10.1	(1,708)
2026	6,382	4,955	6,348	6,461	6,284	6,102	6,396	**4,636**	(1,427)	(34)	78.4	(98.2)	(279.8)	14.1	(1,747)
2027	6,121	4,671	6,121	6,234	6,045	6,129	6,138	**4,732**	(1,450)	0	112.2	(76.6)	8.1	17.0	(1,390)
2028	6,209	4,739	6,209	6,364	6,129	6,218	6,232	**4,845**	(1,470)	0	155.3	(80.3)	8.7	22.3	(1,364)
2029	6,292	4,805	6,292	6,506	6,208	6,301	6,320	**4,973**	(1,487)	0	214.1	(84.2)	9.1	28.3	(1,319)
2030	6,369	4,868	6,369	6,660	6,282	6,379	6,404	**5,116**	(1,501)	0	290.6	(87.4)	9.5	34.7	(1,253)
2031	6,445	4,932	6,445	6,832	6,355	6,454	6,487	**5,281**	(1,513)	0	387.8	(90.0)	9.8	42.0	(1,163)
2032	6,519	4,996	6,519	7,020	6,427	6,529	6,570	**5,465**	(1,523)	0	500.4	(92.4)	10.0	51.0	(1,054)
2033	6,595	5,063	6,595	7,219	6,500	6,605	6,657	**5,663**	(1,532)	0	623.7	(95.2)	10.2	61.7	(931)
2034	6,666	5,127	6,666	7,423	6,568	6,677	6,740	**5,870**	(1,539)	0	756.5	(97.8)	10.3	74.0	(796)
2035	6,708	5,162	6,708	7,604	6,607	6,718	6,795	**6,056**	(1,546)	0	896.7	(100.5)	10.4	87.5	(651)
2036	6,792	5,241	6,792	7,833	6,688	6,802	6,894	**6,290**	(1,551)	0	1,040.9	(103.5)	10.5	101.7	(502)
2037	6,814	5,257	6,814	7,996	6,708	6,825	6,931	**6,459**	(1,557)	0	1,181.8	(106.5)	10.6	116.4	(355)
2038	6,901	5,338	6,901	8,220	6,791	6,912	7,032	**6,689**	(1,563)	0	1,318.6	(109.9)	10.7	131.1	(213)
2039	6,969	5,400	6,969	8,428	6,856	6,980	7,115	**6,902**	(1,569)	0	1,458.9	(113.1)	10.7	145.5	(67)
2040	7,053	5,478	7,053	8,663	6,937	7,063	7,212	**7,143**	(1,575)	0	1,610.4	(115.4)	10.8	159.2	90
2041	7,132	5,552	7,132	8,837	7,015	7,143	7,304	**7,322**	(1,581)	0	1,704.9	(117.2)	10.8	172.0	190
2042	7,176	5,590	7,176	8,966	7,057	7,187	7,360	**7,455**	(1,587)	0	1,789.6	(118.6)	10.8	183.6	279
2043	7,218	5,626	7,218	9,084	7,098	7,229	7,412	**7,576**	(1,592)	0	1,865.5	(120.2)	10.8	193.9	358
2044	7,295	5,697	7,295	9,228	7,174	7,306	7,498	**7,722**	(1,598)	0	1,932.4	(121.6)	10.9	202.7	426
2045	7,356	5,751	7,356	9,346	7,232	7,366	7,566	**7,840**	(1,604)	0	1,990.6	(123.2)	10.9	210.1	484
2046	7,457	5,847	7,457	9,498	7,332	7,468	7,673	**7,990**	(1,610)	0	2,040.7	(125.0)	10.9	216.1	533
2047	7,524	5,908	7,524	9,607	7,397	7,535	7,744	**8,096**	(1,616)	0	2,083.3	(126.8)	10.9	220.7	572
2048	7,532	5,910	7,532	9,651	7,403	7,543	7,756	**8,136**	(1,622)	0	2,119.4	(128.5)	10.9	224.0	604
2049	7,647	6,019	7,647	9,797	7,516	7,658	7,873	**8,276**	(1,628)	0	2,149.9	(130.3)	10.9	226.2	629
2050	7,729	6,095	7,729	9,904	7,597	7,740	7,956	**8,377**	(1,633)	0	2,175.8	(132.1)	10.9	227.1	648

Avg. last 15 yrs	1.6%	0.2%	1.4%	1.6%	1.5%	1.4%	1.6%	-0.3%
Avg. last 10 yrs	1.8%	0.2%	1.5%	1.8%	1.7%	1.6%	1.8%	-0.5%
Avg. last 5 yrs	2.2%	0.7%	2.5%	2.3%	2.0%	1.9%	2.3%	0.2%
Base 2022								
Avg. next 5 yrs	-0.3%	-1.1%	0.3%	0.0%	-0.3%	0.1%	-0.3%	0.7%
Avg. next 10 yrs	0.5%	0.1%	0.8%	1.2%	0.5%	0.7%	0.5%	1.8%
Avg. next 15 yrs	0.6%	0.4%	0.8%	1.7%	0.6%	0.7%	0.7%	2.3%
Avg. next 20 yrs	0.7%	0.6%	0.9%	1.8%	0.7%	0.8%	0.8%	2.5%
Avg. next 25 yrs	0.8%	0.7%	0.9%	1.7%	0.7%	0.8%	0.9%	2.3%

EE: Energy Efficiency (reduces load)
PV: Solar - Photovoltaics (reduces load)
EV: Electric Vehicles (ADDs to load)
DR: Demand Response (Company only) (reduces load)
ES: Energy Storage (reduces load)
EH: Electric Heating Pump Cooling (reduces load)

MECO
WINTER Peaks — **after DER Impacts ***

YEAR	Actuals (MW)	Actuals (% Grwth)	Normal 50-50 (MW)	Normal 50-50 (% Grwth)	Extreme 10-90 (MW)	Extreme 10-90 (% Grwth)	Extreme 05-95 (MW)	Extreme 05-95 (% Grwth)	HDD_wtd ACTUAL
2006	3,875		3,860		3,975		4,007		49.1
2007	3,888	0.4%	3,822	-1.0%	3,933	-1.0%	3,965	-1.1%	48.9
2008	3,729	-4.1%	3,796	-0.7%	3,917	-0.4%	3,952	-0.3%	42.3
2009	3,720	-0.3%	3,821	0.6%	3,937	0.5%	3,970	0.5%	38.5
2010	3,807	2.4%	3,679	-3.7%	3,815	-3.1%	3,854	-2.9%	55.1
2011	3,558	-6.5%	3,675	-0.1%	3,804	-0.3%	3,840	-0.3%	46.9
2012	3,760	5.7%	3,723	1.3%	3,853	1.3%	3,889	1.3%	50.0
2013	3,881	3.2%	3,906	4.9%	4,044	5.0%	4,083	5.0%	46.5
2014	3,662	-5.6%	3,611	-7.5%	3,733	-7.7%	3,767	-7.7%	53.1
2015	3,437	-6.2%	3,514	-2.7%	3,628	-2.8%	3,660	-2.8%	43.9
2016	3,499	1.8%	3,471	-1.2%	3,610	-0.5%	3,649	-0.3%	48.0
2017	3,676	5.1%	3,485	0.4%	3,654	1.2%	3,702	1.5%	56.5
2018	3,692	0.4%	3,586	2.9%	3,731	2.1%	3,772	1.9%	53.4
2019	3,291	-10.9%	3,378	-5.8%	3,521	-5.6%	3,561	-5.6%	43.2
2020	3,333	1.3%	3,498	3.6%	3,634	3.2%	3,672	3.1%	41.6
2021	3,529	5.9%	3,486	-0.3%	3,631	-0.1%	3,672	0.0%	47.0
2022	-	-	3,498	0.3%	3,652	0.6%	3,695	0.6%	-
2023	-	-	3,503	0.1%	3,659	0.2%	3,703	0.2%	-
2024	-	-	3,544	1.2%	3,703	1.2%	3,748	1.2%	-
2025	-	-	3,586	1.2%	3,747	1.2%	3,792	1.2%	-
2026	-	-	3,677	2.5%	3,831	2.2%	3,874	2.2%	-
2027	-	-	3,782	2.9%	3,938	2.8%	3,982	2.8%	-
2028	-	-	3,930	3.9%	4,087	3.8%	4,132	3.8%	-
2029	-	-	4,081	3.9%	4,240	3.7%	4,285	3.7%	-
2030	-	-	4,278	4.8%	4,439	4.7%	4,484	4.6%	-
2031	-	-	4,522	5.7%	4,685	5.6%	4,731	5.5%	-
2032	-	-	4,809	6.3%	4,974	6.2%	5,021	6.1%	-
2033	-	-	5,138	6.8%	5,305	6.7%	5,352	6.6%	-
2034	-	-	5,501	7.1%	5,670	6.9%	5,717	6.8%	-
2035	-	-	5,899	7.2%	6,069	7.1%	6,118	7.0%	-
2036	-	-	6,315	7.1%	6,488	6.9%	6,536	6.8%	-
2037	-		6,754	7.0%	6,929	6.8%	6,978	6.8%	-
2038	-		7,150	5.9%	7,325	5.7%	7,375	5.7%	-
2039	-		7,563	5.8%	7,740	5.7%	7,790	5.6%	-
2040	-		8,009	5.9%	8,188	5.8%	8,239	5.8%	-
2041	-		8,357	4.3%	8,537	4.3%	8,588	4.2%	-
2042	-		8,698	4.1%	8,880	4.0%	8,932	4.0%	-
2043	-		9,011	3.6%	9,198	3.6%	9,252	3.6%	-
2044	-		9,314	3.4%	9,506	3.3%	9,560	3.3%	-
2045	-		9,572	2.8%	9,765	2.7%	9,820	2.7%	-
2046	-		9,799	2.4%	9,994	2.3%	10,049	2.3%	-
2047	-		10,014	2.2%	10,211	2.2%	10,266	2.2%	-
2048	-		10,218	2.0%	10,417	2.0%	10,473	2.0%	-
2049	-		10,326	1.1%	10,526	1.0%	10,582	1.0%	-
2050	-		10,389	0.6%	10,589	0.6%	10,646	0.6%	-

	Normal 50-50	Extreme 10-90	Extreme 05-95
Avg. last 15 yrs	-0.7%	-0.6%	-0.6%
Avg. last 10 yrs	-0.5%	-0.5%	-0.4%
Avg. last 5 yrs	0.1%	0.1%	0.1%
Base 2021			
Avg. next 5 yrs	1.1%	1.1%	1.1%
Avg. next 10 yrs	2.6%	2.6%	2.6%
Avg. next 15 yrs	4.0%	3.9%	3.9%
Avg. next 20 yrs	4.5%	4.4%	4.3%
Avg. next 25 yrs	4.2%	4.1%	4.1%

HDD_wtd	
NORMAL	47.9
EXTREME 90/10	55.6
EXTREME 95/5	57.7

**** impacts include energy efficiency, solar pv, electric vehicles, energy storage, electric heap pumps, and company demand response (solar and demand response are zero at times of winter peak)***

MECO	WINTER 50/50 Peaks (MW) (before & after DERs)														
	SYSTEM PEAK								DER IMPACTS						
Calendar Year	Reconstituted (before DER)	Forecast w/ EE only	Forecast w/ PV only	Forecast w/ EV only	Forecast w/ DR only	Forecast w/ ES only	Forecast w/ EH only	Final Forecast (after all DER)	EE	PV	EV	DR	ES	EH	DER
2006	4,042	3,860	4,042	4,042	4,042	4,042	4,042	**3,860**	(181)	0	0.0	0.0	0.0	0.0	(181)
2007	4,060	3,822	4,060	4,060	4,060	4,060	4,060	**3,822**	(238)	0	0.0	0.0	0.0	0.0	(238)
2008	4,068	3,796	4,068	4,068	4,068	4,068	4,068	**3,796**	(272)	0	0.0	0.0	0.0	0.0	(272)
2009	4,156	3,821	4,156	4,156	4,156	4,156	4,156	**3,821**	(336)	0	0.0	0.0	0.0	0.0	(336)
2010	4,071	3,679	4,071	4,071	4,071	4,071	4,071	**3,679**	(392)	0	0.0	0.0	0.0	0.0	(392)
2011	4,127	3,675	4,127	4,127	4,127	4,127	4,127	**3,675**	(452)	0	0.0	0.0	0.0	0.0	(452)
2012	4,242	3,723	4,242	4,243	4,242	4,242	4,242	**3,723**	(519)	0	0.3	0.0	0.0	0.0	(519)
2013	4,515	3,905	4,515	4,515	4,515	4,515	4,515	**3,906**	(609)	0	0.5	0.0	0.0	0.0	(609)
2014	4,317	3,610	4,317	4,318	4,317	4,317	4,317	**3,611**	(707)	0	1.0	0.0	0.0	0.0	(706)
2015	4,328	3,512	4,328	4,330	4,328	4,328	4,328	**3,514**	(816)	0	1.6	0.0	0.0	0.0	(814)
2016	4,397	3,469	4,397	4,399	4,397	4,397	4,397	**3,471**	(928)	0	1.8	0.0	0.0	0.0	(926)
2017	4,526	3,483	4,526	4,528	4,526	4,525	4,526	**3,485**	(1,043)	0	2.8	0.0	(0.4)	0.0	(1,041)
2018	4,753	3,584	4,753	4,757	4,753	4,751	4,753	**3,586**	(1,169)	0	4.4	0.0	(1.8)	0.0	(1,166)
2019	4,683	3,390	4,683	4,689	4,683	4,665	4,684	**3,378**	(1,293)	0	6.1	0.0	(18.4)	0.7	(1,305)
2020	4,947	3,531	4,947	4,955	4,947	4,905	4,949	**3,498**	(1,416)	0	7.7	0.0	(42.4)	2.2	(1,449)
2021	5,055	3,560	5,055	5,066	5,055	4,966	5,059	**3,486**	(1,496)	0	11.1	0.0	(88.7)	4.2	(1,569)
2022	5,143	3,605	5,143	5,161	5,143	5,008	5,153	**3,498**	(1,538)	0	17.8	0.0	(135.1)	9.7	(1,645)
2023	5,208	3,634	5,208	5,238	5,208	5,027	5,229	**3,503**	(1,575)	0	29.9	0.0	(181.4)	20.7	(1,706)
2024	5,300	3,690	5,300	5,346	5,300	5,072	5,335	**3,544**	(1,610)	0	46.6	0.0	(227.8)	35.4	(1,755)
2025	5,371	3,732	5,371	5,440	5,371	5,107	5,421	**3,586**	(1,639)	0	68.5	0.0	(264.5)	50.2	(1,785)
2026	5,143	3,479	5,143	5,274	5,143	5,152	5,203	**3,677**	(1,665)	0	130.4	0.0	8.2	59.7	(1,466)
2027	5,199	3,512	5,199	5,382	5,199	5,207	5,277	**3,782**	(1,686)	0	183.0	0.0	8.8	78.1	(1,416)
2028	5,274	3,570	5,274	5,526	5,274	5,283	5,373	**3,930**	(1,704)	0	251.9	0.0	9.4	98.6	(1,344)
2029	5,323	3,603	5,323	5,670	5,323	5,332	5,443	**4,081**	(1,720)	0	347.7	0.0	9.8	120.8	(1,241)
2030	5,388	3,655	5,388	5,856	5,388	5,399	5,533	**4,278**	(1,733)	0	467.8	0.0	10.1	144.2	(1,111)
2031	5,453	3,708	5,453	6,074	5,453	5,463	5,634	**4,522**	(1,744)	0	621.7	0.0	10.4	181.9	(930)
2032	5,516	3,763	5,516	6,306	5,516	5,527	5,763	**4,809**	(1,754)	0	789.5	0.0	10.6	246.4	(707)
2033	5,580	3,819	5,580	6,553	5,580	5,591	5,916	**5,138**	(1,762)	0	973.1	0.0	10.8	336.0	(442)
2034	5,642	3,873	5,642	6,811	5,642	5,653	6,090	**5,501**	(1,769)	0	1,168.9	0.0	10.9	448.4	(140)
2035	5,709	3,935	5,709	7,082	5,709	5,720	6,290	**5,899**	(1,775)	0	1,372.7	0.0	11.0	580.9	190
2036	5,777	3,996	5,777	7,354	5,777	5,788	6,507	**6,315**	(1,780)	0	1,577.8	0.0	11.1	730.1	539
2037	5,859	4,073	5,859	7,637	5,859	5,870	6,751	**6,754**	(1,786)	0	1,778.0	0.0	11.2	892.2	895
2038	5,896	4,104	5,896	7,867	5,896	5,907	6,959	**7,150**	(1,792)	0	1,971.4	0.0	11.2	1,063.4	1,254
2039	5,940	4,143	5,940	8,110	5,940	5,952	7,180	**7,563**	(1,798)	0	2,169.9	0.0	11.3	1,239.4	1,623
2040	5,999	4,195	5,999	8,386	5,999	6,010	7,415	**8,009**	(1,804)	0	2,386.6	0.0	11.3	1,416.0	2,010
2041	6,049	4,239	6,049	8,566	6,049	6,060	7,638	**8,357**	(1,810)	0	2,516.8	0.0	11.3	1,589.2	2,308
2042	6,112	4,297	6,112	8,747	6,112	6,124	7,867	**8,698**	(1,815)	0	2,634.8	0.0	11.4	1,755.2	2,586
2043	6,171	4,350	6,171	8,911	6,171	6,183	8,082	**9,011**	(1,821)	0	2,739.7	0.0	11.4	1,910.3	2,840
2044	6,440	4,613	6,440	9,209	6,440	6,029	8,785	**9,314**	(1,827)	0	2,768.1	0.0	(411.6)	2,344.3	2,874
2045	6,485	4,652	6,485	9,332	6,485	6,072	8,971	**9,572**	(1,833)	0	2,846.9	0.0	(412.4)	2,485.9	3,087
2046	6,530	4,692	6,530	9,445	6,530	6,118	9,136	**9,799**	(1,839)	0	2,914.7	0.0	(412.4)	2,605.3	3,269
2047	6,598	4,754	6,598	9,571	6,598	6,186	9,299	**10,014**	(1,845)	0	2,972.4	0.0	(412.4)	2,700.4	3,416
2048	6,690	4,839	6,690	9,712	6,690	6,278	9,459	**10,218**	(1,850)	0	3,021.6	0.0	(412.4)	2,769.5	3,528
2049	6,720	4,863	6,720	9,783	6,720	6,307	9,531	**10,326**	(1,856)	0	3,063.5	0.0	(412.4)	2,811.4	3,606
2050	6,738	4,876	6,738	9,838	6,738	6,326	9,564	**10,389**	(1,862)	0	3,099.3	0.0	(412.4)	2,825.4	3,650
	-														
Avg. last 15 yrs	1.5%	-0.5%	1.5%	1.5%	1.5%	1.4%	1.5%	-0.7%							
Avg. last 10 yrs	2.0%	-0.3%	2.0%	2.1%	2.0%	1.9%	2.1%	-0.5%							
Avg. last 5 yrs	2.8%	0.5%	2.8%	2.9%	2.8%	2.5%	2.8%	0.1%							
Base 2021															
Avg. next 5 yrs	0.3%	-0.5%	0.3%	0.8%	0.3%	0.7%	0.6%	1.1%							
Avg. next 10 yrs	0.8%	0.4%	0.8%	1.8%	0.8%	1.0%	1.1%	2.6%							
Avg. next 15 yrs	0.9%	0.8%	0.9%	2.5%	0.9%	1.0%	1.7%	4.0%							
Avg. next 20 yrs	1.0%	0.9%	1.0%	2.8%	1.0%	1.1%	2.2%	4.7%							
Avg. next 25 yrs	1.1%	1.2%	1.1%	2.6%	1.1%	0.9%	2.5%	4.3%							

EE: Energy Efficiency (reduces load)
PV: Solar - Photovoltaics (reduces load)
EV: Electric Vehicles (ADDs to load)
DR: Demand Response (Company only) (reduces load)
ES: Energy Storage (reduces load)
EH: Electric Heating/Cooling (ADDs to load)

NEMA Zone (Northeast Massachusetts)

NEMA

Annual Peaks — **AFTER DER Impacts ***

YEAR	Actuals (MW)	Actuals (% Grwth)	Normal 50-50 (MW)	Normal 50-50 (% Grwth)	Extreme 90-10 (MW)	Extreme 90-10 (% Grwth)	Extreme 95-5 (MW)	Extreme 95-5 (% Grwth)	Peak Season (50-50)
2006	1,262		1,190		1,282		1,308		S
2007	1,155	-8.5%	1,166	-2.1%	1,252	-2.3%	1,277	-2.4%	S
2008	1,122	-2.8%	1,174	0.7%	1,264	0.9%	1,289	1.0%	S
2009	1,115	-0.6%	1,179	0.4%	1,265	0.1%	1,289	0.0%	S
2010	1,203	7.9%	1,205	2.2%	1,292	2.2%	1,317	2.2%	S
2011	1,259	4.6%	1,172	-2.7%	1,257	-2.7%	1,281	-2.7%	S
2012	1,169	-7.1%	1,195	2.0%	1,281	1.9%	1,305	1.9%	S
2013	1,227	4.9%	1,172	-2.0%	1,257	-1.9%	1,281	-1.8%	S
2014	1,094	-10.9%	1,155	-1.4%	1,242	-1.2%	1,266	-1.1%	S
2015	1,082	-1.0%	1,131	-2.1%	1,218	-1.9%	1,243	-1.8%	S
2016	1,126	4.0%	1,086	-4.0%	1,168	-4.2%	1,191	-4.2%	S
2017	1,044	-7.3%	1,076	-0.9%	1,160	-0.7%	1,183	-0.6%	S
2018	1,150	10.2%	1,094	1.7%	1,181	1.8%	1,206	1.9%	S
2019	1,078	-6.3%	1,076	-1.7%	1,158	-2.0%	1,181	-2.0%	S
2020	1,136	5.4%	1,189	10.5%	1,281	10.6%	1,307	10.7%	S
2021	1,175	3.4%	1,074	-9.7%	1,170	-8.6%	1,198	-8.4%	S
2022	1,176	0.1%	1,114	3.7%	1,204	2.9%	1,230	2.7%	S
2023	-	-	1,120	0.6%	1,207	0.2%	1,232	0.1%	S
2024	-	-	1,135	1.3%	1,222	1.2%	1,247	1.2%	S
2025	-	-	1,154	1.7%	1,241	1.5%	1,265	1.5%	S
2026	-	-	1,168	1.3%	1,256	1.2%	1,280	1.2%	S
2027	-	-	1,196	2.4%	1,284	2.2%	1,308	2.2%	S
2028	-	-	1,225	2.4%	1,312	2.2%	1,337	2.2%	S
2029	-	-	1,258	2.7%	1,345	2.5%	1,370	2.5%	S
2030	-	-	1,296	3.0%	1,383	2.8%	1,408	2.8%	S
2031	-	-	1,341	3.5%	1,429	3.3%	1,454	3.2%	S
2032	-	-	1,392	3.8%	1,480	3.6%	1,505	3.5%	S
2033	-	-	1,447	4.0%	1,535	3.7%	1,560	3.7%	S
2034	-	-	1,517	4.8%	1,593	3.8%	1,618	3.7%	W
2035	-	-	1,632	7.6%	1,690	6.1%	1,706	5.4%	W
2036	-	-	1,752	7.3%	1,810	7.1%	1,827	7.1%	W
2037	-	-	1,878	7.2%	1,937	7.0%	1,954	7.0%	W
2038	-		1,990	6.0%	2,050	5.8%	2,067	5.8%	W
2039	-		2,107	5.9%	2,167	5.7%	2,185	5.7%	W
2040	-		2,235	6.0%	2,295	5.9%	2,313	5.9%	W
2041	-		2,331	4.3%	2,393	4.2%	2,410	4.2%	W
2042	-		2,427	4.1%	2,489	4.0%	2,507	4.0%	W
2043	-		2,514	3.6%	2,578	3.6%	2,597	3.6%	W
2044	-		2,598	3.3%	2,664	3.3%	2,683	3.3%	W
2045	-		2,669	2.7%	2,736	2.7%	2,754	2.7%	W
2046	-		2,732	2.4%	2,799	2.3%	2,818	2.3%	W
2047	-		2,793	2.2%	2,861	2.2%	2,880	2.2%	W
2048	-		2,853	2.1%	2,921	2.1%	2,941	2.1%	W
2049	-		2,884	1.1%	2,953	1.1%	2,972	1.1%	W
2050	-		2,903	0.7%	2,972	0.6%	2,992	0.6%	W

	Normal 50-50	Extreme 90-10	Extreme 95-5
Avg. last 15 yrs	-0.3%	-0.3%	-0.2%
Avg. last 10 yrs	-0.7%	-0.6%	-0.6%
Avg. last 5 yrs	0.7%	0.8%	0.8%
Base 2022			
Avg. next 5 yrs	1.4%	1.3%	1.2%
Avg. next 10 yrs	2.3%	2.1%	2.0%
Avg. next 15 yrs	3.5%	3.2%	3.1%
Avg. next 20 yrs	4.0%	3.7%	3.6%
Avg. next 25 yrs	3.7%	3.5%	3.5%

**** impacts include energy efficiency, solar pv, electric vehicles, energy storage, electric heat pumps, and company demand response***

NEMA

SUMMER Peaks — **AFTER DER Impacts ***

YEAR	Actuals (MW)	Actuals (% Grwth)	Normal 50-50 (MW)	Normal 50-50 (% Grwth)	Extreme 90-10 (MW)	Extreme 90-10 (% Grwth)	Extreme 95-5 (MW)	Extreme 95-5 (% Grwth)	WTHI ACTUAL
2006	1,262		1,190		1,282		1,308		84.5
2007	1,155	-8.5%	1,166	-2.1%	1,252	-2.3%	1,277	-2.4%	82.7
2008	1,122	-2.8%	1,174	0.7%	1,264	0.9%	1,289	1.0%	82.3
2009	1,115	-0.6%	1,179	0.4%	1,265	0.1%	1,289	0.0%	81.0
2010	1,203	7.9%	1,205	2.2%	1,292	2.2%	1,317	2.2%	82.6
2011	1,259	4.6%	1,172	-2.7%	1,257	-2.7%	1,281	-2.7%	85.7
2012	1,169	-7.1%	1,195	2.0%	1,281	1.9%	1,305	1.9%	82.0
2013	1,227	4.9%	1,172	-2.0%	1,257	-1.9%	1,281	-1.8%	84.2
2014	1,094	-10.9%	1,155	-1.4%	1,242	-1.2%	1,266	-1.1%	81.1
2015	1,082	-1.0%	1,131	-2.1%	1,218	-1.9%	1,243	-1.8%	81.4
2016	1,126	4.0%	1,086	-4.0%	1,168	-4.2%	1,191	-4.2%	84.1
2017	1,044	-7.3%	1,076	-0.9%	1,160	-0.7%	1,183	-0.6%	82.0
2018	1,150	10.2%	1,094	1.7%	1,181	1.8%	1,206	1.9%	84.2
2019	1,078	-6.3%	1,076	-1.7%	1,158	-2.0%	1,181	-2.0%	82.7
2020	1,136	5.4%	1,189	10.5%	1,281	10.6%	1,307	10.7%	81.4
2021	1,175	3.4%	1,074	-9.7%	1,170	-8.6%	1,198	-8.4%	85.3
2022	1,176	0.1%	1,114	3.7%	1,204	2.9%	1,230	2.7%	84.5
2023	-	-	1,120	0.6%	1,207	0.2%	1,232	0.1%	-
2024	-	-	1,135	1.3%	1,222	1.2%	1,247	1.2%	-
2025	-	-	1,154	1.7%	1,241	1.5%	1,265	1.5%	-
2026	-	-	1,168	1.3%	1,256	1.2%	1,280	1.2%	-
2027	-	-	1,196	2.4%	1,284	2.2%	1,308	2.2%	-
2028	-	-	1,225	2.4%	1,312	2.2%	1,337	2.2%	-
2029	-	-	1,258	2.7%	1,345	2.5%	1,370	2.5%	-
2030	-	-	1,296	3.0%	1,383	2.8%	1,408	2.8%	-
2031	-	-	1,341	3.5%	1,429	3.3%	1,454	3.2%	-
2032	-	-	1,392	3.8%	1,480	3.6%	1,505	3.5%	-
2033	-	-	1,447	4.0%	1,535	3.7%	1,560	3.7%	-
2034	-	-	1,505	4.0%	1,593	3.8%	1,618	3.7%	-
2035	-	-	1,560	3.6%	1,648	3.4%	1,673	3.4%	-
2036	-	-	1,625	4.2%	1,713	4.0%	1,738	3.9%	-
2037	-	-	1,676	3.1%	1,764	3.0%	1,789	2.9%	-
2038	-		1,739	3.8%	1,827	3.6%	1,852	3.6%	-
2039	-		1,800	3.5%	1,888	3.3%	1,913	3.3%	-
2040	-		1,867	3.7%	1,955	3.6%	1,980	3.5%	-
2041	-		1,915	2.6%	2,004	2.5%	2,029	2.4%	-
2042	-		1,953	1.9%	2,041	1.9%	2,066	1.8%	-
2043	-		1,986	1.7%	2,075	1.7%	2,100	1.6%	-
2044	-		2,025	1.9%	2,113	1.8%	2,138	1.8%	-
2045	-		2,056	1.6%	2,145	1.5%	2,170	1.5%	-
2046	-		2,093	1.8%	2,182	1.7%	2,207	1.7%	-
2047	-		2,121	1.3%	2,209	1.2%	2,234	1.2%	-
2048	-		2,133	0.6%	2,221	0.6%	2,247	0.5%	-
2049	-		2,166	1.6%	2,255	1.5%	2,280	1.5%	-
2050	-		2,190	1.1%	2,279	1.1%	2,304	1.1%	-

	Normal 50-50	Extreme 90-10	Extreme 95-5
Avg. last 15 yrs	-0.3%	-0.3%	-0.2%
Avg. last 10 yrs	-0.7%	-0.6%	-0.6%
Avg. last 5 yrs	0.7%	0.8%	0.8%
Base 2022			
Avg. next 5 yrs	1.4%	1.3%	1.2%
Avg. next 10 yrs	2.3%	2.1%	2.0%
Avg. next 15 yrs	2.8%	2.6%	2.5%
Avg. next 20 yrs	2.8%	2.7%	2.6%
Avg. next 25 yrs	2.6%	2.5%	2.4%

WTHI	
NORMAL	82.7
EXTREME 90/10	85.0
EXTREME 95/5	85.6

**** impacts include energy efficiency, solar pv, electric vehicles, energy storage, electric heap pumps, and company demand response***

NEMA	SUMMER 50/50 Peaks (MW) (before & after DERs)														
	SYSTEM PEAK								DER IMPACTS						
Calendar Year	Reconstituted (before DER)	Forecast w/ EE only	Forecast w/ PV only	Forecast w/ EV only	Forecast w/ DR only	Forecast w/ ES only	Forecast w/ EH only	Final Forecast (after all DER)	EE	PV	EV	DR	ES	EH	DER
2006	1,215	1,190	1,215	1,215	1,215	1,215	1,215	**1,190**	(24)	(0)	0.0	0.0	0.0	0.0	(25)
2007	1,198	1,166	1,197	1,198	1,198	1,198	1,198	**1,166**	(32)	(0)	0.0	0.0	0.0	0.0	(32)
2008	1,213	1,174	1,213	1,213	1,213	1,213	1,213	**1,174**	(39)	(0)	0.0	0.0	0.0	0.0	(39)
2009	1,228	1,180	1,227	1,228	1,228	1,228	1,228	**1,179**	(48)	(1)	0.0	0.0	0.0	0.0	(49)
2010	1,266	1,206	1,265	1,266	1,266	1,266	1,266	**1,205**	(60)	(2)	0.0	0.0	0.0	0.0	(62)
2011	1,247	1,175	1,245	1,247	1,247	1,247	1,247	**1,172**	(73)	(3)	0.0	0.0	0.0	0.0	(76)
2012	1,284	1,197	1,282	1,284	1,284	1,284	1,284	**1,195**	(87)	(1)	0.0	0.0	0.0	0.0	(88)
2013	1,283	1,178	1,276	1,283	1,283	1,283	1,283	**1,172**	(104)	(7)	0.1	0.0	0.0	0.0	(111)
2014	1,297	1,173	1,280	1,298	1,297	1,297	1,297	**1,155**	(125)	(18)	0.1	0.0	0.0	0.0	(142)
2015	1,295	1,147	1,278	1,295	1,295	1,295	1,295	**1,131**	(147)	(16)	0.2	0.0	0.0	0.0	(164)
2016	1,296	1,123	1,258	1,297	1,296	1,296	1,296	**1,086**	(173)	(38)	0.3	(0.1)	0.0	0.0	(211)
2017	1,309	1,110	1,276	1,309	1,307	1,309	1,309	**1,076**	(199)	(33)	0.4	(1.8)	(0.1)	0.0	(233)
2018	1,343	1,118	1,328	1,344	1,335	1,343	1,343	**1,094**	(226)	(15)	0.9	(8.4)	(0.3)	0.0	(249)
2019	1,363	1,110	1,345	1,364	1,348	1,360	1,363	**1,076**	(253)	(18)	1.3	(15.3)	(2.8)	0.0	(287)
2020	1,509	1,229	1,489	1,511	1,495	1,502	1,510	**1,189**	(280)	(20)	1.7	(14.7)	(7.8)	0.1	(321)
2021	1,427	1,125	1,405	1,430	1,413	1,411	1,428	**1,074**	(303)	(23)	2.3	(14.5)	(16.7)	0.3	(354)
2022	1,500	1,183	1,474	1,503	1,480	1,472	1,500	**1,114**	(317)	(26)	3.6	(19.6)	(27.8)	0.6	(386)
2023	1,453	1,126	1,453	1,460	1,438	1,454	1,454	**1,120**	(327)	0	7.4	(15.1)	1.0	0.9	(333)
2024	1,473	1,136	1,473	1,484	1,456	1,474	1,474	**1,135**	(336)	0	11.8	(16.1)	1.3	1.5	(338)
2025	1,494	1,150	1,494	1,511	1,477	1,495	1,496	**1,154**	(344)	0	17.5	(17.1)	1.6	2.2	(340)
2026	1,507	1,156	1,507	1,532	1,489	1,509	1,510	**1,168**	(351)	0	25.2	(17.9)	1.8	3.0	(339)
2027	1,530	1,173	1,530	1,566	1,512	1,532	1,534	**1,196**	(357)	0	35.6	(18.6)	2.0	4.1	(334)
2028	1,549	1,187	1,549	1,598	1,530	1,551	1,555	**1,225**	(362)	0	49.2	(19.5)	2.1	5.4	(324)
2029	1,567	1,201	1,567	1,635	1,547	1,569	1,574	**1,258**	(366)	0	67.9	(20.4)	2.2	6.9	(309)
2030	1,584	1,214	1,584	1,676	1,562	1,586	1,592	**1,296**	(369)	0	92.2	(21.2)	2.3	8.4	(288)
2031	1,600	1,227	1,600	1,723	1,578	1,602	1,610	**1,341**	(373)	0	123.0	(21.8)	2.4	10.2	(259)
2032	1,616	1,241	1,616	1,775	1,594	1,618	1,628	**1,392**	(375)	0	158.7	(22.4)	2.4	12.4	(224)
2033	1,632	1,255	1,632	1,830	1,609	1,635	1,647	**1,447**	(377)	0	197.8	(23.1)	2.5	15.0	(185)
2034	1,648	1,269	1,648	1,888	1,624	1,650	1,666	**1,505**	(379)	0	239.9	(23.7)	2.5	18.0	(142)
2035	1,657	1,276	1,657	1,941	1,632	1,659	1,678	**1,560**	(381)	0	284.4	(24.4)	2.5	21.3	(97)
2036	1,675	1,293	1,675	2,005	1,650	1,677	1,700	**1,625**	(382)	0	330.1	(25.1)	2.6	24.8	(50)
2037	1,680	1,296	1,680	2,054	1,654	1,682	1,708	**1,676**	(384)	0	374.8	(25.9)	2.6	28.3	(4)
2038	1,699	1,313	1,699	2,117	1,672	1,701	1,730	**1,739**	(385)	0	418.1	(26.7)	2.6	31.9	41
2039	1,713	1,327	1,713	2,176	1,686	1,716	1,749	**1,800**	(387)	0	462.5	(27.5)	2.6	35.4	86
2040	1,731	1,343	1,731	2,242	1,703	1,734	1,770	**1,867**	(388)	0	510.6	(28.0)	2.6	38.8	136
2041	1,748	1,359	1,748	2,289	1,720	1,751	1,790	**1,915**	(390)	0	540.5	(28.4)	2.6	41.9	167
2042	1,758	1,367	1,758	2,325	1,729	1,760	1,802	**1,953**	(391)	0	567.4	(28.8)	2.6	44.7	195
2043	1,767	1,374	1,767	2,358	1,738	1,769	1,814	**1,986**	(393)	0	591.5	(29.2)	2.6	47.2	220
2044	1,784	1,390	1,784	2,396	1,754	1,786	1,833	**2,025**	(394)	0	612.7	(29.5)	2.6	49.4	241
2045	1,797	1,401	1,797	2,428	1,767	1,799	1,848	**2,056**	(395)	0	631.2	(29.9)	2.6	51.2	260
2046	1,818	1,421	1,818	2,466	1,788	1,821	1,871	**2,093**	(397)	0	647.1	(30.3)	2.6	52.6	275
2047	1,833	1,434	1,833	2,494	1,802	1,835	1,887	**2,121**	(398)	0	660.7	(30.8)	2.6	53.7	288
2048	1,835	1,435	1,835	2,507	1,803	1,837	1,889	**2,133**	(400)	0	672.2	(31.2)	2.6	54.5	298
2049	1,859	1,458	1,859	2,541	1,828	1,862	1,914	**2,166**	(401)	0	682.0	(31.6)	2.6	55.1	307
2050	1,877	1,474	1,877	2,567	1,845	1,880	1,932	**2,190**	(403)	0	690.2	(32.1)	2.6	55.3	313
Avg. last 15 yrs	1.5%	0.1%	1.4%	1.5%	1.4%	1.4%	1.5%	-0.3%							
Avg. last 10 yrs	1.6%	-0.1%	1.4%	1.6%	1.4%	1.4%	1.6%	-0.7%							
Avg. last 5 yrs	2.8%	1.3%	2.9%	2.8%	2.5%	2.4%	2.8%	0.7%							
Base 2022															
Avg. next 5 yrs	0.4%	-0.2%	0.8%	0.8%	0.4%	0.8%	0.5%	1.4%							
Avg. next 10 yrs	0.8%	0.5%	0.9%	1.7%	0.7%	1.0%	0.8%	2.3%							
Avg. next 15 yrs	0.8%	0.6%	0.9%	2.1%	0.7%	0.9%	0.9%	2.8%							
Avg. next 20 yrs	0.8%	0.7%	0.9%	2.2%	0.8%	0.9%	0.9%	2.8%							
Avg. next 25 yrs	1.7%	1.6%	1.8%	3.8%	1.6%	1.8%	1.9%	4.6%							

EE: Energy Efficiency (reduces load)
PV: Solar - Photovoltaics (reduces load)
EV: Electric Vehicles (ADDs to load)
DR: Demand Response (Company only) (reduces load)
ES: Energy Storage (reduces load)
EH: Electric Heating Pump Cooling (reduces load)

