Supplemental Information

Cost uncertainties and ecological impacts drive tradeoffs between electrical system decarbonization pathways in New England, U.S.A.

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Supporting figures

Supporting tables

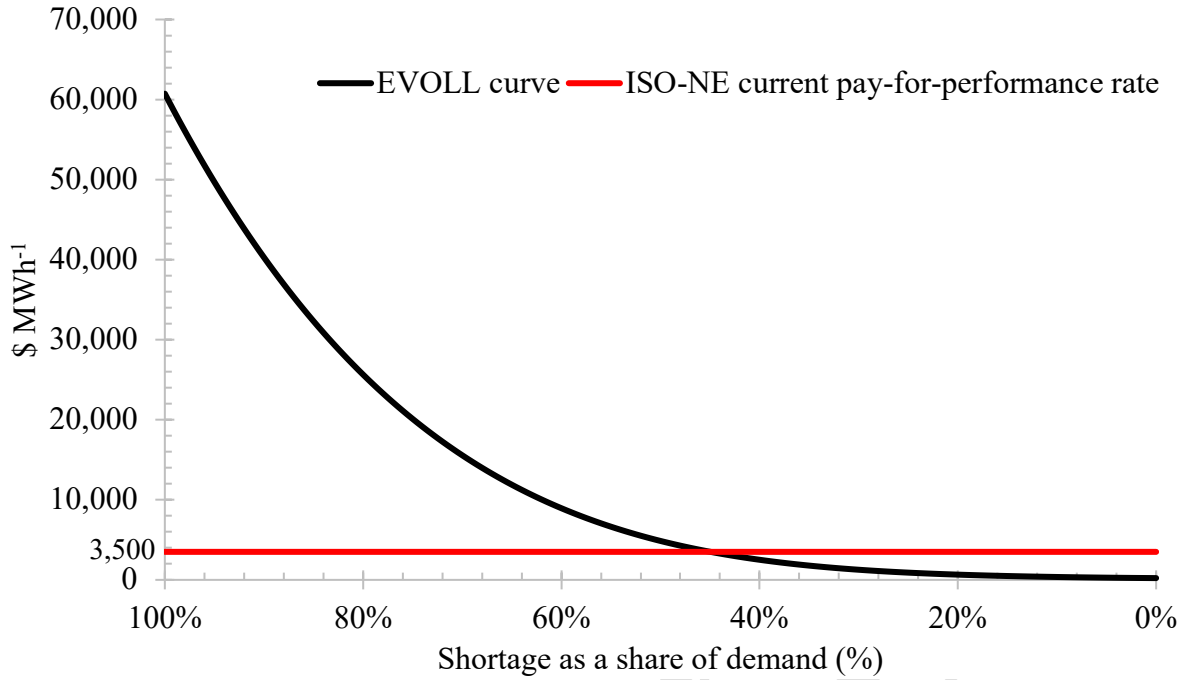

Figure S1: Pay for performance rates and the value of lost load curve used by ISO-NE adapted from the "2023 Assessment Of The ISO New England Electricity Markets" report prepared by Potomac Economics for ISO-NE (Potomac Economics, 2024)

