

2024 Final Draft Energy and Seasonal Peak Forecasts

Reliability Committee



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Today's Presentation

- Provide the Reliability Committee (RC) with a summary of the long-term energy and demand forecasts that will be published in the 2024 Capacity, Energy, Loads, and Transmission (CELT) report



Acronyms

- ASHP Air-Source Heat Pump
- BEV Battery Electric Vehicle
- BTM PV Behind-the-Meter Photovoltaic
- CAGR Compound Annual Growth Rate
- CDD Cooling Degree Days
- CELT Capacity, Energy, Loads, and Transmission Forecast
- CSO Capacity Supply Obligation
- DGFWG Distributed Generation Forecast Working Group
- EE Energy Efficiency
- EEFWG Energy Efficiency Forecast Working Group
- EV Electric Vehicle
- HP Heat Pump
- LFC Load Forecast Committee
- LDV Light-Duty Vehicle
- MAPE Mean Absolute Percent Error
- PAC Planning Advisory Committee
- PDR Passive Demand Resource
- PRD Price Responsive Demand
- WTHI 3-day Weighted Temperature-Humidity Index

Introduction

- The ISO annually develops 10-year forecasts of energy and demand that are published as part of the [Capacity, Energy, Loads, and Transmission \(CELT\) report](#)
- An overview of the [ISO's methodology](#) for developing the 10-year load forecast was given at the September 22, 2023 Load Forecast Committee (LFC) meeting
- Final forecasts will be published in the 2024 CELT Report

CELT 2024 Load Forecast Timeline

Working Group and Committee Meetings

- Load Forecast Committee (LFC)
 - September 22, 2023 – [Forecast methodology review](#), [summer peak review](#)
 - December 8, 2023 – [Moody's November economic forecast](#), [update on heating electrification forecast](#), [update on transportation electrification forecast](#)
 - January 12, 2024 – [draft heating electrification forecast](#), [draft transportation electrification forecast](#), [update on EV managed charging](#)
 - February 23, 2024 – [Draft annual energy and seasonal peak demand forecasts](#)
 - March 28, 2024 – [Final draft annual energy and seasonal peak forecasts](#)
- Distributed Generation Forecast Working Group (DGFWG)
 - October 27, 2023 – [Overview of the Distributed Generation Market Model](#)
 - December 4, 2023 – State DG policy updates from [MA](#), [CT](#), [RI](#), [VT](#), [NH](#), and [ME](#), [PV Forecast Preliminary Policy Modeling](#),
 - February 16, 2024 – [Draft 2024 PV forecast](#), [December 2023 distributed generation survey results](#)
 - March 25, 2024 – [Final 2024 PV forecast](#)
- Energy Efficiency Forecast Working Group Meetings (EEFWG)
 - December 4, 2022 – [EE program data review](#), [EE measure data review](#)
 - February 16, 2024 – [Draft 2024 EE forecast](#)
 - March 25, 2024 – [Updated Draft 2024 EE forecast](#)

Updates Since the CELT 2023 Forecast

- Model estimation period through the end of 2023
 - Peak demand models: 2009 – 2023 (updated from 2008-2022 period used in CELT 2023)
 - Energy models: 1997 – 2023 (updated from 1996-2022 period used in CELT 2023)
- Incorporated Moody's February 2024 economic forecast
 - Indicators used in the gross energy forecast have been updated to reflect composite economic indices
- Incorporated FCA 18 Capacity Supply Obligations (CSOs) for passive demand resources (PDRs)
- Inclusion of final 2024 heating and transportation electrification forecasts
- Net forecast values incorporate the final 2024 energy efficiency (EE) and behind-the-meter photovoltaic (BTM PV) forecasts

Overview of Gross and Net Load Forecasts

- The ISO annually develops 10-year forecasts of energy and demand that are published as part of the [Capacity, Energy, Loads, and Transmission \(CELT\) report](#)
- The gross load forecast reflects a forecast of load:
 - Before reductions from Demand Capacity Resources
 - Includes energy efficiency (EE), passive distributed generation (DG) resources, and price-responsive demand (PRD)
 - Before reductions from BTM PV
 - After load additions associated with forecasts of transportation and heating electrification
- The net load forecast reflects the gross load forecast minus forecasts of EE and BTM PV
 - The annual BTM PV forecast is developed through the [Distributed Generation Forecast Working Group \(DGFWG\)](#)
 - The annual EE forecast is developed through the [Energy Efficiency Forecast Working Group \(EEFWG\)](#)

Gross Load	Net Load
$Load_{Gross} = NEL + PRD + EE + BTMPV + \text{Electrification}$	$Load_{Net} = NEL + PRD + \text{Electrification}$