NEMA
WINTER Peaks — **after DER Impacts ***

YEAR	Actuals (MW)	Actuals (% Grwth)	Normal 50-50 (MW)	Normal 50-50 (% Grwth)	Extreme 10-90 (MW)	Extreme 10-90 (% Grwth)	Extreme 05-95 (MW)	Extreme 05-95 (% Grwth)	HDD_wtd ACTUAL
2006	946		991		1,033		1,045		45.2
2007	956	1.0%	945	-4.7%	980	-5.1%	990	-5.3%	47.6
2008	908	-5.0%	937	-0.9%	976	-0.5%	987	-0.4%	40.4
2009	918	1.1%	955	2.0%	997	2.2%	1,009	2.3%	37.6
2010	940	2.4%	911	-4.7%	954	-4.4%	966	-4.3%	54.0
2011	865	-8.0%	908	-0.3%	949	-0.5%	961	-0.5%	45.3
2012	906	4.8%	895	-1.4%	931	-1.9%	942	-2.0%	53.6
2013	926	2.2%	898	0.3%	937	0.6%	948	0.7%	54.0
2014	886	-4.4%	874	-2.6%	911	-2.8%	922	-2.8%	52.3
2015	840	-5.2%	833	-4.7%	869	-4.7%	879	-4.6%	57.7
2016	836	-0.5%	835	0.2%	877	0.9%	888	1.1%	46.5
2017	887	6.2%	828	-0.8%	882	0.6%	897	1.0%	57.4
2018	897	1.0%	887	7.1%	936	6.2%	950	5.9%	50.0
2019	791	-11.8%	832	-6.2%	876	-6.4%	889	-6.5%	39.7
2020	818	3.5%	882	6.0%	929	6.0%	942	6.0%	40.1
2021	846	3.4%	844	-4.3%	889	-4.3%	902	-4.2%	45.4
2022	-	-	885	4.9%	935	5.2%	949	5.2%	-
2023	-	-	903	2.0%	954	2.0%	968	2.0%	-
2024	-	-	921	2.0%	973	2.0%	987	2.0%	-
2025	-	-	937	1.8%	990	1.8%	1,005	1.8%	-
2026	-	-	968	3.2%	1,019	2.9%	1,033	2.8%	-
2027	-	-	1,001	3.4%	1,052	3.3%	1,067	3.3%	-
2028	-	-	1,047	4.6%	1,099	4.4%	1,114	4.4%	-
2029	-	-	1,093	4.5%	1,146	4.3%	1,161	4.3%	-
2030	-	-	1,154	5.5%	1,208	5.4%	1,223	5.3%	-
2031	-	-	1,228	6.5%	1,283	6.2%	1,298	6.2%	-
2032	-	-	1,314	7.0%	1,369	6.7%	1,385	6.7%	-
2033	-	-	1,411	7.4%	1,467	7.1%	1,483	7.1%	-
2034	-	-	1,517	7.5%	1,574	7.3%	1,590	7.2%	-
2035	-	-	1,632	7.6%	1,690	7.4%	1,706	7.3%	-
2036	-	-	1,752	7.3%	1,810	7.1%	1,827	7.1%	-
2037	-		1,878	7.2%	1,937	7.0%	1,954	7.0%	-
2038	-		1,990	6.0%	2,050	5.8%	2,067	5.8%	-
2039	-		2,107	5.9%	2,167	5.7%	2,185	5.7%	-
2040	-		2,235	6.0%	2,295	5.9%	2,313	5.9%	-
2041	-		2,331	4.3%	2,393	4.2%	2,410	4.2%	-
2042	-		2,427	4.1%	2,489	4.0%	2,507	4.0%	-
2043	-		2,514	3.6%	2,578	3.6%	2,597	3.6%	-
2044	-		2,598	3.3%	2,664	3.3%	2,683	3.3%	-
2045	-		2,669	2.7%	2,736	2.7%	2,754	2.7%	-
2046	-		2,732	2.4%	2,799	2.3%	2,818	2.3%	-
2047	-		2,793	2.2%	2,861	2.2%	2,880	2.2%	-
2048	-		2,853	2.1%	2,921	2.1%	2,941	2.1%	-
2049	-		2,884	1.1%	2,953	1.1%	2,972	1.1%	-
2050	-		2,903	0.7%	2,972	0.6%	2,992	0.6%	-

	Normal 50-50	Extreme 10-90	Extreme 05-95
Avg. last 15 yrs	-1.1%	-1.0%	-1.0%
Avg. last 10 yrs	-0.7%	-0.7%	-0.6%
Avg. last 5 yrs	0.2%	0.3%	0.3%
Base 2021			
Avg. next 5 yrs	2.8%	2.8%	2.8%
Avg. next 10 yrs	3.8%	3.7%	3.7%
Avg. next 15 yrs	5.0%	4.9%	4.8%
Avg. next 20 yrs	5.2%	5.1%	5.0%
Avg. next 25 yrs	4.8%	4.7%	4.7%

HDD_wtd	
NORMAL	47.7
EXTREME 90/10	56.5
EXTREME 95/5	59.0

**** impacts include energy efficiency, solar pv, electric vehicles, energy storage, electric heap pumps, and company demand response (solar and demand response are zero at times of winter peak)***

NEMA	WINTER 50/50 Peaks (MW) (before & after DERs)														
	SYSTEM PEAK								DER IMPACTS						
Calendar Year	Reconstituted (before DER)	Forecast w/ EE only	Forecast w/ PV only	Forecast w/ EV only	Forecast w/ DR only	Forecast w/ ES only	Forecast w/ EH only	Final Forecast (after all DER)	EE	PV	EV	DR	ES	EH	DER
2006	1,035	991	1,035	1,035	1,035	1,035	1,035	**991**	(44)	0	0.0	0.0	0.0	0.0	(44)
2007	1,003	945	1,003	1,003	1,003	1,003	1,003	**945**	(58)	0	0.0	0.0	0.0	0.0	(58)
2008	1,003	937	1,003	1,003	1,003	1,003	1,003	**937**	(66)	0	0.0	0.0	0.0	0.0	(66)
2009	1,037	955	1,037	1,037	1,037	1,037	1,037	**955**	(82)	0	0.0	0.0	0.0	0.0	(82)
2010	1,007	911	1,007	1,007	1,007	1,007	1,007	**911**	(96)	0	0.0	0.0	0.0	0.0	(96)
2011	1,018	908	1,018	1,018	1,018	1,018	1,018	**908**	(110)	0	0.0	0.0	0.0	0.0	(110)
2012	1,021	895	1,021	1,021	1,021	1,021	1,021	**895**	(126)	0	0.1	0.0	0.0	0.0	(126)
2013	1,045	898	1,045	1,045	1,045	1,045	1,045	**898**	(148)	0	0.1	0.0	0.0	0.0	(147)
2014	1,045	874	1,045	1,045	1,045	1,045	1,045	**874**	(171)	0	0.3	0.0	0.0	0.0	(171)
2015	1,030	833	1,030	1,030	1,030	1,030	1,030	**833**	(197)	0	0.5	0.0	0.0	0.0	(197)
2016	1,058	835	1,058	1,059	1,058	1,058	1,058	**835**	(224)	0	0.5	0.0	0.0	0.0	(223)
2017	1,079	827	1,079	1,080	1,079	1,079	1,079	**828**	(251)	0	0.8	0.0	(0.1)	0.0	(251)
2018	1,168	886	1,168	1,169	1,168	1,167	1,168	**887**	(282)	0	1.3	0.0	(0.4)	0.0	(281)
2019	1,146	834	1,146	1,148	1,146	1,141	1,146	**832**	(312)	0	1.8	0.0	(4.5)	0.2	(314)
2020	1,231	889	1,231	1,233	1,231	1,221	1,231	**882**	(342)	0	2.3	0.0	(10.3)	0.5	(349)
2021	1,221	861	1,221	1,225	1,221	1,200	1,222	**844**	(361)	0	3.4	0.0	(21.5)	1.0	(378)
2022	1,281	910	1,281	1,286	1,281	1,248	1,283	**885**	(371)	0	5.5	0.0	(32.7)	2.4	(396)
2023	1,312	932	1,312	1,322	1,312	1,268	1,317	**903**	(380)	0	9.2	0.0	(43.9)	5.0	(410)
2024	1,341	953	1,341	1,355	1,341	1,286	1,350	**921**	(388)	0	14.5	0.0	(55.2)	8.6	(420)
2025	1,363	968	1,363	1,385	1,363	1,299	1,376	**937**	(396)	0	21.3	0.0	(64.1)	12.2	(426)
2026	1,312	911	1,312	1,353	1,312	1,314	1,327	**968**	(402)	0	40.5	0.0	2.0	14.5	(345)
2027	1,329	923	1,329	1,386	1,329	1,332	1,349	**1,001**	(407)	0	56.9	0.0	2.1	19.0	(329)
2028	1,353	942	1,353	1,431	1,353	1,355	1,377	**1,047**	(411)	0	78.3	0.0	2.3	24.0	(307)
2029	1,368	953	1,368	1,476	1,368	1,371	1,398	**1,093**	(415)	0	108.1	0.0	2.4	29.4	(275)
2030	1,389	971	1,389	1,534	1,389	1,391	1,424	**1,154**	(418)	0	145.4	0.0	2.4	35.1	(235)
2031	1,409	988	1,409	1,602	1,409	1,412	1,453	**1,228**	(421)	0	193.2	0.0	2.5	44.3	(181)
2032	1,429	1,006	1,429	1,675	1,429	1,432	1,489	**1,314**	(423)	0	245.4	0.0	2.6	60.0	(115)
2033	1,449	1,024	1,449	1,752	1,449	1,452	1,531	**1,411**	(425)	0	302.4	0.0	2.6	81.8	(38)
2034	1,468	1,042	1,468	1,832	1,468	1,471	1,578	**1,517**	(427)	0	363.3	0.0	2.6	109.2	48
2035	1,490	1,061	1,490	1,916	1,490	1,492	1,631	**1,632**	(428)	0	426.7	0.0	2.7	141.4	143
2036	1,511	1,081	1,511	2,001	1,511	1,513	1,688	**1,752**	(430)	0	490.4	0.0	2.7	177.7	241
2037	1,537	1,106	1,537	2,089	1,537	1,539	1,754	**1,878**	(431)	0	552.6	0.0	2.7	217.2	342
2038	1,548	1,116	1,548	2,161	1,548	1,551	1,807	**1,990**	(432)	0	612.7	0.0	2.7	258.9	442
2039	1,562	1,128	1,562	2,237	1,562	1,565	1,864	**2,107**	(434)	0	674.5	0.0	2.7	301.7	545
2040	1,580	1,145	1,580	2,322	1,580	1,583	1,925	**2,235**	(435)	0	741.8	0.0	2.7	344.7	654
2041	1,596	1,159	1,596	2,378	1,596	1,599	1,983	**2,331**	(437)	0	782.3	0.0	2.7	386.9	735
2042	1,616	1,178	1,616	2,435	1,616	1,619	2,043	**2,427**	(438)	0	819.0	0.0	2.8	427.3	811
2043	1,634	1,195	1,634	2,486	1,634	1,637	2,100	**2,514**	(439)	0	851.6	0.0	2.8	465.0	880
2044	1,708	1,267	1,708	2,568	1,708	1,608	2,278	**2,598**	(441)	0	860.4	0.0	(99.7)	570.7	891
2045	1,722	1,279	1,722	2,606	1,722	1,622	2,327	**2,669**	(442)	0	884.9	0.0	(99.9)	605.2	948
2046	1,736	1,292	1,736	2,642	1,736	1,636	2,370	**2,732**	(444)	0	906.0	0.0	(99.9)	634.2	997
2047	1,757	1,312	1,757	2,681	1,757	1,657	2,414	**2,793**	(445)	0	923.9	0.0	(99.9)	657.4	1,036
2048	1,786	1,339	1,786	2,725	1,786	1,686	2,460	**2,853**	(447)	0	939.2	0.0	(99.9)	674.2	1,067
2049	1,795	1,347	1,795	2,747	1,795	1,695	2,480	**2,884**	(448)	0	952.2	0.0	(99.9)	684.4	1,089
2050	1,801	1,352	1,801	2,764	1,801	1,701	2,489	**2,903**	(449)	0	963.4	0.0	(99.9)	687.8	1,102
	-														
Avg. last 15 yrs	1.1%	-0.9%	1.1%	1.1%	1.1%	1.0%	1.1%	-1.1%							
Avg. last 10 yrs	1.8%	-0.5%	1.8%	1.9%	1.8%	1.7%	1.8%	-0.7%							
Avg. last 5 yrs	2.9%	0.6%	2.9%	3.0%	2.9%	2.5%	2.9%	0.2%							
Base 2021															
Avg. next 5 yrs	1.4%	1.1%	1.4%	2.0%	1.4%	1.8%	1.7%	2.8%							
Avg. next 10 yrs	1.4%	1.4%	1.4%	2.7%	1.4%	1.6%	1.7%	3.8%							
Avg. next 15 yrs	1.4%	1.5%	1.4%	3.3%	1.4%	1.6%	2.2%	5.0%							
Avg. next 20 yrs	1.3%	1.5%	1.3%	3.4%	1.3%	1.4%	2.4%	5.2%							
Avg. next 25 yrs	1.4%	1.6%	1.4%	3.1%	1.4%	1.2%	2.7%	4.8%							

EE: Energy Efficiency (reduces load)
PV: Solar - Photovoltaics (reduces load)
EV: Electric Vehicles (ADDs to load)
DR: Demand Response (Company only) (reduces load)
ES: Energy Storage (reduces load)
EH: Electric Heating/Cooling (ADDs to load)

SEMA Zone (Southeast Massachusetts)

SEMA

Annual Peaks — **AFTER DER Impacts ***

YEAR	Actuals (MW)	Actuals (% Grwth)	Normal 50-50 (MW)	Normal 50-50 (% Grwth)	Extreme 90-10 (MW)	Extreme 90-10 (% Grwth)	Extreme 95-5 (MW)	Extreme 95-5 (% Grwth)	Peak Season (50-50)
2006	1,705		1,575		1,695		1,729		S
2007	1,522	-10.7%	1,589	0.9%	1,703	0.5%	1,735	0.4%	S
2008	1,549	1.8%	1,574	-0.9%	1,688	-0.9%	1,720	-0.9%	S
2009	1,456	-6.0%	1,588	0.9%	1,708	1.2%	1,742	1.3%	S
2010	1,586	8.9%	1,584	-0.3%	1,711	0.2%	1,747	0.3%	S
2011	1,658	4.5%	1,581	-0.2%	1,701	-0.6%	1,734	-0.7%	S
2012	1,551	-6.5%	1,587	0.4%	1,695	-0.3%	1,726	-0.5%	S
2013	1,659	7.0%	1,570	-1.1%	1,688	-0.4%	1,722	-0.2%	S
2014	1,417	-14.6%	1,585	0.9%	1,707	1.1%	1,742	1.2%	S
2015	1,473	4.0%	1,566	-1.1%	1,691	-1.0%	1,726	-0.9%	S
2016	1,519	3.1%	1,536	-2.0%	1,658	-1.9%	1,692	-1.9%	S
2017	1,419	-6.6%	1,523	-0.8%	1,645	-0.8%	1,679	-0.8%	S
2018	1,549	9.1%	1,494	-1.9%	1,613	-1.9%	1,647	-1.9%	S
2019	1,446	-6.6%	1,451	-2.8%	1,567	-2.9%	1,600	-2.9%	S
2020	1,506	4.1%	1,528	5.3%	1,651	5.4%	1,686	5.4%	S
2021	1,549	2.9%	1,454	-4.8%	1,591	-3.7%	1,629	-3.4%	S
2022	1,538	-0.7%	1,440	-1.0%	1,572	-1.1%	1,610	-1.2%	S
2023	-	-	1,427	-0.9%	1,560	-0.8%	1,598	-0.7%	S
2024	-	-	1,448	1.5%	1,587	1.7%	1,626	1.8%	S
2025	-	-	1,464	1.1%	1,604	1.1%	1,643	1.0%	S
2026	-	-	1,469	0.3%	1,609	0.3%	1,649	0.3%	S
2027	-	-	1,489	1.4%	1,631	1.3%	1,671	1.3%	S
2028	-	-	1,504	1.0%	1,647	1.0%	1,687	1.0%	S
2029	-	-	1,525	1.4%	1,663	1.0%	1,703	1.0%	S
2030	-	-	1,562	2.4%	1,698	2.1%	1,736	1.9%	S
2031	-	-	1,606	2.9%	1,743	2.7%	1,782	2.6%	S
2032	-	-	1,657	3.2%	1,795	3.0%	1,833	2.9%	S
2033	-	-	1,713	3.4%	1,851	3.1%	1,890	3.1%	S
2034	-	-	1,771	3.4%	1,910	3.2%	1,950	3.1%	S
2035	-	-	1,824	2.9%	1,963	2.8%	2,002	2.7%	S
2036	-	-	1,949	6.9%	2,031	3.5%	2,071	3.4%	W
2037	-	-	2,086	7.0%	2,140	5.4%	2,155	4.1%	W
2038	-		2,208	5.9%	2,263	5.7%	2,278	5.7%	W
2039	-		2,336	5.8%	2,391	5.7%	2,407	5.7%	W
2040	-		2,475	5.9%	2,530	5.8%	2,546	5.8%	W
2041	-		2,584	4.4%	2,640	4.3%	2,656	4.3%	W
2042	-		2,692	4.2%	2,749	4.1%	2,766	4.2%	W
2043	-		2,798	3.9%	2,857	3.9%	2,873	3.9%	W
2044	-		2,895	3.5%	2,955	3.4%	2,972	3.4%	W
2045	-		2,978	2.8%	3,038	2.8%	3,055	2.8%	W
2046	-		3,050	2.4%	3,110	2.4%	3,128	2.4%	W
2047	-		3,119	2.3%	3,180	2.2%	3,198	2.2%	W
2048	-		3,186	2.1%	3,248	2.1%	3,265	2.1%	W
2049	-		3,220	1.1%	3,282	1.1%	3,300	1.1%	W
2050	-		3,239	0.6%	3,302	0.6%	3,319	0.6%	W

	Normal 50-50	Extreme 90-10	Extreme 95-5
Avg. last 15 yrs	-0.7%	-0.5%	-0.5%
Avg. last 10 yrs	-1.0%	-0.7%	-0.7%
Avg. last 5 yrs	-1.1%	-0.9%	-0.8%
Base 2022			
Avg. next 5 yrs	0.7%	0.7%	0.7%
Avg. next 10 yrs	1.4%	1.3%	1.3%
Avg. next 15 yrs	2.5%	2.1%	2.0%
Avg. next 20 yrs	3.2%	2.8%	2.7%
Avg. next 25 yrs	3.1%	2.9%	2.8%

**** impacts include energy efficiency, solar pv, electric vehicles, energy storage, electric heat pumps, and company demand response***

SEMA

SUMMER Peaks — **AFTER DER Impacts ***

YEAR	Actuals (MW)	Actuals (% Grwth)	Normal 50-50 (MW)	Normal 50-50 (% Grwth)	Extreme 90-10 (MW)	Extreme 90-10 (% Grwth)	Extreme 95-5 (MW)	Extreme 95-5 (% Grwth)	WTHI ACTUAL
2006	1,705		1,575		1,695		1,729		84.9
2007	1,522	-10.7%	1,589	0.9%	1,703	0.5%	1,735	0.4%	81.1
2008	1,549	1.8%	1,574	-0.9%	1,688	-0.9%	1,720	-0.9%	82.5
2009	1,456	-6.0%	1,588	0.9%	1,708	1.2%	1,742	1.3%	80.5
2010	1,586	8.9%	1,584	-0.3%	1,711	0.2%	1,747	0.3%	83.4
2011	1,658	4.5%	1,581	-0.2%	1,701	-0.6%	1,734	-0.7%	84.9
2012	1,551	-6.5%	1,587	0.4%	1,695	-0.3%	1,726	-0.5%	81.7
2013	1,659	7.0%	1,570	-1.1%	1,688	-0.4%	1,722	-0.2%	84.2
2014	1,417	-14.6%	1,585	0.9%	1,707	1.1%	1,742	1.2%	80.2
2015	1,473	4.0%	1,566	-1.1%	1,691	-1.0%	1,726	-0.9%	80.0
2016	1,519	3.1%	1,536	-2.0%	1,658	-1.9%	1,692	-1.9%	83.0
2017	1,419	-6.6%	1,523	-0.8%	1,645	-0.8%	1,679	-0.8%	81.9
2018	1,549	9.1%	1,494	-1.9%	1,613	-1.9%	1,647	-1.9%	83.5
2019	1,446	-6.6%	1,451	-2.8%	1,567	-2.9%	1,600	-2.9%	84.1
2020	1,506	4.1%	1,528	5.3%	1,651	5.4%	1,686	5.4%	82.0
2021	1,549	2.9%	1,454	-4.8%	1,591	-3.7%	1,629	-3.4%	84.5
2022	1,538	-0.7%	1,440	-1.0%	1,572	-1.1%	1,610	-1.2%	84.5
2023	-	-	1,427	-0.9%	1,560	-0.8%	1,598	-0.7%	-
2024	-	-	1,448	1.5%	1,587	1.7%	1,626	1.8%	-
2025	-	-	1,464	1.1%	1,604	1.1%	1,643	1.0%	-
2026	-	-	1,469	0.3%	1,609	0.3%	1,649	0.3%	-
2027	-	-	1,489	1.4%	1,631	1.3%	1,671	1.3%	-
2028	-	-	1,504	1.0%	1,647	1.0%	1,687	1.0%	-
2029	-	-	1,525	1.4%	1,663	1.0%	1,703	1.0%	-
2030	-	-	1,562	2.4%	1,698	2.1%	1,736	1.9%	-
2031	-	-	1,606	2.9%	1,743	2.7%	1,782	2.6%	-
2032	-	-	1,657	3.2%	1,795	3.0%	1,833	2.9%	-
2033	-	-	1,713	3.4%	1,851	3.1%	1,890	3.1%	-
2034	-	-	1,771	3.4%	1,910	3.2%	1,950	3.1%	-
2035	-	-	1,824	2.9%	1,963	2.8%	2,002	2.7%	-
2036	-	-	1,891	3.7%	2,031	3.5%	2,071	3.4%	-
2037	-	-	1,938	2.5%	2,079	2.3%	2,118	2.3%	-
2038	-		2,005	3.4%	2,146	3.2%	2,186	3.2%	-
2039	-		2,066	3.1%	2,208	2.9%	2,249	2.9%	-
2040	-		2,136	3.4%	2,279	3.2%	2,319	3.2%	-
2041	-		2,189	2.5%	2,333	2.3%	2,373	2.3%	-
2042	-		2,227	1.8%	2,372	1.7%	2,412	1.7%	-
2043	-		2,263	1.6%	2,407	1.5%	2,448	1.5%	-
2044	-		2,306	1.9%	2,451	1.8%	2,492	1.8%	-
2045	-		2,341	1.5%	2,487	1.5%	2,528	1.4%	-
2046	-		2,386	1.9%	2,533	1.9%	2,575	1.8%	-
2047	-		2,418	1.3%	2,566	1.3%	2,608	1.3%	-
2048	-		2,429	0.5%	2,577	0.4%	2,619	0.4%	-
2049	-		2,472	1.8%	2,621	1.7%	2,664	1.7%	-
2050	-		2,503	1.3%	2,653	1.2%	2,696	1.2%	-

	Normal 50-50	Extreme 90-10	Extreme 95-5
Avg. last 15 yrs	-0.7%	-0.5%	-0.5%
Avg. last 10 yrs	-1.0%	-0.7%	-0.7%
Avg. last 5 yrs	-1.1%	-0.9%	-0.8%
Base 2022			
Avg. next 5 yrs	0.7%	0.7%	0.7%
Avg. next 10 yrs	1.4%	1.3%	1.3%
Avg. next 15 yrs	2.0%	1.9%	1.8%
Avg. next 20 yrs	2.2%	2.1%	2.0%
Avg. next 25 yrs	2.1%	2.0%	1.9%

WTHI	
NORMAL	82.4
EXTREME 90/10	84.7
EXTREME 95/5	85.4

**** impacts include energy efficiency, solar pv, electric vehicles, energy storage, electric heap pumps, and company demand response***

SEMA	SUMMER 50/50 Peaks (MW) (before & after DERs)														
	SYSTEM PEAK								DER IMPACTS						
Calendar Year	Reconstituted (before DER)	Forecast w/ EE only	Forecast w/ PV only	Forecast w/ EV only	Forecast w/ DR only	Forecast w/ ES only	Forecast w/ EH only	Final Forecast (after all DER)	EE	PV	EV	DR	ES	EH	DER
2006	1,608	1,575	1,608	1,608	1,608	1,608	1,608	**1,575**	(33)	(0)	0.0	0.0	0.0	0.0	(33)
2007	1,632	1,589	1,632	1,632	1,632	1,632	1,632	**1,589**	(43)	(0)	0.0	0.0	0.0	0.0	(44)
2008	1,627	1,574	1,627	1,627	1,627	1,627	1,627	**1,574**	(53)	(0)	0.0	0.0	0.0	0.0	(53)
2009	1,655	1,589	1,654	1,655	1,655	1,655	1,655	**1,588**	(65)	(1)	0.0	0.0	0.0	0.0	(66)
2010	1,665	1,584	1,664	1,665	1,665	1,665	1,665	**1,584**	(81)	(1)	0.0	0.0	0.0	0.0	(81)
2011	1,681	1,584	1,678	1,681	1,681	1,681	1,681	**1,581**	(97)	(3)	0.0	0.0	0.0	0.0	(100)
2012	1,711	1,595	1,703	1,711	1,711	1,711	1,711	**1,587**	(116)	(8)	0.0	0.0	0.0	0.0	(124)
2013	1,737	1,598	1,709	1,737	1,737	1,737	1,737	**1,570**	(139)	(28)	0.1	0.0	0.0	0.0	(167)
2014	1,785	1,619	1,751	1,785	1,785	1,785	1,785	**1,585**	(166)	(35)	0.1	0.0	0.0	0.0	(201)
2015	1,775	1,579	1,763	1,776	1,775	1,775	1,775	**1,566**	(196)	(13)	0.2	0.0	0.0	0.0	(209)
2016	1,842	1,611	1,766	1,842	1,842	1,842	1,842	**1,536**	(231)	(76)	0.2	(0.2)	0.0	0.0	(307)
2017	1,858	1,592	1,791	1,858	1,856	1,858	1,858	**1,523**	(266)	(67)	0.4	(2.4)	(0.1)	0.0	(335)
2018	1,839	1,537	1,807	1,840	1,828	1,839	1,839	**1,494**	(302)	(32)	0.8	(11.4)	(0.4)	0.0	(345)
2019	1,849	1,510	1,813	1,850	1,828	1,845	1,849	**1,451**	(339)	(35)	1.1	(20.7)	(3.7)	0.1	(397)
2020	1,971	1,596	1,931	1,972	1,951	1,960	1,971	**1,528**	(374)	(39)	1.5	(19.9)	(10.5)	0.2	(443)
2021	1,943	1,539	1,898	1,945	1,924	1,921	1,944	**1,454**	(404)	(45)	2.1	(19.5)	(22.5)	0.4	(489)
2022	2,178	1,755	1,917	2,180	2,158	2,140	2,179	**1,440**	(423)	(261)	2.3	(19.8)	(37.5)	0.8	(738)
2023	1,993	1,556	1,936	1,998	1,965	1,940	1,994	**1,427**	(436)	(57)	5.5	(27.2)	(52.6)	1.4	(566)
2024	2,090	1,641	1,837	2,095	2,075	2,155	2,092	**1,448**	(448)	(253)	5.8	(14.5)	65.4	2.5	(642)
2025	2,123	1,664	1,847	2,131	2,107	2,201	2,126	**1,464**	(459)	(275)	8.7	(15.4)	78.2	3.7	(659)
2026	2,144	1,676	1,846	2,156	2,128	2,232	2,149	**1,469**	(468)	(297)	12.6	(16.1)	88.4	5.1	(675)
2027	2,180	1,704	1,860	2,197	2,163	2,276	2,187	**1,489**	(475)	(320)	17.8	(16.7)	96.7	7.0	(690)
2028	2,209	1,727	1,866	2,234	2,192	2,312	2,218	**1,504**	(482)	(343)	24.6	(17.5)	103.3	9.2	(705)
2029	2,102	1,614	2,090	2,162	2,065	1,989	2,112	**1,525**	(487)	(12)	60.5	(36.7)	(112.3)	10.5	(577)
2030	2,126	1,634	2,114	2,208	2,088	2,009	2,139	**1,562**	(492)	(12)	82.2	(38.2)	(116.7)	12.8	(564)
2031	2,150	1,654	2,137	2,260	2,111	2,030	2,165	**1,606**	(496)	(13)	109.8	(39.3)	(120.1)	15.5	(543)
2032	2,173	1,674	2,159	2,315	2,133	2,051	2,192	**1,657**	(499)	(14)	141.7	(40.4)	(122.9)	18.8	(516)
2033	2,197	1,695	2,182	2,374	2,156	2,072	2,220	**1,713**	(502)	(15)	176.7	(41.6)	(125.2)	22.8	(484)
2034	2,220	1,715	2,204	2,434	2,177	2,093	2,247	**1,771**	(505)	(16)	214.3	(42.7)	(127.0)	27.4	(449)
2035	2,233	1,726	2,216	2,487	2,189	2,105	2,265	**1,824**	(507)	(17)	254.1	(43.9)	(128.4)	32.3	(409)
2036	2,260	1,751	2,242	2,555	2,214	2,130	2,297	**1,891**	(509)	(18)	294.9	(45.2)	(129.5)	37.6	(369)
2037	2,267	1,756	2,248	2,601	2,220	2,136	2,310	**1,938**	(511)	(19)	334.8	(46.5)	(130.4)	43.0	(328)
2038	2,294	1,782	2,275	2,668	2,246	2,163	2,343	**2,005**	(513)	(19)	373.5	(48.0)	(131.2)	48.5	(289)
2039	2,316	1,801	2,295	2,729	2,266	2,184	2,369	**2,066**	(515)	(20)	413.2	(49.4)	(131.8)	53.8	(249)
2040	2,342	1,826	2,321	2,798	2,292	2,210	2,401	**2,136**	(517)	(22)	456.1	(50.4)	(132.3)	58.8	(206)
2041	2,367	1,849	2,345	2,850	2,316	2,235	2,431	**2,189**	(518)	(23)	482.9	(51.2)	(132.7)	63.6	(178)
2042	2,381	1,861	2,358	2,888	2,329	2,248	2,449	**2,227**	(520)	(23)	507.1	(51.8)	(133.0)	67.9	(154)
2043	2,394	1,872	2,370	2,923	2,342	2,261	2,466	**2,263**	(522)	(24)	528.7	(52.5)	(133.2)	71.7	(132)
2044	2,419	1,895	2,394	2,967	2,366	2,285	2,494	**2,306**	(524)	(25)	547.9	(53.1)	(133.5)	74.9	(113)
2045	2,438	1,912	2,412	3,002	2,384	2,304	2,515	**2,341**	(526)	(25)	564.6	(53.8)	(133.7)	77.7	(97)
2046	2,470	1,942	2,444	3,049	2,415	2,336	2,550	**2,386**	(528)	(26)	579.1	(54.6)	(133.9)	79.9	(84)
2047	2,491	1,961	2,465	3,082	2,436	2,357	2,573	**2,418**	(530)	(26)	591.4	(55.4)	(133.9)	81.6	(73)
2048	2,494	1,962	2,467	3,096	2,437	2,360	2,576	**2,429**	(532)	(27)	602.0	(56.2)	(133.9)	82.8	(64)
2049	2,530	1,996	2,503	3,141	2,473	2,396	2,613	**2,472**	(534)	(27)	610.9	(56.9)	(133.9)	83.6	(57)
2050	2,556	2,020	2,528	3,174	2,498	2,422	2,640	**2,503**	(536)	(27)	618.6	(57.7)	(133.9)	84.0	(52)
Avg. last 15 yrs	1.9%	0.7%	1.1%	1.9%	1.9%	1.8%	1.9%	-0.7%							
Avg. last 10 yrs	2.4%	1.0%	1.2%	2.5%	2.3%	2.3%	2.4%	-1.0%							
Avg. last 5 yrs	3.2%	2.0%	1.4%	3.2%	3.1%	2.9%	3.2%	-1.1%							
Base 2022															
Avg. next 5 yrs	0.0%	-0.6%	-0.6%	0.2%	0.0%	1.2%	0.1%	0.7%							
Avg. next 10 yrs	0.0%	-0.5%	1.2%	0.6%	-0.1%	-0.4%	0.1%	1.4%							
Avg. next 15 yrs	0.3%	0.0%	1.1%	1.2%	0.2%	0.0%	0.4%	2.0%							
Avg. next 20 yrs	0.4%	0.3%	1.0%	1.4%	0.4%	0.2%	0.6%	2.2%							
Avg. next 25 yrs	0.5%	0.4%	1.0%	1.4%	0.5%	0.4%	0.7%	2.1%							

EE: Energy Efficiency (reduces load)
PV: Solar - Photovoltaics (reduces load)
EV: Electric Vehicles (ADDs to load)
DR: Demand Response (Company only) (reduces load)
ES: Energy Storage (reduces load)
EH: Electric Heating Pump Cooling (reduces load)

SEMA
WINTER Peaks **after DER Impacts ***

YEAR	Actuals (MW)	Actuals (% Grwth)	Normal 50-50 (MW)	Normal 50-50 (% Grwth)	Extreme 10-90 (MW)	Extreme 10-90 (% Grwth)	Extreme 05-95 (MW)	Extreme 05-95 (% Grwth)	HDD_wtd ACTUAL
2006	1,194		1,193		1,230		1,240		46.9
2007	1,181	-1.1%	1,165	-2.4%	1,200	-2.4%	1,209	-2.5%	46.7
2008	1,138	-3.7%	1,134	-2.6%	1,172	-2.3%	1,182	-2.2%	47.3
2009	1,143	0.4%	1,182	4.2%	1,223	4.3%	1,234	4.4%	36.7
2010	1,151	0.8%	1,109	-6.2%	1,150	-5.9%	1,162	-5.8%	54.9
2011	1,084	-5.8%	1,118	0.8%	1,158	0.7%	1,169	0.6%	45.4
2012	1,165	7.4%	1,147	2.6%	1,184	2.3%	1,195	2.2%	49.8
2013	1,218	4.6%	1,228	7.1%	1,269	7.2%	1,281	7.2%	44.4
2014	1,132	-7.0%	1,112	-9.5%	1,150	-9.4%	1,160	-9.4%	52.4
2015	1,058	-6.6%	1,082	-2.7%	1,118	-2.8%	1,128	-2.8%	42.3
2016	1,100	4.0%	1,095	1.2%	1,141	2.1%	1,154	2.3%	46.0
2017	1,155	4.9%	1,108	1.2%	1,162	1.9%	1,178	2.1%	52.6
2018	1,138	-1.4%	1,107	0.0%	1,153	-0.8%	1,166	-1.0%	51.3
2019	1,016	-10.7%	1,043	-5.8%	1,085	-5.8%	1,097	-5.8%	41.7
2020	1,042	2.5%	1,102	5.6%	1,147	5.7%	1,160	5.7%	39.7
2021	1,061	1.9%	1,053	-4.4%	1,095	-4.5%	1,107	-4.6%	45.1
2022	-	-	1,075	2.1%	1,122	2.5%	1,136	2.6%	-
2023	-	-	1,081	0.5%	1,129	0.6%	1,143	0.6%	-
2024	-	-	1,096	1.4%	1,145	1.4%	1,159	1.4%	-
2025	-	-	1,110	1.3%	1,160	1.3%	1,174	1.3%	-
2026	-	-	1,135	2.2%	1,186	2.2%	1,200	2.2%	-
2027	-	-	1,166	2.7%	1,214	2.4%	1,227	2.3%	-
2028	-	-	1,213	4.0%	1,261	3.9%	1,275	3.9%	-
2029	-	-	1,260	3.8%	1,308	3.7%	1,322	3.7%	-
2030	-	-	1,320	4.8%	1,370	4.7%	1,384	4.6%	-
2031	-	-	1,395	5.7%	1,445	5.5%	1,459	5.5%	-
2032	-	-	1,483	6.3%	1,534	6.1%	1,548	6.1%	-
2033	-	-	1,585	6.8%	1,636	6.6%	1,651	6.6%	-
2034	-	-	1,697	7.1%	1,749	6.9%	1,763	6.8%	-
2035	-	-	1,820	7.3%	1,872	7.1%	1,887	7.0%	-
2036	-	-	1,949	7.1%	2,002	6.9%	2,017	6.9%	-
2037	-		2,086	7.0%	2,140	6.9%	2,155	6.8%	-
2038	-		2,208	5.9%	2,263	5.7%	2,278	5.7%	-
2039	-		2,336	5.8%	2,391	5.7%	2,407	5.7%	-
2040	-		2,475	5.9%	2,530	5.8%	2,546	5.8%	-
2041	-		2,584	4.4%	2,640	4.3%	2,656	4.3%	-
2042	-		2,692	4.2%	2,749	4.1%	2,766	4.2%	-
2043	-		2,798	3.9%	2,857	3.9%	2,873	3.9%	-
2044	-		2,895	3.5%	2,955	3.4%	2,972	3.4%	-
2045	-		2,978	2.8%	3,038	2.8%	3,055	2.8%	-
2046	-		3,050	2.4%	3,110	2.4%	3,128	2.4%	-
2047	-		3,119	2.3%	3,180	2.2%	3,198	2.2%	-
2048	-		3,186	2.1%	3,248	2.1%	3,265	2.1%	-
2049	-		3,220	1.1%	3,282	1.1%	3,300	1.1%	-
2050	-		3,239	0.6%	3,302	0.6%	3,319	0.6%	-

	Normal 50-50	Extreme 10-90	Extreme 05-95
Avg. last 15 yrs	-0.8%	-0.8%	-0.8%
Avg. last 10 yrs	-0.6%	-0.6%	-0.5%
Avg. last 5 yrs	-0.8%	-0.8%	-0.8%
Base 2021			
Avg. next 5 yrs	1.5%	1.6%	1.6%
Avg. next 10 yrs	2.9%	2.8%	2.8%
Avg. next 15 yrs	4.2%	4.1%	4.1%
Avg. next 20 yrs	4.6%	4.5%	4.5%
Avg. next 25 yrs	4.3%	4.3%	4.2%

HDD_wtd	
NORMAL	46.3
EXTREME 90/10	53.6
EXTREME 95/5	55.7

**** impacts include energy efficiency, solar pv, electric vehicles, energy storage, electric heap pumps, and company demand response***

