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ISO new england

2024 Final Draft Energy and Seasonal Peak Forecasts

Load Forecast Committee

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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

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- 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
 - 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 <u>Capacity, Energy</u>, <u>Loads, and Transmission (CELT) report</u>
- An overview of the <u>ISO's methodology</u> for developing the 10year 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 <u>Moody's November economic forecast</u>, <u>update on heating electrification</u> <u>forecast</u>, <u>update on transportation electrification forecast</u>
 - January 12, 2024 <u>draft heating electrification forecast</u>, <u>draft transportation electrification</u> forecast, <u>update on EV managed charging</u>
 - 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 <u>Preliminary Policy Modeling</u>,
 - February 16, 2024 <u>Draft 2024 PV forecast</u>, <u>December 2023 distributed generation survey</u> results
 - March 25, 2024 <u>Final 2024 PV forecast</u>
- 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 <u>Updated Draft 2024 EE forecast</u>

Updates Included in the Final Draft 2024 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
- 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

REVIEW OF ENERGY AND PEAK DEMAND FORECASTING ASSUMPTIONS



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 <u>Capacity, Energy, Loads, and Transmission (CELT) report</u>
- 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 <u>Distributed Generation Forecast Working</u> Group (DGFWG)
 - The annual EE forecast is developed though the <u>Energy Efficiency Forecast Working Group (EEFWG)</u>



PDR Reconstitution in the Gross Load Forecast

- Reconstitution for passive demand resources (PDRs) is based on total Capacity Supply Obligations (CSOs) acquired by PDRs in the most recent Forward Capacity Auction (FCA)
 Draft forecasts utilize FCA Qualified Capacity (FCA QC)
- By calibrating to the PDR CSOs from the most recently completed FCA, the new reconstitution methodology results in improved accounting for:
 - The amount of EE that participates in the FCA, and not EE installations in excess of EE resources' CSOs
 - EE expiring measures that are no longer participating as supply in the FCA
- Working in tandem with the gross load forecast, the accounting for PDR in the EE forecast also reflects this methodology
- Further details regarding how load is reconstituted for the purposes of producing the gross load forecast can be found in the <u>September 22, 2023 Long-Term Load Forecast</u> <u>Methodology Overview</u> presentation

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CELT 2024 Summer and Winter PDR Reconstitution

New England



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 <u>slides 13-19 of a December 8, 2023 LFC presentation</u>, and on <u>slides 10-13 of the February 23</u>, <u>2024 LFC presentation</u> 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

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- 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 <u>heating</u> and <u>transportation</u> 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

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State	Building Type	% of Households
NE	Single-Family Detached	58%
NE	Multi-Family with 2 - 4 Units	17%
NE	Multi-Family with 5+ Units	17%
NE	Single-Family Attached	5%
NE	Mobile Home	3%

Heating Electrification Forecast

Example: Residential Space Heating



Final Draft Heating Electrification Forecast

2024 Final Draft Space Heating Adoption Forecast



Transportation Electrification Forecast

Example: Personal Light-Duty Vehicles

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Final Draft 2024 EV Adoption Forecast

Cumulative EV Stock for New England



Electrification Forecast

2024 Final Draft 50/50 Peak Demand



		Tra Ele	nsportat ctrificati	ion on	Ele	Heating ctrificati	on
	Year	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	



		Tra Ele	nsportat ctrificati	ion on		Ele	Heating ctrificati	on
×	Year	CELT 2023 (MW)	CELT 2024 (MW)	Change (MW)		CELT 2023 (MW)	CELT 2024 (MW)	Change (MW)
e l	2024	271	147	-124		370	206	-165
ď	2025	473	325	-148		601	421	-180
_	2026	726	543	-183		848	705	-143
O	2027	1,042	811	-231		1,040	946	-94
t	2028	1,404	1,121	-283		1,333	1,258	-75
	2029	1,822	1,476	-346		1,673	1,612	-61
5	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	

Summer Peak

FINAL DRAFT 2024 ANNUAL ENERGY FORECAST

Final Draft CELT 2024 Forecast

Summer Peak, Winter Peak, and Annual Energy

- The following slides summarize the final draft CELT 2024 annual energy and seasonal peak demand forecasts
- No changes were made to the gross load forecast methodology since CELT 2022
 - Updates to the economic indicators used in the gross energy forecast have been updated to reflect composite economic indices described in the previous section
- The following inputs have been finalized and are reflected in the final draft forecast:
 - FCA 18 PDR summer/winter CSO values
 - Moody's February 2024 macroeconomic outlook
 - Final 2024 heating and transportation electrification forecasts
 - Final 2024 EE and BTM PV forecasts (impacts net forecast only)

Annual Gross Energy Forecast

New England – CELT 2024 Vs. CELT 2023



Annual Gross Energy Forecast

States – CELT 2024 Vs. CELT 2023



Annual Net Energy Forecast

New England – CELT 2024 Vs. CELT 2023



2024 Gross and Net Annual Energy Forecasts

New England - Summary

Year	Transportation Electrification* (GWh)	Heating Electrification* (GWh)	Gross (GWh)	EE** (GWh)	BTM PV** (GWh)	Net** (GWh)
2024	325	640	135,240	10,618	5,444	119,179
2025	1,045	1,127	136,450	11,222	5,943	119,285
2026	1,978	1,676	138,363	11,826	6,431	120,106
2027	3,134	2,292	140,591	12,430	6,863	121,298
2028	4,522	2,979	143,544	12,463	7,361	123,720
2029	6,151	3,749	146,045	12,437	7,867	125,741
2030	8,024	4,618	149,252	12,218	8,379	128,655
2031	10,148	5,614	152,820	11,938	8,899	131,983
2032	12,532	6,742	157,179	11,601	9,452	136,126
2033	15,182	7,996	161,186	11,210	9,975	140,001

* Electrification forecasts are included in both gross and net peak forecasts.