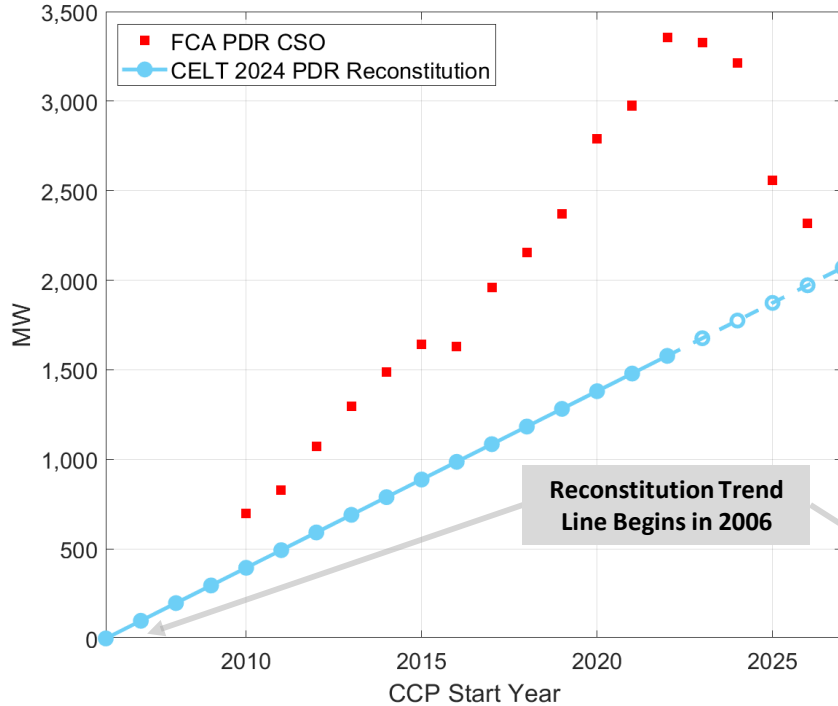


Electrification forecasts were first developed as part of the 2020 forecast cycle.
Electrification = Transportation Electrification + Heating Electrification

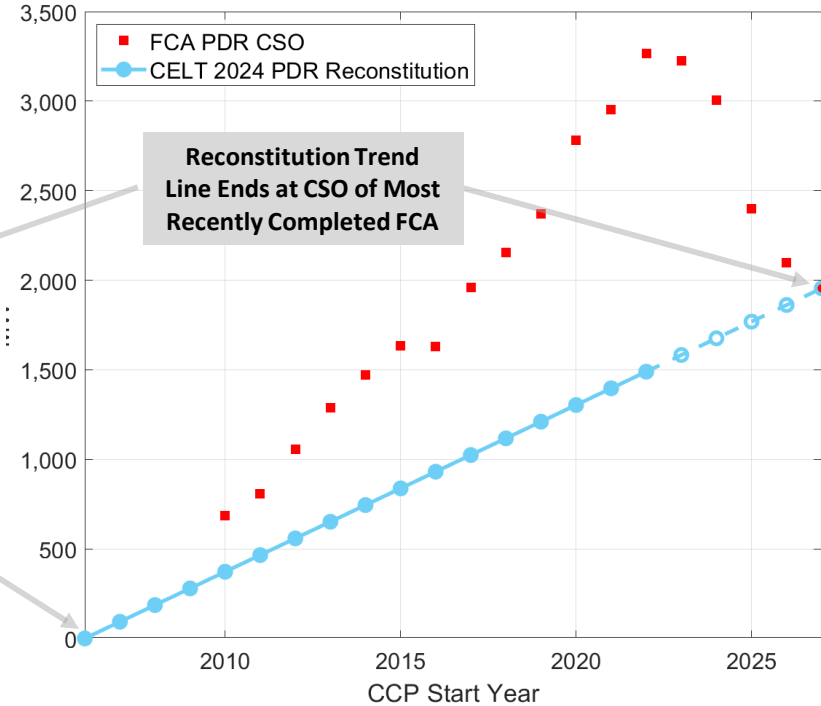
CELT 2024 Summer and Winter PDR Reconstitution