SEMA	WINTER 50/50 Peaks (MW) (before & after DERs)														
	SYSTEM PEAK								DER IMPACTS						
Calendar Year	Reconstituted (before DER)	Forecast w/ EE only	Forecast w/ PV only	Forecast w/ EV only	Forecast w/ DR only	Forecast w/ ES only	Forecast w/ EH only	Final Forecast (after all DER)	EE	PV	EV	DR	ES	EH	DER
2006	1,249	1,193	1,249	1,249	1,249	1,249	1,249	**1,193**	(56)	0	0.0	0.0	0.0	0.0	(56)
2007	1,238	1,165	1,238	1,238	1,238	1,238	1,238	**1,165**	(73)	0	0.0	0.0	0.0	0.0	(73)
2008	1,218	1,134	1,218	1,218	1,218	1,218	1,218	**1,134**	(84)	0	0.0	0.0	0.0	0.0	(84)
2009	1,285	1,182	1,285	1,285	1,285	1,285	1,285	**1,182**	(103)	0	0.0	0.0	0.0	0.0	(103)
2010	1,229	1,109	1,229	1,229	1,229	1,229	1,229	**1,109**	(120)	0	0.0	0.0	0.0	0.0	(120)
2011	1,257	1,118	1,257	1,257	1,257	1,257	1,257	**1,118**	(139)	0	0.0	0.0	0.0	0.0	(139)
2012	1,306	1,147	1,306	1,306	1,306	1,306	1,306	**1,147**	(159)	0	0.1	0.0	0.0	0.0	(159)
2013	1,416	1,228	1,416	1,416	1,416	1,416	1,416	**1,228**	(188)	0	0.1	0.0	0.0	0.0	(187)
2014	1,330	1,112	1,330	1,330	1,330	1,330	1,330	**1,112**	(218)	0	0.3	0.0	0.0	0.0	(217)
2015	1,333	1,082	1,333	1,333	1,333	1,333	1,333	**1,082**	(251)	0	0.4	0.0	0.0	0.0	(251)
2016	1,381	1,094	1,381	1,381	1,381	1,381	1,381	**1,095**	(286)	0	0.5	0.0	0.0	0.0	(286)
2017	1,429	1,107	1,429	1,430	1,429	1,429	1,429	**1,108**	(322)	0	0.8	0.0	(0.1)	0.0	(321)
2018	1,467	1,107	1,467	1,469	1,467	1,467	1,467	**1,107**	(361)	0	1.1	0.0	(0.6)	0.0	(360)
2019	1,446	1,047	1,446	1,447	1,446	1,440	1,446	**1,043**	(399)	0	1.9	0.0	(6.0)	0.2	(403)
2020	1,550	1,113	1,550	1,552	1,550	1,536	1,551	**1,102**	(437)	0	2.0	0.0	(13.8)	0.7	(448)
2021	1,539	1,078	1,539	1,542	1,539	1,510	1,540	**1,053**	(461)	0	3.0	0.0	(29.0)	1.4	(486)
2022	1,585	1,111	1,585	1,590	1,585	1,541	1,588	**1,075**	(474)	0	4.9	0.0	(44.2)	3.2	(510)
2023	1,610	1,125	1,610	1,619	1,610	1,551	1,617	**1,081**	(485)	0	8.4	0.0	(59.3)	6.8	(530)
2024	1,642	1,146	1,642	1,655	1,642	1,567	1,653	**1,096**	(496)	0	13.2	0.0	(74.5)	11.6	(546)
2025	1,666	1,161	1,666	1,686	1,666	1,580	1,683	**1,110**	(505)	0	19.5	0.0	(86.5)	16.5	(556)
2026	1,694	1,181	1,694	1,722	1,694	1,598	1,717	**1,135**	(513)	0	28.0	0.0	(96.1)	22.4	(559)
2027	1,605	1,085	1,605	1,657	1,605	1,608	1,631	**1,166**	(520)	0	52.3	0.0	2.9	25.7	(439)
2028	1,631	1,105	1,631	1,703	1,631	1,634	1,663	**1,213**	(525)	0	72.0	0.0	3.1	32.4	(418)
2029	1,647	1,117	1,647	1,747	1,647	1,650	1,687	**1,260**	(530)	0	99.4	0.0	3.2	39.7	(388)
2030	1,670	1,136	1,670	1,804	1,670	1,673	1,717	**1,320**	(534)	0	133.8	0.0	3.3	47.4	(349)
2031	1,692	1,154	1,692	1,869	1,692	1,695	1,751	**1,395**	(537)	0	177.9	0.0	3.4	59.8	(296)
2032	1,713	1,173	1,713	1,939	1,713	1,717	1,794	**1,483**	(540)	0	226.0	0.0	3.5	80.9	(230)
2033	1,735	1,192	1,735	2,014	1,735	1,739	1,845	**1,585**	(543)	0	278.6	0.0	3.5	110.4	(150)
2034	1,756	1,211	1,756	2,091	1,756	1,760	1,903	**1,697**	(545)	0	334.8	0.0	3.6	147.3	(59)
2035	1,779	1,232	1,779	2,172	1,779	1,783	1,970	**1,820**	(547)	0	393.2	0.0	3.6	190.9	41
2036	1,802	1,254	1,802	2,254	1,802	1,806	2,042	**1,949**	(549)	0	451.9	0.0	3.6	239.9	147
2037	1,830	1,280	1,830	2,339	1,830	1,834	2,123	**2,086**	(550)	0	509.3	0.0	3.7	293.1	256
2038	1,843	1,291	1,843	2,407	1,843	1,846	2,192	**2,208**	(552)	0	564.7	0.0	3.7	349.4	366
2039	1,858	1,304	1,858	2,480	1,858	1,862	2,265	**2,336**	(554)	0	621.6	0.0	3.7	407.2	479
2040	1,878	1,322	1,878	2,562	1,878	1,882	2,343	**2,475**	(556)	0	683.7	0.0	3.7	465.2	597
2041	1,895	1,337	1,895	2,616	1,895	1,899	2,417	**2,584**	(558)	0	721.0	0.0	3.7	522.1	689
2042	1,917	1,357	1,917	2,671	1,917	1,920	2,493	**2,692**	(559)	0	754.8	0.0	3.7	576.7	776
2043	2,009	1,448	2,009	2,776	2,009	1,874	2,726	**2,798**	(561)	0	767.1	0.0	(134.3)	717.3	789
2044	2,030	1,467	2,030	2,823	2,030	1,895	2,800	**2,895**	(563)	0	793.0	0.0	(134.5)	770.2	866
2045	2,045	1,480	2,045	2,860	2,045	1,910	2,862	**2,978**	(565)	0	815.6	0.0	(134.8)	816.7	933
2046	2,060	1,494	2,060	2,895	2,060	1,926	2,916	**3,050**	(567)	0	835.0	0.0	(134.8)	856.0	990
2047	2,084	1,515	2,084	2,935	2,084	1,949	2,971	**3,119**	(568)	0	851.6	0.0	(134.8)	887.2	1,036
2048	2,115	1,545	2,115	2,981	2,115	1,980	3,025	**3,186**	(570)	0	865.7	0.0	(134.8)	909.9	1,071
2049	2,125	1,553	2,125	3,003	2,125	1,990	3,049	**3,220**	(572)	0	877.7	0.0	(134.8)	923.7	1,095
2050	2,132	1,558	2,132	3,020	2,132	1,997	3,060	**3,239**	(574)	0	887.9	0.0	(134.8)	928.3	1,108
	-														
Avg. last 15 yrs	1.4%	-0.7%	1.4%	1.4%	1.4%	1.3%	1.4%	-0.8%							
Avg. last 10 yrs	2.0%	-0.4%	2.0%	2.1%	2.0%	1.9%	2.1%	-0.6%							
Avg. last 5 yrs	2.2%	-0.3%	2.2%	2.2%	2.2%	1.8%	2.2%	-0.8%							
Base 2021															
Avg. next 5 yrs	1.9%	1.9%	1.9%	2.2%	1.9%	1.1%	2.2%	1.5%							
Avg. next 10 yrs	1.0%	0.7%	1.0%	1.9%	1.0%	1.2%	1.3%	2.9%							
Avg. next 15 yrs	1.1%	1.0%	1.1%	2.6%	1.1%	1.2%	1.9%	4.2%							
Avg. next 20 yrs	0.8%	0.8%	0.8%	1.9%	0.8%	0.9%	1.4%	3.1%							
Avg. next 25 yrs	1.2%	1.3%	1.2%	2.6%	1.2%	1.0%	2.6%	4.3%							

EE: Energy Efficiency (reduces load)
PV: Solar - Photovoltaics (reduces load)
EV: Electric Vehicles (ADDs to load)
DR: Demand Response (Company only) (reduces load)
ES: Energy Storage (reduces load)
EH: Electric Heating/Cooling (ADDs to load)

WCMA Zone (Western/Central Massachusetts)

WCMA

Annual Peaks — **AFTER DER Impacts ***

YEAR	Actuals (MW)	Actuals (% Grwth)	Normal 50-50 (MW)	Normal 50-50 (% Grwth)	Extreme 90-10 (MW)	Extreme 90-10 (% Grwth)	Extreme 95-5 (MW)	Extreme 95-5 (% Grwth)	Peak Season (50-50)
2006	2,229		2,092		2,197		2,226		S
2007	2,088	-6.3%	2,104	0.5%	2,206	0.4%	2,235	0.4%	S
2008	2,167	3.8%	2,107	0.2%	2,204	-0.1%	2,232	-0.1%	S
2009	1,984	-8.4%	2,064	-2.0%	2,161	-1.9%	2,189	-1.9%	S
2010	2,137	7.7%	2,089	1.2%	2,192	1.4%	2,221	1.5%	S
2011	2,182	2.1%	2,112	1.1%	2,212	0.9%	2,240	0.9%	S
2012	2,073	-5.0%	2,078	-1.6%	2,178	-1.5%	2,207	-1.5%	S
2013	2,165	4.5%	2,059	-0.9%	2,161	-0.8%	2,190	-0.8%	S
2014	1,935	-10.6%	2,049	-0.5%	2,154	-0.3%	2,184	-0.3%	S
2015	1,935	0.0%	2,034	-0.7%	2,139	-0.7%	2,168	-0.7%	S
2016	1,983	2.4%	2,029	-0.3%	2,129	-0.5%	2,157	-0.5%	S
2017	1,879	-5.2%	1,998	-1.5%	2,117	-0.5%	2,151	-0.3%	S
2018	2,026	7.8%	1,986	-0.6%	2,086	-1.5%	2,115	-1.7%	S
2019	1,882	-7.1%	1,929	-2.9%	2,025	-2.9%	2,053	-2.9%	S
2020	1,904	1.2%	1,946	0.9%	2,060	1.7%	2,092	1.9%	S
2021	1,978	3.9%	1,925	-1.0%	2,021	-1.9%	2,048	-2.1%	S
2022	2,006	1.4%	1,960	1.8%	2,070	2.4%	2,101	2.6%	S
2023	-	-	1,967	0.4%	2,070	0.0%	2,099	-0.1%	S
2024	-	-	1,992	1.3%	2,095	1.2%	2,124	1.2%	S
2025	-	-	2,023	1.5%	2,125	1.5%	2,155	1.5%	S
2026	-	-	2,045	1.1%	2,148	1.1%	2,177	1.1%	S
2027	-	-	2,090	2.2%	2,193	2.1%	2,222	2.1%	S
2028	-	-	2,133	2.1%	2,237	2.0%	2,266	2.0%	S
2029	-	-	2,183	2.3%	2,287	2.2%	2,316	2.2%	S
2030	-	-	2,239	2.6%	2,343	2.5%	2,372	2.4%	S
2031	-	-	2,305	2.9%	2,409	2.8%	2,438	2.8%	S
2032	-	-	2,378	3.2%	2,482	3.1%	2,512	3.0%	S
2033	-	-	2,458	3.3%	2,562	3.2%	2,592	3.2%	S
2034	-	-	2,541	3.4%	2,645	3.2%	2,675	3.2%	S
2035	-	-	2,617	3.0%	2,721	2.9%	2,751	2.8%	S
2036	-	-	2,754	5.2%	2,830	4.0%	2,851	3.7%	W
2037	-	-	2,939	6.7%	3,016	6.6%	3,038	6.5%	W
2038	-		3,105	5.7%	3,183	5.5%	3,205	5.5%	W
2039	-		3,279	5.6%	3,358	5.5%	3,380	5.5%	W
2040	-		3,467	5.7%	3,546	5.6%	3,569	5.6%	W
2041	-		3,614	4.2%	3,694	4.2%	3,717	4.2%	W
2042	-		3,759	4.0%	3,840	4.0%	3,863	3.9%	W
2043	-		3,892	3.5%	3,974	3.5%	3,998	3.5%	W
2044	-		4,021	3.3%	4,105	3.3%	4,129	3.3%	W
2045	-		4,130	2.7%	4,216	2.7%	4,240	2.7%	W
2046	-		4,227	2.3%	4,313	2.3%	4,337	2.3%	W
2047	-		4,319	2.2%	4,406	2.1%	4,430	2.1%	W
2048	-		4,406	2.0%	4,494	2.0%	4,519	2.0%	W
2049	-		4,451	1.0%	4,540	1.0%	4,565	1.0%	W
2050	-		4,477	0.6%	4,567	0.6%	4,592	0.6%	W

	Normal 50-50	Extreme 90-10	Extreme 95-5
Avg. last 15 yrs	-0.5%	-0.4%	-0.4%
Avg. last 10 yrs	-0.6%	-0.5%	-0.5%
Avg. last 5 yrs	-0.4%	-0.4%	-0.5%
BASE 2022			
Avg. next 5 yrs	1.3%	1.2%	1.1%
Avg. next 10 yrs	2.0%	1.8%	1.8%
Avg. next 15 yrs	2.7%	2.5%	2.5%
Avg. next 20 yrs	3.3%	3.1%	3.1%
Avg. next 25 yrs	3.2%	3.1%	3.0%

**** impacts include energy efficiency, solar pv, electric vehicles, energy storage, electric heat pumps, and company demand response***

WCMA

SUMMER Peaks — **AFTER DER Impacts ***

YEAR	Actuals (MW)	Actuals (% Grwth)	Normal 50-50 (MW)	Normal 50-50 (% Grwth)	Extreme 90-10 (MW)	Extreme 90-10 (% Grwth)	Extreme 95-5 (MW)	Extreme 95-5 (% Grwth)	WTHI ACTUAL
2006	2,229		2,092		2,197		2,226		82.7
2007	2,088	-6.3%	2,104	0.5%	2,206	0.4%	2,235	0.4%	80.7
2008	2,167	3.8%	2,107	0.2%	2,204	-0.1%	2,232	-0.1%	81.6
2009	1,984	-8.4%	2,064	-2.0%	2,161	-1.9%	2,189	-1.9%	79.2
2010	2,137	7.7%	2,089	1.2%	2,192	1.4%	2,221	1.5%	81.3
2011	2,182	2.1%	2,112	1.1%	2,212	0.9%	2,240	0.9%	82.5
2012	2,073	-5.0%	2,078	-1.6%	2,178	-1.5%	2,207	-1.5%	80.5
2013	2,165	4.5%	2,059	-0.9%	2,161	-0.8%	2,190	-0.8%	82.3
2014	1,935	-10.6%	2,049	-0.5%	2,154	-0.3%	2,184	-0.3%	79.5
2015	1,935	0.0%	2,034	-0.7%	2,139	-0.7%	2,168	-0.7%	79.4
2016	1,983	2.4%	2,029	-0.3%	2,129	-0.5%	2,157	-0.5%	80.5
2017	1,879	-5.2%	1,998	-1.5%	2,117	-0.5%	2,151	-0.3%	79.4
2018	2,026	7.8%	1,986	-0.6%	2,086	-1.5%	2,115	-1.7%	81.2
2019	1,882	-7.1%	1,929	-2.9%	2,025	-2.9%	2,053	-2.9%	79.8
2020	1,904	1.2%	1,946	0.9%	2,060	1.7%	2,092	1.9%	80.0
2021	1,978	3.9%	1,925	-1.0%	2,021	-1.9%	2,048	-2.1%	82.1
2022	2,006	1.4%	1,960	1.8%	2,070	2.4%	2,101	2.6%	80.0
2023	-	-	1,967	0.4%	2,070	0.0%	2,099	-0.1%	-
2024	-	-	1,992	1.3%	2,095	1.2%	2,124	1.2%	-
2025	-	-	2,023	1.5%	2,125	1.5%	2,155	1.5%	-
2026	-	-	2,045	1.1%	2,148	1.1%	2,177	1.1%	-
2027	-	-	2,090	2.2%	2,193	2.1%	2,222	2.1%	-
2028	-	-	2,133	2.1%	2,237	2.0%	2,266	2.0%	-
2029	-	-	2,183	2.3%	2,287	2.2%	2,316	2.2%	-
2030	-	-	2,239	2.6%	2,343	2.5%	2,372	2.4%	-
2031	-	-	2,305	2.9%	2,409	2.8%	2,438	2.8%	-
2032	-	-	2,378	3.2%	2,482	3.1%	2,512	3.0%	-
2033	-	-	2,458	3.3%	2,562	3.2%	2,592	3.2%	-
2034	-	-	2,541	3.4%	2,645	3.2%	2,675	3.2%	-
2035	-	-	2,617	3.0%	2,721	2.9%	2,751	2.8%	-
2036	-	-	2,711	3.6%	2,815	3.5%	2,845	3.4%	-
2037	-	-	2,780	2.6%	2,885	2.5%	2,915	2.4%	-
2038	-		2,872	3.3%	2,977	3.2%	3,007	3.2%	-
2039	-		2,958	3.0%	3,063	2.9%	3,093	2.9%	-
2040	-		3,055	3.3%	3,160	3.2%	3,190	3.1%	-
2041	-		3,126	2.3%	3,232	2.3%	3,261	2.2%	-
2042	-		3,180	1.7%	3,285	1.7%	3,315	1.6%	-
2043	-		3,229	1.5%	3,334	1.5%	3,364	1.5%	-
2044	-		3,286	1.8%	3,392	1.7%	3,422	1.7%	-
2045	-		3,333	1.4%	3,439	1.4%	3,469	1.4%	-
2046	-		3,391	1.7%	3,497	1.7%	3,527	1.7%	-
2047	-		3,433	1.2%	3,539	1.2%	3,569	1.2%	-
2048	-		3,449	0.5%	3,555	0.5%	3,585	0.5%	-
2049	-		3,502	1.5%	3,609	1.5%	3,639	1.5%	-
2050	-		3,541	1.1%	3,648	1.1%	3,678	1.1%	-

	Normal 50-50	Extreme 90-10	Extreme 95-5
Avg. last 15 yrs	-0.5%	-0.4%	-0.4%
Avg. last 10 yrs	-0.6%	-0.5%	-0.5%
Avg. last 5 yrs	-0.4%	-0.4%	-0.5%
BASE 2022			
Avg. next 5 yrs	1.3%	1.2%	1.1%
Avg. next 10 yrs	2.0%	1.8%	1.8%
Avg. next 15 yrs	2.4%	2.2%	2.2%
Avg. next 20 yrs	1.8%	1.7%	1.6%
Avg. next 25 yrs	2.0%	1.9%	1.8%

WTHI

NORMAL	80.6
EXTREME 90/10	82.2
EXTREME 95/5	82.7

**** impacts include energy efficiency, solar pv, electric vehicles, energy storage, electric heap pumps, and company demand response***

WCMA	SUMMER 50/50 Peaks (MW) (before & after DERs)														
	SYSTEM PEAK								DER IMPACTS						
Calendar Year	Reconstituted (before DER)	Forecast w/ EE only	Forecast w/ PV only	Forecast w/ EV only	Forecast w/ DR only	Forecast w/ ES only	Forecast w/ EH only	Final Forecast (after all DER)	EE	PV	EV	DR	ES	EH	DER
2006	2,138	2,092	2,138	2,138	2,138	2,138	2,138	**2,092**	(45)	(0)	0.0	0.0	0.0	0.0	(46)
2007	2,163	2,104	2,162	2,163	2,163	2,163	2,163	**2,104**	(59)	(0)	0.0	0.0	0.0	0.0	(59)
2008	2,180	2,108	2,180	2,180	2,180	2,180	2,180	**2,107**	(73)	(0)	0.0	0.0	0.0	0.0	(73)
2009	2,155	2,066	2,154	2,155	2,155	2,155	2,155	**2,064**	(90)	(1)	0.0	0.0	0.0	0.0	(91)
2010	2,202	2,092	2,199	2,202	2,202	2,202	2,202	**2,089**	(110)	(3)	0.0	0.0	0.0	0.0	(113)
2011	2,252	2,120	2,245	2,252	2,252	2,252	2,252	**2,112**	(132)	(7)	0.0	0.0	0.0	0.0	(140)
2012	2,243	2,086	2,235	2,243	2,243	2,243	2,243	**2,078**	(157)	(8)	0.0	0.0	0.0	0.0	(165)
2013	2,288	2,100	2,247	2,288	2,288	2,288	2,288	**2,059**	(188)	(41)	0.1	0.0	0.0	0.0	(228)
2014	2,355	2,131	2,273	2,356	2,355	2,355	2,355	**2,049**	(224)	(83)	0.2	0.0	0.0	0.0	(306)
2015	2,362	2,098	2,297	2,362	2,362	2,362	2,362	**2,034**	(264)	(64)	0.3	0.0	0.0	0.0	(328)
2016	2,529	2,220	2,337	2,529	2,528	2,529	2,529	**2,029**	(309)	(192)	0.4	(0.2)	0.0	0.0	(500)
2017	2,485	2,130	2,356	2,486	2,482	2,485	2,485	**1,998**	(355)	(129)	0.6	(3.2)	(0.1)	0.0	(487)
2018	2,463	2,061	2,402	2,464	2,448	2,463	2,463	**1,986**	(403)	(61)	1.3	(15.0)	(0.5)	0.0	(478)
2019	2,418	1,968	2,409	2,420	2,391	2,413	2,418	**1,929**	(450)	(9)	2.2	(27.3)	(5.0)	0.1	(489)
2020	2,561	2,064	2,479	2,563	2,535	2,547	2,561	**1,946**	(496)	(82)	2.4	(26.2)	(13.8)	0.2	(615)
2021	2,609	2,074	2,512	2,612	2,583	2,579	2,609	**1,925**	(535)	(97)	3.3	(25.8)	(29.7)	0.5	(683)
2022	2,707	2,149	2,597	2,712	2,672	2,658	2,708	**1,960**	(558)	(110)	5.0	(34.8)	(49.5)	1.0	(747)
2023	2,556	1,981	2,556	2,566	2,529	2,558	2,558	**1,967**	(575)	0	9.9	(26.9)	1.8	1.5	(589)
2024	2,591	2,000	2,591	2,606	2,562	2,593	2,593	**1,992**	(591)	0	15.6	(28.6)	2.4	2.6	(599)
2025	2,627	2,023	2,627	2,650	2,597	2,630	2,631	**2,023**	(604)	0	23.1	(30.4)	2.8	3.9	(605)
2026	2,651	2,035	2,651	2,684	2,619	2,654	2,656	**2,045**	(616)	0	33.2	(31.8)	3.2	5.4	(606)
2027	2,691	2,065	2,691	2,738	2,658	2,694	2,698	**2,090**	(626)	0	46.8	(33.1)	3.5	7.4	(601)
2028	2,724	2,090	2,724	2,788	2,689	2,727	2,733	**2,133**	(634)	0	64.8	(34.7)	3.7	9.7	(590)
2029	2,755	2,114	2,755	2,844	2,718	2,759	2,767	**2,183**	(641)	0	89.2	(36.3)	3.9	12.2	(572)
2030	2,784	2,137	2,784	2,905	2,746	2,788	2,799	**2,239**	(647)	0	121.1	(37.7)	4.1	15.0	(544)
2031	2,812	2,160	2,812	2,973	2,773	2,816	2,830	**2,305**	(652)	0	161.5	(38.9)	4.2	18.2	(507)
2032	2,840	2,184	2,840	3,048	2,800	2,844	2,862	**2,378**	(656)	0	208.3	(39.9)	4.3	22.1	(461)
2033	2,868	2,208	2,868	3,128	2,827	2,872	2,895	**2,458**	(660)	0	259.6	(41.1)	4.4	26.7	(410)
2034	2,895	2,232	2,895	3,210	2,853	2,899	2,927	**2,541**	(663)	0	314.8	(42.2)	4.4	32.0	(354)
2035	2,910	2,245	2,910	3,284	2,867	2,915	2,948	**2,617**	(666)	0	373.2	(43.4)	4.5	37.9	(294)
2036	2,942	2,274	2,942	3,375	2,897	2,946	2,986	**2,711**	(668)	0	433.1	(44.7)	4.5	44.0	(231)
2037	2,950	2,280	2,950	3,442	2,904	2,955	3,001	**2,780**	(671)	0	491.6	(46.0)	4.6	50.4	(170)
2038	2,983	2,310	2,983	3,531	2,935	2,987	3,040	**2,872**	(673)	0	548.5	(47.4)	4.6	56.8	(111)
2039	3,008	2,333	3,008	3,615	2,959	3,013	3,071	**2,958**	(676)	0	606.8	(48.8)	4.6	63.0	(50)
2040	3,040	2,361	3,040	3,709	2,990	3,044	3,108	**3,055**	(678)	0	669.7	(49.8)	4.6	68.9	15
2041	3,069	2,389	3,069	3,778	3,019	3,074	3,144	**3,126**	(681)	0	709.0	(50.6)	4.6	74.5	57
2042	3,086	2,403	3,086	3,830	3,035	3,090	3,165	**3,180**	(683)	0	744.3	(51.2)	4.7	79.5	94
2043	3,101	2,416	3,101	3,877	3,050	3,106	3,185	**3,229**	(686)	0	775.8	(51.9)	4.7	84.0	127
2044	3,130	2,442	3,130	3,934	3,078	3,135	3,218	**3,286**	(688)	0	803.7	(52.5)	4.7	87.8	156
2045	3,153	2,463	3,153	3,981	3,100	3,158	3,244	**3,333**	(690)	0	827.9	(53.2)	4.7	91.0	180
2046	3,191	2,498	3,191	4,040	3,137	3,196	3,285	**3,391**	(693)	0	848.8	(54.0)	4.7	93.6	200
2047	3,216	2,521	3,216	4,083	3,161	3,221	3,312	**3,433**	(695)	0	866.6	(54.7)	4.7	95.6	217
2048	3,219	2,521	3,219	4,101	3,163	3,224	3,316	**3,449**	(698)	0	881.7	(55.5)	4.7	97.0	230
2049	3,262	2,562	3,262	4,156	3,206	3,267	3,360	**3,502**	(700)	0	894.5	(56.3)	4.7	97.9	240
2050	3,293	2,590	3,293	4,198	3,236	3,297	3,391	**3,541**	(703)	0	905.3	(57.1)	4.7	98.4	248
Avg. last 15 yrs	1.5%	0.1%	1.2%	1.5%	1.4%	1.4%	1.5%	-0.5%							
Avg. last 10 yrs	1.9%	0.3%	1.5%	1.9%	1.8%	1.7%	1.9%	-0.6%							
Avg. last 5 yrs	1.7%	0.2%	2.0%	1.8%	1.5%	1.4%	1.7%	-0.4%							
BASE 2022															
Avg. next 5 yrs	-0.1%	-0.8%	0.7%	0.2%	-0.1%	0.3%	-0.1%	1.3%							
Avg. next 10 yrs	0.5%	0.2%	0.9%	1.2%	0.5%	0.7%	0.6%	2.0%							
Avg. next 15 yrs	0.6%	0.4%	0.9%	1.6%	0.6%	0.7%	0.7%	2.4%							
Avg. next 20 yrs	0.7%	0.6%	0.9%	1.7%	0.6%	0.8%	0.8%	2.4%							
Avg. next 25 yrs	0.7%	0.6%	0.9%	1.6%	0.7%	0.8%	0.8%	2.3%							

EE: Energy Efficiency (reduces load)
PV: Solar - Photovoltaics (reduces load)
EV: Electric Vehicles (ADDs to load)
DR: Demand Response (Company only) (reduces load)
ES: Energy Storage (reduces load)
EH: Electric Heating Pump Cooling (reduces load)

WCMA
WINTER Peaks — **after DER Impacts ***

YEAR	Actuals (MW)	Actuals (% Grwth)	Normal 50-50 (MW)	Normal 50-50 (% Grwth)	Extreme 10-90 (MW)	Extreme 10-90 (% Grwth)	Extreme 05-95 (MW)	Extreme 05-95 (% Grwth)	HDD_wtd ACTUAL
2006	1,764		1,756		1,804		1,818		51.9
2007	1,778	0.8%	1,748	-0.4%	1,796	-0.4%	1,810	-0.4%	51.3
2008	1,717	-3.4%	1,746	-0.1%	1,797	0.0%	1,811	0.1%	44.7
2009	1,701	-0.9%	1,741	-0.3%	1,793	-0.2%	1,808	-0.2%	42.5
2010	1,740	2.3%	1,676	-3.7%	1,731	-3.5%	1,746	-3.4%	59.2
2011	1,637	-5.9%	1,671	-0.3%	1,726	-0.3%	1,741	-0.3%	45.9
2012	1,719	5.0%	1,692	1.2%	1,743	1.0%	1,758	1.0%	54.1
2013	1,776	3.3%	1,780	5.2%	1,834	5.2%	1,850	5.2%	49.8
2014	1,677	-5.6%	1,669	-6.2%	1,722	-6.1%	1,737	-6.1%	54.3
2015	1,589	-5.2%	1,627	-2.6%	1,678	-2.6%	1,692	-2.6%	46.2
2016	1,595	0.3%	1,596	-1.9%	1,655	-1.3%	1,672	-1.2%	52.8
2017	1,673	4.9%	1,594	-0.1%	1,665	0.6%	1,685	0.8%	59.0
2018	1,691	1.1%	1,633	2.5%	1,695	1.8%	1,712	1.6%	57.3
2019	1,515	-10.4%	1,545	-5.4%	1,604	-5.4%	1,621	-5.3%	46.6
2020	1,501	-1.0%	1,584	2.6%	1,648	2.7%	1,666	2.8%	43.9
2021	1,621	8.0%	1,604	1.2%	1,665	1.0%	1,682	1.0%	49.5
2022	-	-	1,604	0.0%	1,671	0.4%	1,690	0.5%	-
2023	-	-	1,572	-2.0%	1,639	-1.9%	1,658	-1.9%	-
2024	-	-	1,589	1.1%	1,658	1.1%	1,677	1.1%	-
2025	-	-	1,606	1.1%	1,676	1.1%	1,695	1.1%	-
2026	-	-	1,648	2.6%	1,715	2.4%	1,734	2.3%	-
2027	-	-	1,692	2.7%	1,760	2.6%	1,779	2.6%	-
2028	-	-	1,754	3.7%	1,823	3.6%	1,842	3.6%	-
2029	-	-	1,817	3.6%	1,887	3.5%	1,906	3.5%	-
2030	-	-	1,899	4.5%	1,970	4.4%	1,990	4.4%	-
2031	-	-	2,001	5.4%	2,073	5.2%	2,093	5.2%	-
2032	-	-	2,121	6.0%	2,193	5.8%	2,214	5.8%	-
2033	-	-	2,259	6.5%	2,332	6.3%	2,353	6.3%	-
2034	-	-	2,411	6.7%	2,485	6.6%	2,506	6.5%	-
2035	-	-	2,579	6.9%	2,654	6.8%	2,675	6.7%	-
2036	-	-	2,754	6.8%	2,830	6.6%	2,851	6.6%	-
2037	-	-	2,939	6.7%	3,016	6.6%	3,038	6.5%	-
2038	-	-	3,105	5.7%	3,183	5.5%	3,205	5.5%	-
2039	-	-	3,279	5.6%	3,358	5.5%	3,380	5.5%	-
2040	-	-	3,467	5.7%	3,546	5.6%	3,569	5.6%	-
2041	-	-	3,614	4.2%	3,694	4.2%	3,717	4.2%	-
2042	-	-	3,759	4.0%	3,840	4.0%	3,863	3.9%	-
2043	-	-	3,892	3.5%	3,974	3.5%	3,998	3.5%	-
2044	-	-	4,021	3.3%	4,105	3.3%	4,129	3.3%	-
2045	-	-	4,130	2.7%	4,216	2.7%	4,240	2.7%	-
2046	-	-	4,227	2.3%	4,313	2.3%	4,337	2.3%	-
2047	-	-	4,319	2.2%	4,406	2.1%	4,430	2.1%	-
2048	-	-	4,406	2.0%	4,494	2.0%	4,519	2.0%	-
2049	-	-	4,451	1.0%	4,540	1.0%	4,565	1.0%	-
2050	-	-	4,477	0.6%	4,567	0.6%	4,592	0.6%	-

Avg. last 15 yrs	-0.6%	-0.5%	-0.5%
Avg. last 10 yrs	-0.4%	-0.4%	-0.3%
Avg. last 5 yrs	0.1%	0.1%	0.1%
BASE 2020			
Avg. next 5 yrs	0.5%	0.6%	0.6%
Avg. next 10 yrs	2.2%	2.2%	2.2%
Avg. next 15 yrs	3.7%	3.6%	3.6%
Avg. next 20 yrs	4.1%	4.1%	4.0%
Avg. next 25 yrs	4.0%	3.9%	3.9%

HDD_wtd

NORMAL	50.4
EXTREME 90/10	58.2
EXTREME 95/5	60.4

**** impacts include energy efficiency, solar pv, electric vehicles, energy storage, electric heap pumps, and company demand response***

WCMA	WINTER 50/50 Peaks (MW) (before & after DERs)														
	SYSTEM PEAK								DER IMPACTS						
Calendar Year	Reconstituted (before DER)	Forecast w/ EE only	Forecast w/ PV only	Forecast w/ EV only	Forecast w/ DR only	Forecast w/ ES only	Forecast w/ EH only	Final Forecast (after all DER)	EE	PV	EV	DR	ES	EH	DER
2006	1,838	1,756	1,838	1,838	1,838	1,838	1,838	**1,756**	(82)	0	0.0	0.0	0.0	0.0	(82)
2007	1,856	1,748	1,856	1,856	1,856	1,856	1,856	**1,748**	(108)	0	0.0	0.0	0.0	0.0	(108)
2008	1,870	1,746	1,870	1,870	1,870	1,870	1,870	**1,746**	(124)	0	0.0	0.0	0.0	0.0	(124)
2009	1,894	1,741	1,894	1,894	1,894	1,894	1,894	**1,741**	(152)	0	0.0	0.0	0.0	0.0	(152)
2010	1,854	1,676	1,854	1,854	1,854	1,854	1,854	**1,676**	(178)	0	0.0	0.0	0.0	0.0	(178)
2011	1,877	1,671	1,877	1,877	1,877	1,877	1,877	**1,671**	(206)	0	0.0	0.0	0.0	0.0	(206)
2012	1,928	1,692	1,928	1,928	1,928	1,928	1,928	**1,692**	(236)	0	0.1	0.0	0.0	0.0	(236)
2013	2,057	1,780	2,057	2,057	2,057	2,057	2,057	**1,780**	(277)	0	0.2	0.0	0.0	0.0	(277)
2014	1,991	1,669	1,991	1,991	1,991	1,991	1,991	**1,669**	(322)	0	0.4	0.0	0.0	0.0	(322)
2015	1,998	1,626	1,998	1,999	1,998	1,998	1,998	**1,627**	(372)	0	0.6	0.0	0.0	0.0	(371)
2016	2,018	1,595	2,018	2,019	2,018	2,018	2,018	**1,596**	(423)	0	0.8	0.0	0.0	0.0	(422)
2017	2,067	1,592	2,067	2,069	2,067	2,067	2,067	**1,594**	(475)	0	1.2	0.0	(0.2)	0.0	(474)
2018	2,164	1,632	2,164	2,166	2,164	2,163	2,164	**1,633**	(532)	0	2.0	0.0	(0.8)	0.0	(531)
2019	2,139	1,550	2,139	2,142	2,139	2,131	2,139	**1,545**	(589)	0	2.6	0.0	(7.9)	0.3	(594)
2020	2,243	1,598	2,243	2,246	2,243	2,224	2,244	**1,584**	(645)	0	3.4	0.0	(18.3)	1.0	(658)
2021	2,317	1,635	2,317	2,321	2,317	2,278	2,318	**1,604**	(681)	0	4.7	0.0	(38.2)	1.8	(713)
2022	2,351	1,650	2,351	2,358	2,351	2,293	2,355	**1,604**	(700)	0	7.4	0.0	(58.2)	4.2	(747)
2023	2,346	1,629	2,346	2,359	2,346	2,268	2,355	**1,572**	(717)	0	12.4	0.0	(78.2)	9.0	(774)
2024	2,386	1,653	2,386	2,405	2,386	2,288	2,401	**1,589**	(733)	0	19.2	0.0	(98.1)	15.3	(797)
2025	2,417	1,670	2,417	2,445	2,417	2,303	2,439	**1,606**	(747)	0	28.1	0.0	(114.0)	21.7	(811)
2026	2,324	1,566	2,324	2,377	2,324	2,327	2,350	**1,648**	(758)	0	53.4	0.0	3.5	25.9	(676)
2027	2,348	1,580	2,348	2,423	2,348	2,352	2,382	**1,692**	(768)	0	74.8	0.0	3.8	33.8	(656)
2028	2,381	1,605	2,381	2,484	2,381	2,385	2,424	**1,754**	(776)	0	102.9	0.0	4.0	42.7	(627)
2029	2,402	1,619	2,402	2,544	2,402	2,406	2,454	**1,817**	(784)	0	142.0	0.0	4.2	52.3	(585)
2030	2,431	1,641	2,431	2,622	2,431	2,435	2,493	**1,899**	(790)	0	190.9	0.0	4.4	62.5	(532)
2031	2,459	1,664	2,459	2,713	2,459	2,463	2,538	**2,001**	(795)	0	253.6	0.0	4.5	78.8	(458)
2032	2,487	1,688	2,487	2,809	2,487	2,491	2,594	**2,121**	(799)	0	322.1	0.0	4.6	106.7	(366)
2033	2,515	1,712	2,515	2,912	2,515	2,519	2,660	**2,259**	(803)	0	396.9	0.0	4.6	145.5	(256)
2034	2,542	1,736	2,542	3,018	2,542	2,546	2,736	**2,411**	(806)	0	476.7	0.0	4.7	194.2	(130)
2035	2,571	1,763	2,571	3,131	2,571	2,576	2,823	**2,579**	(808)	0	559.8	0.0	4.7	251.5	8
2036	2,601	1,789	2,601	3,244	2,601	2,605	2,917	**2,754**	(811)	0	643.4	0.0	4.8	316.1	153
2037	2,637	1,823	2,637	3,362	2,637	2,641	3,023	**2,939**	(814)	0	725.0	0.0	4.8	386.4	302
2038	2,653	1,836	2,653	3,456	2,653	2,657	3,113	**3,105**	(816)	0	803.8	0.0	4.8	460.5	453
2039	2,672	1,853	2,672	3,557	2,672	2,677	3,209	**3,279**	(819)	0	884.8	0.0	4.9	536.7	607
2040	2,698	1,876	2,698	3,671	2,698	2,703	3,311	**3,467**	(822)	0	973.1	0.0	4.9	613.2	769
2041	2,720	1,895	2,720	3,746	2,720	2,724	3,408	**3,614**	(824)	0	1,026.2	0.0	4.9	688.2	895
2042	2,747	1,920	2,747	3,821	2,747	2,752	3,507	**3,759**	(827)	0	1,074.2	0.0	4.9	760.1	1,012
2043	2,773	1,943	2,773	3,890	2,773	2,778	3,600	**3,892**	(830)	0	1,117.0	0.0	4.9	827.2	1,119
2044	2,887	2,054	2,887	4,015	2,887	2,709	3,902	**4,021**	(832)	0	1,128.6	0.0	(177.3)	1,015.2	1,134
2045	2,906	2,071	2,906	4,067	2,906	2,728	3,982	**4,130**	(835)	0	1,160.7	0.0	(177.7)	1,076.5	1,224
2046	2,926	2,088	2,926	4,114	2,926	2,748	4,054	**4,227**	(838)	0	1,188.3	0.0	(177.7)	1,128.2	1,301
2047	2,955	2,115	2,955	4,167	2,955	2,778	4,125	**4,319**	(840)	0	1,211.8	0.0	(177.7)	1,169.4	1,363
2048	2,995	2,152	2,995	4,227	2,995	2,818	4,195	**4,406**	(843)	0	1,231.9	0.0	(177.7)	1,199.3	1,410
2049	3,008	2,163	3,008	4,257	3,008	2,831	4,226	**4,451**	(846)	0	1,249.0	0.0	(177.7)	1,217.4	1,443
2050	3,016	2,168	3,016	4,280	3,016	2,839	4,240	**4,477**	(848)	0	1,263.6	0.0	(177.7)	1,223.5	1,461
	-														
Avg. last 15 yrs	1.6%	-0.5%	1.6%	1.6%	1.6%	1.4%	1.6%	-0.6%							
Avg. last 10 yrs	2.1%	-0.2%	2.1%	2.1%	2.1%	2.0%	2.1%	-0.4%							
Avg. last 5 yrs	2.8%	0.5%	2.8%	2.8%	2.8%	2.5%	2.8%	0.1%							
BASE 2020															
Avg. next 5 yrs	0.1%	-0.9%	0.1%	0.5%	0.1%	0.4%	0.3%	0.5%							
Avg. next 10 yrs	0.6%	0.2%	0.6%	1.6%	0.6%	0.8%	0.9%	2.2%							
Avg. next 15 yrs	0.8%	0.6%	0.8%	2.3%	0.8%	0.9%	1.5%	3.7%							
Avg. next 20 yrs	0.8%	0.7%	0.8%	2.4%	0.8%	0.9%	1.9%	4.1%							
Avg. next 25 yrs	0.9%	1.0%	0.9%	2.3%	0.9%	0.8%	2.3%	4.0%							