** Net figures utilize the final 2024 EE forecast and the final 2024 PV forecast

FINAL DRAFT 2024 SUMMER PEAK DEMAND FORECAST

Summer Gross 50/50 Peak Forecast

New England – CELT 2024 Vs. CELT 2023



Summer Gross 50/50 Peak Forecast

States – CELT 2024 Vs. CELT 2023



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		



2024 Gross Summer 50/50 and 90/10 Peak Forecasts



2024 Gross and Net Summer Peak Forecasts

New England - Summary

Year	Transportation Electrification* 50/50 (MW)	Transportation Electrification* 90/10 (MW)	Heating Electrification* 50/50 (MW)	Heating Electrification* 90/10 (MW)	Gross 50/50 (MW)	Gross 90/10 (MW)	EE** (MW)	BTM PV** (MW)	Net** 50/50 (MW)	Net** 90/10 (MW)
2024	51	53	2	2	27,424	29,254	1,775	1,097	24,553	26,383
2025	155	159	5	5	27,593	29,434	1,873	1,141	24,579	26,419
2026	330	339	9	9	27,835	29,688	1,972	1,161	24,702	26,554
2027	515	528	14	14	28,088	29,953	2,070	1,173	24,845	26,710
2028	734	752	21	21	28,376	30,254	2,102	1,199	25,076	26,954
2029	986	1,011	28	28	28,700	30,592	2,117	1,218	25,364	27,256
2030	1,273	1,304	38	38	29,058	30,966	2,117	1,236	25,706	27,613
2031	1,592	1,631	50	50	29,453	31,377	2,101	1,253	26,100	28,023
2032	1,946	1,994	66	66	29,886	31,826	2,069	1,269	26,547	28,488
2033	2,334	2,391	85	85	30,359	32,313	2,023	1,284	27,052	29,007

* Electrification forecasts are included in both gross and net peak forecasts.

** Net figures utilize the final 2024 EE forecast and the final 2024 PV forecast

FINAL DRAFT 2024 WINTER PEAK DEMAND FORECAST

Winter Gross 50/50 Peak Forecast

New England – CELT 2024 Vs. CELT 2023

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Year	Gross CELT 2023	Gross CELT 2024	Change	Change	00,000	CELT	「Vintage	CAGR					
	(MW)	(MW)	(MW)	(%)	28.000	CE	LT 2023	3.0%					
					28,000	CE	LT 2024	3.1%					1
2024	22,461	21,984	-477	-2.1%									
2025	22,958	22,407	-550	-2.4%	26,000								-
2026	23,541	22,937	-604	-2.6%	2								
2027	24,180	23,514	-666	-2.8%	≦ ^{24,000}								-
2028	24,896	24,166	-730	-2.9%	22.000		\sim				•		
2029	25,701	24,916	-785	-3.1%	22,000	۸	+		م ب ^ر	\ /		•	
2030	26,610	25,768	-842	-3.2%	20.000 -				¥				
2031	27,646	26,736	-910	-3.3%	20,000		•					-	
2032	28,810	27,803	-1,008	-3.5%	18 000	•		1					
2033		28,970			1995	20	00 20	005 2	010	2015	2020	2025	2030
					1		Actua	I-•-Actual	(CELT 20	23) - CE	ELT 2023	CELT 2024	

Winter Gross 50/50 Peak Forecast

States – CELT 2024 Vs. CELT 2023



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		



2024 Gross Winter 50/50 and 90/10 Peak Forecasts



2024 Gross and Net Winter Peak Forecasts

New England - Summary

Year	Transportation Electrification* 50/50 (MW)	Transportation Electrification* 90/10 (MW)	Heating Electrification* 50/50 (MW)	Heating Electrification* 90/10 (MW)	Gross 50/50 (MW)	Gross 90/10 (MW)	EE** (MW)	BTM PV** (MW)	Net** 50/50 (MW)	Net** 90/10 (MW)
2024	147	152	206	242	21,984	22,765	1,676	0	20,308	21,089
2025	325	335	421	495	22,407	23,242	1,769	0	20,639	21,473
2026	543	563	705	782	22,937	23,800	1,862	0	21,075	21,939
2027	811	837	946	1,106	23,514	24,446	1,955	0	21,559	22,491
2028	1,121	1,156	1,258	1,472	24,166	25,176	2,030	0	22,136	23,146
2029	1,476	1,522	1,612	1,889	24,916	26,000	2,092	0	22,825	23,908
2030	1,880	1,932	1,998	2,402	25,768	26,931	2,140	0	23,628	24,791
2031	2,325	2,389	2,469	2,971	26,736	27,985	2,174	0	24,562	25,811
2032	2,814	2,892	3,005	3,623	27,803	29,165	2,194	0	25,608	26,971
2033	3,348	3,440	3,604	4,356	28,970	30,472	2,202	0	26,768	28,270

* Electrification forecasts are included in both gross and net peak forecasts.

** Net figures utilize the final 2024 EE forecast. The PV forecast does not impact winter peak.

Further Information on the CELT 2024 Load Forecast

- More detailed information on the forecast will be available on the <u>Load Forecast webpage</u> 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 <u>LFC webpage</u>

Questions