New England

Summer (June) PDR CSO

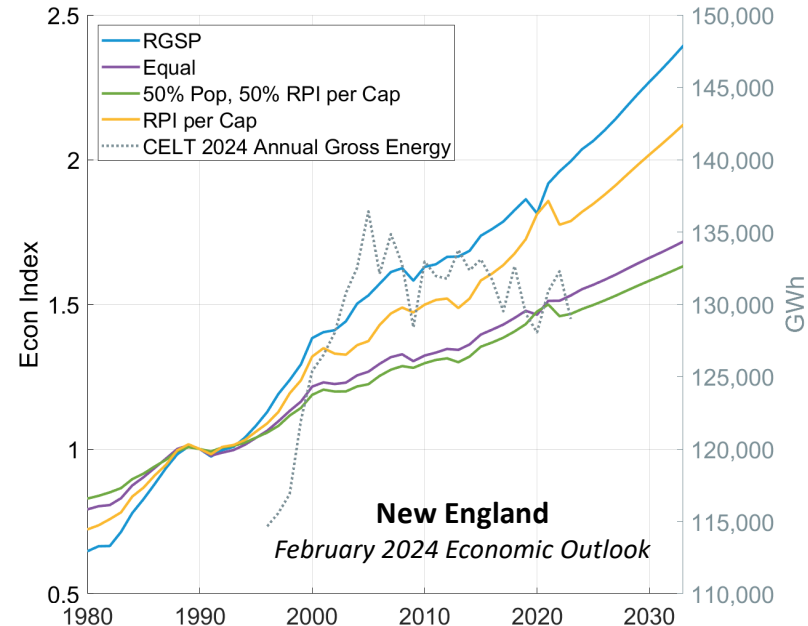


Winter (December) PDR CSO



Economic Indicators Used in Energy Modeling

- The 10-year economic outlook is an input into the ISO's gross energy forecast
- As was discussed on [slides 13-19 of a December 8, 2023 LFC presentation](#), and on [slides 10-13 of the February 23, 2024 LFC presentation](#) ISO has re-evaluated the economic indicators used in state and regional energy modeling with the purpose of creating better alignment between forecast and observed energy in the CELT 2024 forecast
 - Demand forecasts have not demonstrated the same inaccuracies exhibited by the energy forecasts, therefore the objective was to lower the energy forecast while minimizing impact on peak demand
- Blends of economic indicators were chosen based on simulations of the CELT 2023 forecast
- Three variable constructions (indexed to 1990) were found to be most appropriate
 - **"Equal"** – Equal weighting of RGSP, Employment, Population, Real Personal Income per Capita
 - **"50% Pop, %50 RPI per Cap"** – Equal weighting of Population and Real Personal Income per Capita
 - **"RPI per Cap"** – Real Personal Income per Capita
- Differing indices were used across the months and states, optimizing a reduction in the energy forecast, while maintaining minimal peak impact



FINAL DRAFT 2024 ELECTRIFICATION FORECASTS

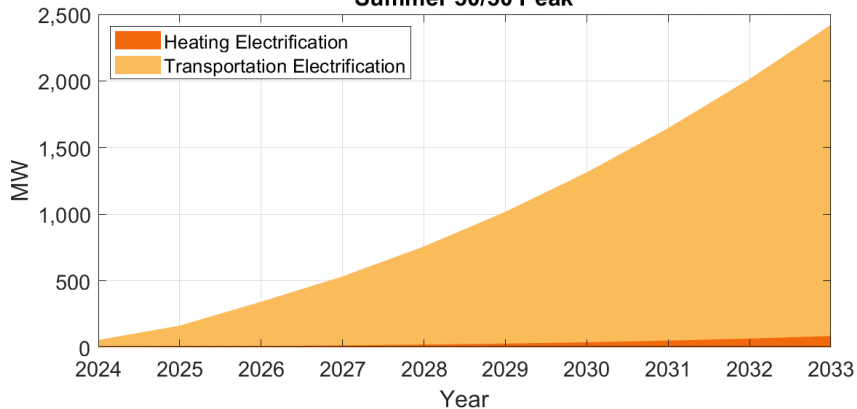
Final Draft 2024 Electrification Forecasts

- The 2024 [heating](#) and [transportation](#) electrification forecasts were presented at the January 12, 2024 LFC meeting
 - Updates for 2024 include:
 - [Enhanced modeling of partial heating applications](#)
 - [Inclusion of EV managed charging for personal light-duty vehicles](#)
 - Final forecasts are expected to be unchanged from the draft forecasts
- Gross and net forecasts include the impacts of electrification

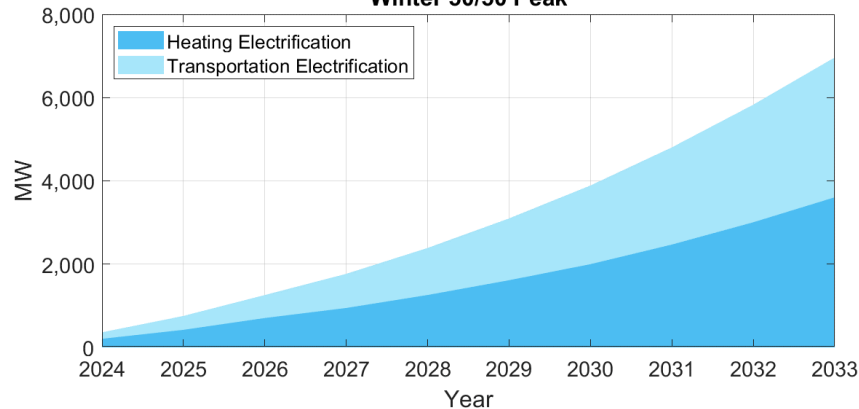
Electrification Forecast

2024 Final Draft 50/50 Peak Demand

Summer 50/50 Peak



Winter 50/50 Peak



Summer Peak

Year	Transportation Electrification			Heating Electrification		
	CELT 2023 (MW)	CELT 2024 (MW)	Change (MW)	CELT 2023 (MW)	CELT 2024 (MW)	Change (MW)
2024	126	51	-75	5	2	-3
2025	245	155	-90	8	5	-3
2026	456	330	-126	12	9	-3
2027	669	515	-154	17	14	-3
2028	922	734	-189	23	21	-3
2029	1,216	986	-230	31	28	-3
2030	1,551	1,273	-278	41	38	-3
2031	1,927	1,592	-335	53	50	-3
2032	2,346	1,946	-400	69	66	-3
2033		2,334			85	