EE: Energy Efficiency (reduces load)
PV: Solar - Photovoltaics (reduces load)
EV: Electric Vehicles (ADDs to load)
DR: Demand Response (Company only) (reduces load)
ES: Energy Storage (reduces load)
EH: Electric Heating/Cooling (ADDs to load)

Nantucket (COMPANY)

NANT

Annual Peaks — **AFTER DER Impacts ***

YEAR	Actuals (MW)	Actuals (% Grwth)	Normal 50-50 (MW)	Normal 50-50 (% Grwth)	Extreme 90-10 (MW)	Extreme 90-10 (% Grwth)	Extreme 95-5 (MW)	Extreme 95-5 (% Grwth)	Peak Season (50-50)
2006	39		37		39		39		S
2007	39	-1.2%	41	10.5%	43	11.9%	44	12.2%	S
2008	39	-0.5%	40	-1.5%	42	-2.2%	43	-2.4%	S
2009	39	1.3%	40	1.2%	43	1.5%	44	1.6%	S
2010	40	2.7%	39	-3.2%	42	-1.9%	43	-1.6%	S
2011	41	0.8%	41	5.4%	44	5.1%	45	5.0%	S
2012	44	8.2%	45	8.2%	47	6.5%	48	6.1%	S
2013	45	3.7%	45	0.2%	47	0.7%	48	0.8%	S
2014	41	-10.9%	45	0.1%	48	1.0%	49	1.3%	S
2015	46	12.5%	44	-2.5%	47	-1.3%	48	-1.0%	S
2016	50	10.3%	49	12.1%	53	11.8%	54	11.7%	S
2017	46	-8.7%	46	-6.9%	49	-7.9%	50	-8.2%	S
2018	50	8.9%	49	7.2%	53	9.1%	54	9.6%	S
2019	51	1.2%	47	-3.5%	51	-4.6%	52	-4.8%	S
2020	52	2.5%	48	2.4%	54	7.3%	56	8.5%	S
2021	53	2.4%	51	6.3%	56	2.0%	57	1.0%	S
2022	58	9.4%	52	1.0%	58	3.9%	59	4.7%	S
2023	-	-	53	2.1%	59	2.2%	61	2.2%	S
2024	-	-	54	1.7%	60	1.8%	62	1.9%	S
2025	-	-	55	1.7%	61	1.7%	63	1.8%	S
2026	-	-	56	1.9%	62	2.0%	64	2.0%	S
2027	-	-	57	2.2%	64	2.3%	66	2.3%	S
2028	-	-	58	2.3%	65	2.3%	67	2.3%	S
2029	-	-	60	2.4%	67	2.2%	69	2.2%	S
2030	-	-	61	2.3%	68	2.2%	70	2.2%	S
2031	-	-	63	2.5%	70	2.4%	72	2.4%	S
2032	-	-	64	2.5%	72	2.4%	74	2.4%	S
2033	-	-	66	2.5%	73	2.4%	75	2.4%	S
2034	-	-	67	2.6%	75	2.5%	77	2.5%	S
2035	-	-	69	2.5%	77	2.4%	79	2.4%	S
2036	-	-	71	2.4%	79	2.4%	81	2.4%	S
2037	-	-	72	2.3%	81	2.3%	83	2.3%	S
2038	-		74	2.2%	82	2.2%	85	2.1%	S
2039	-		76	2.2%	84	2.1%	86	2.1%	S
2040	-		77	2.1%	86	2.1%	88	2.1%	S
2041	-		79	1.7%	87	1.7%	90	1.6%	S
2042	-		80	1.5%	88	1.5%	91	1.5%	S
2043	-		81	1.4%	90	1.4%	92	1.4%	S
2044	-		82	1.2%	91	1.2%	93	1.2%	S
2045	-		83	1.1%	92	1.1%	94	1.1%	S
2046	-		84	1.0%	93	1.0%	95	1.0%	S
2047	-		84	0.9%	94	0.9%	96	0.9%	S
2048	-		85	0.8%	94	0.8%	97	0.8%	S
2049	-		86	0.7%	95	0.7%	98	0.7%	S
2050	-		86	0.6%	96	0.6%	98	0.6%	S

	Normal 50-50	Extreme 90-10	Extreme 95-5
Avg. last 15 yrs	1.7%	1.9%	2.0%
Avg. last 10 yrs	1.5%	2.0%	2.2%
Avg. last 5 yrs	2.6%	3.4%	3.7%
Base 2022			
Avg. next 5 yrs	1.9%	2.0%	2.0%
Avg. next 10 yrs	2.1%	2.2%	2.2%
Avg. next 15 yrs	2.3%	2.2%	2.2%
Avg. next 20 yrs	2.2%	2.2%	2.2%
Avg. next 25 yrs	2.0%	2.0%	1.9%

**** impacts include energy efficiency, solar pv, electric vehicles, energy storage, electric heat pumps, and company demand response***

NANT	Annual 50/50 Peaks (MW) (before & after DERs)														
	SYSTEM PEAK								DER IMPACTS						
Calendar Year	Reconstituted (before DER)	Forecast w/ EE only	Forecast w/ PV only	Forecast w/ EV only	Forecast w/ DR only	Forecast w/ ES only	Forecast w/ EH only	Final Forecast (after all DER)	EE	PV	EV	DR	ES	EH	DER
2006	37	37	37	37	37	37	37	**37**	(1)	(0)	0.0	0.0	0.0	0.0	(1)
2007	41	41	41	41	41	41	41	**41**	(1)	(0)	0.0	0.0	0.0	0.0	(1)
2008	41	40	41	41	41	41	41	**40**	(1)	(0)	0.0	0.0	0.0	0.0	(1)
2009	41	40	41	41	41	41	41	**40**	(1)	(0)	0.0	0.0	0.0	0.0	(1)
2010	40	39	40	40	40	40	40	**39**	(1)	(0)	0.0	0.0	0.0	0.0	(1)
2011	43	41	43	43	43	43	43	**41**	(2)	(0)	0.0	0.0	0.0	0.0	(2)
2012	46	45	46	46	46	46	46	**45**	(2)	(0)	0.0	0.0	0.0	0.0	(2)
2013	47	45	47	47	47	47	47	**45**	(2)	(0)	0.0	0.0	0.0	0.0	(2)
2014	47	45	47	47	47	47	47	**45**	(3)	(0)	0.0	0.0	0.0	0.0	(3)
2015	47	44	47	47	47	47	47	**44**	(3)	(0)	0.0	0.0	0.0	0.0	(3)
2016	53	49	52	53	53	53	53	**49**	(4)	(0)	0.0	(0.0)	0.0	0.0	(4)
2017	50	46	50	50	50	50	50	**46**	(4)	(0)	0.0	(0.0)	0.0	0.0	(4)
2018	54	49	53	54	54	54	54	**49**	(5)	(1)	0	(0)	0	0	(5)
2019	53	48	52	53	53	53	53	**47**	(5)	(1)	0	(0)	0	0	(6)
2020	54	48	54	54	54	54	54	**48**	(6)	(0)	0	(0)	0	0	(6)
2021	58	52	57	58	58	58	58	**51**	(6)	(1)	0	(0)	0	0	(7)
2022	64	58	58	64	64	64	64	**52**	(6)	(6)	0	0	0	0	(12)
2023	61	54	60	61	60	61	61	**53**	(7)	(1)	0	(0)	0	0	(8)
2024	62	55	61	62	62	62	62	**54**	(7)	(1)	0	(0)	0	0	(8)
2025	63	56	62	63	63	63	63	**55**	(7)	(1)	0	(0)	0	0	(8)
2026	64	57	63	64	64	64	64	**56**	(7)	(1)	0	(0)	0	0	(8)
2027	65	58	64	66	65	65	65	**57**	(7)	(1)	0	(0)	0	0	(8)
2028	65	58	65	66	65	65	65	**58**	(7)	(0)	1	(0)	0	0	(7)
2029	66	59	66	67	66	66	66	**60**	(7)	(0)	1	(0)	0	0	(7)
2030	67	60	67	69	67	67	68	**61**	(8)	(0)	1	(0)	0	0	(6)
2031	68	61	68	70	68	68	69	**63**	(8)	(0)	2	(0)	0	0	(6)
2032	69	62	69	72	69	69	70	**64**	(8)	(0)	2	(0)	0	0	(5)
2033	70	63	70	74	70	70	71	**66**	(8)	(0)	3	(0)	0	0	(5)
2034	71	64	71	75	71	71	72	**67**	(8)	(0)	4	(0)	0	0	(4)
2035	72	65	72	77	72	72	73	**69**	(8)	(0)	4	(0)	0	0	(3)
2036	73	66	73	79	73	73	74	**71**	(8)	(0)	5	(0)	0	1	(3)
2037	74	66	74	80	74	74	75	**72**	(8)	(0)	6	(0)	0	1	(2)
2038	75	67	75	82	75	75	76	**74**	(8)	(0)	7	(0)	0	1	(1)
2039	76	68	76	83	76	76	77	**76**	(8)	(0)	7	(0)	0	1	(1)
2040	77	69	77	85	77	77	78	**77**	(8)	(0)	8	(0)	0	1	0
2041	78	70	77	86	77	78	79	**79**	(8)	(0)	8	(0)	0	1	1
2042	79	71	78	87	78	79	80	**80**	(8)	(0)	9	(0)	0	1	1
2043	79	71	79	89	79	79	80	**81**	(8)	(0)	9	(0)	0	1	2
2044	80	72	79	90	80	80	81	**82**	(8)	(0)	10	(0)	0	1	2
2045	81	72	80	90	80	81	82	**83**	(8)	(0)	10	(0)	0	1	2
2046	81	73	81	91	81	81	82	**84**	(8)	(0)	10	(0)	0	1	2
2047	82	74	81	92	81	82	83	**84**	(8)	(0)	10	(0)	0	1	3
2048	82	74	82	93	82	82	83	**85**	(8)	(0)	11	(0)	0	1	3
2049	83	74	82	93	82	83	84	**86**	(8)	(0)	11	(0)	0	1	3
2050	83	75	83	94	83	83	84	**86**	(8)	(0)	11	(0)	0	1	3
Avg. last 15 yrs	3.0%	2.4%	2.3%	3.0%	3.0%	3.0%	3.0%	1.7%							
Avg. last 10 yrs	3.3%	2.6%	2.3%	3.3%	3.3%	3.3%	3.3%	1.5%							
Avg. last 5 yrs	5.3%	4.8%	3.2%	5.3%	5.3%	5.3%	5.3%	2.6%							
Base 2022															
Avg. next 5 yrs	0.3%	0.1%	1.9%	0.5%	0.3%	0.3%	0.4%	1.9%							
Avg. next 10 yrs	0.8%	0.7%	1.7%	1.1%	0.8%	0.8%	0.8%	2.1%							
Avg. next 15 yrs	1.0%	0.9%	1.6%	1.5%	1.0%	1.0%	1.0%	2.3%							
Avg. next 20 yrs	1.0%	1.0%	1.5%	1.6%	1.0%	1.0%	1.1%	2.2%							
Avg. next 25 yrs	1.0%	1.0%	1.3%	1.4%	0.9%	1.0%	1.0%	2.0%							

EE: Energy Efficiency (reduces load)
PV: Solar - Photovoltaics (reduces load)
EV: Electric Vehicles (ADDs to load)
DR: Demand Response (Company only) (reduces load)
ES: Energy Storage (reduces load)
EH: Electric Heating Pump Cooling (Adds load)

NANT
WINTER Peaks — **after DER Impacts ***

YEAR	Actuals (MW)	Actuals (% Grwth)	Normal 50-50 (MW)	Normal 50-50 (% Grwth)	Extreme 10-90 (MW)	Extreme 10-90 (% Grwth)	Extreme 05-95 (MW)	Extreme 05-95 (% Grwth)	HDD_wtd ACTUAL
2006	28		30		32		33		41.0
2007	28	0.9%	33	9.8%	35	7.6%	35	7.1%	27.3
2008	25	-9.4%	25	-23.2%	27	-22.3%	27	-22.1%	43.9
2009	26	1.4%	27	8.4%	29	8.0%	29	7.9%	35.0
2010	25	-3.2%	26	-4.9%	28	-5.0%	28	-5.1%	37.4
2011	24	-4.6%	25	-3.8%	27	-3.6%	27	-3.6%	39.1
2012	27	14.5%	26	6.0%	28	7.3%	29	7.6%	50.0
2013	29	7.9%	30	13.1%	32	12.2%	33	12.0%	36.2
2014	30	1.1%	28	-4.6%	30	-4.6%	31	-4.6%	48.8
2015	30	1.6%	28	-1.2%	30	0.1%	31	0.5%	52.9
2016	29	-4.4%	29	3.2%	32	3.8%	32	4.0%	42.1
2017	32	12.0%	31	7.0%	34	8.2%	35	8.6%	47.9
2018	33	3.6%	33	5.6%	36	3.9%	36	3.5%	44.0
2019	29	-12.6%	31	-4.7%	34	-4.0%	35	-3.8%	36.7
2020	33	11.6%	33	5.9%	36	4.1%	36	3.7%	41.2
2021	32	-2.1%	33	0.9%	36	2.3%	37	2.7%	38.6
2022	-	-	34	1.8%	37	1.9%	38	1.9%	-
2023	-	-	35	2.4%	38	2.4%	39	2.4%	-
2024	-	-	35	2.2%	39	2.2%	40	2.1%	-
2025	-	-	36	2.1%	40	2.1%	41	2.1%	-
2026	-	-	37	2.5%	41	2.5%	42	2.5%	-
2027	-	-	38	2.9%	42	2.8%	43	2.8%	-
2028	-	-	39	3.1%	43	3.0%	44	3.0%	-
2029	-	-	41	3.2%	44	3.1%	45	3.1%	-
2030	-	-	42	3.2%	46	3.1%	47	3.1%	-
2031	-	-	44	3.7%	47	3.6%	48	3.5%	-
2032	-	-	45	4.0%	49	3.9%	50	3.8%	-
2033	-	-	47	4.3%	51	4.1%	52	4.1%	-
2034	-	-	49	4.6%	53	4.4%	55	4.3%	-
2035	-	-	52	4.6%	56	4.4%	57	4.3%	-
2036	-	-	54	4.6%	58	4.4%	59	4.3%	-
2037	-		57	4.5%	61	4.3%	62	4.2%	-
2038	-		59	4.4%	63	4.2%	64	4.1%	-
2039	-		62	4.3%	66	4.1%	67	4.0%	-
2040	-		64	4.2%	69	4.0%	70	4.0%	-
2041	-		66	3.3%	71	3.2%	72	3.2%	-
2042	-		68	3.0%	73	2.9%	74	2.9%	-
2043	-		70	2.7%	75	2.6%	76	2.6%	-
2044	-		72	2.4%	76	2.3%	78	2.3%	-
2045	-		73	2.1%	78	2.0%	79	2.0%	-
2046	-		75	1.8%	79	1.7%	80	1.7%	-
2047	-		76	1.5%	80	1.4%	82	1.4%	-
2048	-		77	1.2%	81	1.2%	83	1.2%	-
2049	-		77	0.9%	82	0.9%	83	0.9%	-
2050	-		78	0.7%	83	0.7%	84	0.7%	-

Avg. last 15 yrs	0.8%	0.8%	0.9%
Avg. last 10 yrs	3.0%	3.2%	3.3%
Avg. last 5 yrs	2.8%	2.8%	2.8%
Base 2021			
Avg. next 5 yrs	2.2%	2.2%	2.2%
Avg. next 10 yrs	2.7%	2.7%	2.6%
Avg. next 14 yrs	3.5%	3.4%	3.4%

HDD_wtd	
NORMAL	42.6
EXTREME 90/10	51.5
EXTREME 95/5	54.1

**** impacts include energy efficiency, solar pv, electric vehicles, energy storage, electric heap pumps, and company demand response (solar and demand response are zero at times of winter peak)***

NANT	WINTER 50/50 Peaks (MW) (before & after DERs)														
	SYSTEM PEAK								DER IMPACTS						
Calendar Year	Reconstituted (before DER)	Forecast w/ EE only	Forecast w/ PV only	Forecast w/ EV only	Forecast w/ DR only	Forecast w/ ES only	Forecast w/ EH only	Final Forecast (after all DER)	EE	PV	EV	DR	ES	EH	DER
2006	31	30	31	31	31	31	31	**30**	(1)	0	0.0	0.0	0.0	0.0	(1)
2007	34	33	34	34	34	34	34	**33**	(1)	0	0.0	0.0	0.0	0.0	(1)
2008	26	25	26	26	26	26	26	**25**	(1)	0	0.0	0.0	0.0	0.0	(1)
2009	29	27	29	29	29	29	29	**27**	(2)	0	0.0	0.0	0.0	0.0	(2)
2010	28	26	28	28	28	28	28	**26**	(2)	0	0.0	0.0	0.0	0.0	(2)
2011	27	25	27	27	27	27	27	**25**	(2)	0	0.0	0.0	0.0	0.0	(2)
2012	29	26	29	29	29	29	29	**26**	(3)	0	0.0	0.0	0.0	0.0	(3)
2013	33	30	33	33	33	33	33	**30**	(3)	0	0.0	0.0	0.0	0.0	(3)
2014	32	28	32	32	32	32	32	**28**	(4)	0	0.0	0.0	0.0	0.0	(4)
2015	32	29	31	32	32	32	32	**28**	(3)	(1)	0.0	0.0	0.0	0.0	(4)
2016	32	29	32	32	32	32	32	**29**	(3)	(0)	0.0	0.0	0.0	0.0	(3)
2017	36	31	36	36	36	36	36	**31**	(5)	0	0.0	0.0	0.0	0.0	(5)
2018	39	33	39	39	39	39	39	**33**	(6)	0	0.0	0.0	0.0	0.0	(6)
2019	38	31	38	38	38	38	38	**31**	(6)	0	0.0	0.0	0.0	0.0	(6)
2020	40	33	40	40	40	40	40	**33**	(7)	0	0.0	0.0	0.0	0.0	(7)
2021	45	37	41	45	45	45	45	**33**	(8)	(4)	0.0	0.0	0.0	0.0	(12)
2022	41	34	41	42	41	41	42	**34**	(8)	0	0.1	0.0	0.0	0.0	(8)
2023	42	34	42	43	42	42	42	**35**	(8)	0	0.2	0.0	0.0	0.1	(8)
2024	43	35	43	43	43	43	43	**35**	(8)	0	0.3	0.0	0.0	0.2	(8)
2025	44	36	44	44	44	44	44	**36**	(8)	0	0.4	0.0	0.0	0.3	(8)
2026	45	36	45	45	45	45	45	**37**	(8)	0	0.6	0.0	0.0	0.3	(7)
2027	45	37	45	46	45	45	46	**38**	(8)	0	0.8	0.0	0.0	0.4	(7)
2028	46	38	46	47	46	46	47	**39**	(9)	0	1.1	0.0	0.0	0.6	(7)
2029	47	38	47	49	47	47	48	**41**	(9)	0	1.6	0.0	0.0	0.7	(6)
2030	48	39	48	50	48	48	49	**42**	(9)	0	2.1	0.0	0.0	0.8	(6)
2031	48	40	48	51	48	48	50	**44**	(9)	0	2.8	0.0	0.0	1.0	(5)
2032	49	40	49	53	49	49	51	**45**	(9)	0	3.6	0.0	0.0	1.4	(4)
2033	50	41	50	54	50	50	52	**47**	(9)	0	4.4	0.0	0.0	1.9	(3)
2034	50	42	50	56	50	50	53	**49**	(9)	0	5.3	0.0	0.0	2.6	(1)
2035	51	42	51	57	51	51	54	**52**	(9)	0	6.2	0.0	0.0	3.3	1
2036	52	43	52	59	52	52	56	**54**	(9)	0	7.2	0.0	0.0	4.2	2
2037	52	43	52	60	52	52	57	**57**	(9)	0	8.7	0.0	0.0	5.1	5
2038	52	43	52	62	52	52	58	**59**	(9)	0	9.7	0.0	0.0	6.1	7
2039	53	44	53	64	53	53	60	**62**	(9)	0	10.7	0.0	0.0	7.1	9
2040	53	44	53	65	53	53	62	**64**	(9)	0	11.7	0.0	0.0	8.1	11
2041	54	45	54	66	54	54	63	**66**	(9)	0	12.4	0.0	0.0	9.1	12
2042	55	45	55	67	55	55	65	**68**	(9)	0	12.9	0.0	0.0	10.1	14
2043	55	46	55	68	55	55	66	**70**	(9)	0	13.5	0.0	0.0	11.0	15
2044	55	46	55	69	55	55	67	**72**	(9)	0	13.9	0.0	0.0	11.8	17
2045	56	47	56	70	56	56	68	**73**	(9)	0	14.3	0.0	0.0	12.5	18
2046	56	47	56	71	56	56	69	**75**	(9)	0	14.6	0.0	0.0	13.1	18
2047	57	47	57	72	57	57	70	**76**	(9)	0	14.9	0.0	0.0	13.6	19
2048	57	48	57	72	57	57	71	**77**	(9)	0	15.2	0.0	0.0	13.9	20
2049	57	48	57	73	57	57	71	**77**	(9)	0	15.4	0.0	0.0	14.1	20
2050	58	48	58	73	58	58	72	**78**	(9)	0	15.6	0.0	0.0	14.2	20
	-														
Avg. last 15 yrs	2.6%	1.5%	1.9%	2.6%	2.6%	2.6%	2.6%	0.8%							
Avg. last 10 yrs	5.2%	4.2%	4.2%	5.2%	5.2%	5.2%	5.2%	3.0%							
Avg. last 5 yrs	6.8%	5.1%	4.8%	6.8%	6.8%	6.8%	6.8%	2.8%							
Base 2021															
Avg. next 5 yrs	-0.1%	-0.6%	1.8%	0.1%	-0.1%	-0.1%	0.0%	2.2%							
Avg. next 10 yrs	0.8%	0.6%	1.7%	1.3%	0.8%	0.8%	1.0%	2.7%							
Avg. next 15 yrs	1.0%	0.9%	1.6%	1.8%	1.0%	1.0%	1.5%	3.3%							

EE: Energy Efficiency (reduces load)
PV: Solar - Photovoltaics (reduces load)
EV: Electric Vehicles (ADDs to load)
DR: Demand Response (Company only) (reduces load)
ES: Energy Storage (reduces load)
EH: Electric Heating/Cooling (ADDs to load)

Appendix B: Power Supply Areas

The Company provides peak load growth forecast for the 18 power supply areas in its Massachusetts service territory. The forecasting process leverages regional information to allocates the system-level load growth projection and outlook on distributed energy resources (DER) to the feeder level. The allocations of load growth, energy efficiency, and medium- and heavy-duty electric vehicle growth use regional energy growth information. The allocations on solar PV, light-duty electric vehicles, and electric heat pumps use demographic information, heating fuel type information, and land availability. The feeder level forecasts are then aggregated to the power supply area level, and a year-over-year peak load growth rate is generated and presented in the tables below.

Year One Weather-Adjustment and Multi-Year Annual Growth Percentages (Summer) — **after EE, PV, EV, and EH impacts**

			2022 Weather-Adjustments (2)			Annual Growth Rates (percents) (3)					5-yr avg	5-yr avg	5-yr avg	5-yr avg	5-yr avg
State	PSA	Zone (1)	for 50/50	for 90/10	for 95/5	_2023	_2024	_2025	_2026	_2027	'23 to '27	'28 to '32	'33 to '37	'38 to '42	'43 to '47
MA	Adams	WCMA	97.7%	103.2%	104.8%	2.0	1.8	2.0	1.4	2.4	1.9	3.6	3.9	3.6	2.1
MA	Athol	WCMA	97.7%	103.2%	104.8%	1.7	3.3	0.8	3.2	4.0	2.6	3.9	4.3	2.5	1.1
MA	Attleboro	SEMA	93.6%	102.3%	104.7%	0.1	0.2	0.8	0.3	0.1	0.3	2.5	3.1	2.4	1.1
MA	Brockton	SEMA	93.6%	102.3%	104.7%	0.0	0.3	1.0	0.6	1.5	0.7	2.4	3.5	2.3	1.1
MA	Essex	NEMA	94.7%	102.4%	104.6%	0.6	1.3	1.5	1.2	2.0	1.3	2.6	3.7	2.9	1.3
MA	Fall River	SEMA	93.6%	102.3%	104.7%	0.4	0.5	0.7	0.3	1.5	0.7	2.0	2.9	2.1	1.2
MA	Gardner	WCMA	97.7%	103.2%	104.8%	1.7	2.1	1.8	-0.3	3.0	1.7	2.9	3.5	2.0	0.8
MA	Leominster	WCMA	97.7%	103.2%	104.8%	1.2	1.9	1.8	0.9	1.9	1.5	2.2	2.6	2.8	1.7
MA	Marlboro	WCMA	97.7%	103.2%	104.8%	1.3	1.5	1.5	1.2	1.9	1.5	1.6	2.6	2.5	1.3
MA	Merrimack	NEMA/WCMA	96.0%	102.7%	104.6%	1.0	0.8	1.2	0.8	1.6	1.1	2.0	2.9	2.5	1.4
MA	North Hampton	WCMA	97.7%	103.2%	104.8%	1.9	1.9	1.9	0.7	2.4	1.8	2.5	3.4	3.4	1.5
MA	Palmer	WCMA	97.7%	103.2%	104.8%	1.9	0.0	1.3	1.9	3.1	1.6	3.7	3.9	2.2	1.1
MA	South Berkshire	WCMA	97.7%	103.2%	104.8%	1.8	1.9	2.1	0.7	2.4	1.8	2.7	4.1	3.3	1.2
MA	Surburban	NEMA	94.7%	102.4%	104.6%	1.0	1.2	1.4	1.1	1.8	1.3	2.2	2.8	3.2	2.0
MA	Uxbridge	SEMA/WCMA	93.6%	102.3%	104.7%	0.3	1.5	1.5	1.7	2.5	1.5	3.4	3.6	2.7	1.0
MA	Webster	WCMA	97.7%	103.2%	104.8%	0.6	2.6	0.3	1.1	2.1	1.3	3.3	3.8	2.3	1.2
MA	Weymouth	SEMA	93.6%	102.3%	104.7%	0.4	0.4	0.9	0.5	1.3	0.7	1.8	3.3	3.8	1.9
MA	Worcester	WCMA	97.7%	103.2%	104.8%	1.4	2.1	1.7	1.5	2.3	1.8	2.4	2.6	2.4	1.6

(1) Zones refer to ISO-NE designations

(2) These first year weather-adjustment values can be applied to actual MW readings for current summer peaks to determine what the weather-adjusted value is for any of the three weather scenarios.

(3) These annual growth percents are under the 90/10 weather scenario and can be applied to the current summer peaks to determine what the growth for each area is.

Year One Weather-Adjustment and Multi-Year Annual Growth Percentages (Summer)									after EE, EV, and EH impacts					
			2022 Weather-Adjustments (2)			Annual Growth Rates (percents) (3)					5-yr avg	5-yr avg	5-yr avg	5-yr avg	5-yr avg
State	PSA	Zone (1)	for 50/50	for 90/10	for 95/5	_2023	_2024	_2025	_2026	_2027	'23 to '27	'28 to '32	'33 to '37	'38 to '42	'43 to '47
MA	Adams	WCMA	97.7%	103.2%	104.8%	2.2	2.0	2.1	1.7	2.5	2.1	3.8	3.8	3.6	2.1
MA	Athol	WCMA	97.7%	103.2%	104.8%	3.9	3.1	3.2	3.2	3.7	3.4	4.2	4.0	2.4	1.1
MA	Attleboro	SEMA	93.6%	102.3%	104.7%	0.8	0.7	1.0	0.7	1.6	0.9	2.3	2.8	2.4	1.2
MA	Brockton	SEMA	93.6%	102.3%	104.7%	0.6	0.8	1.1	0.9	1.8	1.0	2.4	3.2	2.4	1.1
MA	Essex	NEMA	94.7%	102.4%	104.6%	1.2	1.4	1.6	1.3	2.2	1.6	2.7	3.4	2.9	1.3
MA	Fall River	SEMA	93.6%	102.3%	104.7%	0.6	0.6	0.9	0.6	1.6	0.9	2.2	2.5	2.2	1.2
MA	Gardner	WCMA	97.7%	103.2%	104.8%	1.9	1.7	1.9	2.0	2.3	2.0	3.0	3.3	2.3	1.1
MA	Leominster	WCMA	97.7%	103.2%	104.8%	2.0	1.9	2.0	1.5	2.3	1.9	2.5	2.5	2.7	1.7
MA	Marlboro	WCMA	97.7%	103.2%	104.8%	1.3	1.5	1.7	1.3	2.1	1.6	2.0	2.4	2.2	1.4
MA	Merrimack	NEMA/WCMA	96.0%	102.7%	104.6%	1.1	1.3	1.5	1.1	1.9	1.4	2.2	2.6	2.5	1.4
MA	North Hampton	WCMA	97.7%	103.2%	104.8%	2.0	2.0	2.1	1.7	2.5	2.0	2.7	3.0	3.5	1.6
MA	Palmer	WCMA	97.7%	103.2%	104.8%	2.2	2.0	2.2	2.1	2.8	2.3	3.4	3.7	2.3	1.1
MA	South Berkshire	WCMA	97.7%	103.2%	104.8%	1.9	2.0	2.1	1.9	2.5	2.1	3.3	3.9	3.3	1.2
MA	Surburban	NEMA	94.7%	102.4%	104.6%	1.2	1.4	1.6	1.2	2.0	1.5	2.3	2.7	3.2	2.0
MA	Uxbridge	SEMA/WCMA	93.6%	102.3%	104.7%	1.8	2.2	2.3	2.1	2.9	2.2	3.1	3.5	2.8	1.1
MA	Webster	WCMA	97.7%	103.2%	104.8%	1.9	1.8	1.9	1.9	2.4	2.0	3.1	3.6	2.6	1.3
MA	Weymouth	SEMA	93.6%	102.3%	104.7%	0.5	0.7	1.0	0.7	1.5	0.9	2.0	2.9	3.9	1.9
MA	Worcester	WCMA	97.7%	103.2%	104.8%	1.8	2.0	2.1	1.7	2.3	2.0	2.4	2.6	2.2	1.7

(1) Zones refer to ISO-NE designations

(2) These first year weather-adjustment values can be applied to actual MW readings for current summer peaks to determine what the weather-adjusted value is for any of the three weather scenarios.

(3) These annual growth percents are under the 90/10 weather scenario and can be applied to the current summer peaks to determine what the growth for each area is.

Year One Weather-Adjustment and Multi-Year Annual Growth Percentages (WINTER)								after EE, PV, EV, and EH impacts							
			2021/22 Weather-Adjustments (2)					Annual Growth Rates (percent			5-yr avg	5-yr avg	5-yr avg	5-yr avg	5-yr avg
State	PSA	Zone (1)	for 50/50	for 10/90	for 05/95	2022	2023	2024	2025	2026	'22 to '26	'27 to '31	'32 to '36	'37 to '41	'42 to '46
MA	Adams	WCMA	98.9%	102.7%	103.8%	2.2	2.3	2.5	2.3	3.1	2.5	6.0	7.0	6.0	4.0
MA	Athol	WCMA	98.9%	102.7%	103.8%	4.0	3.5	3.5	3.7	4.4	3.8	6.9	7.5	3.4	1.5
MA	Attleboro	SEMA	99.2%	103.2%	104.3%	1.1	1.2	1.9	1.5	2.7	1.7	4.4	6.4	5.3	2.2
MA	Brockton	SEMA	99.2%	103.2%	104.3%	0.6	1.1	1.9	1.9	2.7	1.6	4.9	7.3	5.4	2.7
MA	Essex	NEMA	99.7%	105.1%	106.6%	1.6	2.0	2.4	2.3	3.5	2.4	4.7	6.9	5.9	2.1
MA	Fall River	SEMA	99.2%	103.2%	104.3%	0.5	0.6	1.2	1.1	2.2	1.1	4.2	6.6	5.3	3.1
MA	Gardner	WCMA	98.9%	102.7%	103.8%	2.3	2.0	2.3	2.5	2.8	2.4	4.6	5.8	4.4	1.6
MA	Leominster	WCMA	98.9%	102.7%	103.8%	2.6	2.9	2.9	2.6	3.7	3.0	5.8	7.8	7.0	2.8
MA	Marlboro	WCMA	98.9%	102.7%	103.8%	1.6	1.9	2.2	2.6	3.8	2.4	2.9	5.0	4.4	1.9
MA	Merrimack	NEMA/WCMA	99.3%	104.0%	105.3%	0.8	1.5	1.9	1.9	2.7	1.7	4.0	6.2	5.4	3.2
MA	Northampton	WCMA	98.9%	102.7%	103.8%	2.1	2.3	2.6	2.3	3.2	2.5	4.4	6.6	6.7	3.2
MA	Palmer	WCMA	98.9%	102.7%	103.8%	2.4	2.3	2.7	2.8	3.6	2.7	5.4	6.7	4.2	1.8
MA	South Berkshire	WCMA	98.9%	102.7%	103.8%	2.0	2.2	2.6	2.7	3.2	2.6	5.5	7.2	5.6	2.0
MA	Surburban	NEMA	99.7%	105.1%	106.6%	1.3	1.7	2.1	2.0	2.8	2.0	4.0	6.6	6.8	4.2
MA	Uxbridge	SEMA/WCMA	99.2%	103.2%	104.3%	2.5	3.3	3.7	4.0	5.8	3.9	5.2	7.3	5.1	1.8
MA	Webster	WCMA	98.9%	102.7%	103.8%	2.3	2.2	2.7	2.8	3.5	2.7	4.7	6.3	4.6	1.8
MA	Weymouth	SEMA	99.2%	103.2%	104.3%	0.4	0.9	1.6	1.5	2.1	1.3	4.1	7.4	8.1	3.7
MA	Worcester	WCMA	98.9%	102.7%	103.8%	1.8	2.0	2.4	2.1	2.7	2.2	3.7	5.6	5.2	3.1

(1) Zones refer to ISO-NE designations

(2) These first year weather-adjustment values can be applied to actual MW readings for current winter peaks to determine what the weather-adjusted value is for any of the three weather scenarios.

(3) These annual growth percents are under the 90/10 weather scenario and can be applied to the current summer peaks to determine what the growth for each area is.

Appendix C: Study Areas

The Company provides peak load growth forecast for the 46 study areas in its Massachusetts service territory. The forecasting process leverages regional information to allocates the system-level load growth projection and outlook on distributed energy resources (DER) to the feeder level. The allocations of load growth, energy efficiency, and medium- and heavy-duty electric vehicle growth use regional energy growth information. The allocations on solar PV, light-duty electric vehicles, and electric heat pumps use demographic information, heating fuel type information, and land availability. The feeder level forecasts are then aggregated to the study area level, and a year-over-year peak load growth rate is generated and presented in the tables below.