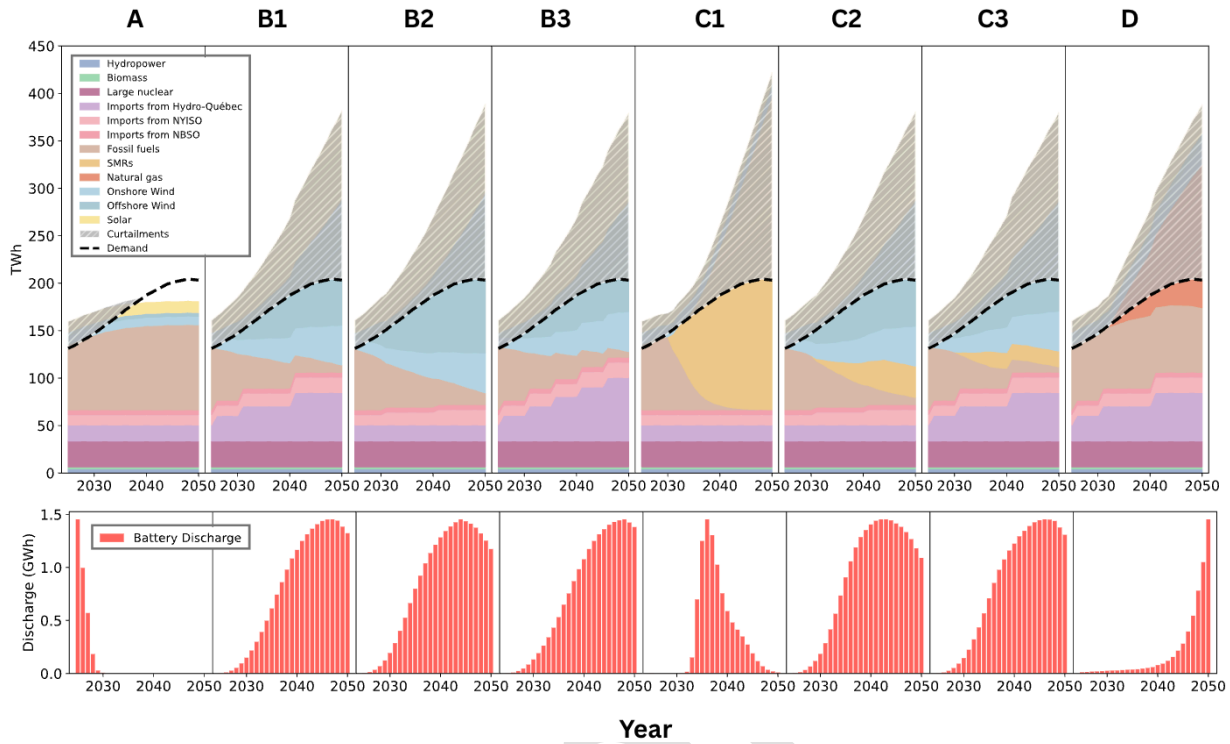

Figure S2: Modeled electricity generation by resource (top panels) and battery discharge (bottom panels) for the eight decarbonization pathways from 2025 to 2050 (simulation #1). Stacked areas in the upper charts indicate generation from hydropower, biomass, nuclear, imports, fossil fuels, natural gas, small modular reactors, onshore wind, offshore wind, and solar; the black dashed line shows the total demand. The greyed hashed region shows the total curtailments. The lower charts display annual battery discharge profiles (in GWh) under each pathway.

Table S1: Yearly capacity schedule for eight decarbonization pathways (2025–2050). All units are in megawatts.

Pathway A

Year	Large nuclear	Hydropower	Biomass	Solar	Onshore Wind	Offshore Wind	Small modular reactor	New natural gas	Imports from Hydro-Quebec	Imports from NBSO	Imports from NYISO	Storage
2025-2050	3350	900	400	9027	3233	974	0	0	2125	1050	3200	4199

Pathway B1

Year	Large nuclear	Hydropower	Biomass	Solar	Onshore Wind	Offshore Wind	Small modular reactor	New natural gas	Imports from Hydro-Quebec	Imports from NBSO	Imports from NYISO	Storage
2025	3350	900	400	10315	3563	1471	0	0	2125	1050	3200	4551
2026	3350	900	400	11833	3903	2029	0	0	3325	1050	3200	4968
2027	3350	900	400	13563	4254	2648	0	0	3325	1050	3200	5445
2028	3350	900	400	15490	4615	3327	0	0	3325	1050	3200	5976
2029	3350	900	400	17596	4988	4067	0	0	3325	1050	3200	6556
2030	3350	900	400	19864	5371	4867	0	0	3325	1050	3200	7180
2031	3350	900	400	22277	5764	5728	0	0	4525	1050	4000	7841
2032	3350	900	400	24819	6169	6650	0	0	4525	1050	4000	8536
2033	3350	900	400	27473	6584	7633	0	0	4525	1050	4000	9258
2034	3350	900	400	30221	7010	8676	0	0	4525	1050	4000	10003
2035	3350	900	400	33047	7446	9780	0	0	4525	1050	4000	10764
2036	3350	900	400	35934	7893	10944	0	0	4525	1050	4000	11537
2037	3350	900	400	38866	8351	12169	0	0	4525	1050	4000	12316
2038	3350	900	400	41824	8820	13455	0	0	4525	1050	4000	13096
2039	3350	900	400	44793	9299	14801	0	0	4525	1050	4000	13871
2040	3350	900	400	47756	9789	16209	0	0	4525	1050	4000	14637
2041	3350	900	400	50695	10290	17676	0	0	6225	1050	4800	15387

2042	3350	900	400	53593	10801	19205	0	0	6225	1050	4800	16117
2043	3350	900	400	56435	11324	20794	0	0	6225	1050	4800	16821
2044	3350	900	400	59203	11856	22444	0	0	6225	1050	4800	17493
2045	3350	900	400	61879	12400	24154	0	0	6225	1050	4800	18129
2046	3350	900	400	64448	12954	25925	0	0	6225	1050	4800	18723
2047	3350	900	400	66892	13519	27757	0	0	6225	1050	4800	19270
2048	3350	900	400	69195	14095	29650	0	0	6225	1050	4800	19764
2049	3350	900	400	71339	14681	31603	0	0	6225	1050	4800	20200
2050	3350	900	400	73308	15278	33617	0	0	6225	1050	4800	20572

Pathway B2

Year	Large nuclear	Hydropower	Biomass	Solar	Onshore Wind	Offshore Wind	Small modular reactor	New natural gas	Imports from Hydro-Quebec	Imports from NBSO	Imports from NYISO	Storage
2025	3350	900	400	9027	3233	1185	0	0	2125	1050	3200	4199
2026	3350	900	400	10315	3563	1820	0	0	2125	1050	3200	4551
2027	3350	900	400	11833	3903	2533	0	0	2125	1050	3200	4968
2028	3350	900	400	13563	4254	3322	0	0	2125	1050	3200	5445
2029	3350	900	400	15490	4615	4189	0	0	2125	1050	3200	5976
2030	3350	900	400	17596	4988	5133	0	0	2125	1050	3200	6556
2031	3350	900	400	19864	5371	6155	0	0	2125	1050	3200	7180
2032	3350	900	400	22277	5764	7253	0	0	2125	1050	4000	7841
2033	3350	900	400	24819	6169	8428	0	0	2125	1050	4000	8536
2034	3350	900	400	27473	6584	9681	0	0	2125	1050	4000	9258
2035	3350	900	400	30221	7010	11011	0	0	2125	1050	4000	10003
2036	3350	900	400	33047	7446	12418	0	0	2125	1050	4000	10764
2037	3350	900	400	35934	7893	13902	0	0	2125	1050	4000	11537
2038	3350	900	400	38866	8351	15463	0	0	2125	1050	4000	12316
2039	3350	900	400	41824	8820	17101	0	0	2125	1050	4000	13096
2040	3350	900	400	44793	9299	18817	0	0	2125	1050	4000	13871