Winter Peak

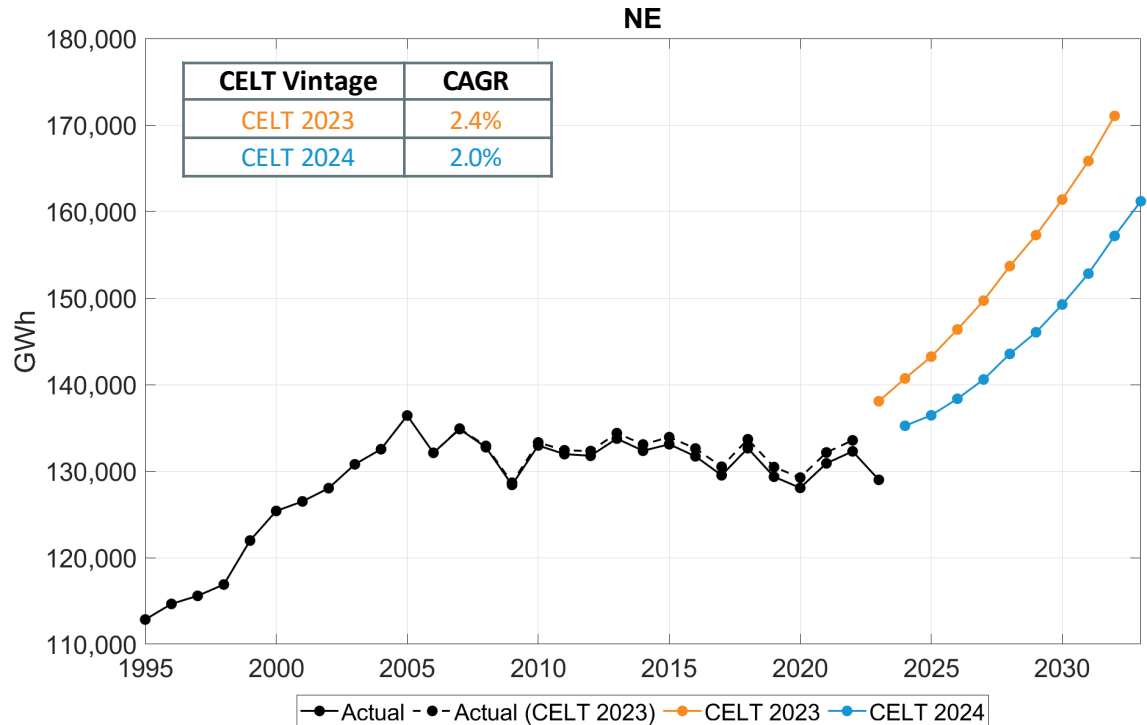
Year	Transportation Electrification			Heating Electrification		
	CELT 2023 (MW)	CELT 2024 (MW)	Change (MW)	CELT 2023 (MW)	CELT 2024 (MW)	Change (MW)
2024	271	147	-124	370	206	-165
2025	473	325	-148	601	421	-180
2026	726	543	-183	848	705	-143
2027	1,042	811	-231	1,040	946	-94
2028	1,404	1,121	-283	1,333	1,258	-75
2029	1,822	1,476	-346	1,673	1,612	-61
2030	2,293	1,880	-412	2,063	1,998	-65
2031	2,820	2,325	-495	2,521	2,469	-52
2032	3,420	2,814	-605	2,965	3,005	40
2033		3,348			3,604	

FINAL DRAFT 2024 ANNUAL ENERGY, SUMMER PEAK, AND WINTER PEAK FORECASTS

Annual Gross Energy Forecast

New England – CELT 2024 Vs. CELT 2023

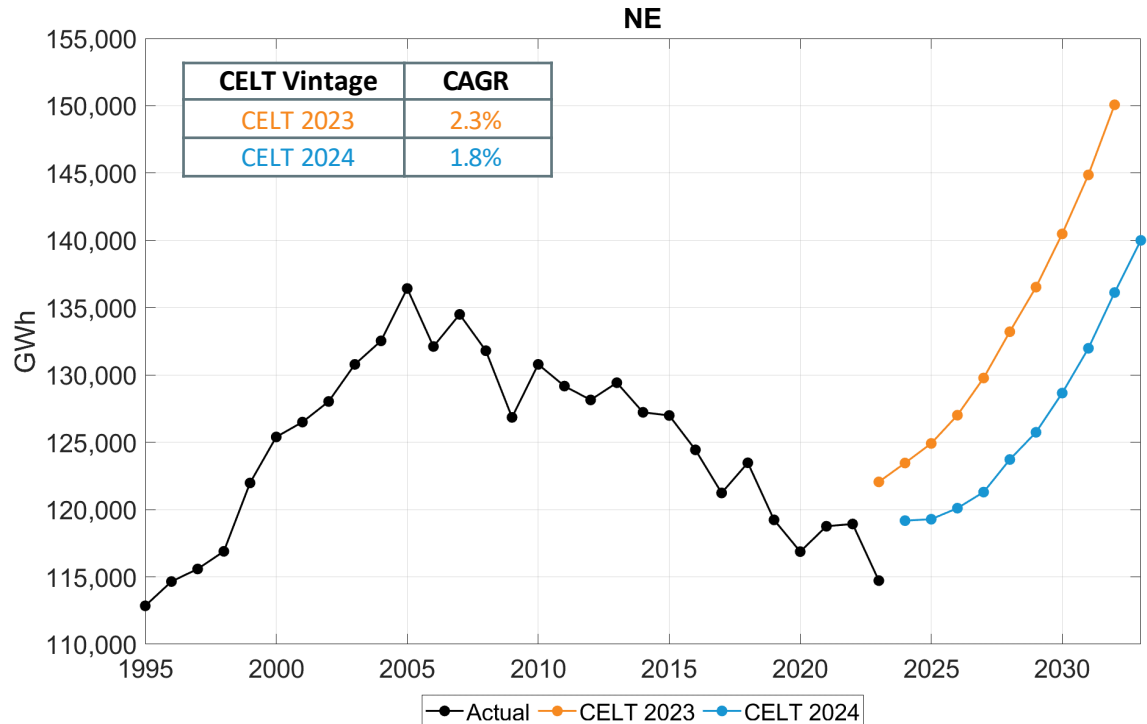
Year	Gross CELT 2023 (GWh)	Gross CELT 2024 (GWh)	Change (GWh)	Change (%)
2024	140,711	135,240	-5,471	-3.9%
2025	143,230	136,450	-6,780	-4.7%
2026	146,370	138,363	-8,007	-5.5%
2027	149,703	140,591	-9,112	-6.1%
2028	153,690	143,544	-10,146	-6.6%
2029	157,274	146,045	-11,229	-7.1%
2030	161,384	149,252	-12,132	-7.5%
2031	165,838	152,820	-13,017	-7.8%
2032	171,050	157,179	-13,871	-8.1%
2033		161,186		