Year One Weather-Adjustment (90/10) and Multi-Year Annual Growth Percentage (Summer), after EE, PV, EV, and EH impacts																															
Study Area	Weather Adjustment	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Adams/Deerfield	103.2%	2.0%	1.8%	2.0%	1.4%	2.4%	2.6%	3.3%	4.2%	3.3%	4.3%	4.6%	4.8%	2.9%	3.6%	3.4%	3.8%	3.3%	4.0%	3.5%	2.9%	2.7%	2.9%	1.8%	1.8%	1.2%	0.6%	1.2%	0.7%
Amesbury Newburyport	102.4%	0.9%	0.1%	0.1%	0.3%	2.0%	1.9%	2.2%	2.4%	3.0%	3.0%	3.0%	3.0%	3.5%	3.2%	1.9%	3.2%	3.5%	2.9%	2.0%	1.2%	1.1%	1.3%	1.0%	1.3%	0.9%	0.3%	1.2%	0.9%
Attleboro	102.3%	0.4%	0.1%	0.8%	0.3%	0.4%	1.7%	1.9%	2.1%	3.5%	4.2%	4.0%	2.5%	3.5%	3.6%	3.1%	2.9%	2.6%	2.9%	2.2%	1.5%	1.2%	1.4%	0.8%	1.3%	1.0%	0.4%	1.3%	0.9%
Ayer Clinton	103.2%	-0.1%	2.1%	1.7%	-0.4%	2.0%	3.5%	1.7%	-0.2%	3.3%	2.9%	3.5%	3.7%	3.1%	2.6%	2.3%	2.9%	3.1%	3.9%	2.7%	1.8%	1.5%	1.7%	1.3%	1.6%	0.9%	0.4%	1.2%	0.9%
Barre-Athol	103.2%	1.7%	2.8%	-0.3%	3.1%	3.7%	3.9%	4.4%	3.0%	5.0%	4.3%	5.4%	6.3%	3.7%	3.6%	3.6%	3.5%	2.9%	3.0%	1.8%	1.3%	1.1%	1.3%	1.1%	1.3%	1.0%	0.4%	1.3%	1.0%
Beverly	102.4%	-0.4%	1.2%	1.5%	0.9%	1.8%	0.3%	2.0%	2.0%	2.6%	3.1%	3.3%	3.2%	2.7%	4.2%	2.3%	4.3%	3.0%	2.9%	2.0%	1.6%	1.5%	1.6%	1.4%	1.7%	1.1%	0.4%	1.2%	0.9%
Billerica	103.2%	1.2%	0.3%	1.4%	1.1%	1.7%	1.8%	2.2%	2.4%	2.6%	2.5%	2.7%	3.1%	3.0%	3.2%	2.9%	2.8%	3.4%	3.0%	2.1%	1.2%	1.0%	1.2%	1.0%	1.2%	0.9%	0.4%	1.2%	0.9%
Bridgewater	102.3%	0.1%	-0.9%	0.8%	0.8%	1.5%	1.7%	2.2%	2.7%	3.7%	4.0%	4.3%	4.5%	3.7%	4.1%	2.9%	3.0%	2.5%	3.5%	1.7%	1.1%	1.0%	1.2%	1.0%	1.2%	0.9%	0.3%	1.2%	0.9%
Brockton	102.3%	0.1%	0.4%	0.8%	0.4%	0.7%	1.6%	1.7%	2.1%	2.5%	2.7%	3.5%	3.9%	3.0%	3.9%	2.7%	3.0%	2.9%	2.9%	1.8%	1.2%	1.1%	1.3%	1.1%	1.4%	1.0%	0.4%	1.3%	0.9%
Brockton NW / Randolph	102.3%	-0.8%	0.3%	0.8%	0.5%	1.5%	1.5%	1.8%	2.0%	2.9%	3.6%	3.9%	3.6%	3.1%	3.9%	3.0%	3.0%	2.7%	3.2%	2.3%	1.6%	1.3%	1.4%	1.1%	1.3%	0.9%	0.4%	1.2%	0.9%
Cape Ann	102.4%	1.2%	1.3%	1.5%	1.2%	2.1%	2.1%	3.0%	3.1%	3.4%	3.9%	4.2%	4.0%	4.0%	4.4%	3.6%	4.7%	3.9%	3.1%	1.7%	1.3%	1.1%	1.2%	1.0%	1.2%	0.9%	0.4%	1.1%	0.8%
Chelmsford Westford	103.2%	1.0%	0.4%	1.4%	1.1%	1.9%	1.9%	2.0%	2.2%	2.5%	2.5%	2.3%	2.6%	2.7%	3.9%	2.7%	3.5%	2.6%	2.7%	1.7%	1.7%	1.4%	1.5%	1.3%	1.3%	1.5%	0.8%	1.6%	0.8%
Dracut	102.7%	1.1%	1.2%	1.4%	1.0%	2.0%	-2.2%	2.8%	3.2%	3.4%	3.4%	3.5%	4.2%	3.2%	3.7%	3.4%	2.4%	3.2%	3.3%	1.7%	1.5%	1.4%	1.5%	1.3%	1.3%	1.0%	0.4%	1.2%	0.9%
Everett Malden Medford	102.4%	1.0%	1.2%	1.5%	1.1%	1.8%	1.7%	1.9%	2.0%	2.4%	2.2%	2.2%	2.6%	2.6%	2.7%	2.8%	4.6%	3.5%	4.6%	3.2%	2.7%	2.6%	2.5%	2.0%	2.0%	1.4%	0.8%	1.3%	1.0%
Fall River	102.3%	0.4%	0.4%	0.6%	0.3%	1.2%	1.2%	1.5%	1.7%	1.9%	1.8%	2.0%	2.6%	1.5%	2.3%	2.6%	2.6%	2.4%	2.6%	2.0%	1.3%	1.2%	1.4%	1.2%	1.5%	1.0%	0.4%	1.4%	1.0%
Gardner Winchendon	103.2%	-2.2%	1.6%	1.3%	1.6%	2.1%	5.7%	0.6%	2.1%	3.8%	4.0%	3.7%	5.6%	2.9%	3.4%	3.0%	2.9%	1.1%	3.3%	1.3%	1.3%	1.4%	1.2%	1.0%	1.3%	0.9%	0.4%	1.2%	1.2%
Hanover	102.3%	0.5%	0.3%	1.1%	0.7%	1.3%	1.6%	1.9%	2.0%	3.0%	4.3%	4.2%	3.4%	4.0%	3.8%	2.7%	2.9%	2.9%	3.5%	1.9%	1.4%	1.0%	1.1%	0.9%	1.3%	0.9%	0.4%	1.0%	0.9%
Haverhill	102.4%	1.0%	0.4%	1.1%	0.8%	-0.3%	1.7%	2.0%	2.1%	2.2%	2.4%	3.1%	3.7%	2.4%	2.9%	2.5%	2.8%	2.5%	3.3%	1.9%	2.8%	2.3%	2.9%	2.3%	2.3%	1.7%	0.9%	1.6%	1.1%
Hopedale East	102.3%	-0.3%	-0.1%	0.7%	0.3%	-0.7%	1.7%	1.6%	2.0%	3.0%	3.0%	3.0%	3.1%	3.3%	2.7%	2.6%	3.6%	2.6%	2.9%	1.9%	0.6%	1.1%	1.3%	1.1%	1.2%	1.0%	0.1%	1.3%	1.1%
Hopedale West	102.3%	0.1%	1.5%	1.4%	1.7%	2.4%	2.9%	2.5%	3.3%	4.0%	4.1%	4.2%	3.8%	3.2%	3.6%	3.3%	3.0%	2.5%	4.2%	2.2%	1.4%	1.0%	1.4%	1.0%	1.2%	0.9%	0.4%	1.2%	1.1%
Lawrence	102.7%	1.0%	1.2%	1.3%	0.8%	1.6%	1.7%	1.7%	1.7%	1.8%	1.8%	1.8%	2.1%	1.5%	2.7%	1.6%	2.2%	1.8%	2.4%	1.7%	1.2%	1.1%	1.4%	1.0%	1.5%	1.1%	0.4%	1.3%	1.1%
Leominster	103.2%	1.8%	1.8%	1.9%	1.4%	1.5%	2.5%	1.4%	2.5%	2.7%	2.6%	2.7%	3.2%	2.1%	2.4%	2.0%	2.6%	2.8%	2.9%	3.4%	2.5%	2.3%	2.3%	1.7%	1.9%	1.3%	0.7%	1.5%	1.3%
Lowell	103.2%	1.1%	1.0%	1.1%	0.8%	1.5%	1.5%	1.5%	1.6%	1.7%	1.7%	2.1%	2.0%	1.4%	3.8%	1.7%	2.2%	2.0%	2.3%	1.7%	3.0%	3.7%	3.1%	2.6%	2.6%	2.2%	1.6%	2.5%	1.6%
Lynn	102.4%	1.0%	1.2%	1.4%	1.0%	1.7%	1.7%	1.8%	1.9%	2.0%	2.0%	2.2%	2.2%	1.6%	2.5%	1.7%	2.4%	2.1%	2.3%	1.8%	1.4%	2.3%	1.6%	1.4%	1.6%	1.2%	0.6%	1.4%	1.1%
Marlboro	103.2%	1.3%	1.5%	1.5%	1.2%	1.8%	1.9%	1.4%	2.0%	1.2%	1.4%	2.4%	3.9%	2.4%	2.8%	1.5%	3.4%	1.9%	3.4%	2.3%	1.7%	1.5%	1.7%	1.0%	1.4%	1.0%	0.4%	1.3%	1.4%
Melrose Saugus	102.4%	1.1%	1.2%	1.5%	1.2%	1.9%	1.8%	2.1%	2.2%	2.5%	2.6%	2.8%	3.0%	3.2%	3.9%	2.8%	3.9%	3.1%	4.0%	2.3%	1.7%	1.7%	1.9%	1.5%	1.7%	1.3%	0.7%	1.3%	0.9%
Methuen	102.7%	1.1%	0.8%	1.4%	-1.4%	1.8%	1.6%	0.0%	2.7%	2.8%	2.8%	3.0%	3.5%	2.9%	3.1%	2.8%	3.0%	2.8%	3.0%	3.5%	2.6%	1.9%	1.7%	1.4%	1.8%	1.5%	0.9%	1.6%	1.0%
Millbury-Grafton	103.2%	0.6%	2.7%	-0.1%	1.5%	2.1%	5.1%	0.9%	2.5%	3.8%	4.1%	3.6%	3.9%	3.3%	4.1%	3.2%	3.6%	2.4%	3.5%	1.7%	1.0%	1.1%	1.2%	0.8%	1.5%	1.1%	0.6%	1.3%	2.0%
Monson-Palmer-Longmeadow	103.2%	1.7%	-0.1%	0.6%	2.2%	2.9%	3.1%	3.5%	3.7%	4.0%	4.1%	5.0%	3.9%	3.4%	4.2%	3.2%	3.2%	2.6%	2.5%	1.5%	1.0%	1.0%	1.3%	1.0%	1.2%	0.9%	0.4%	1.2%	0.9%
Nantucket	99.2%	2.2%	1.9%	1.8%	2.0%	2.3%	2.3%	2.2%	2.2%	2.4%	2.4%	2.4%	2.5%	2.4%	2.4%	2.3%	2.2%	2.1%	2.1%	1.7%	1.5%	1.4%	1.2%	1.1%	1.0%	0.9%	0.8%	0.7%	0.7%
North Andover	102.7%	1.1%	1.2%	1.4%	1.1%	1.7%	1.6%	1.8%	2.0%	2.3%	0.8%	2.3%	2.7%	2.5%	2.5%	2.4%	2.4%	2.4%	2.6%	1.7%	1.3%	1.1%	1.3%	1.0%	1.3%	0.9%	0.4%	1.2%	0.9%
North Lowell	103.2%	1.2%	1.2%	1.4%	1.1%	1.9%	1.8%	2.0%	2.2%	2.4%	2.5%	2.5%	2.8%	2.2%	3.1%	3.2%	3.1%	2.9%	3.8%	2.6%	2.1%	1.8%	1.5%	1.2%	1.5%	1.3%	0.5%	1.7%	1.4%
Northampton-S berkshire	103.2%	1.9%	1.9%	1.9%	0.5%	2.5%	1.7%	2.7%	3.3%	2.3%	3.0%	3.7%	4.6%	2.7%	4.3%	3.1%	4.4%	3.6%	3.3%	2.6%	2.0%	1.8%	1.7%	1.4%	1.3%	0.9%	0.4%	1.2%	0.9%
Pepperell Dunstable	103.2%	0.9%	1.3%	1.7%	-2.9%	2.9%	3.2%	3.8%	4.0%	4.0%	4.0%	3.6%	2.9%	6.4%	4.2%	2.1%	3.5%	3.5%	2.4%	1.2%	0.9%	0.8%	1.0%	0.9%	1.2%	0.8%	0.4%	1.1%	0.8%
Quincy	102.3%	0.3%	0.3%	0.8%	0.4%	1.2%	1.2%	1.4%	1.5%	1.9%	2.1%	2.3%	2.8%	2.3%	3.3%	2.5%	3.4%	5.6%	4.9%	3.9%	3.2%	2.8%	2.5%	2.2%	2.2%	1.4%	0.7%	1.2%	0.9%
Revere Winthrop	102.4%	0.9%	1.2%	1.4%	1.1%	2.0%	1.9%	2.4%	2.4%	2.7%	2.2%	2.1%	2.7%	1.8%	2.3%	3.2%	3.0%	3.9%	3.8%	3.0%	2.4%	3.6%	3.8%	3.4%	3.5%	2.6%	1.7%	2.2%	1.6%
Salem Swampscott	102.4%	1.1%	1.3%	1.5%	1.1%	1.8%	1.8%	2.0%	2.1%	2.5%	2.7%	3.0%	3.6%	3.0%	3.6%	2.7%	3.3%	4.0%	4.0%	3.0%	2.4%	2.2%	2.3%	1.8%	1.7%	1.1%	0.5%	1.2%	0.8%
Scituate	102.3%	0.5%	0.9%	1.5%	1.2%	2.1%	1.8%	2.2%	2.3%	3.1%	3.1%	2.0%	2.7%	5.8%	3.2%	1.4%	1.9%	1.9%	2.2%	1.3%	0.9%	0.8%	1.1%	0.9%	1.2%	0.9%	0.3%	1.2%	0.9%
Somerset	102.3%	0.2%	0.5%	0.8%	0.5%	2.0%	0.9%	2.9%	3.5%	4.1%	4.7%	4.8%	3.3%	3.2%	5.3%	2.6%	2.2%	2.1%	2.6%	1.4%	1.0%	0.9%	1.2%	1.0%	1.3%	0.9%	0.4%	1.2%	0.9%
Spencer-Rutland	103.2%	0.9%	1.7%	-0.6%	-0.1%	1.7%	5.2%	-1.1%	4.1%	5.2%	4.8%	4.7%	5.8%	3.8%	4.5%	4.3%	3.6%	3.2%	3.6%	1.4%	1.2%	1.0%	1.0%	0.9%	1.1%	0.8%	0.4%	1.1%	0.9%
Tewksbury	102.7%	1.1%	1.2%	0.8%	0.8%	1.9%	1.9%	2.1%	2.3%	2.5%	2.7%	2.8%	2.8%	3.1%	3.8%	2.3%	2.3%	2.6%	2.7%	2.0%	1.4%	1.3%	1.1%	0.9%	1.3%	0.9%	0.4%	1.2%	0.9%
Topsfield	102.4%	1.0%	1.6%	2.0%	2.3%	2.9%	2.9%	3.1%	2.9%	3.0%	2.1%	1.8%	1.6%	5.5%	0.6%	1.6%	2.1%	2.1%	2.4%	1.3%	1.0%	0.9%	1.2%	0.9%	1.2%	0.8%	0.4%	1.2%	0.9%
Webster Southbridge Charlton	103.2%	1.0%	2.4%	-1.4%	1.0%	2.1%	3.9%	1.1%	3.4%	4.0%	4.0%	3.4%	5.7%	2.8%	3.7%	3.3%	3.1%	1.7%	3.6%	1.3%	1.8%	1.5%	1.9%	1.4%	1.5%	1.1%	0.5%	1.3%	1.6%
Weymouth Holbrook	102.3%	0.5%	0.6%	1.0%	0.6%	1.5%	1.5%	1.7%	2.1%	1.6%	4.2%	4.1%	4.0%	4.3%	4.2%	3.3%	3.2%	3.9%	4.4%	2.8%	2.1%	1.7%	1.6%	1.2%	1.4%	0.8%	0.3%	1.1%	0.9%
Worcester North	103.2%	1.3%	2.1%	1.5%	1.5%	2.3%	2.7%	1.8%	2.3%	2.4%	2.5%	2.9%	3.4%	2.1%	2.9%	2.0%	2.4%	3.2%	3.2%	2.3%	1.7%	1.4%	1.7%	1.6%	1.7%	1.2%	0.6%	1.4%	0.9%
Worcester South	103.2%	1.5%	2.1%	1.9%	1.6%	2.2%	2.2%	2.0%	2.3%	2.3%	2.2%	2.4%	2.6%	2.3%	2.4%	1.8%	2.3%	2.0%	2.3%	1.7%	1.5%	1.3%	1.7%	1.7%	1.9%	2.5%	0.9%	1.7%	1.3%

Year One Weather-Adjustment and Multi-Year Annual Growth Percentage (Summer), after EE, EV, and EH impacts																																
Study Area	Weather Adjustment (90/10)	Weather Adjustment (50/50)	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Adams/Deerfield	103.2%	97.7%	2.3%	2.0%	2.1%	1.7%	2.5%	2.7%	3.4%	4.3%	4.2%	4.0%	4.1%	4.4%	2.7%	4.1%	3.4%	3.8%	3.4%	3.9%	3.5%	3.1%	2.8%	2.9%	1.8%	1.8%	1.2%	0.7%	1.2%	0.9%
Amesbury Newburyport	102.4%	94.7%	1.1%	1.3%	1.6%	1.2%	2.0%	1.9%	2.2%	2.3%	2.7%	2.6%	2.6%	2.7%	3.0%	3.2%	1.7%	2.9%	3.9%	3.2%	2.0%	1.3%	1.1%	1.3%	1.0%	1.3%	0.9%	0.4%	1.2%	0.9%
Attleboro	102.3%	93.6%	0.7%	0.6%	1.0%	0.7%	1.7%	1.8%	2.0%	2.2%	3.2%	3.6%	3.5%	2.8%	3.0%	3.7%	3.1%	2.9%	2.9%	2.9%	2.2%	1.5%	1.2%	1.4%	1.1%	1.3%	1.0%	0.4%	1.2%	0.9%
Ayer Clinton	103.2%	97.7%	2.2%	2.0%	2.0%	1.5%	2.2%	2.2%	2.5%	2.7%	2.8%	2.5%	3.0%	3.0%	2.6%	2.3%	2.2%	2.5%	2.6%	4.4%	2.6%	1.8%	1.5%	1.7%	1.3%	1.5%	0.9%	0.4%	1.2%	0.9%
Barre-Athol	103.2%	97.7%	3.9%	3.1%	3.2%	3.3%	3.7%	3.5%	4.2%	4.9%	4.4%	3.9%	4.8%	5.2%	3.2%	3.2%	3.7%	3.4%	2.8%	2.9%	1.8%	1.3%	1.1%	1.3%	1.1%	1.3%	1.0%	0.4%	1.3%	1.0%
Beverly	102.4%	94.7%	1.2%	1.3%	1.5%	1.2%	1.9%	1.8%	2.0%	2.0%	2.2%	2.7%	2.8%	2.8%	2.3%	3.7%	2.0%	3.7%	3.4%	2.9%	2.0%	1.6%	1.5%	1.6%	1.4%	1.7%	1.1%	0.4%	1.2%	0.9%
Billerica	103.2%	97.7%	1.2%	1.2%	1.5%	1.2%	2.0%	1.9%	2.2%	2.5%	2.6%	2.6%	2.7%	3.2%	2.4%	2.9%	2.4%	2.6%	4.1%	3.1%	2.1%	1.3%	1.0%	1.2%	1.0%	1.2%	0.9%	0.4%	1.2%	0.9%
Bridgewater	102.3%	93.6%	0.6%	0.8%	1.0%	1.0%	1.8%	1.8%	2.3%	2.6%	3.2%	3.4%	3.7%	3.9%	3.9%	4.4%	2.9%	3.0%	2.6%	3.5%	1.8%	1.2%	1.0%	1.3%	1.0%	1.2%	0.9%	0.4%	1.2%	0.9%
Brockton	102.3%	93.6%	0.5%	0.6%	0.9%	0.6%	1.5%	1.7%	1.8%	2.2%	2.5%	2.8%	2.9%	3.3%	2.6%	3.5%	3.1%	3.0%	2.9%	3.0%	1.8%	1.2%	1.1%	1.3%	1.1%	1.4%	1.0%	0.4%	1.3%	0.9%
Brockton NW / Randolph	102.3%	93.6%	0.6%	0.8%	1.0%	0.7%	1.6%	1.6%	1.9%	2.1%	2.5%	3.1%	3.3%	3.2%	2.7%	4.0%	3.0%	3.0%	2.7%	3.3%	2.3%	1.6%	1.3%	1.4%	1.1%	1.3%	0.9%	0.4%	1.2%	0.9%
Cape Ann	102.4%	94.7%	1.3%	1.5%	1.7%	1.4%	2.2%	2.3%	3.1%	3.2%	3.5%	3.9%	3.8%	3.5%	4.1%	4.5%	3.6%	4.8%	3.9%	3.1%	1.8%	1.4%	1.1%	1.2%	1.0%	1.3%	0.9%	0.4%	1.1%	0.8%
Chelmsford Westford	103.2%	97.7%	1.1%	1.3%	1.5%	1.2%	1.9%	2.0%	2.1%	2.2%	2.5%	2.6%	2.3%	2.6%	2.7%	3.3%	2.3%	3.1%	3.2%	2.8%	1.8%	1.7%	1.4%	1.5%	1.3%	1.6%	1.5%	0.8%	1.6%	1.1%
Dracut	102.7%	95.9%	1.2%	1.3%	1.6%	1.3%	2.1%	2.1%	2.4%	2.7%	2.9%	2.9%	3.0%	3.7%	2.8%	3.3%	3.8%	3.4%	3.2%	3.3%	2.2%	1.4%	1.3%	1.5%	1.3%	1.3%	1.0%	0.4%	1.2%	0.9%
Everett Malden Medford	102.4%	94.7%	1.2%	1.4%	1.6%	1.2%	1.9%	1.8%	2.1%	2.1%	2.4%	2.3%	2.3%	2.7%	2.7%	2.8%	2.2%	4.0%	3.9%	4.6%	3.2%	2.7%	2.6%	2.5%	2.0%	2.0%	1.4%	0.8%	1.3%	1.0%
Fall River	102.3%	93.6%	0.6%	0.6%	0.8%	0.4%	1.3%	1.4%	1.6%	1.8%	2.0%	1.8%	2.0%	2.7%	1.6%	2.4%	1.8%	2.4%	2.1%	2.4%	1.8%	1.2%	1.1%	1.3%	1.1%	1.4%	1.0%	0.3%	1.3%	0.9%
Gardner Winchendon	103.2%	97.7%	2.1%	1.8%	1.9%	2.1%	2.3%	2.4%	2.7%	2.9%	3.3%	3.5%	3.8%	3.6%	2.6%	3.2%	2.6%	3.4%	2.8%	2.8%	1.7%	1.2%	1.4%	1.2%	1.0%	1.3%	0.9%	0.4%	1.2%	0.9%
Hanover	102.3%	93.6%	0.6%	0.8%	1.3%	1.0%	1.9%	1.7%	2.0%	2.1%	3.1%	3.8%	3.6%	3.0%	4.0%	3.8%	2.7%	3.0%	3.0%	3.5%	1.9%	1.4%	1.0%	1.2%	0.9%	1.3%	0.9%	0.4%	1.2%	0.9%
Haverhill	102.4%	94.7%	1.1%	1.2%	1.4%	1.0%	1.7%	1.7%	2.0%	2.1%	2.2%	2.4%	2.6%	3.2%	2.1%	2.6%	2.2%	2.5%	2.2%	3.0%	2.9%	2.8%	2.3%	2.9%	2.3%	2.3%	1.7%	0.9%	1.6%	1.1%
Hopedale East	102.3%	93.6%	0.8%	0.7%	1.1%	0.6%	1.5%	1.4%	1.7%	2.1%	2.5%	2.5%	2.6%	2.6%	2.7%	2.3%	2.2%	3.9%	2.6%	2.9%	1.9%	1.3%	1.1%	1.3%	1.1%	1.4%	1.0%	0.3%	1.3%	0.9%
Hopedale West	102.3%	93.6%	1.8%	2.2%	2.3%	2.1%	2.9%	2.6%	2.7%	2.9%	3.5%	3.9%	3.7%	3.3%	3.4%	3.4%	3.7%	3.3%	3.1%	4.0%	2.2%	1.5%	1.3%	1.3%	1.0%	1.2%	0.9%	0.4%	1.2%	0.9%
Lawrence	102.7%	95.9%	1.1%	1.2%	1.4%	0.9%	1.7%	1.7%	1.8%	1.7%	1.8%	1.8%	1.8%	2.1%	1.6%	2.8%	1.6%	2.3%	2.0%	2.2%	1.7%	1.2%	1.1%	1.4%	1.2%	1.5%	1.1%	0.4%	1.3%	1.0%
Leominster	103.2%	97.7%	1.8%	1.9%	2.1%	1.5%	2.3%	2.1%	2.3%	2.5%	2.7%	2.6%	2.8%	3.0%	2.2%	2.4%	2.0%	2.7%	2.3%	2.5%	3.0%	2.2%	3.1%	2.3%	1.8%	1.9%	1.3%	0.7%	1.5%	1.0%
Lowell	103.2%	97.7%	1.1%	1.1%	1.2%	0.9%	1.6%	1.5%	1.6%	1.6%	1.8%	1.7%	2.2%	2.1%	1.4%	3.8%	1.8%	2.3%	2.1%	2.3%	1.7%	3.0%	2.5%	2.7%	3.8%	2.6%	2.2%	1.6%	2.5%	1.6%
Lynn	102.4%	94.7%	1.1%	1.3%	1.5%	1.1%	1.8%	1.7%	1.9%	2.0%	2.0%	2.1%	2.3%	2.3%	1.6%	2.6%	1.8%	2.4%	2.1%	2.3%	1.9%	1.4%	1.3%	1.5%	1.3%	1.5%	1.1%	0.5%	1.3%	1.0%
Marlboro	103.2%	97.7%	1.4%	1.5%	1.7%	1.3%	2.1%	1.7%	1.8%	2.0%	2.3%	2.4%	2.4%	2.5%	2.4%	2.9%	1.8%	2.6%	2.3%	2.8%	2.0%	1.5%	1.3%	1.5%	2.2%	1.4%	1.0%	0.4%	1.3%	0.9%
Melrose Saugus	102.4%	94.7%	1.2%	1.4%	1.6%	1.3%	2.0%	2.0%	2.2%	2.3%	2.6%	2.7%	3.0%	3.1%	2.8%	3.5%	2.4%	4.3%	3.2%	4.0%	2.3%	1.7%	1.7%	1.9%	1.5%	1.8%	1.3%	0.7%	1.3%	0.9%
Methuen	102.7%	95.9%	1.2%	1.3%	1.5%	1.1%	1.9%	1.8%	2.1%	2.3%	2.5%	2.5%	2.6%	3.1%	2.5%	2.7%	2.4%	2.7%	2.5%	3.6%	3.4%	2.5%	1.9%	1.7%	1.4%	1.8%	1.4%	0.9%	1.6%	1.0%
Millbury-Grafton	103.2%	97.7%	1.9%	2.0%	2.2%	1.9%	2.5%	2.6%	2.9%	2.8%	3.3%	3.6%	3.5%	3.0%	2.9%	3.8%	3.4%	3.6%	3.4%	3.0%	1.7%	1.2%	1.1%	1.2%	1.2%	1.5%	1.1%	0.6%	1.3%	0.9%
Monson-Palmer-Longmeadow	103.2%	97.7%	2.2%	2.0%	2.2%	2.1%	2.8%	2.9%	3.2%	3.3%	3.7%	3.8%	4.4%	3.5%	3.0%	4.5%	3.3%	3.2%	2.7%	2.8%	1.6%	1.1%	1.0%	1.3%	1.0%	1.2%	0.9%	0.4%	1.2%	0.9%
Nantucket	99.2%	89.1%	2.3%	2.0%	1.8%	2.1%	2.3%	2.3%	2.2%	2.1%	2.1%	2.1%	2.1%	2.1%	2.0%	2.0%	2.0%	2.0%	2.0%	1.9%	1.6%	1.5%	1.3%	1.2%	1.1%	1.0%	0.9%	0.8%	0.7%	0.6%
North Andover	102.7%	95.9%	1.2%	1.3%	1.5%	1.1%	1.8%	1.7%	1.8%	2.1%	2.3%	2.2%	2.3%	2.7%	2.5%	2.5%	1.7%	2.6%	2.1%	2.3%	1.6%	1.1%	1.0%	1.2%	0.9%	1.3%	0.9%	0.3%	1.2%	0.9%
North Lowell	103.2%	97.7%	1.3%	1.3%	1.5%	1.1%	2.0%	1.9%	2.1%	2.3%	2.5%	2.5%	2.6%	2.9%	2.3%	3.2%	2.5%	2.8%	3.5%	3.8%	2.6%	2.1%	1.9%	1.5%	1.3%	1.5%	1.3%	0.5%	1.7%	1.4%
Northampton-S berkshire	103.2%	97.7%	2.0%	2.0%	2.1%	1.8%	2.5%	2.6%	2.7%	3.3%	3.1%	3.3%	3.9%	4.0%	2.3%	3.8%	2.7%	5.6%	3.7%	3.7%	2.5%	1.9%	1.8%	1.7%	1.4%	1.3%	0.9%	0.4%	1.2%	0.9%
Pepperell Dunstable	103.2%	97.7%	1.0%	1.5%	1.9%	1.7%	2.6%	2.8%	3.3%	3.4%	3.4%	3.5%	3.2%	2.6%	6.2%	4.2%	3.7%	3.4%	3.3%	2.4%	1.2%	0.9%	0.8%	1.0%	0.9%	1.2%	0.8%	0.3%	1.1%	0.8%
Quincy	102.3%	93.6%	0.5%	0.6%	0.9%	0.6%	1.4%	1.4%	1.5%	1.6%	2.0%	2.2%	2.4%	2.9%	2.4%	2.8%	2.1%	3.0%	5.9%	4.9%	3.9%	3.2%	2.8%	2.5%	2.2%	2.2%	1.4%	0.7%	1.2%	0.9%
Revere Winthrop	102.4%	94.7%	1.1%	1.3%	1.6%	1.2%	2.1%	2.1%	2.5%	2.5%	2.8%	2.3%	2.3%	2.8%	1.9%	2.3%	2.4%	2.7%	3.5%	4.4%	3.0%	2.4%	3.6%	3.8%	3.4%	3.4%	2.6%	1.7%	2.2%	1.6%
Salem Swampscott	102.4%	94.7%	1.2%	1.4%	1.6%	1.3%	2.0%	1.9%	2.1%	2.2%	2.6%	2.7%	3.0%	3.6%	2.6%	3.3%	2.4%	3.6%	4.0%	4.0%	3.0%	2.4%	2.2%	2.3%	1.8%	1.7%	1.1%	0.5%	1.2%	0.8%
Scituate	102.3%	93.6%	0.6%	1.0%	1.6%	1.3%	2.2%	2.1%	2.2%	2.4%	3.2%	3.1%	2.1%	2.3%	5.6%	3.3%	1.5%	2.0%	1.9%	2.3%	1.3%	0.9%	0.8%	1.1%	0.9%	1.3%	0.9%	0.3%	1.2%	0.9%
Somerset	102.3%	93.6%	0.6%	0.7%	1.0%	0.9%	2.3%	2.3%	2.8%	2.9%	3.6%	4.0%	4.1%	3.5%	3.2%	5.3%	2.6%	2.4%	2.2%	2.6%	1.4%	1.1%	0.9%	1.2%	1.0%	1.3%	0.9%	0.4%	1.2%	0.9%
Spencer-Rutland	103.2%	97.7%	1.8%	1.3%	1.5%	2.0%	2.2%	2.4%	3.1%	3.3%	4.5%	4.1%	4.3%	4.4%	4.1%	4.4%	4.2%	3.9%	3.1%	3.3%	1.6%	1.1%	0.9%	1.0%	0.9%	1.1%	0.8%	0.4%	1.1%	0.9%
Tewksbury	102.7%	95.9%	1.1%	1.3%	1.5%	1.2%	1.9%	1.9%	2.1%	2.3%	2.5%	2.7%	2.8%	2.8%	3.1%	2.9%	2.0%	2.1%	3.3%	2.8%	2.1%	1.4%	1.3%	1.1%	1.0%	1.3%	0.9%	0.4%	1.2%	0.9%
Topsfield	102.4%	94.7%	1.0%	1.7%	2.1%	2.4%	3.0%	2.9%	3.2%	2.9%	3.1%	2.1%	1.8%	1.6%	4.9%	4.3%	1.6%	2.1%	2.1%	2.3%	1.4%	1.0%	0.9%	1.2%	0.9%	1.2%	0.8%	0.3%	1.2%	0.9%
Webster Southbridge Charlton	103.2%	97.7%	2.1%	1.9%	2.0%	1.7%	2.5%	2.5%	2.7%	3.0%	3.4%	3.5%	3.8%	3.6%	2.7%	3.4%	3.7%	3.3%	2.9%	3.0%	1.8%	1.7%	1.5%	1.8%	1.4%	1.5%	1.1%	0.5%	1.3%	0.9%
Weymouth Holbrook	102.3%	93.6%	0.7%	0.9%	1.2%	0.8%	1.6%	1.7%	1.9%	2.2%	2.7%	3.6%	3.6%	3.5%	4.2%	4.3%	3.3%	3.3%	3.9%	4.4%	2.8%	2.1%	1.7%	1.6%	1.2%	1.4%	0.8%	0.3%	1.1%	0.9%
Worcester North	103.2%	97.7%	1.7%	2.0%	2.1%	1.7%	2.4%	2.2%	2.3%	2.3%	2.4%	2.5%	3.0%	3.1%	2.1%	2.9%	2.1%	2.4%	2.6%	3.0%	2.1%	1.5%	2.1%	1.7%	1.4%	1.7%	1.2%	0.6%	1.4%	1.1%
Worcester South	103.2%	97.7%	1.8%	2.0%	2.1%	1.6%	2.3%	2.1%	2.2%	2.3%	2.3%	2.3%	2.4%	2.6%	2.3%	2.5%	1.9%	2.4%	2.1%	2.3%	1.7%	1.5%	1.3%	1.7%	1.7%	1.9%	1.4%	0.7%	1.6%	1.3%