2041	3350	900	400	47756	9789	20609	0	0	2125	1050	4000	14637
2042	3350	900	400	50695	10290	22479	0	0	2125	1050	4800	15387
2043	3350	900	400	53593	10801	24426	0	0	2125	1050	4800	16117
2044	3350	900	400	56435	11324	26450	0	0	2125	1050	4800	16821
2045	3350	900	400	59203	11856	28551	0	0	2125	1050	4800	17493
2046	3350	900	400	61879	12400	30729	0	0	2125	1050	4800	18129
2047	3350	900	400	64448	12954	32985	0	0	2125	1050	4800	18723
2048	3350	900	400	66892	13519	35317	0	0	2125	1050	4800	19270
2049	3350	900	400	69195	14095	37727	0	0	2125	1050	4800	19764
2050	3350	900	400	71339	14681	40214	0	0	2125	1050	4800	20200

Pathway B3

Year	Large nuclear	Hydropower	Biomass	Solar	Onshore Wind	Offshore Wind	Small modular reactor	New natural gas	Imports from Hydro-Quebec	Imports from NBSO	Imports from NYISO	Storage
2025	3350	900	400	10315	3563	1311	0	0	2125	1050	3200	4551
2026	3350	900	400	11833	3903	1798	0	0	3325	1050	3200	4968
2027	3350	900	400	13563	4254	2337	0	0	3325	1050	3200	5445
2028	3350	900	400	15490	4615	2930	0	0	3325	1050	3200	5976
2029	3350	900	400	17596	4988	3576	0	0	3325	1050	3200	6556
2030	3350	900	400	19864	5371	4275	0	0	3325	1050	3200	7180
2031	3350	900	400	22277	5764	5027	0	0	4525	1050	4000	7841
2032	3350	900	400	24819	6169	5832	0	0	4525	1050	4000	8536
2033	3350	900	400	27473	6584	6690	0	0	4525	1050	4000	9258
2034	3350	900	400	30221	7010	7601	0	0	4525	1050	4000	10003
2035	3350	900	400	33047	7446	8566	0	0	4525	1050	4000	10764
2036	3350	900	400	35934	7893	9583	0	0	5725	1050	4000	11537
2037	3350	900	400	38866	8351	10654	0	0	5725	1050	4000	12316
2038	3350	900	400	41824	8820	11777	0	0	5725	1050	4000	13096
2039	3350	900	400	44793	9299	12954	0	0	5725	1050	4000	13871

2040	3350	900	400	47756	9789	14184	0	0	5725	1050	4000	14637
2041	3350	900	400	50695	10290	15467	0	0	6925	1050	4800	15387
2042	3350	900	400	53593	10801	16803	0	0	6925	1050	4800	16117
2043	3350	900	400	56435	11324	18192	0	0	6925	1050	4800	16821
2044	3350	900	400	59203	11856	19634	0	0	6925	1050	4800	17493
2045	3350	900	400	61879	12400	21129	0	0	6925	1050	4800	18129
2046	3350	900	400	64448	12954	22678	0	0	8125	1050	4800	18723
2047	3350	900	400	66892	13519	24279	0	0	8125	1050	4800	19270
2048	3350	900	400	69195	14095	25934	0	0	8125	1050	4800	19764
2049	3350	900	400	71339	14681	27641	0	0	8125	1050	4800	20200
2050	3350	900	400	73308	15278	29402	0	0	8125	1050	4800	20572

Pathway C1

Year	Large nuclear	Hydropower	Biomass	Solar	Onshore Wind	Offshore Wind	Small modular reactor	New natural gas	Imports from Hydro-Quebec	Imports from NBSO	Imports from NYISO	Storage
2025	3350	900	400	9027	3233	974	0	0	2125	1050	3200	4199
2026	3350	900	400	9027	3233	974	0	0	2125	1050	3200	4199
2027	3350	900	400	9027	3233	974	0	0	2125	1050	3200	4199
2028	3350	900	400	9027	3233	974	0	0	2125	1050	3200	4199
2029	3350	900	400	9027	3233	974	0	0	2125	1050	3200	4199
2030	3350	900	400	9027	3233	974	0	0	2125	1050	3200	4199
2031	3350	900	400	9027	3233	974	2100	0	2125	1050	3200	4199
2032	3350	900	400	9027	3233	974	4200	0	2125	1050	3200	4199
2033	3350	900	400	9027	3233	974	6300	0	2125	1050	3200	4199
2034	3350	900	400	9027	3233	974	8400	0	2125	1050	3200	4199
2035	3350	900	400	9027	3233	974	10500	0	2125	1050	3200	4199
2036	3350	900	400	9027	3233	974	12600	0	2125	1050	3200	4199
2037	3350	900	400	9027	3233	974	14700	0	2125	1050	3200	4199
2038	3350	900	400	9027	3233	974	16800	0	2125	1050	3200	4199

2039	3350	900	400	9027	3233	974	18900	0	2125	1050	3200	4199
2040	3350	900	400	9027	3233	974	21000	0	2125	1050	3200	4199
2041	3350	900	400	9027	3233	974	23100	0	2125	1050	3200	4199
2042	3350	900	400	9027	3233	974	25200	0	2125	1050	3200	4199
2043	3350	900	400	9027	3233	974	27300	0	2125	1050	3200	4199
2044	3350	900	400	9027	3233	974	29400	0	2125	1050	3200	4199
2045	3350	900	400	9027	3233	974	31500	0	2125	1050	3200	4199
2046	3350	900	400	9027	3233	974	33600	0	2125	1050	3200	4199
2047	3350	900	400	9027	3233	974	35700	0	2125	1050	3200	4199
2048	3350	900	400	9027	3233	974	37800	0	2125	1050	3200	4199
2049	3350	900	400	9027	3233	974	39900	0	2125	1050	3200	4199
2050	3350	900	400	9027	3233	974	42000	0	2125	1050	3200	4199