Annual Net Energy Forecast

New England – CELT 2024 Vs. CELT 2023

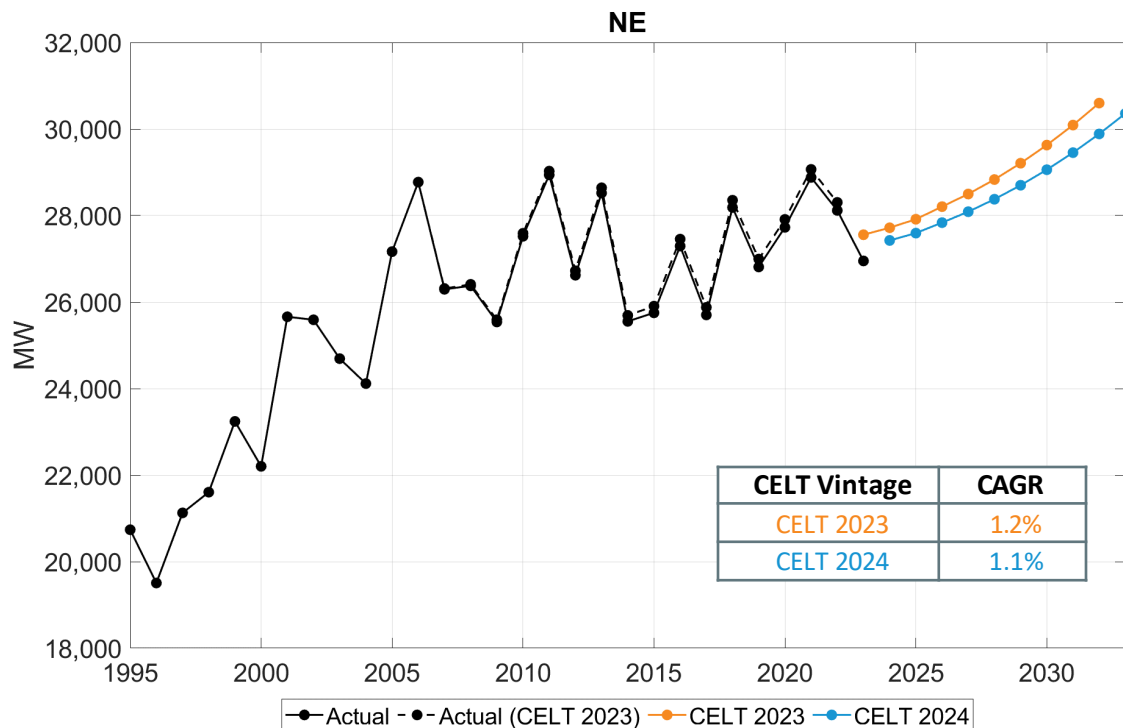
Year	Net CELT 2023 (GWh)	Net CELT 2024 (GWh)	Change (GWh)	Change (%)
2024	123,460	119,179	-4,281	-3.5%
2025	124,914	119,285	-5,629	-4.5%
2026	127,013	120,106	-6,907	-5.4%
2027	129,776	121,298	-8,478	-6.5%
2028	133,214	123,720	-9,494	-7.1%
2029	136,526	125,741	-10,785	-7.9%
2030	140,481	128,655	-11,826	-8.4%
2031	144,865	131,983	-12,881	-8.9%
2032	150,073	136,126	-13,947	-9.3%
2033		140,001		