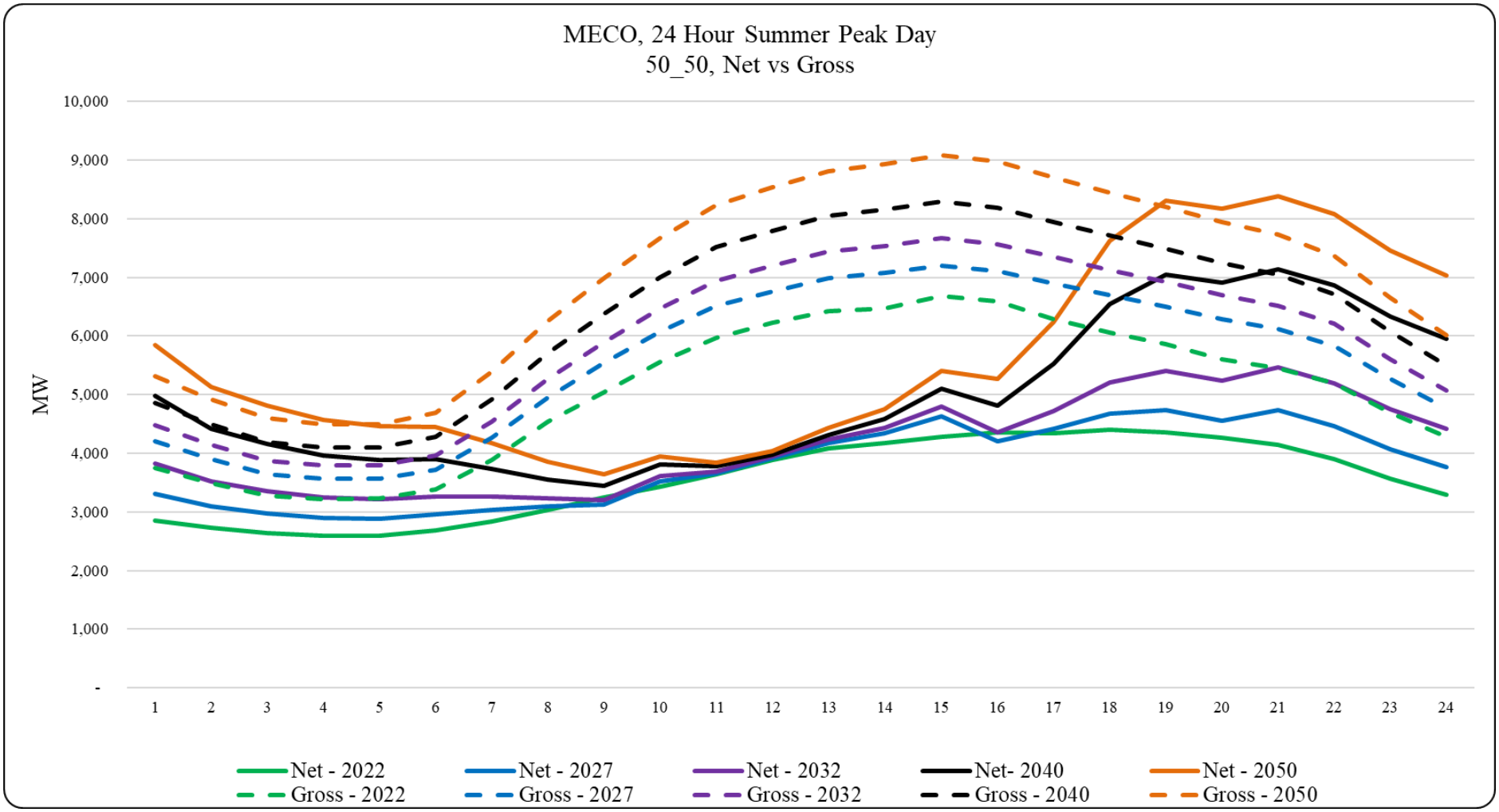
Year One Weather-Adjustment (90/10) and Multi-Year Annual Growth Percentage (Winter), after EE, PV, EV, and EH impacts																															
Study Area	Weather Adjustment	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Adams/Deerfield	102.7%	2.3%	2.3%	2.5%	2.2%	3.1%	4.4%	5.2%	6.5%	6.7%	7.2%	8.0%	7.8%	5.3%	6.8%	6.9%	6.5%	6.1%	6.2%	5.8%	5.1%	4.7%	3.4%	5.4%	3.7%	2.7%	1.7%	-0.1%	2.0%	0.27%
Amesbury Newburyport	105.1%	1.3%	1.6%	2.2%	2.2%	3.0%	3.5%	4.0%	4.3%	5.2%	5.5%	5.9%	6.3%	7.2%	7.2%	5.2%	5.7%	8.0%	6.2%	4.5%	3.4%	3.0%	1.6%	4.3%	3.1%	2.3%	1.4%	0.0%	2.1%	0.33%
Attleboro	103.2%	0.9%	0.9%	1.6%	1.7%	2.9%	3.9%	4.1%	4.6%	6.8%	8.1%	8.3%	6.6%	7.5%	7.5%	7.6%	5.5%	7.6%	6.1%	5.1%	4.2%	3.0%	1.2%	3.5%	1.9%	1.5%	0.9%	-0.1%	2.1%	0.33%
Ayer Clinton	102.7%	2.6%	2.7%	2.6%	2.2%	3.0%	3.1%	3.7%	4.1%	4.5%	4.7%	5.8%	5.5%	5.7%	5.0%	5.2%	5.2%	5.5%	5.7%	4.4%	3.5%	2.9%	1.9%	2.1%	1.9%	1.2%	0.7%	0.7%	1.4%	0.27%
Barre-Athol	102.7%	4.0%	3.5%	3.5%	3.7%	4.4%	5.6%	6.5%	7.3%	7.3%	8.1%	10.2%	8.4%	5.8%	7.0%	6.2%	5.7%	3.1%	3.8%	2.5%	1.9%	1.7%	1.7%	1.5%	1.5%	1.2%	0.7%	1.0%	1.0%	0.27%
Beverly	105.1%	1.6%	1.7%	2.2%	2.1%	3.1%	2.9%	3.4%	3.5%	4.1%	5.6%	6.2%	6.1%	6.0%	7.9%	5.7%	7.6%	7.0%	6.2%	5.1%	4.4%	3.8%	1.4%	3.2%	2.1%	1.4%	0.8%	-0.3%	2.2%	0.33%
Billerica	102.7%	1.4%	1.4%	2.0%	2.0%	2.9%	3.5%	3.9%	4.6%	5.1%	5.2%	5.6%	7.5%	6.2%	6.5%	6.6%	4.6%	8.1%	6.0%	4.5%	3.5%	3.0%	1.3%	4.0%	2.4%	1.9%	1.2%	-0.2%	2.3%	0.27%
Bridgewater	103.2%	0.6%	1.2%	1.7%	2.3%	3.2%	3.9%	4.8%	5.4%	6.8%	7.9%	8.8%	8.5%	8.2%	8.8%	7.1%	4.9%	7.4%	6.7%	4.4%	3.9%	2.9%	1.6%	3.6%	2.3%	1.7%	1.1%	-0.1%	2.0%	0.33%
Brockton	103.2%	0.5%	0.8%	1.3%	1.2%	2.1%	3.0%	3.1%	3.8%	4.6%	5.4%	6.0%	6.8%	6.0%	7.1%	5.8%	5.4%	6.8%	5.7%	4.3%	3.8%	3.0%	2.0%	3.8%	2.5%	2.0%	1.3%	0.4%	1.8%	0.33%
Brockton NW / Randolph	103.2%	0.7%	1.0%	1.6%	1.5%	2.4%	3.2%	3.6%	3.9%	4.8%	6.4%	7.1%	7.1%	6.7%	7.6%	7.0%	5.2%	7.3%	6.6%	5.4%	4.6%	4.1%	2.3%	4.0%	2.3%	1.9%	1.4%	-0.1%	2.1%	0.33%
Cape Ann	105.1%	1.7%	2.1%	2.4%	2.2%	3.5%	3.2%	4.7%	4.7%	5.6%	6.9%	7.2%	5.6%	7.6%	8.0%	7.1%	6.2%	8.8%	5.8%	4.5%	3.7%	2.7%	0.4%	3.0%	1.6%	1.3%	0.7%	-0.3%	2.1%	0.33%
Chelmsford Westford	102.7%	1.3%	1.7%	2.1%	2.1%	2.8%	3.2%	3.4%	3.8%	4.5%	4.9%	4.6%	6.6%	6.6%	7.1%	6.0%	6.0%	6.6%	5.6%	4.1%	4.2%	3.6%	1.9%	4.8%	3.2%	2.9%	2.1%	0.7%	2.5%	0.27%
Dracut	104.0%	1.3%	1.5%	2.3%	2.3%	3.2%	4.0%	4.6%	5.3%	5.9%	6.1%	6.4%	9.4%	7.8%	8.2%	8.0%	5.5%	8.6%	6.7%	5.0%	4.1%	3.8%	2.2%	4.3%	2.5%	1.9%	1.3%	0.1%	2.0%	0.31%
Everett Malden Medford	105.1%	1.3%	1.6%	2.1%	1.9%	2.6%	3.0%	3.3%	3.5%	4.3%	4.4%	4.6%	6.4%	6.5%	6.4%	6.1%	7.9%	7.2%	7.9%	6.2%	5.4%	5.0%	3.4%	6.1%	4.2%	3.4%	2.3%	0.8%	2.1%	0.33%
Fall River	103.2%	0.5%	0.5%	1.0%	0.7%	1.5%	2.6%	2.8%	3.3%	3.6%	3.6%	4.1%	7.7%	5.4%	6.4%	6.0%	6.2%	5.8%	6.0%	5.1%	4.4%	4.0%	4.1%	2.7%	2.9%	2.2%	1.4%	2.0%	0.5%	0.33%
Gardner Winchendon	102.7%	2.3%	2.0%	2.3%	2.5%	2.8%	3.6%	3.9%	4.1%	5.1%	6.1%	7.1%	6.0%	5.5%	6.1%	4.6%	6.9%	4.5%	5.3%	3.4%	2.0%	2.0%	2.1%	1.1%	1.5%	1.2%	0.7%	1.4%	0.6%	0.27%
Hanover	103.2%	0.6%	1.3%	2.3%	2.3%	3.1%	4.0%	4.2%	4.4%	6.8%	8.7%	8.4%	7.2%	9.0%	8.0%	6.7%	4.7%	8.2%	6.9%	4.7%	4.1%	3.5%	1.7%	3.9%	2.9%	2.3%	1.6%	0.2%	1.9%	0.33%
Haverhill	105.1%	1.1%	1.3%	1.6%	1.5%	2.2%	3.1%	3.5%	3.7%	4.1%	4.7%	5.4%	8.3%	5.9%	6.5%	6.2%	5.7%	6.0%	6.9%	5.1%	6.0%	5.1%	3.7%	6.1%	4.0%	3.2%	2.2%	0.9%	2.4%	0.33%
Hopedale East	103.2%	1.4%	1.6%	2.2%	1.4%	2.6%	2.0%	2.8%	3.4%	4.4%	4.9%	5.2%	5.7%	6.1%	5.2%	5.5%	6.0%	5.5%	5.3%	4.1%	3.0%	2.6%	1.9%	3.1%	2.0%	1.6%	1.0%	0.4%	1.7%	0.33%
Hopedale West	103.2%	2.5%	3.1%	3.6%	3.7%	5.4%	3.0%	4.0%	4.3%	5.9%	7.2%	7.5%	6.4%	7.1%	6.8%	6.0%	6.4%	5.6%	6.3%	3.6%	2.7%	2.2%	0.7%	3.4%	1.5%	1.2%	0.7%	-0.4%	2.3%	0.33%
Lawrence	104.0%	1.1%	1.2%	1.4%	1.0%	1.6%	2.4%	2.2%	2.2%	2.7%	2.5%	2.8%	4.7%	3.9%	5.3%	-0.3%	9.5%	-3.6%	7.0%	3.5%	3.0%	10.3%	0.3%	2.3%	5.1%	1.9%	0.7%	4.1%	0.2%	0.31%
Leominster	102.7%	1.9%	2.0%	2.4%	2.0%	2.8%	3.1%	3.4%	3.8%	4.4%	4.7%	5.4%	5.5%	5.1%	5.2%	4.8%	5.4%	4.9%	5.1%	5.8%	4.8%	3.4%	2.9%	2.3%	2.2%	1.6%	1.1%	1.0%	1.5%	0.27%
Lowell	102.7%	1.1%	1.1%	1.2%	1.1%	1.7%	2.3%	2.2%	2.3%	2.6%	2.7%	3.5%	4.7%	3.8%	7.0%	4.7%	4.9%	5.1%	5.2%	4.5%	6.3%	5.0%	5.9%	4.8%	4.5%	3.4%	2.3%	1.0%	3.2%	0.27%
Lynn	105.1%	1.2%	1.4%	1.4%	1.4%	2.0%	2.2%	2.3%	2.5%	2.7%	3.0%	3.5%	4.1%	3.6%	4.7%	4.1%	4.7%	4.4%	4.7%	4.2%	3.8%	3.6%	4.0%	2.9%	2.6%	1.6%	1.0%	1.8%	0.6%	0.33%
Marlboro	102.7%	1.6%	2.0%	2.3%	2.6%	3.8%	1.8%	2.5%	2.8%	3.7%	4.1%	4.4%	5.1%	5.3%	5.8%	4.6%	5.0%	4.9%	5.3%	3.9%	3.2%	2.5%	2.6%	1.7%	1.7%	1.3%	0.8%	0.9%	1.2%	0.27%
Melrose Saugus	105.1%	1.4%	1.8%	2.2%	2.2%	3.0%	3.3%	3.7%	4.0%	4.7%	5.4%	6.1%	7.2%	6.9%	7.7%	6.6%	7.0%	7.7%	7.4%	5.4%	4.7%	4.6%	2.6%	4.9%	3.5%	2.7%	1.9%	0.3%	2.1%	0.33%
Methuen	104.0%	1.3%	1.4%	1.8%	1.8%	2.6%	3.5%	3.9%	4.5%	4.9%	5.2%	5.8%	8.3%	7.1%	6.9%	6.9%	6.2%	7.4%	6.6%	7.0%	5.8%	4.6%	2.4%	4.7%	3.3%	2.6%	1.9%	0.7%	2.2%	0.31%
Millbury-Grafton	102.7%	2.3%	2.6%	3.5%	3.3%	4.0%	3.6%	4.6%	4.5%	5.8%	6.9%	7.2%	6.2%	6.7%	7.8%	6.4%	6.7%	7.1%	6.0%	3.8%	2.7%	2.4%	1.4%	2.7%	1.8%	1.5%	1.0%	0.3%	1.9%	0.27%
Monson-Palmer-Longmeadow	102.7%	2.4%	2.3%	2.7%	2.8%	3.6%	4.3%	4.8%	4.9%	5.8%	6.7%	8.0%	6.2%	5.2%	7.2%	6.4%	5.8%	5.3%	4.7%	2.8%	2.2%	1.9%	1.5%	2.3%	1.7%	1.4%	0.8%	0.6%	1.4%	0.27%
Nantucket	114.0%	2.4%	2.2%	2.1%	2.5%	2.8%	3.0%	3.1%	3.1%	3.6%	3.9%	4.1%	4.4%	4.4%	4.4%	4.3%	4.2%	4.1%	4.0%	3.2%	2.9%	2.6%	2.3%	2.0%	1.7%	1.4%	1.2%	0.9%	0.7%	1.75%
North Andover	104.0%	1.4%	1.6%	1.9%	1.8%	2.6%	2.5%	3.0%	3.5%	4.1%	4.2%	4.6%	6.1%	5.9%	5.5%	4.7%	5.0%	5.4%	5.0%	4.0%	3.5%	3.2%	2.2%	2.9%	2.5%	1.9%	1.1%	0.9%	1.4%	0.31%
North Lowell	102.7%	1.5%	1.4%	2.0%	1.8%	2.7%	3.3%	3.6%	4.1%	4.7%	4.9%	5.2%	7.9%	6.4%	7.7%	7.4%	6.2%	7.9%	7.5%	6.2%	5.4%	5.1%	2.8%	5.1%	3.5%	3.2%	1.7%	0.6%	2.6%	0.27%
Northampton-S berkshire	102.7%	2.1%	2.3%	2.6%	2.5%	3.3%	4.0%	4.3%	5.2%	5.4%	6.2%	7.8%	7.6%	5.8%	7.5%	5.9%	8.5%	7.1%	6.7%	4.6%	3.7%	3.5%	1.6%	4.1%	2.0%	1.5%	1.0%	-0.2%	2.3%	0.27%
Pepperell Dunstable	102.7%	1.6%	2.4%	3.1%	3.6%	5.1%	4.4%	5.7%	5.9%	6.4%	7.3%	7.0%	6.3%	11.3%	8.1%	7.6%	5.1%	8.2%	4.8%	3.5%	3.2%	2.9%	1.2%	4.4%	3.1%	1.7%	0.8%	-0.2%	1.9%	0.27%
Quincy	103.2%	0.3%	0.6%	1.4%	1.1%	1.8%	2.6%	2.6%	2.9%	3.8%	4.5%	5.1%	6.8%	6.4%	6.8%	6.4%	7.0%	10.2%	9.2%	7.7%	6.9%	6.3%	4.1%	5.8%	2.9%	1.9%	1.2%	0.0%	2.1%	0.33%
Revere Winthrop	105.1%	1.2%	1.6%	2.0%	1.9%	2.9%	3.4%	4.0%	4.1%	4.7%	4.3%	4.6%	6.8%	5.4%	6.2%	6.7%	7.0%	7.5%	7.0%	6.7%	6.0%	7.1%	5.3%	7.8%	5.7%	3.7%	2.6%	1.4%	2.6%	0.33%
Salem Swampscott	105.1%	1.4%	1.8%	2.2%	2.1%	2.9%	3.1%	3.4%	3.7%	4.6%	5.4%	6.2%	7.9%	6.5%	7.0%	6.9%	6.9%	8.5%	7.6%	6.4%	5.6%	5.3%	3.9%	5.0%	2.8%	1.9%	1.0%	-0.1%	2.0%	0.33%
Scituate	103.2%	0.5%	1.8%	3.4%	3.4%	4.0%	5.5%	5.1%	5.3%	7.4%	7.6%	5.7%	6.1%	13.3%	7.4%	4.8%	3.2%	6.4%	5.1%	3.6%	3.3%	3.1%	1.6%	4.2%	2.9%	2.2%	1.4%	-0.8%	2.8%	0.33%
Somerset	103.2%	0.6%	0.9%	1.6%	2.0%	3.8%	4.9%	5.7%	5.8%	7.2%	8.2%	8.8%	7.4%	7.4%	10.0%	6.2%	3.6%	6.7%	5.4%	3.8%	3.5%	3.1%	1.7%	4.0%	2.7%	1.9%	1.2%	0.0%	2.0%	0.33%
Spencer-Rutland	102.7%	1.7%	1.8%	1.9%	2.5%	2.8%	3.3%	3.9%	4.1%	5.8%	6.0%	6.7%	3.9%	6.4%	6.7%	6.5%	4.0%	7.0%	4.9%	2.6%	1.8%	1.6%	-0.1%	3.1%	1.4%	1.1%	0.7%	-0.6%	2.5%	0.27%
Tewksbury	104.0%	1.3%	1.6%	1.9%	1.8%	2.6%	3.0%	3.4%	3.8%	4.3%	4.9%	5.2%	5.9%	6.5%	5.8%	4.5%	4.1%	5.7%	5.1%	4.1%	3.4%	3.2%	1.4%	3.5%	2.3%	1.8%	1.2%	0.5%	1.9%	0.31%
Topsfield	105.1%	1.6%	3.0%	4.2%	5.3%	5.9%	5.6%	6.2%	5.7%	6.2%	4.8%	4.7%	4.3%	11.8%	8.7%	5.1%	3.7%	7.3%	4.8%	3.4%	3.1%	2.8%	1.7%	3.1%	1.5%	1.2%	0.8%	-0.4%	2.3%	0.33%
Webster Southbridge Charlton	102.7%	2.4%	2.4%	2.6%	2.5%	3.4%	3.3%	3.8%	4.1%	5.1%	5.9%	6.8%	6.2%	5.6%	6.3%	5.0%	6.6%	4.4%	4.8%	3.4%	2.8%	2.3%	2.2%	2.1%	1.8%	1.3%	0.8%	-0.4%	2.6%	0.27%
Weymouth Holbrook	103.2%	0.7%	1.3%	1.9%	1.7%	2.5%	3.3%	3.6%	4.2%	5.4%	7.4%	7.7%	7.6%	8.5%	8.6%	7.6%	5.2%	9.6%	8.2%	6.1%	5.4%	4.8%	2.5%	3.3%	2.0%	1.4%	0.8%	-0.1%	2.0%	0.33%
Worcester North	102.7%	1.7%	2.0%	2.4%	2.1%	2.6%	3.1%	3.1%	3.2%	3.5%	3.9%	4.9%	5.5%	4.4%	5.5%	4.7%	4.5%	5.6%	5.6%	3.9%	4.0%	3.7%	3.9%	2.9%	2.4%	1.9%	1.1%	1.3%	1.2%	0.27%
Worcester South	102.7%	1.8%	1.9%	2.3%	1.9%	2.4%	2.8%	2.8%	3.0%	3.3%	3.4%	3.9%	4.7%	4.7%	4.8%	4.4%	4.7%	4.7%	4.9%	4.2%	4.0%	3.7%	4.0%	3.3%	3.0%	2.0%	1.2%	1.8%	1.2%	0.27%

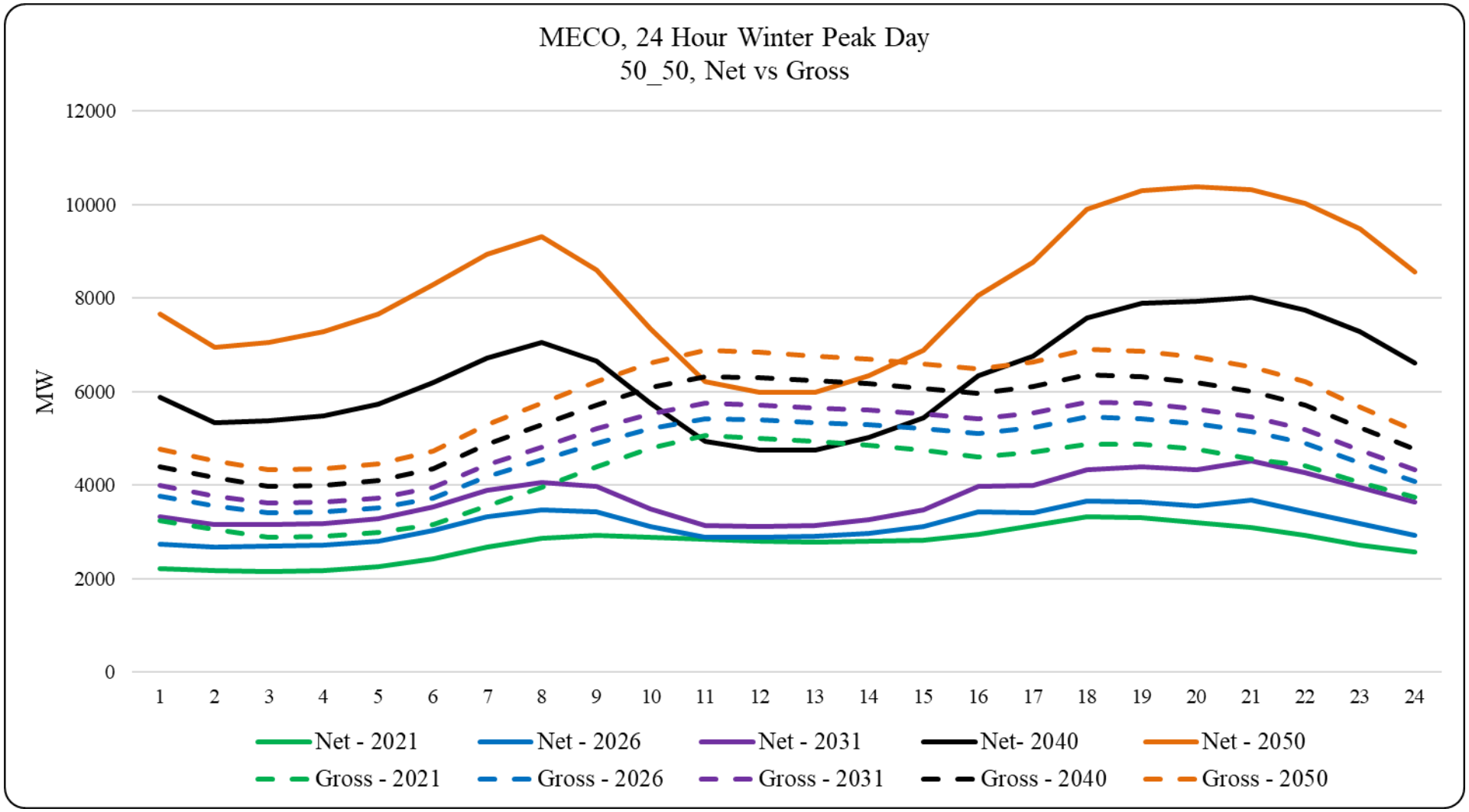
Appendix D: Historical Summer Peaks Days and Hours

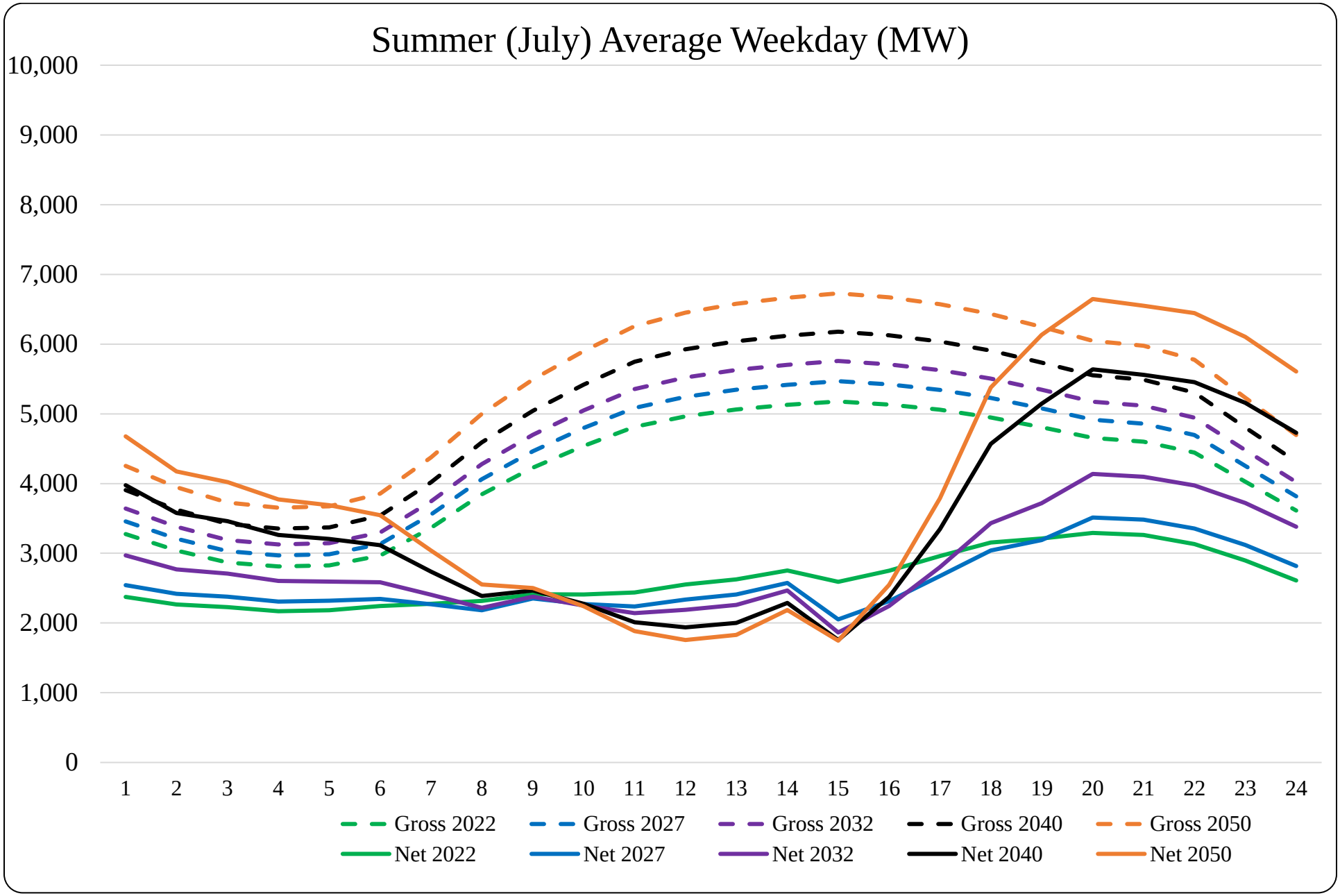
year	dt_wcma	hr_wcma	dt_nema	hr_nema	dt_sema	hr_sema	dt_ma	hr_ma	dt_nant	hr_nant	dt_meco	hr_meco
2003	6/27/2003	14	8/22/2003	16	8/22/2003	15	8/22/2003	15	8/8/2003	19	6/27/2003	14
2004	8/30/2004	16	8/3/2004	17	8/30/2004	16	8/30/2004	16	8/20/2004	20	8/30/2004	16
2005	7/27/2005	15	7/27/2005	17	7/27/2005	16	7/27/2005	16	8/5/2005	19	7/27/2005	16
2006	8/2/2006	15	8/2/2006	17	8/2/2006	16	8/2/2006	16	8/3/2006	19	8/2/2006	16
2007	6/27/2007	15	6/27/2007	16	8/3/2007	15	6/27/2007	15	8/3/2007	19	6/27/2007	15
2008	6/10/2008	17	6/10/2008	18	6/10/2008	17	6/10/2008	17	8/2/2008	19	6/10/2008	17
2009	8/18/2009	14	8/18/2009	14	8/18/2009	15	8/18/2009	14	8/21/2009	19	8/18/2009	14
2010	7/7/2010	15	7/6/2010	15	7/6/2010	17	7/6/2010	15	8/6/2010	18	7/6/2010	15
2011	7/22/2011	14	7/22/2011	15	7/22/2011	16	7/22/2011	15	7/22/2011	19	7/22/2011	15
2012	7/17/2012	17	7/17/2012	18	7/17/2012	16	7/17/2012	17	8/4/2012	19	7/17/2012	17
2013	7/19/2013	15	7/19/2013	17	7/19/2013	15	7/19/2013	15	7/19/2013	18	7/19/2013	15
2014	7/2/2014	15	7/2/2014	16	9/2/2014	16	7/2/2014	16	7/3/2014	19	7/2/2014	16
2015	9/8/2015	17	9/9/2015	17	7/20/2015	18	7/20/2015	17	7/29/2015	18	7/20/2015	17
2016	8/12/2016	15	8/12/2016	16	8/12/2016	16	8/12/2016	15	8/14/2016	18	8/12/2016	15
2017	6/13/2017	17	6/13/2017	17	6/13/2017	18	6/13/2017	17	7/20/2017	19	6/13/2017	17
2018	8/29/2018	18	8/29/2018	18	8/29/2018	18	8/29/2018	18	8/6/2018	18	8/29/2018	18
2019	7/30/2019	19	7/30/2019	18	7/21/2019	18	7/30/2019	18	7/21/2019	18	7/30/2019	18
2020	7/27/2020	18	7/27/2020	18	7/27/2020	18	7/27/2020	18	7/28/2020	19	7/27/2020	18
2021	6/29/2021	18	6/30/2021	17	6/30/2021	18	6/29/2021	18	8/13/2021	18	6/29/2021	18
2022	8/4/2022	18	8/8/2022	18	8/9/2022	15	8/8/2022	18	8/6/2022	18	8/8/2022	18

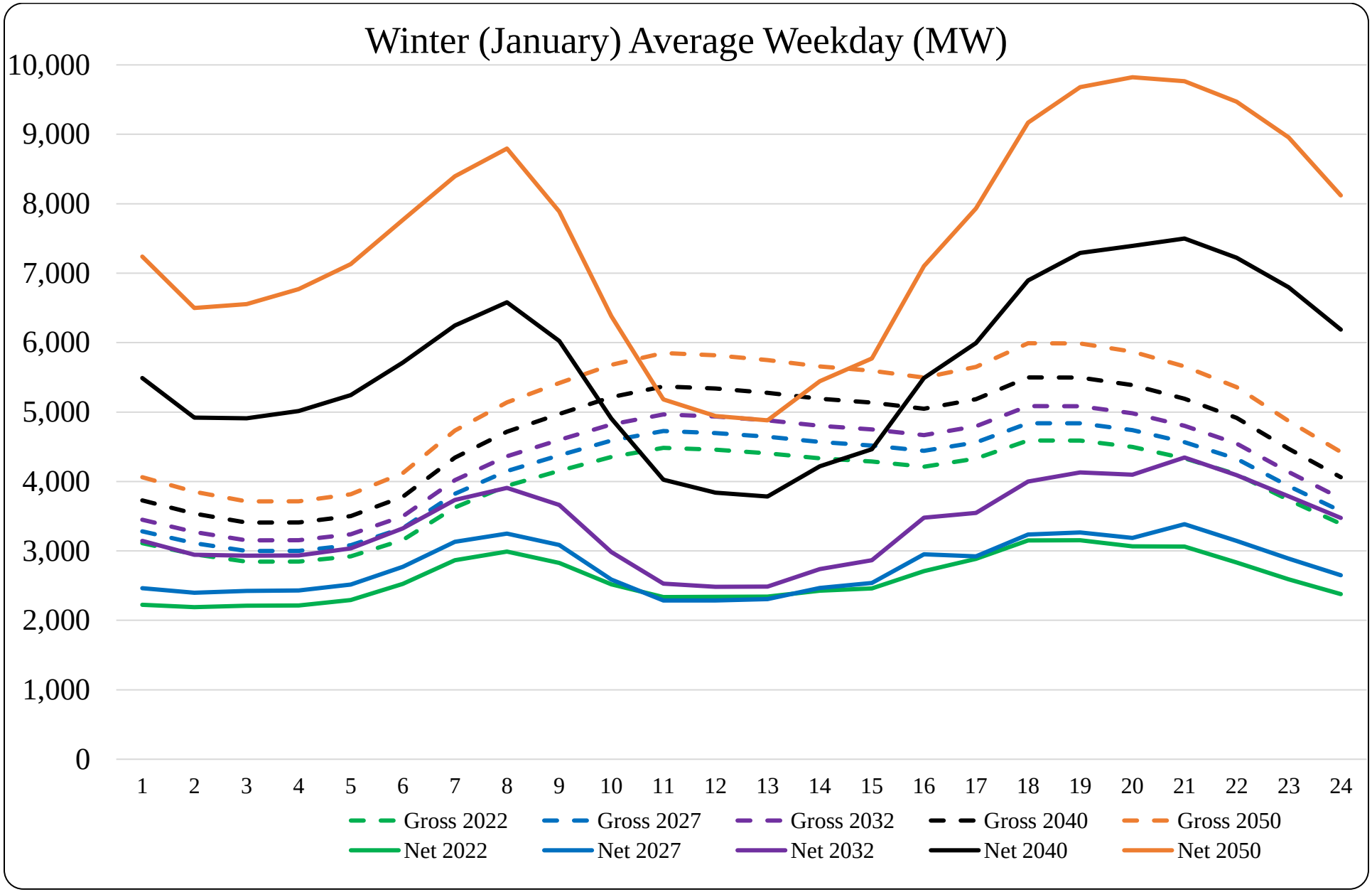
Appendix E: Load Shapes for Typical Day Types

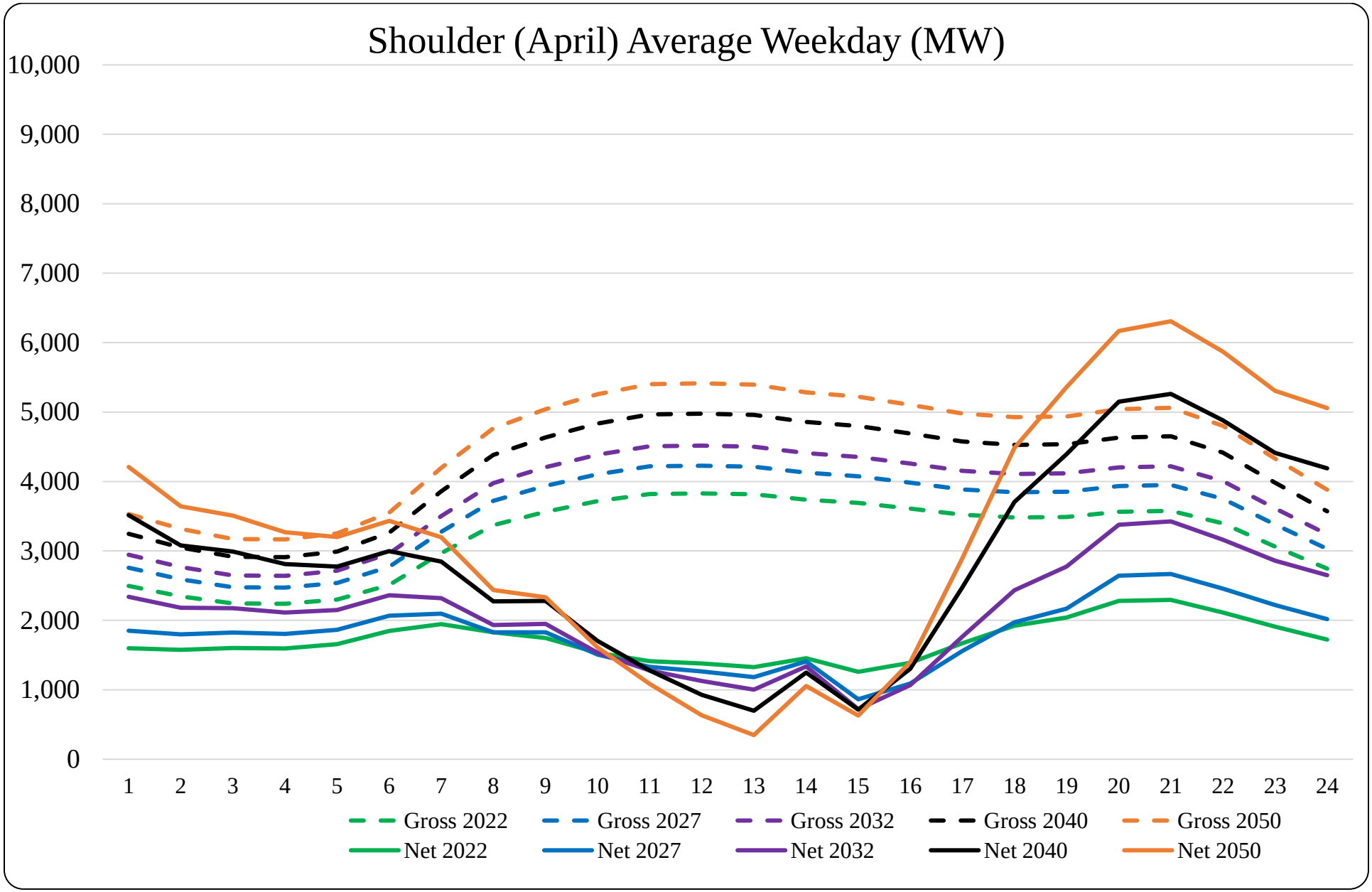
(for Base Case)

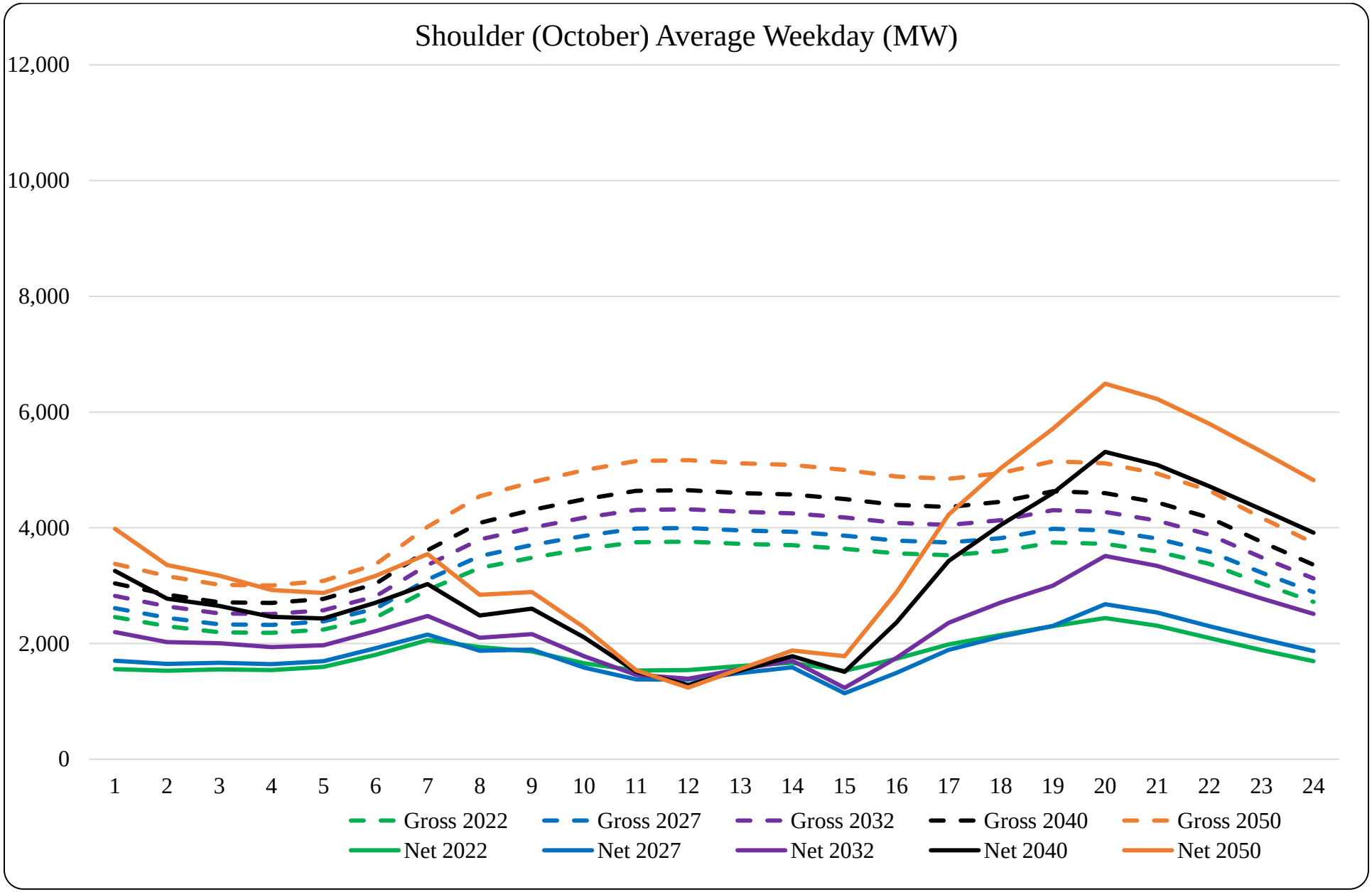

MECO, 24 Hour Summer Peak Day
50_50, Net vs Gross
MW
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
-
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Net - 2022
Net - 2027
Net - 2032
Net- 2040
Net - 2050
Gross - 2022
Gross - 2027
Gross - 2032
Gross - 2040
Gross - 2050

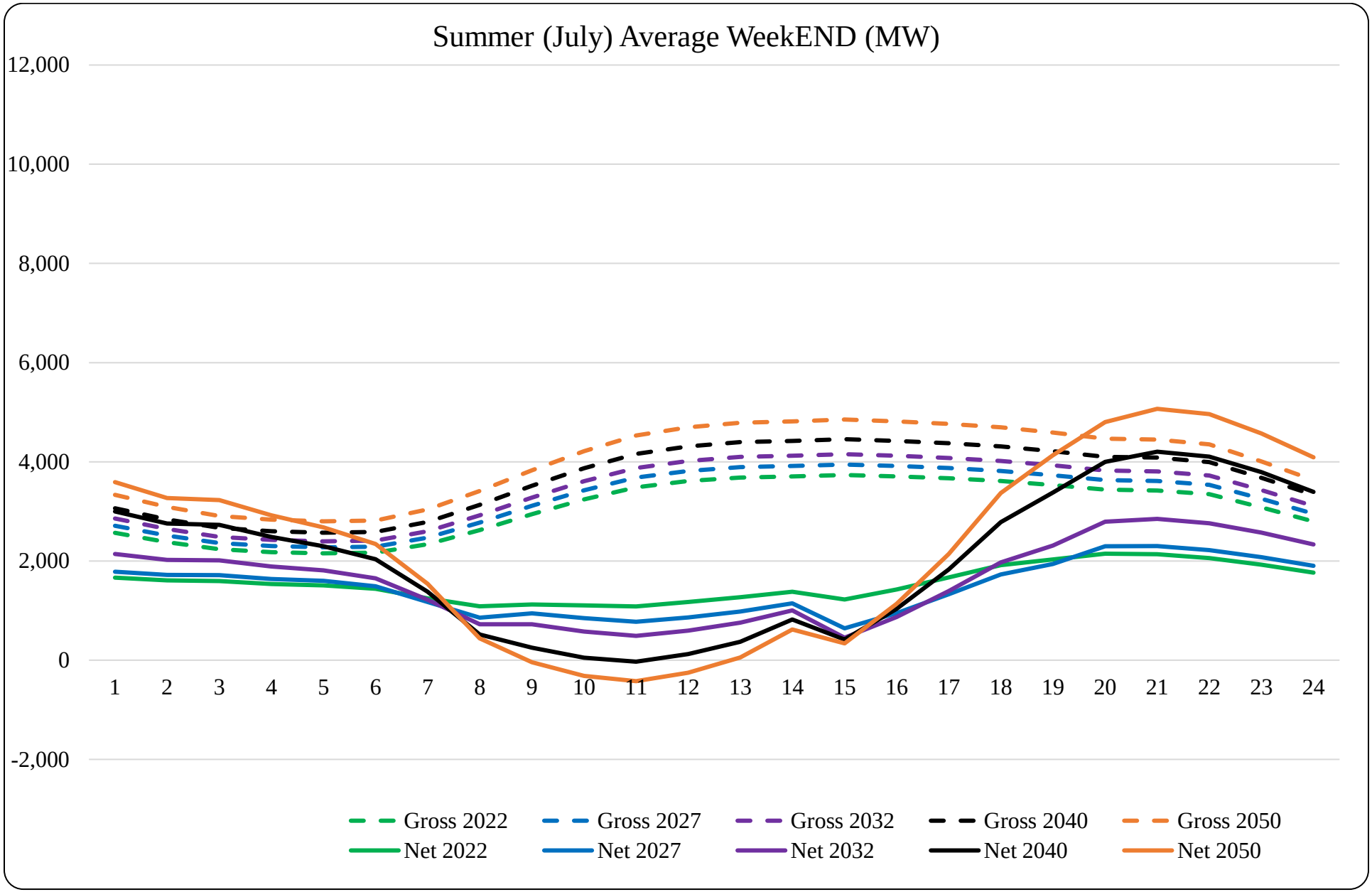

MECO, 24 Hour Winter Peak Day
50_50, Net vs Gross
MW
12000
10000
8000
6000
4000
2000
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Net - 2021
Net - 2026
Net - 2031
Net- 2040
Net - 2050
Gross - 2021
Gross - 2026
Gross - 2031
Gross - 2040
Gross - 2050