Pathway C2

Year	Large nuclear	Hydropower	Biomass	Solar	Onshore Wind	Offshore Wind	Small modular reactor	New natural gas	Imports from Hydro-Quebec	Imports from NBSO	Imports from NYISO	Storage
2025	3350	900	400	10315	3563	1471	0	0	2125	1050	3200	4551
2026	3350	900	400	11833	3903	2029	0	0	2125	1050	3200	4968
2027	3350	900	400	13563	4254	2648	0	0	2125	1050	3200	5445
2028	3350	900	400	15490	4615	3327	0	0	2125	1050	3200	5976
2029	3350	900	400	17596	4988	4067	0	0	2125	1050	3200	6556
2030	3350	900	400	19864	5371	4867	0	0	2125	1050	3200	7180
2031	3350	900	400	22277	5764	5728	300	0	2125	1050	4000	7841
2032	3350	900	400	24819	6169	6650	600	0	2125	1050	4000	8536
2033	3350	900	400	27473	6584	7633	900	0	2125	1050	4000	9258
2034	3350	900	400	30221	7010	8676	1200	0	2125	1050	4000	10003
2035	3350	900	400	33047	7446	9780	1500	0	2125	1050	4000	10764
2036	3350	900	400	35934	7893	10944	1800	0	2125	1050	4000	11537
2037	3350	900	400	38866	8351	12169	2100	0	2125	1050	4000	12316

2038	3350	900	400	41824	8820	13455	2400	0	2125	1050	4000	13096
2039	3350	900	400	44793	9299	14801	2700	0	2125	1050	4000	13871
2040	3350	900	400	47756	9789	16209	3000	0	2125	1050	4000	14637
2041	3350	900	400	50695	10290	17676	3300	0	2125	1050	4800	15387
2042	3350	900	400	53593	10801	19205	3600	0	2125	1050	4800	16117
2043	3350	900	400	56435	11324	20794	3900	0	2125	1050	4800	16821
2044	3350	900	400	59203	11856	22444	4200	0	2125	1050	4800	17493
2045	3350	900	400	61879	12400	24154	4200	0	2125	1050	4800	18129
2046	3350	900	400	64448	12954	25925	4200	0	2125	1050	4800	18723
2047	3350	900	400	66892	13519	27757	4200	0	2125	1050	4800	19270
2048	3350	900	400	69195	14095	29650	4200	0	2125	1050	4800	19764
2049	3350	900	400	71339	14681	31603	4200	0	2125	1050	4800	20200
2050	3350	900	400	73308	15278	33617	4200	0	2125	1050	4800	20572

Pathway C3

Year	Large nuclear	Hydropower	Biomass	Solar	Onshore Wind	Offshore Wind	Small modular reactor	New natural gas	Imports from Hydro-Quebec	Imports from NBSO	Imports from NYISO	Storage
2025	3350	900	400	10315	3563	1311	0	0	2125	1050	3200	4551
2026	3350	900	400	11833	3903	1798	0	0	3325	1050	3200	4968
2027	3350	900	400	13563	4254	2337	0	0	3325	1050	3200	5445
2028	3350	900	400	15490	4615	2930	0	0	3325	1050	3200	5976
2029	3350	900	400	17596	4988	3576	0	0	3325	1050	3200	6556
2030	3350	900	400	19864	5371	4275	0	0	3325	1050	3200	7180
2031	3350	900	400	22277	5764	5027	300	0	4525	1050	4000	7841
2032	3350	900	400	24819	6169	5832	600	0	4525	1050	4000	8536
2033	3350	900	400	27473	6584	6690	900	0	4525	1050	4000	9258
2034	3350	900	400	30221	7010	7601	1200	0	4525	1050	4000	10003
2035	3350	900	400	33047	7446	8566	1500	0	4525	1050	4000	10764
2036	3350	900	400	35934	7893	9583	1800	0	4525	1050	4000	11537

2037	3350	900	400	38866	8351	10654	2100	0	4525	1050	4000	12316
2038	3350	900	400	41824	8820	11777	2100	0	4525	1050	4000	13096
2039	3350	900	400	44793	9299	12954	2100	0	4525	1050	4000	13871
2040	3350	900	400	47756	9789	14184	2100	0	4525	1050	4000	14637
2041	3350	900	400	50695	10290	15467	2100	0	6225	1050	4800	15387
2042	3350	900	400	53593	10801	16803	2100	0	6225	1050	4800	16117
2043	3350	900	400	56435	11324	18192	2100	0	6225	1050	4800	16821
2044	3350	900	400	59203	11856	19634	2100	0	6225	1050	4800	17493
2045	3350	900	400	61879	12400	21129	2100	0	6225	1050	4800	18129
2046	3350	900	400	64448	12954	22678	2100	0	6225	1050	4800	18723
2047	3350	900	400	66892	13519	24279	2100	0	6225	1050	4800	19270
2048	3350	900	400	69195	14095	25934	2100	0	6225	1050	4800	19764
2049	3350	900	400	71339	14681	27641	2100	0	6225	1050	4800	20200
2050	3350	900	400	73308	15278	29402	2100	0	6225	1050	4800	20572