Summer Gross 50/50 Peak Forecast

New England – CELT 2024 Vs. CELT 2023

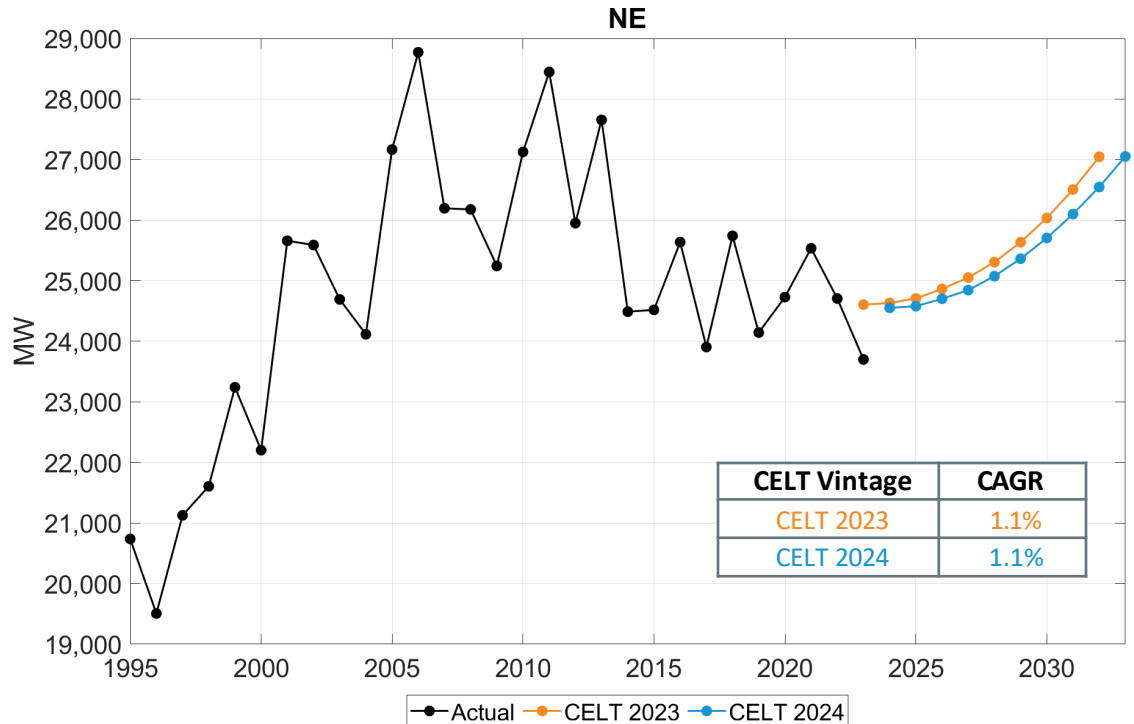
Year	Gross CELT 2023 (MW)	Gross CELT 2024 (MW)	Change (MW)	Change (%)
2024	27,717	27,424	-293	-1.1%
2025	27,914	27,593	-321	-1.2%
2026	28,205	27,835	-370	-1.3%
2027	28,497	28,088	-409	-1.4%
2028	28,832	28,376	-455	-1.6%
2029	29,209	28,700	-510	-1.7%
2030	29,628	29,058	-570	-1.9%
2031	30,090	29,453	-637	-2.1%
2032	30,599	29,886	-713	-2.3%
2033		30,359		



Summer Net 50/50 Peak Forecast

New England – CELT 2024 Vs. CELT 2023

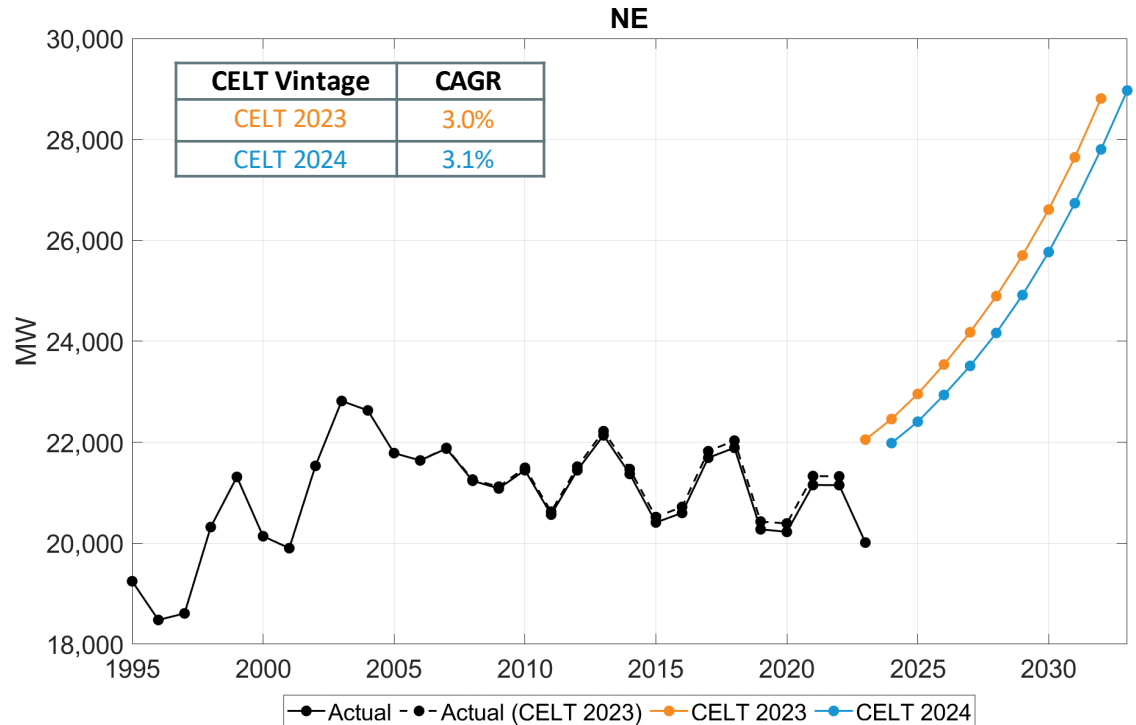
Year	Net CELT 2023 (MW)	Net CELT 2024 (MW)	Change (MW)	Change (%)
2024	24,633	24,553	-81	-0.3%
2025	24,708	24,579	-129	-0.5%
2026	24,866	24,702	-164	-0.7%
2027	25,052	24,845	-207	-0.8%
2028	25,307	25,076	-231	-0.9%
2029	25,636	25,364	-272	-1.1%
2030	26,036	25,706	-330	-1.3%
2031	26,505	26,100	-405	-1.5%
2032	27,046	26,547	-498	-1.8%
2033		27,052		