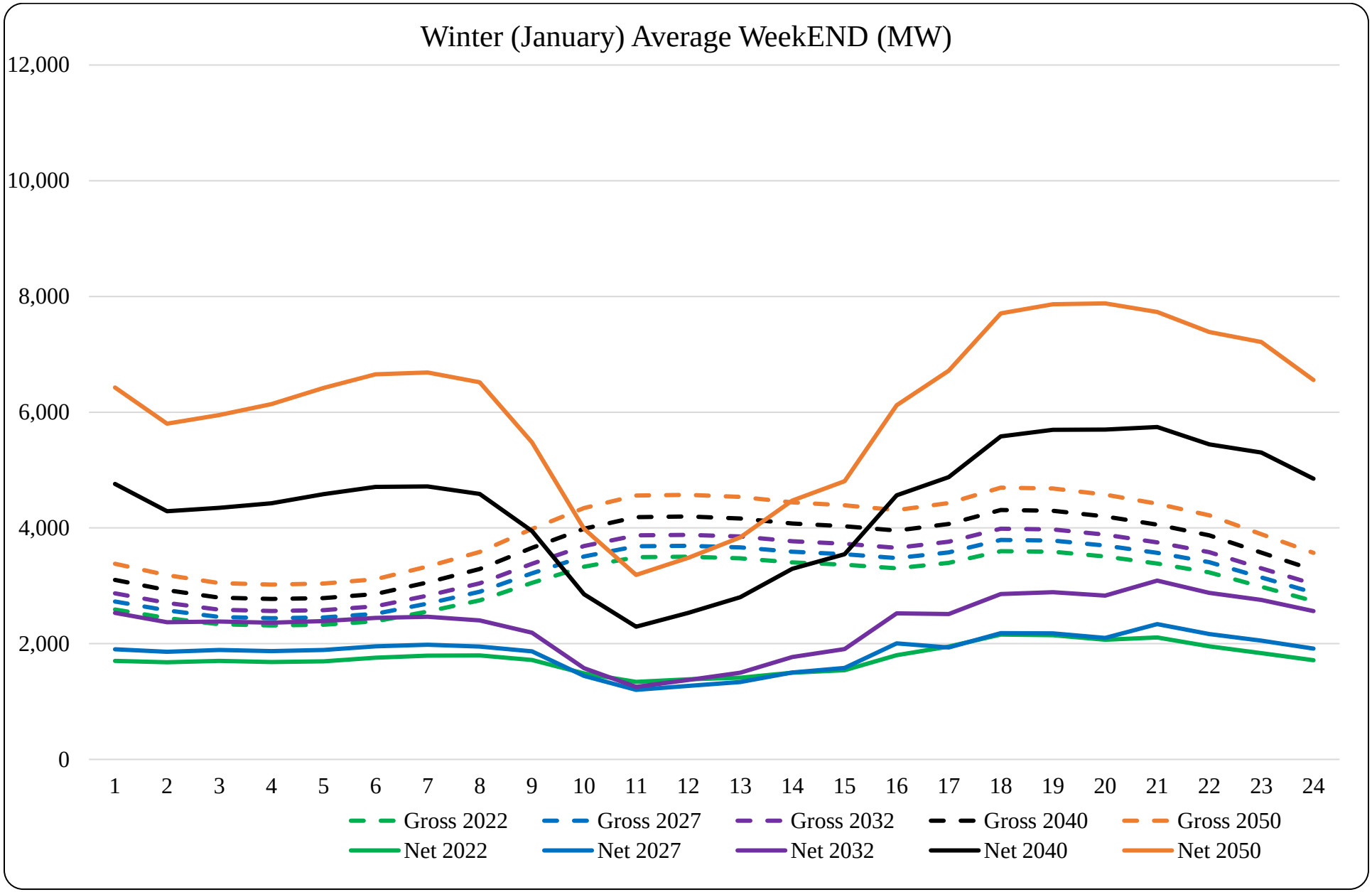

Summer (July) Average Weekday (MW)
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Gross 2022
Gross 2027
Gross 2032
Gross 2040
Gross 2050
Net 2022
Net 2027
Net 2032
Net 2040
Net 2050

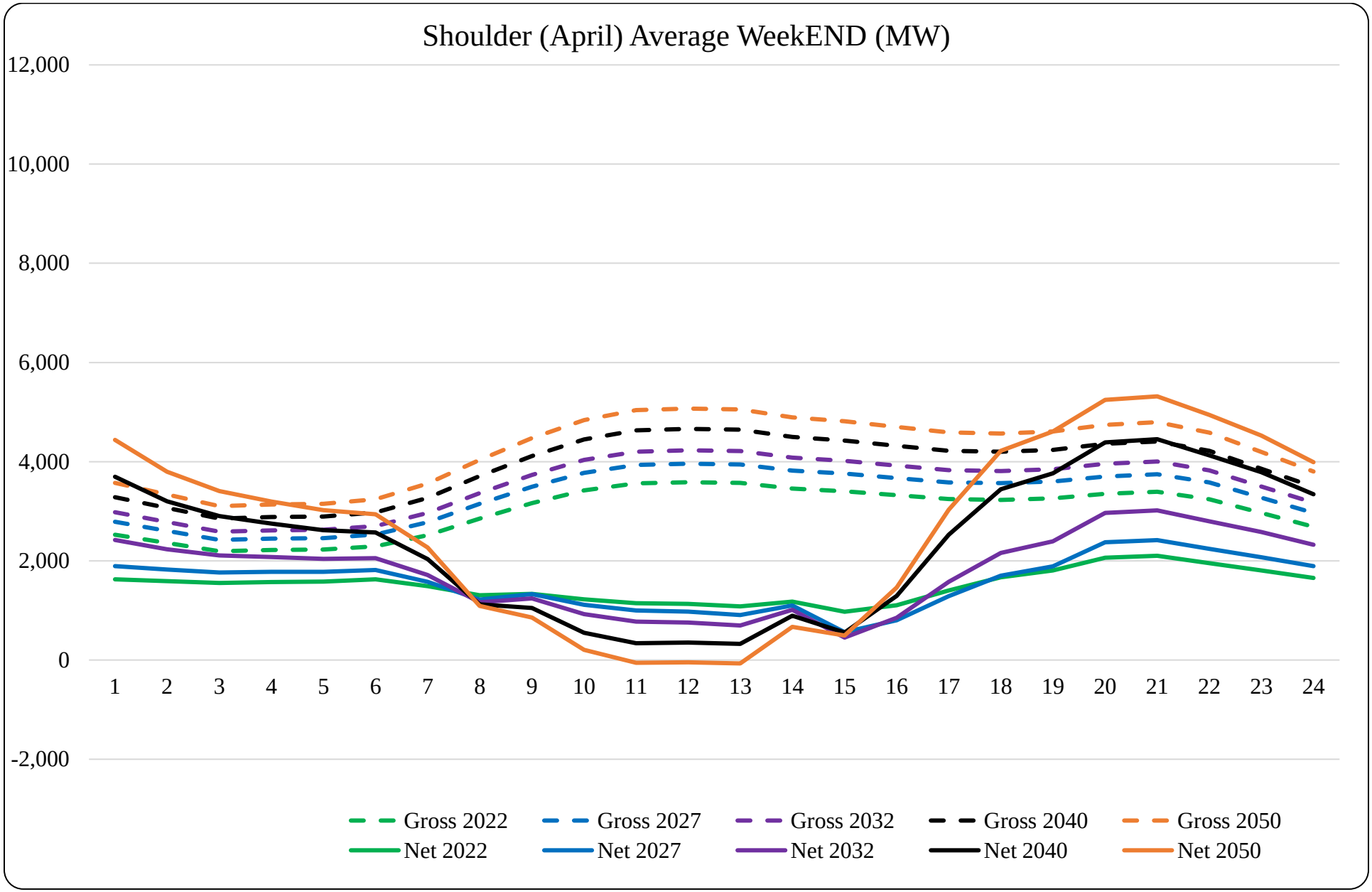

Winter (January) Average Weekday (MW)
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Gross 2022
Gross 2027
Gross 2032
Gross 2040
Gross 2050
Net 2022
Net 2027
Net 2032
Net 2040
Net 2050

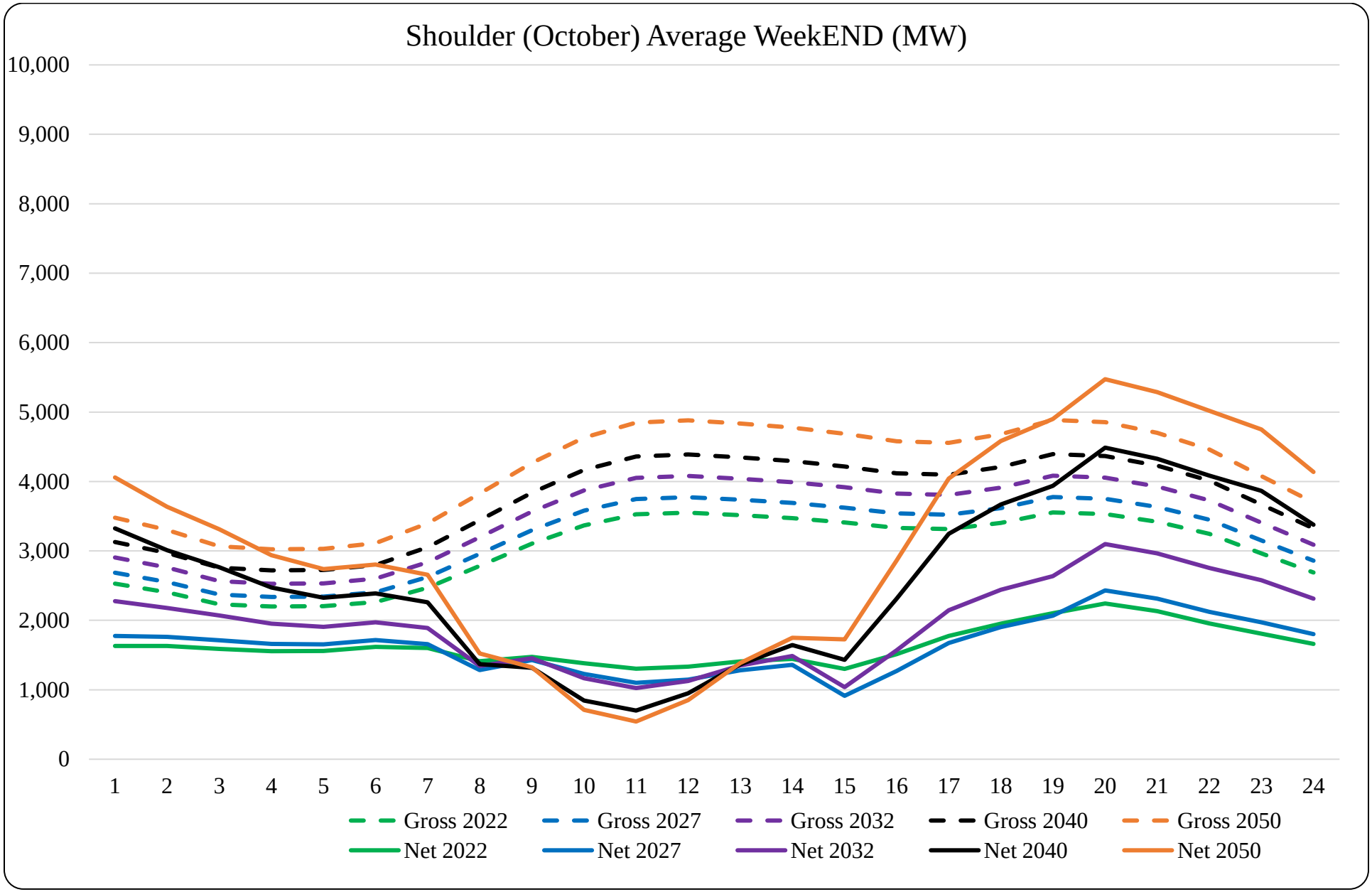

Shoulder (April) Average Weekday (MW)
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Gross 2022
Gross 2027
Gross 2032
Gross 2040
Gross 2050
Net 2022
Net 2027
Net 2032
Net 2040
Net 2050


Shoulder (October) Average Weekday (MW)
12,000
10,000
8,000
6,000
4,000
2,000
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Gross 2022
Gross 2027
Gross 2032
Gross 2040
Gross 2050
Net 2022
Net 2027
Net 2032
Net 2040
Net 2050


Summer (July) Average WeekEND (MW)
12,000
10,000
8,000
6,000
4,000
2,000
0
-2,000
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
Gross 2022
Gross 2027
Gross 2032
Gross 2040
Gross 2050
Net 2022
Net 2027
Net 2032
Net 2040
Net 2050


Winter (January) Average WeekEND (MW)
12,000
10,000
8,000
6,000
4,000
2,000
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Gross 2022
Gross 2027
Gross 2032
Gross 2040
Gross 2050
Net 2022
Net 2027
Net 2032
Net 2040
Net 2050

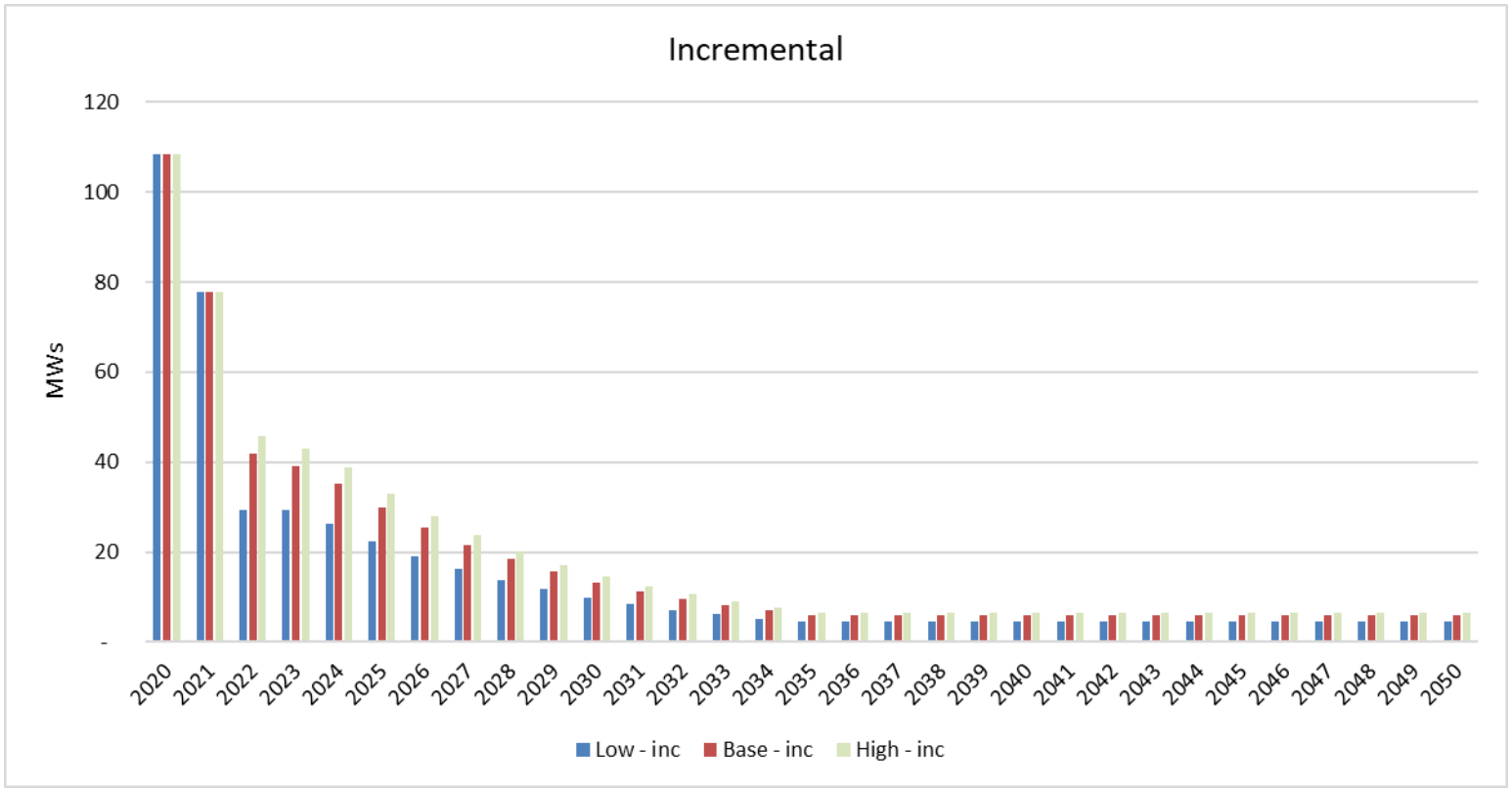

Shoulder (April) Average WeekEND (MW)
12,000
10,000
8,000
6,000
4,000
2,000
0
-2,000
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
Gross 2022
Gross 2027
Gross 2032
Gross 2040
Gross 2050
Net 2022
Net 2027
Net 2032
Net 2040
Net 2050

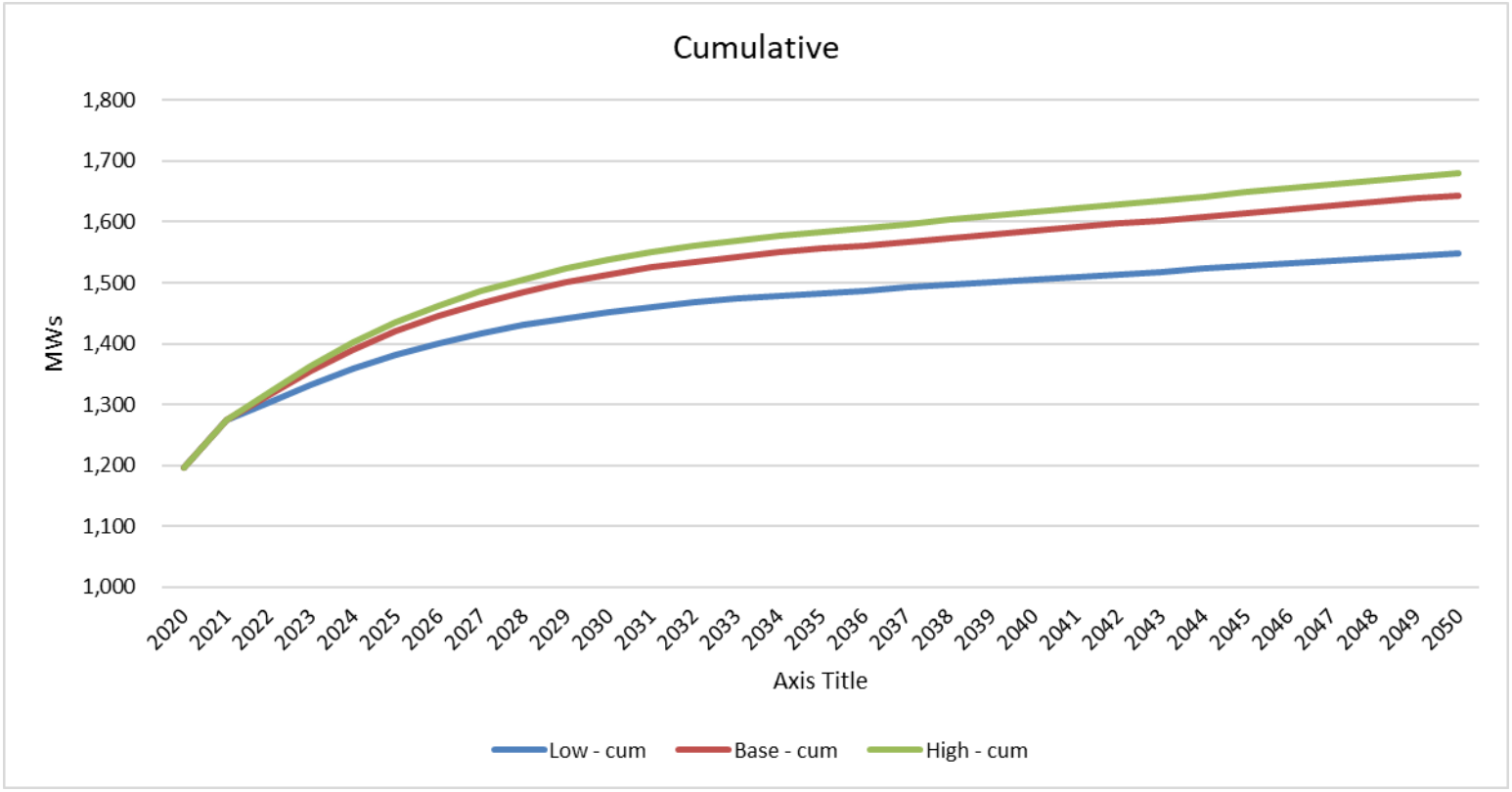

Shoulder (October) Average WeekEND (MW)
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Gross 2022
Gross 2027
Gross 2032
Gross 2040
Gross 2050
Net 2022
Net 2027
Net 2032
Net 2040
Net 2050

Appendix F: DER Scenarios Inputs

Energy Efficiency

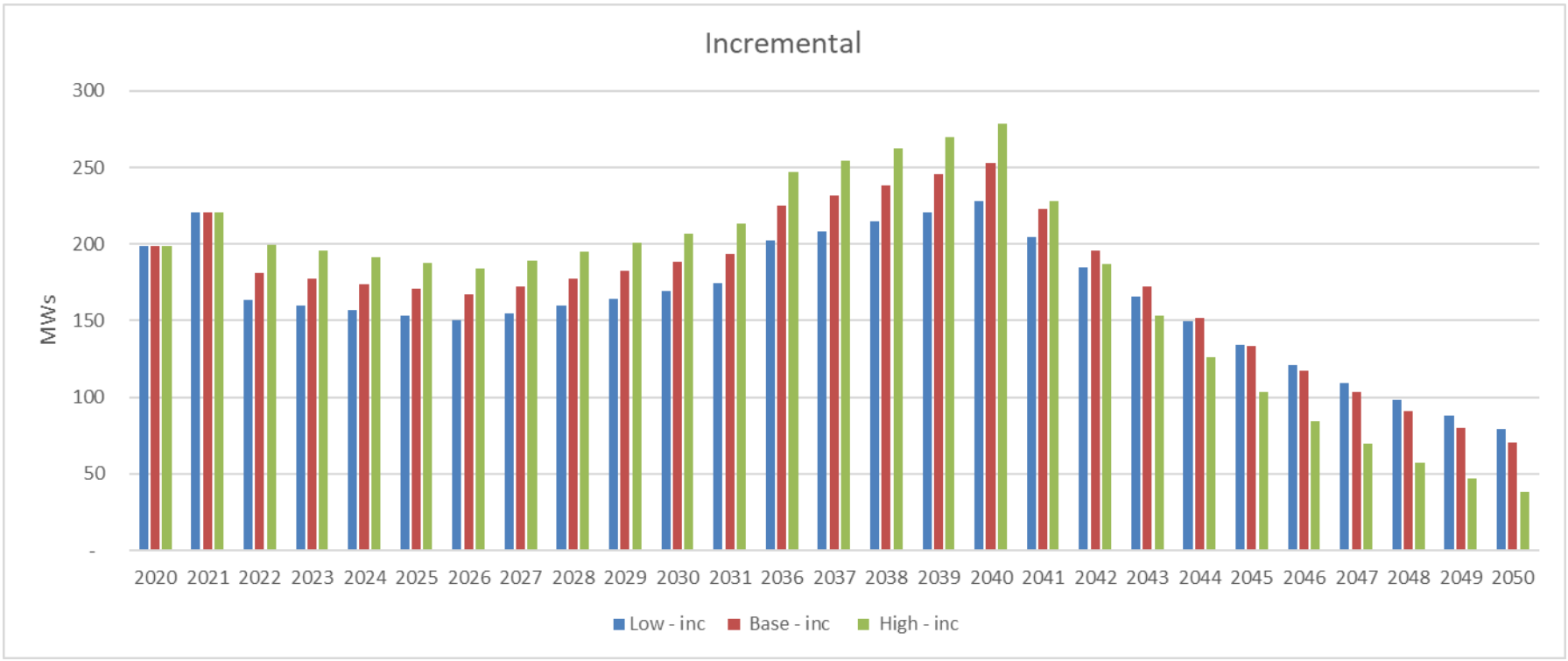
Summer Peak MWs						
Year	**Low - inc**	**Low - cum**	**Base - inc**	**Base - cum**	**High - inc**	**High - cum**
2020	108	1,196	108	1,196	108	1,196
2021	78	1,274	78	1,274	78	1,274
2022	29	1,303	42	1,316	46	1,320
2023	29	1,332	39	1,355	43	1,363
2024	26	1,359	35	1,390	39	1,401
2025	22	1,381	30	1,420	33	1,434
2026	19	1,400	25	1,445	28	1,462
2027	16	1,416	22	1,467	24	1,486
2028	14	1,430	18	1,485	20	1,506
2029	12	1,442	16	1,501	17	1,523
2030	10	1,452	13	1,514	15	1,538
2031	8	1,460	11	1,525	12	1,550
2032	7	1,468	10	1,535	11	1,561
2033	6	1,474	8	1,543	9	1,570
2034	5	1,479	7	1,550	8	1,577
2035	4	1,483	6	1,556	6	1,584
2036	4	1,488	6	1,562	6	1,590
2037	4	1,492	6	1,568	6	1,597
2038	4	1,496	6	1,573	6	1,603
2039	4	1,501	6	1,579	6	1,610
2040	4	1,505	6	1,585	6	1,616
2041	4	1,510	6	1,591	6	1,623
2042	4	1,514	6	1,597	6	1,629
2043	4	1,519	6	1,603	6	1,636
2044	4	1,523	6	1,609	6	1,642
2045	4	1,527	6	1,615	6	1,649
2046	4	1,532	6	1,620	6	1,655
2047	4	1,536	6	1,626	6	1,662
2048	4	1,541	6	1,632	6	1,668
2049	4	1,545	6	1,638	6	1,674
2050	4	1,549	6	1,644	6	1,681

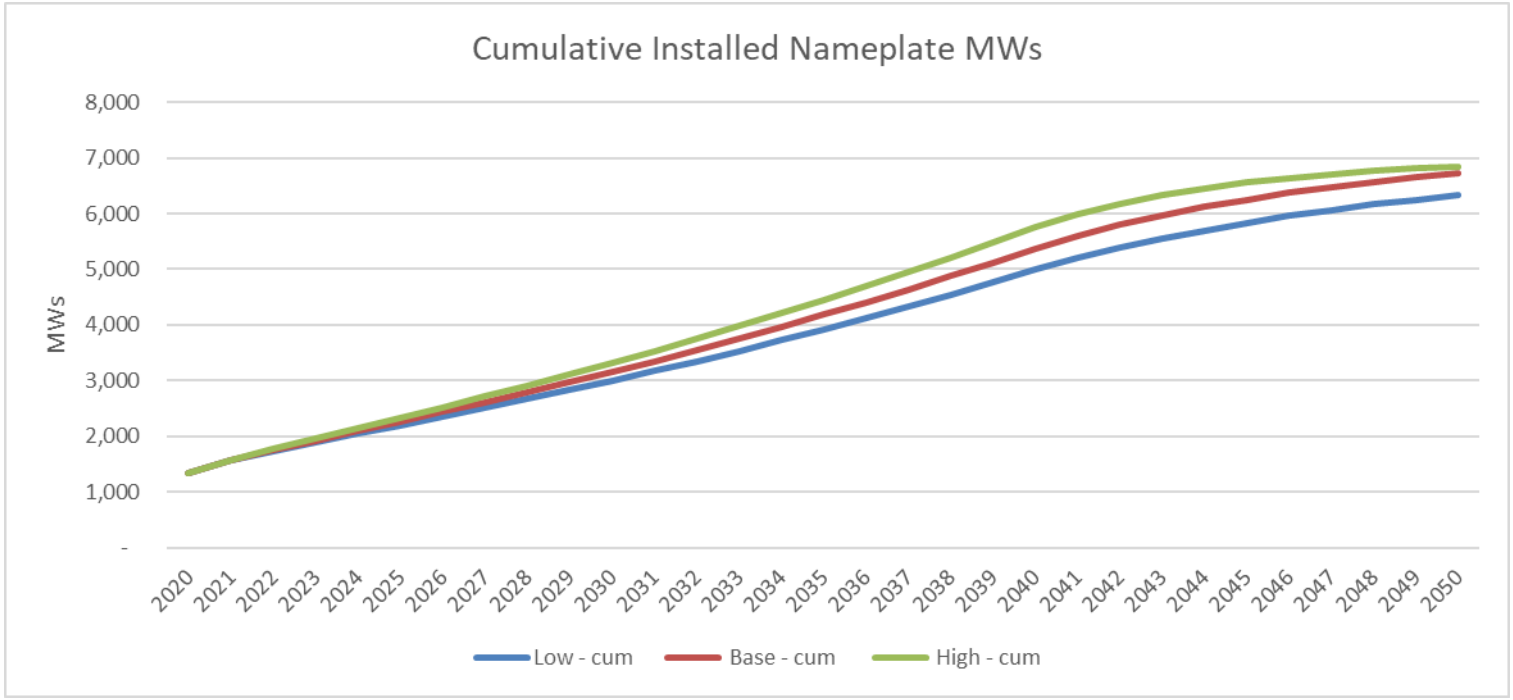

Incremental
120
100
80
60
40
20
-
MWs
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038
2039
2040
2041
2042
2043
2044
2045
2046
2047
2048
2049
2050
Low - inc
Base - inc
High - inc


Cumulative
1,800
1,700
1,600
1,500
1,400
1,300
1,200
1,100
1,000
MWs
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038
2039
2040
2041
2042
2043
2044
2045
2046
2047
2048
2049
2050
Axis Title
Low - cum
Base - cum
High - cum

Solar – PV

Connected Nameplated (MW)						
Year	**Low - inc**	**Low - cum**	**Base - inc**	**Base - cum**	**High - inc**	**High - cum**
2020	198	1,343	198	1,343	198	1,343
2021	221	1,564	221	1,564	221	1,564
2022	163	1,727	181	1,745	199	1,763
2023	160	1,887	178	1,923	195	1,959
2024	157	2,044	174	2,097	192	2,150
2025	154	2,197	171	2,268	188	2,338
2026	150	2,348	167	2,435	184	2,522
2027	155	2,503	172	2,607	189	2,711
2028	160	2,662	177	2,785	195	2,907
2029	164	2,827	183	2,967	201	3,108
2030	169	2,996	188	3,155	207	3,315
2031	174	3,171	194	3,349	213	3,528
2032	180	3,350	200	3,549	220	3,747
2033	185	3,536	206	3,755	226	3,974
2034	191	3,726	212	3,966	233	4,207
2035	196	3,923	218	4,185	240	4,447
2036	202	4,125	225	4,409	247	4,694
2037	208	4,333	231	4,641	255	4,948
2038	215	4,548	238	4,879	262	5,211
2039	221	4,769	246	5,125	270	5,481
2040	228	4,996	253	5,378	278	5,759
2041	205	5,201	223	5,600	228	5,987
2042	184	5,386	196	5,796	187	6,174
2043	166	5,552	172	5,969	153	6,328
2044	149	5,701	152	6,120	126	6,453
2045	134	5,835	133	6,254	103	6,557
2046	121	5,956	117	6,371	85	6,641
2047	109	6,065	103	6,474	69	6,711
2048	98	6,163	91	6,565	57	6,767
2049	88	6,251	80	6,645	47	6,814
2050	79	6,331	70	6,716	38	6,852

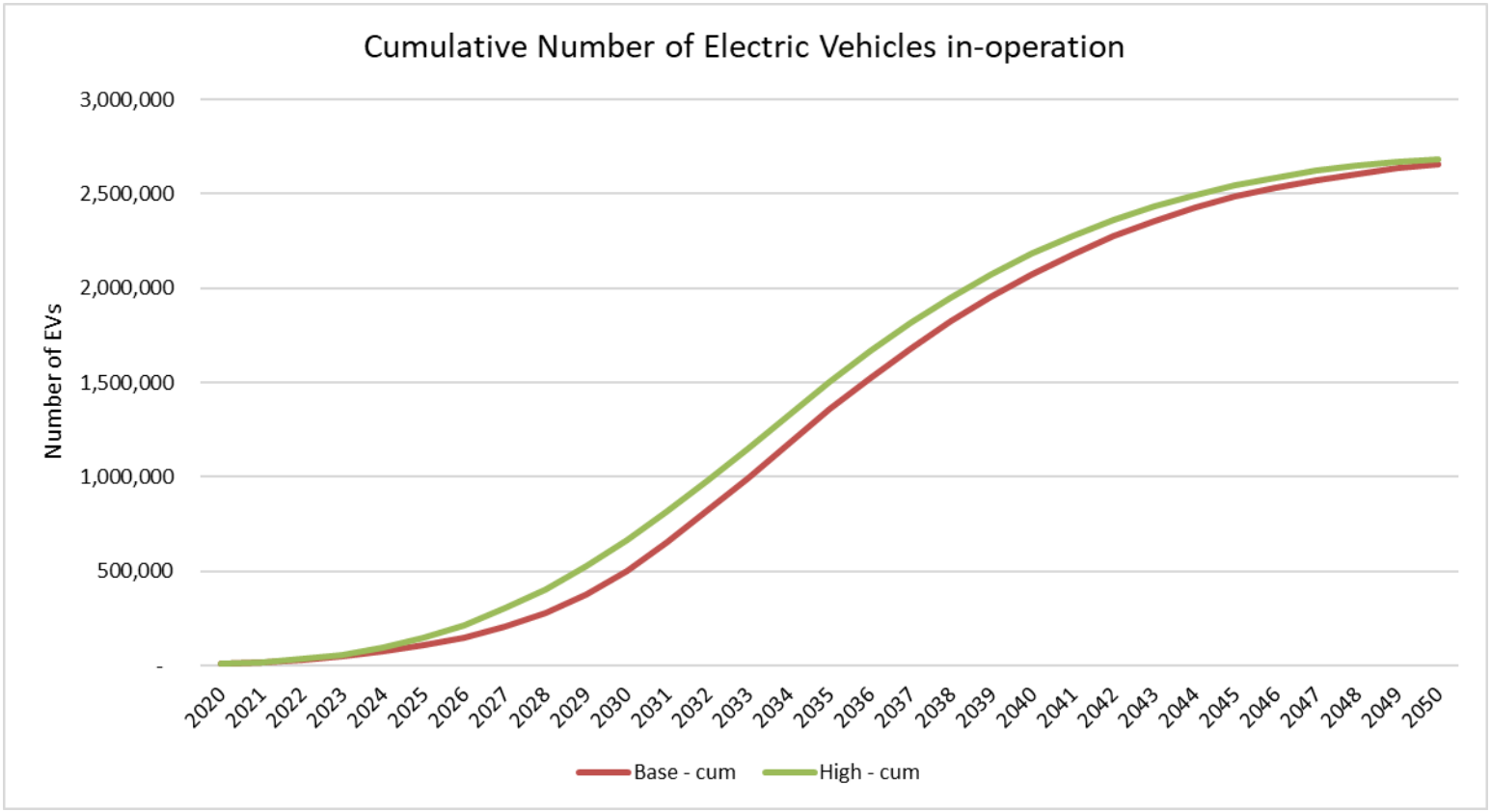

Incremental
300
250
200
150
100
50
-
MWs
2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046 2047 2048 2049 2050
Low - inc
Base - inc
High - inc


Cumulative Installed Nameplate MWs
MWs
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
-
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038
2039
2040
2041
2042
2043
2044
2045
2046
2047
2048
2049
2050
Low - cum
Base - cum
High - cum

Electric Vehicles

Number of Vehicles				
Year	**Base - inc**	**Base - cum**	**High - inc**	**High - cum**
2020	2,847	13,919	2,847	13,919
2021	6,142	20,061	6,142	20,061
2022	12,167	32,228	14,070	34,131
2023	18,114	50,342	23,526	57,657
2024	24,477	74,819	36,733	94,390
2025	31,825	106,644	50,992	145,382
2026	42,982	149,626	70,386	215,768
2027	56,567	206,193	87,180	302,948
2028	72,673	278,866	103,774	406,722
2029	99,610	378,476	120,208	526,930
2030	122,001	500,477	138,469	665,399
2031	154,503	654,980	152,589	817,988
2032	164,701	819,681	162,128	980,116
2033	174,313	993,994	170,987	1,151,103
2034	181,691	1,175,685	177,535	1,328,638
2035	180,911	1,356,596	175,869	1,504,507
2036	168,802	1,525,398	162,786	1,667,293
2037	156,537	1,681,935	149,366	1,816,659
2038	142,846	1,824,781	134,543	1,951,202
2039	129,592	1,954,373	120,300	2,071,502
2040	120,268	2,074,641	110,266	2,181,768
2041	105,159	2,179,800	94,944	2,276,712
2042	93,758	2,273,558	83,547	2,360,259
2043	81,759	2,355,317	72,299	2,432,558
2044	70,212	2,425,529	61,593	2,494,151
2045	59,261	2,484,790	51,486	2,545,637
2046	49,290	2,534,080	41,567	2,587,204
2047	40,301	2,574,381	33,298	2,620,502
2048	32,761	2,607,142	26,407	2,646,909
2049	26,486	2,633,628	20,769	2,667,678
2050	21,402	2,655,030	16,259	2,683,937

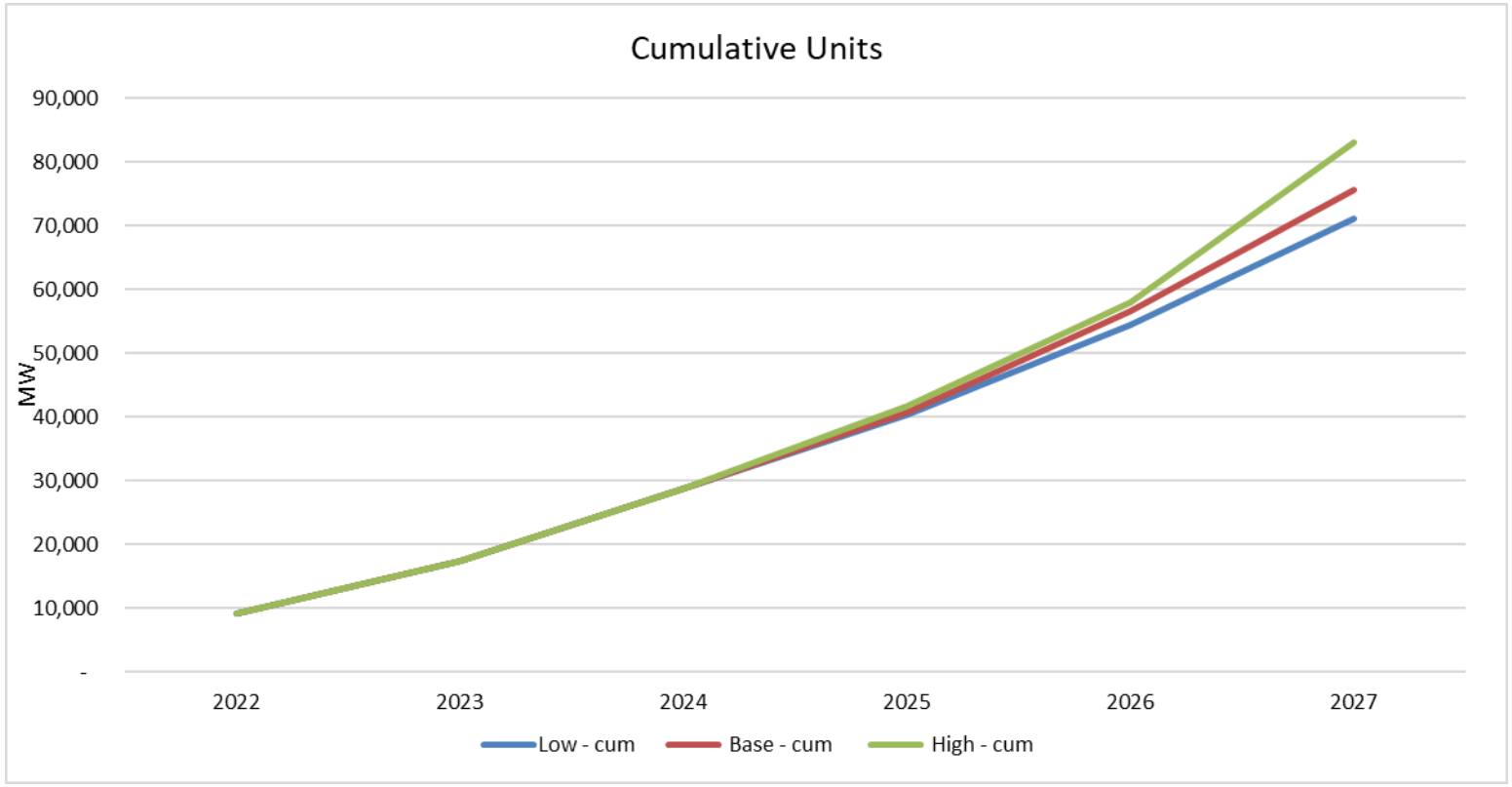
Number of Light-duty Vehicles				
Year	**Base - inc**	**Base - cum**	**High - inc**	**High - cum**
2020	2,840	13,912	2,840	13,912
2021	6,140	20,052	6,140	20,052
2022	12,165	32,217	14,068	34,120
2023	17,802	50,019	23,222	57,342
2024	24,060	74,079	36,308	93,650
2025	31,300	105,379	50,448	144,098
2026	42,353	147,732	69,717	213,815
2027	55,747	203,479	86,294	300,109
2028	71,427	274,906	102,402	402,511
2029	97,856	372,762	118,219	520,730
2030	119,746	492,508	135,841	656,571
2031	151,757	644,265	149,301	805,872
2032	161,624	805,889	158,343	964,215
2033	170,919	976,808	166,702	1,130,917
2034	178,068	1,154,876	172,837	1,303,754
2035	177,093	1,331,969	170,779	1,474,533
2036	164,815	1,496,784	157,338	1,631,871
2037	152,557	1,649,341	143,878	1,775,749
2038	138,905	1,788,246	129,048	1,904,797
2039	125,713	1,913,959	114,860	2,019,657
2040	116,478	2,030,437	104,919	2,124,576
2041	101,479	2,131,916	89,850	2,214,426
2042	90,134	2,222,050	78,793	2,293,219
2043	78,214	2,300,264	67,911	2,361,130
2044	66,764	2,367,028	57,592	2,418,722
2045	55,930	2,422,958	47,888	2,466,610
2046	46,092	2,469,050	39,107	2,505,717
2047	37,251	2,506,301	31,254	2,536,971
2048	29,852	2,536,153	24,708	2,561,679
2049	23,784	2,559,937	19,412	2,581,091
2050	18,910	2,578,847	15,233	2,596,324