Pathway D

Year	Large nuclear	Hydropower	Biomass	Solar	Onshore Wind	Offshore Wind	Small modular reactor	New natural gas	Imports from Hydro-Quebec	Imports from NBSO	Imports from NYISO	Storage
2025	3350	900	400	9361	3353	1010	0	0	2125	1050	3200	4551
2026	3350	900	400	9707	3477	1047	0	0	3325	1050	3200	4968
2027	3350	900	400	10066	3606	1086	0	0	3325	1050	3200	5445
2028	3350	900	400	10438	3739	1126	0	0	3325	1050	3200	5976
2029	3350	900	400	10824	3877	1168	0	0	3325	1050	3200	6556
2030	3350	900	400	11224	4020	1211	0	0	3325	1050	3200	7180
2031	3350	900	400	11639	4169	1256	0	0	4525	1050	4000	7841
2032	3350	900	400	12070	4323	1302	0	0	4525	1050	4000	8536
2033	3350	900	400	12517	4483	1350	0	1131	4525	1050	4000	9258
2034	3350	900	400	12980	4649	1400	0	2262	4525	1050	4000	10003
2035	3350	900	400	13460	4821	1452	0	3393	4525	1050	4000	10764

2036	3350	900	400	13958	4999	1506	0	4524	4525	1050	4000	11537
2037	3350	900	400	14474	5184	1562	0	5655	4525	1050	4000	12316
2038	3350	900	400	15010	5376	1620	0	6786	4525	1050	4000	13096
2039	3350	900	400	15565	5575	1680	0	7917	4525	1050	4000	13871
2040	3350	900	400	16141	5781	1742	0	9048	4525	1050	4000	14637
2041	3350	900	400	16738	5995	1806	0	10179	6225	1050	4800	15387
2042	3350	900	400	17357	6217	1873	0	11310	6225	1050	4800	16117
2043	3350	900	400	17999	6447	1942	0	12441	6225	1050	4800	16821
2044	3350	900	400	18665	6686	2014	0	13572	6225	1050	4800	17493
2045	3350	900	400	19356	6933	2089	0	14703	6225	1050	4800	18129
2046	3350	900	400	20072	7190	2166	0	15834	6225	1050	4800	18723
2047	3350	900	400	20815	7456	2246	0	16965	6225	1050	4800	19270
2048	3350	900	400	21585	7732	2329	0	18096	6225	1050	4800	19764
2049	3350	900	400	22384	8018	2415	0	19227	6225	1050	4800	20200
2050	3350	900	400	23212	8315	2504	0	20358	6225	1050	4800	20572

Table S2: Average annual (2022–2050) electricity generation capacity changes under a no Inflation Reduction Act scenario (U.S. EIA AEO, 2023).

Source	**Average annual change in the U.S. (%)**
Coal	-2.7%
Oil and Natural Gas Steam	-1.1%
Combined Cycle (CC)	1.0%
Combustion Turbine/Diesel (CT)	3.1%
Nuclear Power	-0.2%
Pumped Storage	0.0%
Diurnal Storage	6.3%
Fuel Cells	0.7%
Renewable Sources	3.7%
Distributed Generation (Natural Gas)	--
Total	**1.8%**

Table S3: Facility and unit-level operational characteristics, ramp category, retirement timelines, and emissions factors for all fossil fuel power plant facilities in New England. This table includes each facility's nameplate capacity (MW) and capacity factor (in brackets), ramp designation, projected retirement year, and average CO_2, NO_x, SO_2, and heat input rates on a per-MW basis. Note this retirement schedule in this study applies to all pathways except A and D.

Facility name	Facility [unit] ID	Location	Nameplate capacity (MW) [capacity factor]	Ramp	Retirement year	CO2 tons MW^{-1}	NOx lbs. MW^{-1}	SO2 lbs. MW^{-1}	Heat input MMBtu MW^{-1}
Alfred L Pierce Generating Station	6635 [AP-1]	New Haven County, CT	84 [0.62]	1H	2062	0.63	0.56	0.01	6.29
Bellingham	10307 [1]	Norfolk County, MA	257.4 [0.37]	12H	2046	0.67	0.88	0.03	4.11
Bellingham	10307 [2]	Norfolk County, MA	257.4 [0.37]	12H	2046	0.68	0.92	0.03	4.24
Bellingham Power Generation LLC	55211 [2]	Norfolk County, MA	289 [0.45]	12H	2057	0.65	0.1	0.01	4.9
Bellingham Power Generation LLC	55211 [1]	Norfolk County, MA	289 [0.44]	12H	2057	0.66	0.1	0.01	4.93
Berkshire Power	55041 [1]	Hampden County, MA	289 [0.67]	12H	2054	0.43	0.11	0	4.85
Berlin 5	3734 [A]	Washington County, VT	41.8 [0.89]	10M	2027	0.79	0.12	0.01	13.22
Berlin 5	3734 [B]	Washington County, VT	41.8 [0.89]	10M	2027	0.79	0.12	0.01	13.22
Blackstone Power	55212 [1]	Worcester County, MA	289 [0.44]	12H	2056	0.64	0.1	0.01	4.78

Facility name	Facility [unit] ID	Location	Nameplate capacity (MW) [capacity factor]	Ramp	Retirement year	CO2 tons MW^{-1}	NOx lbs. MW^{-1}	SO2 lbs. MW^{-1}	Heat input MMBtu MW^{-1}
Generation LLC									
Blackstone Power Generation LLC	55212 [2]	Worcester County, MA	289 [0.45]	12H	2056	0.65	0.09	0.01	4.89
Branford	540 [10]	New Haven County, CT	21.8 [0.53]	10M	2024	0.78	14.91	0.01	7
Bridgeport Energy	55042 [BE1]	Fairfield County, CT	350 [0.62]	12H	2053	0.44	0.13	0	4.55
Bridgeport Energy	55042 [BE2]	Fairfield County, CT	350 [0.64]	12H	2053	0.43	0.13	0	4.57
Bridgeport Harbor Station	568 [BHB5]	Fairfield County, CT	575.6 [0.78]	1H	2074	0.38	0.04	0	5.03
Bridgeport Harbor Station	568 [BHB2]	Fairfield County, CT	179.5 [0.78]	1H	2016	1.02	1.39	3.35	9.95
Burgess BioPower	58054 [ST01]	Coos County, NH	75 [0.94]	OVER	2058	1.52	0.92	0.07	13.69
Canal Station	1599 [2]	Barnstable County, MA	580 [0.35]	12H	2030	0.76	1.49	2.2	3.77
Canal Station	1599 [3]	Barnstable County, MA	367.7 [0.69]	12H	2030	0.6	0.1	0.01	6.62
Canal Station	1599 [1]	Barnstable County, MA	585 [0.53]	12H	2023	0.78	0.98	3.51	5.07
Cleary Flood	1682 [8]	Bristol County, MA	28 [0.61]	10M	2021	1.19	3.87	10.45	9.01