Winter Gross 50/50 Peak Forecast

New England – CELT 2024 Vs. CELT 2023

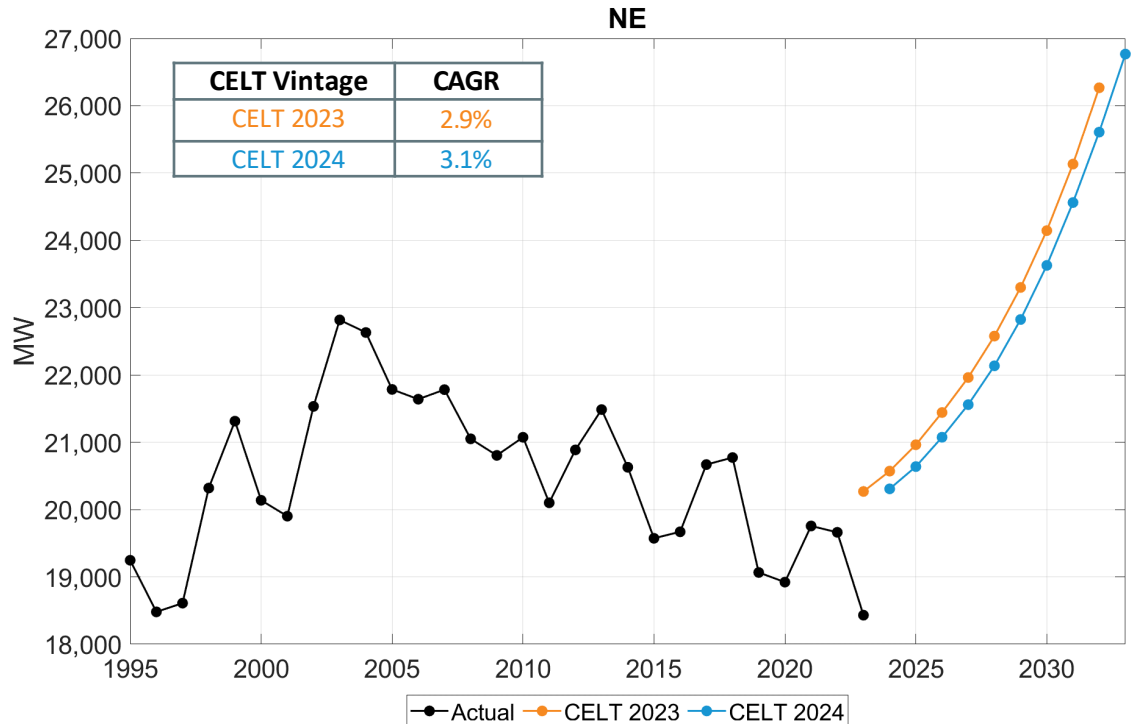
Year	Gross CELT 2023 (MW)	Gross CELT 2024 (MW)	Change (MW)	Change (%)
2024	22,461	21,984	-477	-2.1%
2025	22,958	22,407	-550	-2.4%
2026	23,541	22,937	-604	-2.6%
2027	24,180	23,514	-666	-2.8%
2028	24,896	24,166	-730	-2.9%
2029	25,701	24,916	-785	-3.1%
2030	26,610	25,768	-842	-3.2%
2031	27,646	26,736	-910	-3.3%
2032	28,810	27,803	-1,008	-3.5%
2033		28,970		