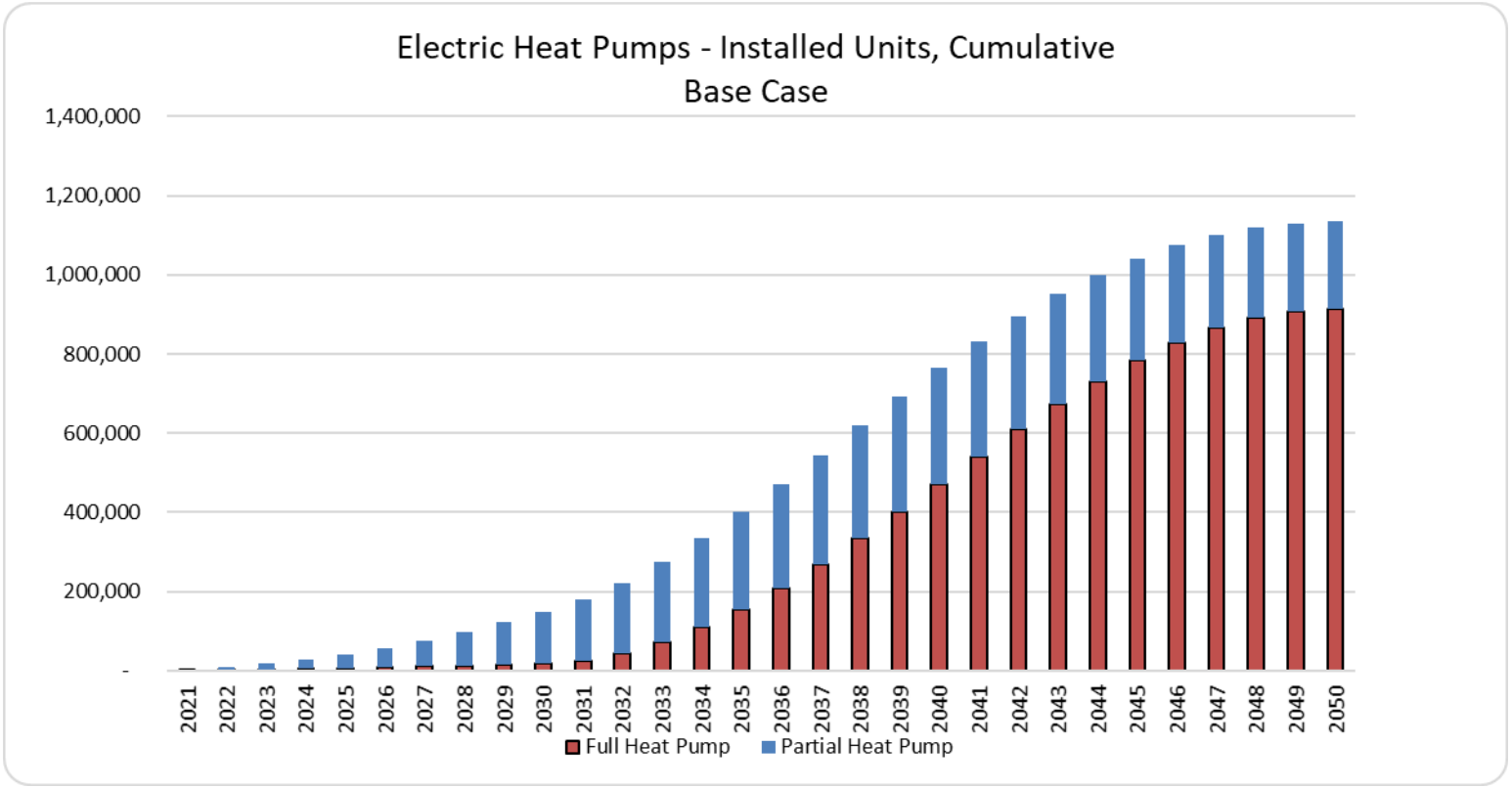

Cumulative Number of Electric Vehicles in-operation
Number of EVs
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
-
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038
2039
2040
2041
2042
2043
2044
2045
2046
2047
2048
2049
2050
Base - cum
High - cum

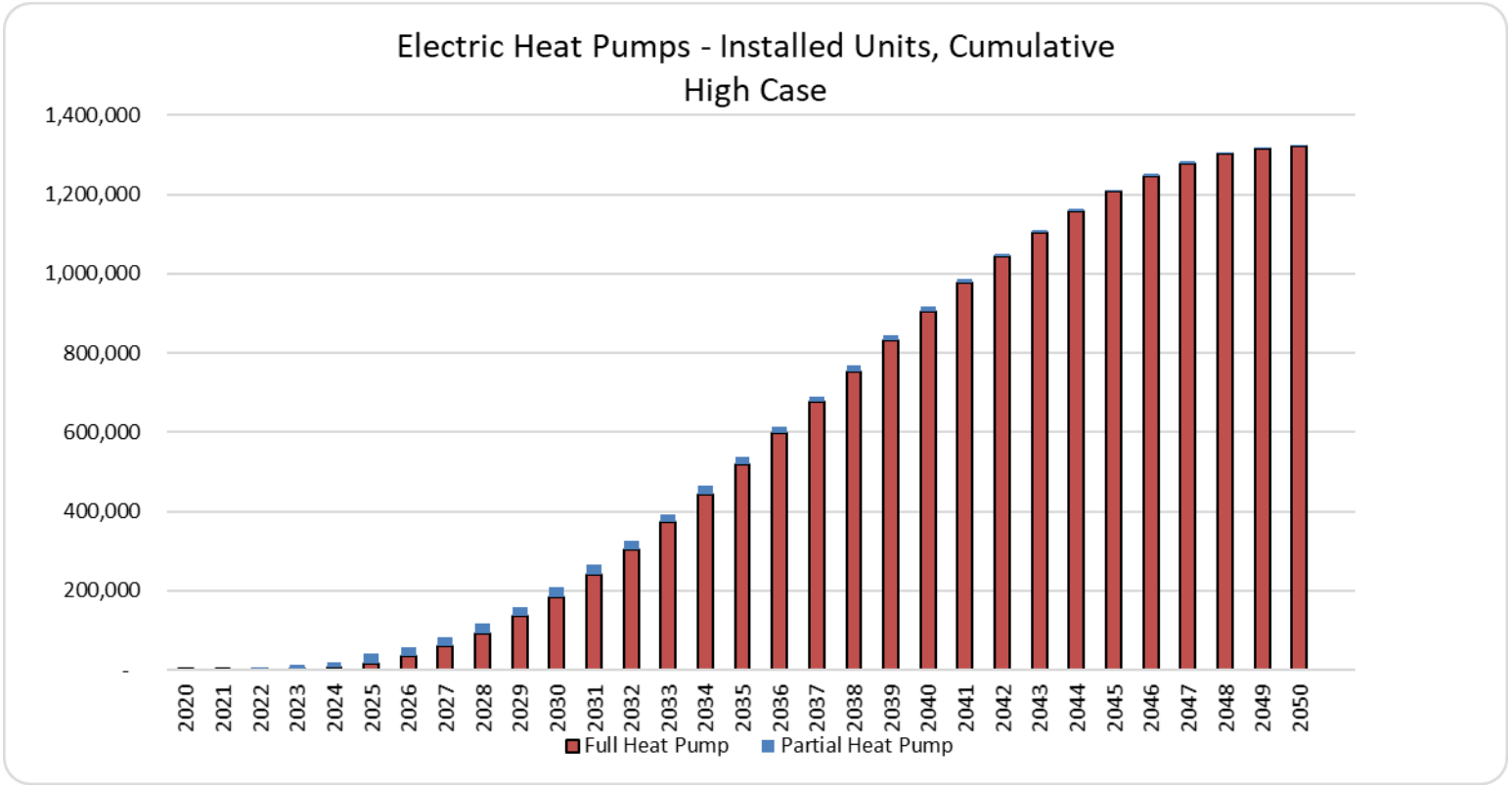
Electric Heat Pumps

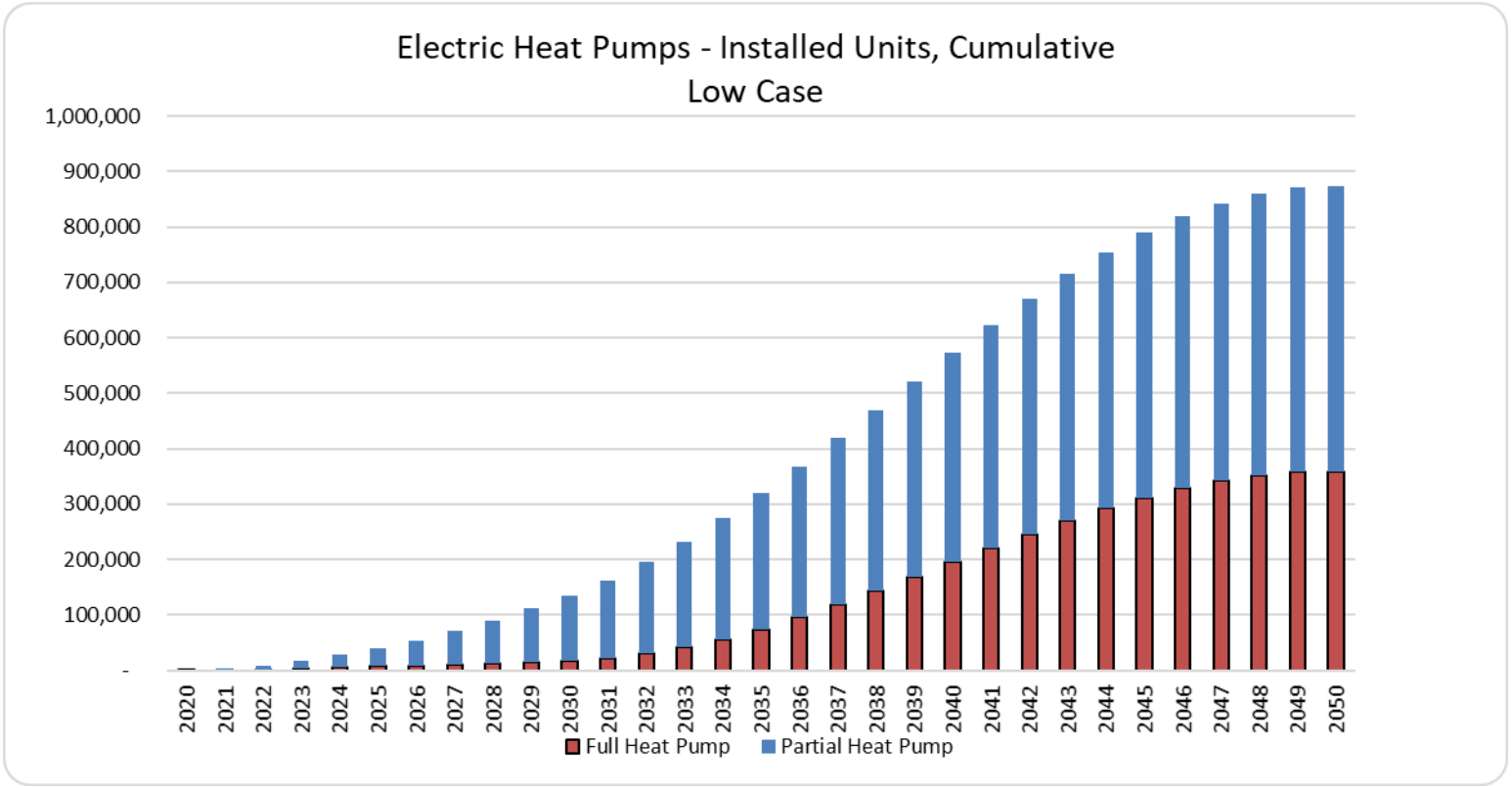
(Number of Electric Heat Pumps)

Year	Low - inc	Low - cum	Base - inc	Base - cum	High - inc	High - cum
2019	849	849	849	849	849	849
2020	1,515	2,364	1,515	2,364	1,515	2,364
2021	1,957	4,321	1,957	4,321	1,957	4,321
2022	4,782	9,102	4,782	9,103	4,782	9,103
2023	8,238	17,341	8,238	17,341	8,238	17,341
2024	11,452	28,792	11,452	28,792	11,452	28,792
2025	11,427	40,219	11,992	40,785	12,886	41,678
2026	14,184	54,403	15,748	56,533	16,272	57,950
2027	16,800	71,203	19,084	75,617	25,132	83,082
2028	19,243	90,446	21,897	97,514	33,633	116,715
2029	21,482	111,928	24,099	121,613	41,654	158,369
2030	23,491	135,420	25,618	147,231	49,081	207,450
2031	27,240	162,660	31,821	179,052	55,807	263,257
2032	32,611	195,271	42,482	221,534	61,736	324,993
2033	37,501	232,773	51,947	273,482	66,784	391,777
2034	41,809	274,581	59,993	333,475	70,879	462,655
2035	45,443	320,024	66,434	399,909	73,962	536,617
2036	48,324	368,349	71,130	471,039	75,989	612,606
2037	50,388	418,737	73,985	545,024	76,932	689,538
2038	51,585	470,321	74,954	619,978	76,777	766,315
2039	51,881	522,202	74,065	694,043	75,526	841,841
2040	51,261	573,464	71,371	765,414	73,197	915,038
2041	49,728	623,192	67,335	832,748	69,824	984,862
2042	47,301	670,493	62,198	894,946	65,454	1,050,316
2043	44,018	714,511	55,937	950,883	60,150	1,110,466
2044	39,935	754,446	48,906	999,789	53,988	1,164,454
2045	35,122	789,567	41,424	1,041,213	47,055	1,211,509
2046	29,664	819,231	33,748	1,074,961	39,451	1,250,960
2047	23,660	842,891	26,063	1,101,024	31,283	1,282,243
2048	17,219	860,110	18,474	1,119,499	22,670	1,304,913
2049	10,461	870,571	11,015	1,130,513	13,733	1,318,645
2050	3,509	874,080	3,659	1,134,172	4,599	1,323,245


Cumulative Units
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
-
MW
2022
2023
2024
2025
2026
2027
Low - cum
Base - cum
High - cum

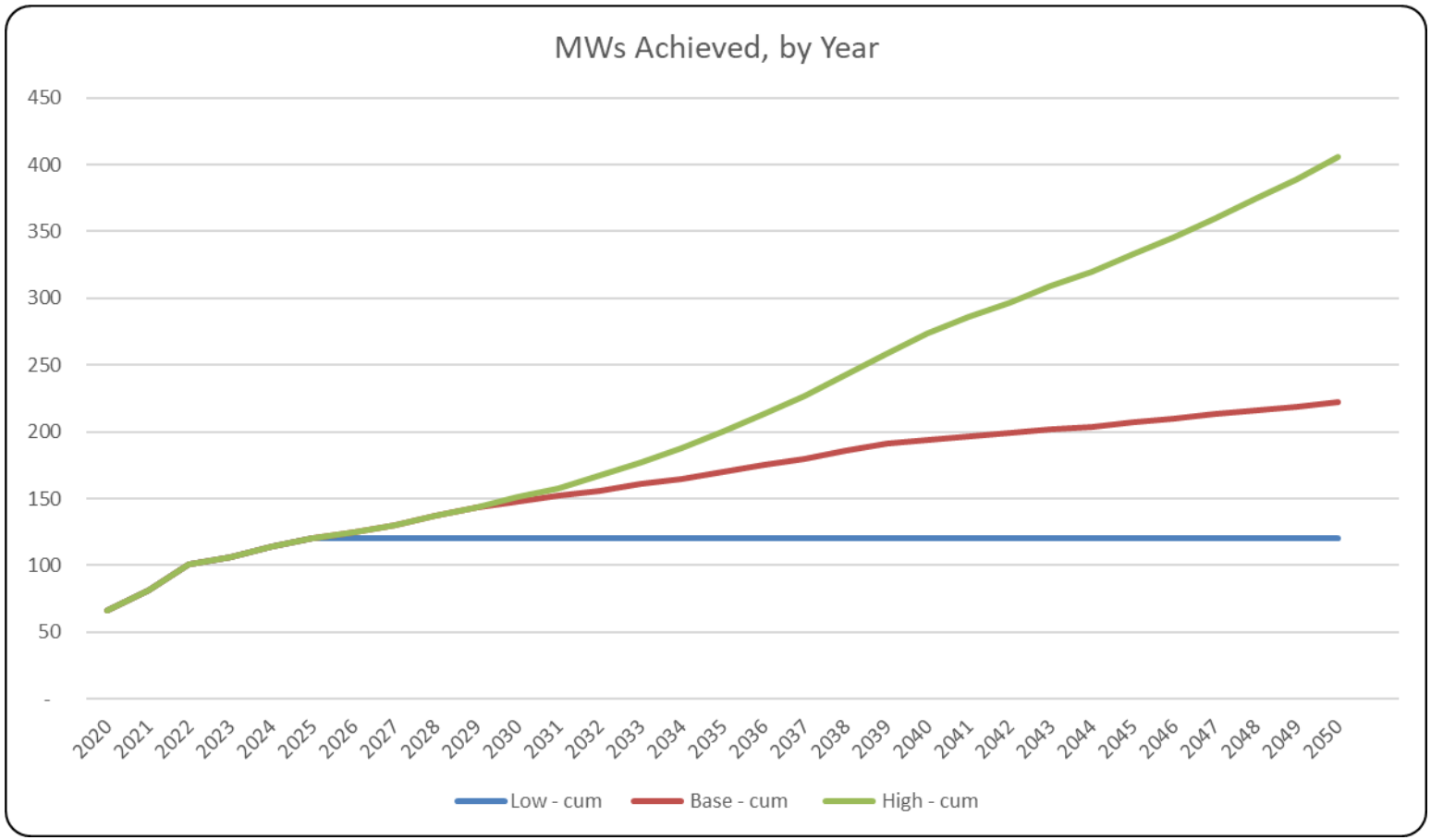

Electric Heat Pumps - Installed Units, Cumulative
Base Case
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
-
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038
2039
2040
2041
2042
2043
2044
2045
2046
2047
2048
2049
2050
Full Heat Pump
Partial Heat Pump


Electric Heat Pumps - Installed Units, Cumulative
High Case
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
-
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038
2039
2040
2041
2042
2043
2044
2045
2046
2047
2048
2049
2050
Full Heat Pump
Partial Heat Pump


Electric Heat Pumps - Installed Units, Cumulative
Low Case
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
-
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038
2039
2040
2041
2042
2043
2044
2045
2046
2047
2048
2049
2050
Full Heat Pump
Partial Heat Pump

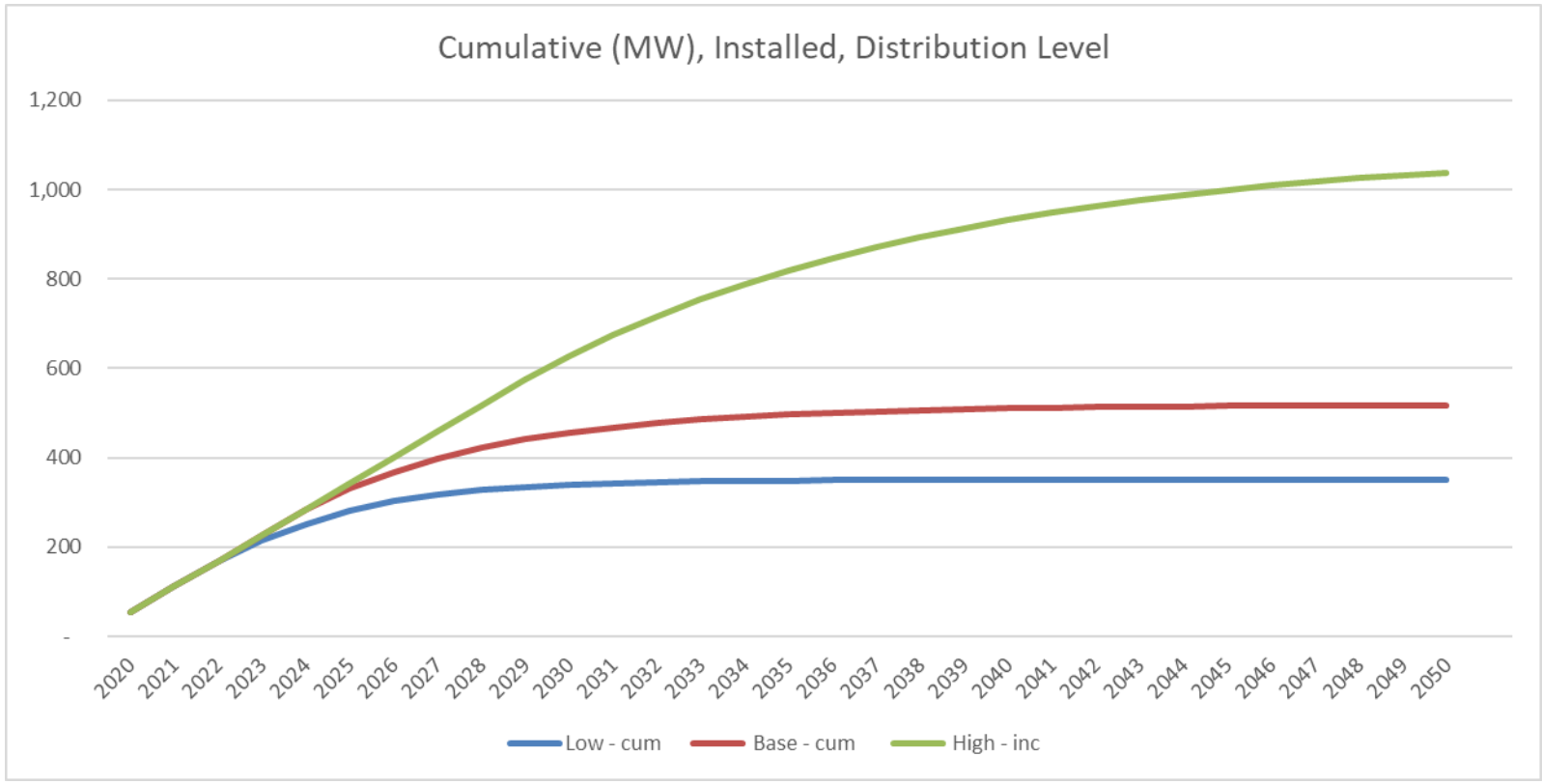
Demand Response

year	Low - cum	Base - cum	High - cum
2020	66	66	66
2021	81	81	81
2022	101	101	101
2023	106	106	106
2024	114	114	114
2025	120	120	120
2026	120	125	125
2027	120	130	130
2028	120	137	137
2029	120	143	143
2030	120	148	151
2031	120	152	158
2032	120	156	167
2033	120	161	177
2034	120	165	188
2035	120	170	200
2036	120	175	213
2037	120	180	227
2038	120	186	243
2039	120	191	259
2040	120	194	274
2041	120	197	286
2042	120	199	297
2043	120	202	309
2044	120	204	320
2045	120	207	333
2046	120	210	346
2047	120	213	360
2048	120	216	375
2049	120	219	389
2050	120	222	406


MWs Achieved, by Year
450
400
350
300
250
200
150
100
50
-
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038
2039
2040
2041
2042
2043
2044
2045
2046
2047
2048
2049
2050
Low - cum
Base - cum
High - cum

Energy Storage

year	Low - inc	Low - cum	Base - inc	Base - cum	High - inc	High - cum
2020	30	53	30	53	30	53
2021	58	111	58	111	58	111
2022	58	169	58	169	58	169
2023	46	215	58	227	58	227
2024	37	252	58	285	58	285
2025	30	282	46	331	58	343
2026	21	303	37	368	58	401
2027	15	318	30	398	58	459
2028	10	328	24	422	58	517
2029	7	335	19	441	58	575
2030	5	340	15	456	52	627
2031	3	343	12	468	47	674
2032	2	345	10	478	42	716
2033	2	347	8	486	38	754
2034	1	348	6	492	34	788
2035	1	349	5	497	31	819
2036	1	350	4	501	28	847
2037	-	350	3	504	25	872
2038	-	350	3	507	22	894
2039	-	350	2	509	20	914
2040	-	350	2	511	18	932
2041	-	350	1	512	16	948
2042	-	350	1	513	15	963
2043	-	350	1	514	13	976
2044	-	350	1	515	12	988
2045	-	350	1	516	11	999
2046	-	350	-	516	10	1,009
2047	-	350	-	516	9	1,018
2048	-	350	-	516	8	1,026
2049	-	350	-	516	7	1,033
2050	-	350	-	516	6	1,039


Cumulative (MW), Installed, Distribution Level
1,200
1,000
800
600
400
200
-
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038
2039
2040
2041
2042
2043
2044
2045
2046
2047
2048
2049
2050
Low - cum
Base - cum
High - inc

Appendix G: DER Scenarios Development

Persistent and non-persistent savings are differentiated to correctly account for the accumulation of claimable savings over time. Non-persistent savings from behavioral programs like the home energy report do not accumulate over time. Home energy report savings are assumed to remain at the same level for each year of the planning cycle across all three cases. Savings from persistent programs do accumulate over time (i.e. lighting programs).

All EE savings are in adjusted gross terms.

Any savings from heat pumps and demand response programs are removed as they are projected separately.

Base

- The Company annual plans from the Subject Matter Experts (SMEs) are used for the short-term through 2024.
- Post-2024, the cumulative value of persistent EE savings is still expected to continue to grow but at a slower rate each year. The residential savings growth rate slows by 15% annually to account for saturation of claimable savings until 2035 and stays flat thereafter until 2050 whereas the commercial savings growth rate slows by 5% annually until 2050.

High

- For 2021, the incremental EE is equal to the base case and reflects the Company's annual plan.
- Post 2021, a declining annual incremental EE assumption is applied to the 2021 incremental commercial savings. The rate is at 5% to model a slower decline in claimable persistent savings. For residential savings, the incremental is 110% of the base case incremental savings value.

Low

- For 2021, the incremental EE is equal to the base case and reflects the Company's annual plan.
- Post-2021, incremental savings for residential and commercial from traditional EE programs are 75% of base case. This is the result of both rising EE baselines leading to lower levels of claimable savings and the shifting of resources to electrification of heat programs.

Solar -PV

Base

- The near-term prediction is based on the recent historical trend and SME's outlook on applications in the Company's queue and the assumption that National Grid will fill its share (i.e., 45%23) of the State's existing solar standards of 3.2 GW24 by mid 2020s.
- In the longer-term, continuous growth is projected in order to achieve the National Grid's share (i.e., 45%) of the State policy target under the All Options scenario as stated in its 2050 decarbonization roadmap25. The All Options scenario targets a 6.99 GW of behind-the-meter (BTM) PV connection and a 16.2 GW of ground-mounted PV connection by 2050 for the State of Massachusetts. In this base case, it is assumed that all the BTM PV and 50% of the ground-mounted PV will be on the distribution system. It is then assumed that the Company will take its share of these. Thus, about 3.1 GW (6.9 GW * 100% * 45%) of BTM PV and 3.6 GW (16.2 GW * 50% * 45%) of ground-mounted PV are projected to be on the Company's distribution system by 2050.

High

- The near-term predictions are based on the SME's outlook for a stretching target and the assumption that the Company will achieve its estimated share of the State's existing solar standards at an earlier year than in the base case.
- In the longer term, the high case assumes the Company achieves its estimated share of the policy target of the All-Option scenario at a slightly early year.

Low

- The near-term predictions are based on the SME's outlook for a moderate connection case and the assumption that the Company will achieve its estimated share of the State's existing solar standards at a slightly later year than in the base case.
- In the longer term, the low case estimates the Company may achieve its estimated share of the policy target of the All-Option scenario at a slightly later year.

[23] 45% was the share for National Grid when the SMART program opened. It was the percentage of customers National Grid serves in the State of Massachusetts compared with Eversource and Unitil. This same share is assumed for calculating National Grid share of the State's existing and planned solar goals.
[24] *MA Clean Energy and Climate Plan for 2030*, page 68, June 2022.
[25] *Massachusetts 2050 Decarbonization Roadmap*, December 2020

Electric Vehicles

Light-duty Vehicles

Base

The base case is developed around California's Advanced Clean Car II (ACC-II)26 rules, which are expected to be adopted by Massachusetts. In the near-term, the zero-emission vehicle share of light-duty vehicle (LDV) sales is created based on the techno-economic potential and current market trends. In the medium-term (2026 -2030), the ACC-II rules have a range of possible outcomes, so the zero-emission vehicle sales share rises in line with the "flexibilities"27 (or lower-bound) of what the ACC-II rules require, reaching 59.5% in 2030. In the longer term (2031 and onward), zero emission vehicle sales match the ACC-II rules and reach 100% zero emissions vehicles in 2035 (and assume no more than 20% plug-in hybrid electric vehicles). Vehicle scrap is assumed based upon market data to develop the net EV in-operation numbers.

High

The high case is developed based upon the upper-bound of ACC-II rules for both near and long terms in which the zero-emission vehicle share of LDV sales is estimated to achieve 68% by 2030 and 100% by 2035.

Low

The low case is the same as the base case in terms of zero-emission vehicle sales share and growth rate, following the lower-bound of ACC-II rules in the near term, and trending to the upper-bound of ACC-II rules in 2026 and onward. It differs, however, from the base case in the EV charging profiles. While unmanaged charging is considered for the base case, the managed charging profile to mitigate the EV load impact on the peak demand is considered in the low case. For managed charging, it is assumed that 75% of the light-duty EV (LDEV) owners have access to the home chargers, and 75% of those do not charge their vehicles at home during the peak hours (4PM to 10PM). Away-from-home charging is assumed to continue unmanaged.

Medium-duty and Heavy-duty Vehicles, and E-buses

Base

The base case for the adoptions of medium-duty EV (MDEV), heavy- duty EV (HDEV) and E-buses is based on the California's Advanced Clean Trucks (ACT)28 rules through 2035 which have been adopted by the state. In the base case, the sales shares for MDEV, HDEV, and E-buses are estimated to be about 63%, 40%, and 75% of MDV, HDV, and buses, respectively, by the end of 2035. To extend the forecast until 2050, a similar growth rate is considered from 2036 to 2040, and after that 3% growth

[26] https://ww2.arb.ca.gov/rulemaking/2022/advanced-clean-cars-ii, retrieved September 2022

[27] Flexibilities include provisions to transfer ZEV "sales values" across all states that have adopted the regulations (e.g., a manufacturer can overachieve in California and underachieve elsewhere), provisions to sell affordable EVs in environmental justice areas, and using historical ZEV sales credits to meet the annual ZEV sales targets. All of the flexibilities provided in the rules expire by or before 2031.

[28] https://ww2.arb.ca.gov/our-work/programs/advanced-clean-trucks, retrieved September 2022

in sales share is assumed through 2050. That leads to 100%, 80%, and 100% sales shares for MDEV, HDEV, and E-Buses by the end of the forecast horizon, respectively.

High

The high case reflects an accelerated adoption rate. It is built on the base case where each year is multiplied by a growth factor. The growth factor is created to show 2% more increase in the sales share than the previous year until 2027. It will then increase to 3% through the end of the forecast horizon. That results in 85%, 54% and 100% sales shares for MDEV, HDEV, and E-Buses, respectively, by the end of 2035. All three sales shares reach to 100% by 2050.

Low

The low case is intended to show a slower growth rate than the base case. It is created based upon Bloomberg New Energy Finance's (BNEF) 2022 Electric Vehicle Outlook, which projects the MDEV, HDEV, and E-Buses in-operation shares through 2040. To extend the forecast until 2050, the Company extended the trend in the growth of EV sales for each vehicle type. The estimated vehicle-in-operation (VIO) shares for MDEV, HDEV, and E-Buses are about 14%, 18% and 63% by the end of 2035, respectively. The shares will increase to 51%, 63%, and 100% for MDEV. HDEV, and E-Buses by the end of the forecast horizon, respectively.

Combined forecasts

The overall base EV case is created by combining the base cases for LDEV, MDEV, HDEV, and E-buses. The overall high EV case combines the high case for LDEV, MDEV and HDEV and high E-bus case. The overall low EV case combines the low cases for LDEV, MDEV, HDEV, and E-buses.

Electric Heat

The three scenarios assume that the Company will meet the approved heat pump targets for the years 2022 to 2024.

Base Case:

Post 2024, the company assumes that Company's pro rata share of CECP PHASED pathway's target in 2050 will be met29. Thus, about 1.34 million of units will be installed by 2050 and about 80% of those will be installed as full applications. Penetration rates are expected to be about 86% of residential homes and 58% of commercial space heating capacity.

High Case:

Post 2024, the company assumes that Company's pro rata share of CECP Full Electrification pathway's target in 2050 will be met. In this case, the company would expect about 1.56 million full application heat pump installations by that year. This could represent the about 97% of penetration of all residential home and 88% of commercial space heating capacity in the commercial sector.

Low Case:

Post 2024, the company assumes that Company's pro rata share of CECP HYBRID pathway's target in 2050 will be met That would mean that about 1.03 mill. of heat pumps will be expected by 2050. The percentage of full applications in this scenario is lower than in other scenarios or 40% for the residential sector and 60% for the commercial sector.

[29] *Massachusetts Clean Energy and Climate Plan for 2025 and 2030*, June 2022

Demand Response

Base Case:

For the short term (i.e. until 2024), he forecast represents the projections developed by the Company's demand response SME. the approved Company targets from the SME Program Administrator for DR is used as the projection. Post year 2024, most technologies will growth annually at a decreasing rate. The annual average growth is approximately 2.5% over the forecast horizon[30].

High Case:

The high case is a continued incremental growth following the approved program years. Beginning in year 2025, most technologies will growth annually at a decreasing rate. The annual average growth is approximately 5.0% over the forecast horizon[33].

Low Case:

For the short-term, the approved Company targets from the SME Program Administrator for DR is used as the projections. Post year 2024, no additional incremental MW are added. It is assumed that the program's market potential is at its maximum and the projections are held constant through year 2050

[30] Exception: C&I Peak Savings is fixed for the entire forecast period at the 2022 level

Energy Storage

Base Case:

It was assumed that the Company would make a share of the statewide energy storage policy goals. In Massachusetts, the state policy is 1000 MWh by 202531. For summer peak impacts this is first converted to a MW equivalent using a four to one charging to peak output factor. Thus, the 1000 MWh target is about 250 MW. Only a portion of these is at the distribution level and will lower the load forecast (the remainder being considered supply by the ISO-NE and not considered in this load forecast). Based on the amount of energy storage installed in the state as of 2021, about 36.5% is considered distribution level and thus load reducing.

Based on this the storage targets considered load reducing are lowered to 92.5 MWs (37% * 250) by year 2025. The Company's share of storage as in the state as of this year is about 78%. This is assumed to persist through year 2025. Thus, it is assumed that the year 2025 target for the Company is 72.15 MW (78% * 150). Not all energy storage will help to reduce the Company's summer peaks. A number of customers may use their storage to serve their own needs and times. It is assumed that only 85% of the installed energy storage amounts will impact the peak load. Thus, the final year 2025 target for peak reducing storage is 61.3 MW (85% * 72.15).

Current proposed forecast projects 282 MW (low case), 331 MW (base case) and 343 MW of energy storage by 2025 in the company' service territory. All projections are well above the inferred company's share in the state 2025 goal.

Massachusetts does not currently have explicit energy storage targets beyond year 2025. However, the state has published two studies, one the Clean Energy and Climate Plan for 2030 (CECP) and two the "Energy Pathways to Deep Decarbonization 2050". In the 2050 document, there are several scenarios that can guide the state to meeting its year 2050 long-term Climate goals. For example, by the year 2050, the "All options" scenario implies about 3,000 MW of large-scale energy storage (generation), "100% Renewable" scenario implies about 4,000 MW and the "No thermal" scenario implies 12,000 MW32.

The company used those inferred long-run energy storage capacity to provide a context to its long-term forecast at the distribution level. In order to do that, the company made two assumptions in the long run: (a) the company 'share of energy storage in the state will approximate the company's load share in the state (45%) and (b) more energy storage will move towards the supply side and less new storage as distribution level load reductions. The longer-term distribution share is assumed to drop to 20% (vs. 37% now). By using these assumptions, the current company's long term energy storage installed capacity forecast in 2050 will relate to the different pathways from "Energy Pathways to Deep Decarbonization 2050 as follows: the low case forecast of 351 MW will be close to the "All Options" scenario, the base case forecast of 516 MW will be between "All Options" and "100% renewable" scenarios and finally, the high case forecast of 1,040 MW will be between "100% Renewables" and "No Thermal" scenarios, but closer to the later.

[31] https://www.mass.gov/info-details/esi-goals-storage-target

[32] *Energy Pathways to Deep Decarbonization. A Technical Report of the Massachusetts 2050 Decarbonization RoadMap*. Page 61, December 2020

Finally, it is assumed the long-term peak reducing estimate will remain at 85% (85% is based on similar findings in New York which have significant pricing signals during peak hours). For the base case scenario, this lowers the final target to 439 MW by year 2050 (85% * 516).

The actual projections for installed energy storage are as follows. As of the end of year 2021 there was about 111 MW installed in the Company's service territory, about 58 MW of which was installed in the year 2021 alone. The base case assumes a continuation of this 58 MW per for the next three years, before assuming some saturation. Saturation is assumed to be 20% less per year for each subsequent year forward. This puts the Company on a path to easily surpass both the year 2025 and year 2050 targets determined above. Thus, it can be said that the Company is on-target for the CECP 2030 goals for this DER.

High Case:

The high case is similar to the base case, however, the 58 MW per year of new installations continues to year 2030. Then, saturation is assumed to be 10% less per year for each subsequent year forward up to 2050.

Low Case:

The low case assumes that saturation begins in 2023 already and at level of 20-30% less new installations each year. It is noted that this drop-off may not necessarily mean that total energy storage installations are dropping off, but instead that more have moved from the distribution level (which is the focus of this forecast) to the bulk system, supply side (which would not be included in this forecast).