Facility name	Facility [unit] ID	Location	Nameplate capacity (MW) [capacity factor]	Ramp	Retirement year	CO2 tons MW^{-1}	NOx lbs. MW^{-1}	SO2 lbs. MW^{-1}	Heat input MMBtu MW^{-1}
Cleary Flood	1682 [9]	Bristol County, MA	118 [0.49]	10M	2030	0.63	1.6	0.07	5.15
Cos Cob	542 [10]	Fairfield County, CT	25 [0.56]	10M	2024	0.78	13.5	0.01	6.27
Cos Cob	542 [11]	Fairfield County, CT	25 [0.58]	10M	2024	0.78	13.36	0.01	6.51
Cos Cob	542 [12]	Fairfield County, CT	25 [0.58]	10M	2024	0.78	13.7	0.01	6.58
Cos Cob	542 [14]	Fairfield County, CT	20 [0.72]	10M	2030	0.78	16.34	0.01	10.33
Cos Cob	542 [13]	Fairfield County, CT	20 [0.68]	10M	2030	0.78	18.2	0.01	10.38
CPV Towantic Energy Center	56047 [2]	New Haven County, CT	565.5 [0.62]	12H	2073	0.39	0.04	0	4.1
CPV Towantic Energy Center	56047 [1]	New Haven County, CT	565.5 [0.63]	12H	2073	0.38	0.04	0	4.1
Dartmouth Power	52026 [2]	Bristol County, MA	24.7 [0.7]	12H	2064	0.63	0.13	0.01	7.4
Dartmouth Power	52026 [1]	Bristol County, MA	77 [0.63]	12H	2047	0.48	0.26	0.01	5.06
Devon	544 [10]	New Haven County, CT	18.6 [0.67]	1H	2040	0.78	13.74	0.01	7.67
Devon	544 [14]	New Haven County, CT	43 [0.55]	1H	2051	0.79	8.21	0.18	5.98
Devon	544 [13]	New Haven County, CT	43 [0.56]	1H	2051	0.8	8.41	0.21	6.03
Devon	544 [12]	New Haven County, CT	43 [0.56]	1H	2051	0.78	8.27	0.19	6.07

Facility name	Facility [unit] ID	Location	Nameplate capacity (MW) [capacity factor]	Ramp	Retirement year	CO2 tons MW^{-1}	NOx lbs. MW^{-1}	SO2 lbs. MW^{-1}	Heat input MMBtu MW^{-1}
Devon	544 [11]	New Haven County, CT	43 [0.56]	1H	2051	0.79	8.66	0.2	6.1
Devon	544 [16]	New Haven County, CT	51 [0.72]	1H	2065	0.58	0.11	0.01	5.17
Devon	544 [15]	New Haven County, CT	51 [0.72]	1H	2065	0.58	0.12	0.01	5.22
Devon	544 [18]	New Haven County, CT	51 [0.74]	1H	2065	0.58	0.13	0.01	5.44
Devon	544 [17]	New Haven County, CT	51 [0.75]	1H	2065	0.59	0.11	0.01	5.53
Dighton	55026 [1]	Bristol County, MA	200 [0.74]	12H	2054	0.46	0.1	0	5.72
Exelon West Medway II	59882 [J5]	Norfolk County, MA	131.8 [0.39]	10M	2074	0.55	0.09	0.01	3.62
Exelon West Medway II	59882 [J4]	Norfolk County, MA	131.8 [0.4]	10M	2074	0.55	0.09	0.01	3.69
Fore River Energy Center	55317 [11]	Norfolk County, MA	593.6 [0.53]	OVER	2058	0.42	0.05	0	3.74
Fore River Energy Center	55317 [12]	Norfolk County, MA	593.6 [0.55]	OVER	2058	0.44	0.05	0	4.01
Framingham Station	1586 [FJ-3]	Middlesex County, MA	14.2 [0.41]	10M	2024	0.78	11.86	0.01	8.46
Framingham Station	1586 [FJ-2]	Middlesex County, MA	14.2 [0.4]	10M	2024	0.78	11.18	0.01	8.74
Framingham Station	1586 [FJ-1]	Middlesex County, MA	14.2 [0.43]	10M	2024	0.78	11.44	0.01	8.87
Franklin Drive	561 [10]	Litchfield County, CT	21.8 [0.47]	10M	2024	0.78	18.45	0.01	7.26