Winter Net 50/50 Peak Forecast

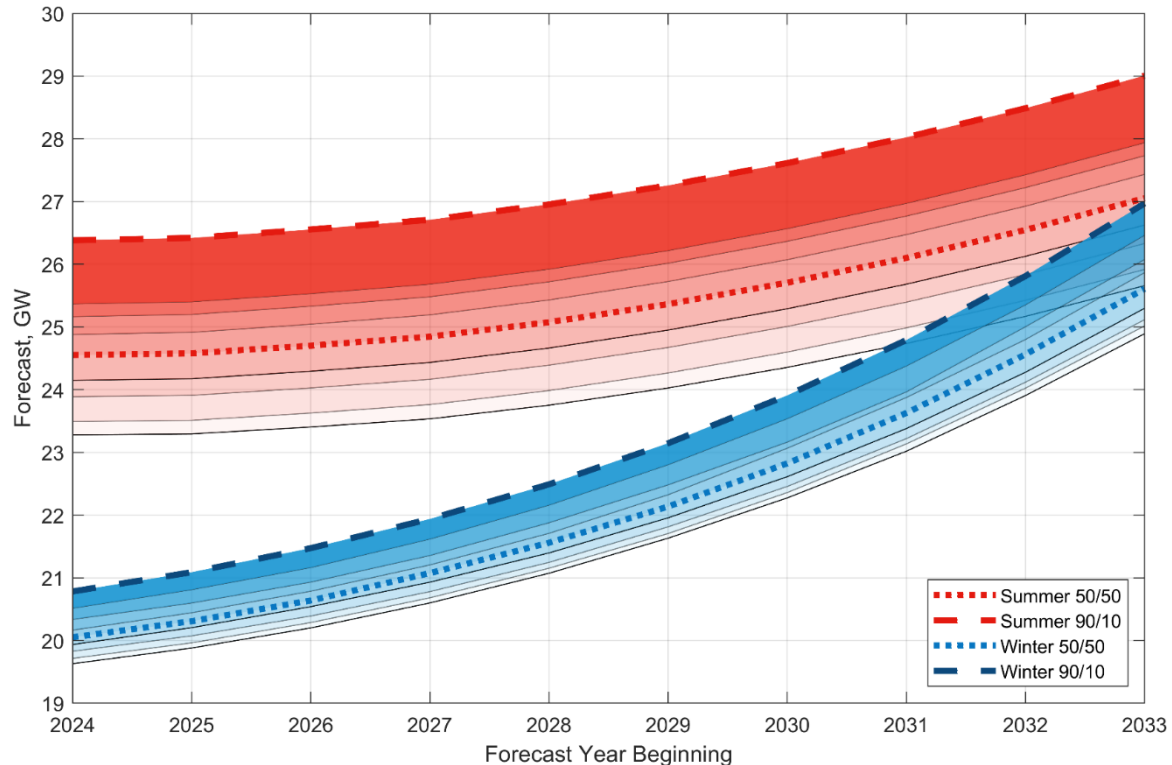
New England – CELT 2024 Vs. CELT 2023

Year	Net CELT 2023 (MW)	Net CELT 2024 (MW)	Change (MW)	Change (%)
2024	20,572	20,308	-264	-1.3%
2025	20,964	20,639	-325	-1.6%
2026	21,442	21,075	-367	-1.7%
2027	21,963	21,559	-404	-1.8%
2028	22,578	22,136	-442	-2.0%
2029	23,301	22,825	-476	-2.0%
2030	24,145	23,628	-517	-2.1%
2031	25,133	24,562	-571	-2.3%
2032	26,267	25,608	-659	-2.5%
2033		26,768		



Winter and Summer Peak Convergence

- Plot shows “peak” portion of probabilistic net demand forecast distribution for both winter and summer
 - Forecasts include impacts of both heating and transportation electrification
- By 2033, the 90/10 net winter demand forecast equals the 50/50 net summer demand forecast
- Beyond the forecast horizon, by the mid-2030s, electrification is expected to cause winter peak demand to become the typical, prevailing peak season



Further Information on the CELT 2024 Load Forecast

- More detailed information on the forecast will be available on the [Load Forecast webpage](#) by May 1, 2024
 - 2024 Forecast Data Workbook
 - 2024 Forecast Itemization Workbook
- Materials detailing all of the work incorporated into the CELT 2024 forecast, including the electrification forecasts and other work can be found on the ISO's [LFC webpage](#)

APPENDIX I

Forecast Data Workbook Description

Forecast Data Workbook (1 of 3)

Description of Contents

Worksheet	Description of Contents
1	ISONE Control Area & New England States Net Energy for Load (NEL) and Seasonal Peak Load History
2A	Summer Peak Load Forecast: ISONE Control Area, States, Regional System Plan (RSP) Sub-areas, and SMD Load Zone Forecasts <ul style="list-style-type: none">Expected weather case (50th percentile), extreme weather case (90th percentile) and compound annual growth rates
2B	Winter Peak Load Forecast (Same details as 2A)
2C	Annual Energy Forecast: ISONE Control Area, States, RSP Sub-areas, and SMD Load Zones Forecasts
3	Confidence Intervals: Energy and Seasonal Peak Load Forecast and 90% confidence Intervals for ISONE Control Area, States, and RSP Sub-areas
4	ISONE Control Area and New England States Monthly Peak Load Forecast
5	Weather Normalized History & Forecast (ISONE Control Area only)

Forecast Data Workbook (2 of 3)

Description of Contents

Worksheet	Description of Contents
6	Monthly Net Energy for Load Forecast: ISONE Control Area and States
7	Seasonal Peak Load Forecast Distributions: ISONE Control Area and States
8	Energy Model Economic/Demographic Variables: ISONE Control Area and States
9	Adjusting the State Energy Forecasts to the ISONE Energy Forecast
10G	Current CELT Gross forecast differences from prior year: ISONE and the New England States
10N	Current CELT Net forecast differences from prior year: ISONE and the New England States
11	Percentage of ISONE Control Area, operating companies, and load zones portioned out to the RSP sub-areas (Summer 2022 and Summer 2031)
12	Annual Energy and Seasonal Peak Forecast (Transpose of Tab 2 data)

Forecast Data Workbook (3 of 3)

Description of Contents

Worksheet	Description of Contents
13	Westinghouse Capacity Model Program Load Inputs (Power Years)
14	Summary Tables: ISONE Control Area, States, Regional System Plan Sub-areas, and SMD Load Zones Energy and Seasonal Peak Load Forecast
15	Current CELT forecast differences from prior year: BTM PV and EE for ISONE and states
16	Heating and Transportation Electrification Forecasts
17	Values used to reconstitute historical loads for the impact of Passive Demand Resources (PDRs) participating in the FCM for the purposes of producing the gross load forecast
18	Adjusted gross seasonal peak forecasts for ARA ICR calculations

Questions