Facility name	Facility [unit] ID	Location	Nameplate capacity (MW) [capacity factor]	Ramp	Retirement year	CO2 tons MW^{-1}	NOx lbs. MW^{-1}	SO2 lbs. MW^{-1}	Heat input MMBtu MW^{-1}
Granite Ridge Energy	55170 [1]	Rockingham County, NH	530 [0.36]	12H	2058	0.64	0.1	0.01	3.9
Granite Ridge Energy	55170 [2]	Rockingham County, NH	530 [0.36]	12H	2058	0.64	0.1	0.01	3.91
J C McNeil	589 [1]	Chittenden County, VT	59.5 [0.82]	OVER	2029	1.48	0.98	0.01	11.55
Kendall Green Energy LLC	1595 [S6]	Middlesex County, MA	20 [0.44]	12H	2025	0.78	23.04	0.01	9.98
Kendall Green Energy LLC	1595 [4]	Middlesex County, MA	253.6 [1.03]	12H	2030	0.39	0.05	0	6.65
Kendall Green Energy LLC	1595 [3]	Middlesex County, MA	54.4 [0.82]	12H	2009	1.47	1.28	8.28	13.57
Kendall Green Energy LLC	1595 [2]	Middlesex County, MA	50.2 [0.87]	12H	2004	1.54	1	0.01	14.75
Kleen Energy Systems Project	56798 [U1]	Middlesex County, CT	494 [0.55]	12H	2066	0.41	0.05	0	3.79
Kleen Energy Systems Project	56798 [U2]	Middlesex County, CT	494 [0.55]	12H	2066	0.41	0.05	0	3.8
Lake Road Generating Company	55149 [LRG3]	Windham County, CT	280 [0.52]	12H	2056	0.66	0.07	0.01	5.75
Lake Road Generating Company	55149 [LRG1]	Windham County, CT	280 [0.51]	12H	2056	0.67	0.08	0.01	5.76

Facility name	Facility [unit] ID	Location	Nameplate capacity (MW) [capacity factor]	Ramp	Retirement year	CO2 tons MW^{-1}	NOx lbs. MW^{-1}	SO2 lbs. MW^{-1}	Heat input MMBtu MW^{-1}
Lake Road Generating Company	55149 [LRG2]	Windham County, CT	280 [0.52]	12H	2056	0.66	0.08	0.01	5.84
Lost Nation	2362 [CT1]	Coos County, NH	18 [0.42]	10M	2024	0.78	21.48	0.01	14.44
Maine Independence Station	55068 [2]	Penobscot County, ME	371.2 [0.28]	12H	2055	0.7	0.21	0.01	3.33
Maine Independence Station	55068 [1]	Penobscot County, ME	371.2 [0.29]	12H	2055	0.7	0.2	0.01	3.34
Manchester Street Station	3236 [9]	Providence County, RI	171 [0.5]	12H	2050	0.72	0.41	0.01	5.97
Manchester Street Station	3236 [10]	Providence County, RI	173 [0.51]	12H	2050	0.7	0.35	0.01	6.03
Manchester Street Station	3236 [11]	Providence County, RI	171 [0.52]	12H	2050	0.71	0.37	0.01	6.16
MBTA South Boston Power Facility	10176 [B]	Suffolk County, MA	69 [0.4]	10M	2030	0.72	1.41	0.01	3.61
MBTA South Boston Power Facility	10176 [A]	Suffolk County, MA	69 [0.41]	10M	2030	0.71	1.36	0.01	3.61
Medway Station	1592 [J1T1]	Norfolk County, MA	45 [0.24]	1H	2025	1.69	11.23	0.01	4.95
Medway Station	1592 [J1T2]	Norfolk County, MA	45 [0.26]	1H	2025	1.55	10.72	0.01	4.98

Facility name	Facility [unit] ID	Location	Nameplate capacity (MW) [capacity factor]	Ramp	Retirement year	CO2 tons MW^{-1}	NOx lbs. MW^{-1}	SO2 lbs. MW^{-1}	Heat input MMBtu MW^{-1}
Medway Station	1592 [J2T1]	Norfolk County, MA	45 [0.26]	1H	2025	1.6	9.44	0.01	5.04
Medway Station	1592 [J2T2]	Norfolk County, MA	45 [0.25]	1H	2025	1.63	10.37	0.01	5.04
Medway Station	1592 [J3T2]	Norfolk County, MA	45 [0.28]	1H	2025	1.54	9.75	0.01	5.37
Medway Station	1592 [J3T1]	Norfolk County, MA	45 [0.28]	1H	2025	1.57	10.55	0.01	5.42
Merrimack	2364 [CT2]	Merrimack County, NH	18.6 [0.42]	OVER	2024	0.78	24.04	0.01	12.81
Merrimack	2364 [CT1]	Merrimack County, NH	18.6 [0.43]	OVER	2024	0.78	23.18	0.01	12.88
Merrimack	2364 [1]	Merrimack County, NH	113.6 [0.87]	OVER	2030	1.02	2.77	1.32	8.67
Merrimack	2364 [2]	Merrimack County, NH	345.6 [0.77]	OVER	2030	1.01	2.57	1.53	7.62
Middletown	562 [10]	Middlesex County, CT	18.6 [0.49]	10M	2021	0.78	17.23	0.01	7.87
Middletown	562 [14]	Middlesex County, CT	60.5 [0.58]	10M	2030	0.58	0.05	0.01	4.23
Middletown	562 [15]	Middlesex County, CT	60.5 [0.58]	10M	2030	0.6	0.06	0.01	4.36
Middletown	562 [12]	Middlesex County, CT	60.5 [0.59]	10M	2030	0.59	0.07	0.01	4.43
Middletown	562 [13]	Middlesex County, CT	60.5 [0.59]	10M	2030	0.59	0.06	0.01	4.44
Middletown	562 [2]	Middlesex County, CT	113.6 [0.58]	10M	2013	0.68	1.21	0.54	6.36

Facility name	Facility [unit] ID	Location	Nameplate capacity (MW) [capacity factor]	Ramp	Retirement year	CO2 tons MW^{-1}	NOx lbs. MW^{-1}	SO2 lbs. MW^{-1}	Heat input MMBtu MW^{-1}
Middletown	562 [3]	Middlesex County, CT	239.4 [0.53]	10M	2019	0.62	2	0.3	5.36
Middletown	562 [4]	Middlesex County, CT	414.9 [0.39]	10M	2028	1.11	3.15	3.64	5.33
Milford Power Company LLC	55126 [CT02]	New Haven County, CT	289 [0.81]	12H	2057	0.42	0.05	0	5.7
Milford Power Company LLC	55126 [CT01]	New Haven County, CT	289 [0.83]	12H	2057	0.42	0.05	0	5.85
Milford Power, LLC	54805 [1]	Worcester County, MA	249.3 [0.45]	1H	2048	0.59	0.3	0.01	4.44
Millennium Power	55079 [1]	Worcester County, MA	360 [0.55]	12H	2055	0.64	0.14	0.01	5.87
Montville	546 [5]	New London County, CT	80.4 [0.59]	10M	2009	0.82	1.46	1.92	6.74
Montville	546 [6]	New London County, CT	414.9 [0.33]	10M	2026	1.05	2.57	3.53	4.24
Mystic	1588 [94]	Middlesex County, MA	593.6 [0.49]	12H	2024	0.43	0.05	0	3.51
Mystic	1588 [93]	Middlesex County, MA	593.6 [0.49]	12H	2024	0.43	0.06	0	3.53
Mystic	1588 [82]	Middlesex County, MA	593.6 [0.51]	12H	2024	0.42	0.06	0	3.62
Mystic	1588 [81]	Middlesex County, MA	593.6 [0.51]	12H	2024	0.42	0.05	0	3.65
New Haven Harbor	6156 [NHHS2]	New Haven County, CT	60.5 [0.59]	OVER	2030	0.58	0.19	0.01	4.36
New Haven Harbor	6156 [NHHS3]	New Haven County, CT	60.5 [0.6]	OVER	2030	0.58	0.15	0.01	4.39

Facility name	Facility [unit] ID	Location	Nameplate capacity (MW) [capacity factor]	Ramp	Retirement year	CO2 tons MW^{-1}	NOx lbs. MW^{-1}	SO2 lbs. MW^{-1}	Heat input MMBtu MW^{-1}
New Haven Harbor	6156 [NHHS4]	New Haven County, CT	60.5 [0.6]	OVER	2030	0.58	0.15	0.01	4.4
New Haven Harbor	6156 [NHB1]	New Haven County, CT	460 [0.35]	OVER	2030	0.78	1.19	1.89	3.7
Newington	8002 [1]	Rockingham County, NH	414 [0.35]	OVER	2029	0.95	2.33	4.08	4.54
Newington Energy	55661 [2]	Rockingham County, NH	419.9 [0.48]	12H	2057	0.44	0.1	0.01	3.48
Newington Energy	55661 [1]	Rockingham County, NH	419.9 [0.5]	12H	2057	0.45	0.1	0.01	3.62
Ocean State Power	51030 [2]	Providence County, RI	171.4 [0.41]	12H	2045	0.73	0.34	0.01	5.05
Ocean State Power	51030 [1]	Providence County, RI	171.4 [0.43]	12H	2045	0.71	0.31	0.01	5.06
Ocean State Power II	54324 [3]	Providence County, RI	171.4 [0.4]	12H	2046	0.76	0.35	0.01	5.14
Ocean State Power II	54324 [4]	Providence County, RI	171.4 [0.42]	12H	2046	0.75	0.37	0.01	5.23
Penny Lane Gas Turbine	3754 [CT1]	Chittenden County, VT	25.5 [0.92]	1H	2026	0.78	0.1	0.01	13.17
Penny Lane Gas Turbine	3754 [CT2]	Chittenden County, VT	25.5 [0.92]	1H	2026	0.78	0.1	0.01	13.17
Pittsfield Generating	50002 [1]	Berkshire County, MA	93.4 [0.34]	12H	2045	0.71	0.28	0	3.94
Pittsfield Generating	50002 [3]	Berkshire County, MA	93.4 [0.35]	12H	2045	0.71	0.25	0	4.07
Pittsfield Generating	50002 [2]	Berkshire County, MA	93.4 [0.35]	12H	2045	0.72	0.27	0	4.08

Facility name	Facility [unit] ID	Location	Nameplate capacity (MW) [capacity factor]	Ramp	Retirement year	CO2 tons MW^{-1}	NOx lbs. MW^{-1}	SO2 lbs. MW^{-1}	Heat input MMBtu MW^{-1}
Potter	1660 [4]	Norfolk County, MA	58 [0.67]	12H	2024	0.53	0.11	0.01	5.6
Potter	1660 [5]	Norfolk County, MA	58 [0.67]	12H	2024	0.53	0.14	0.01	5.62
Potter	1660 [3]	Norfolk County, MA	101 [0.44]	12H	2024	0.74	4.75	0	5.5
Rhode Island State Energy Center	55107 [RISEP2]	Providence County, RI	400 [0.62]	12H	2057	0.4	0.05	0	4.18
Rhode Island State Energy Center	55107 [RISEP1]	Providence County, RI	400 [0.62]	12H	2057	0.4	0.05	0	4.21
Rumford Power	55100 [1]	Oxford County, ME	272.9 [0.64]	12H	2055	0.43	0.16	0	4.7
Ryegate Associates	51026 [1]	Caledonia County, VT	20 [0.95]		2037	1.48	0.55	0.01	14.24
Salem Harbor Station NGCC	60903 [2]	Essex County, MA	399.1 [0.56]	12H	2073	0.41	0.07	0	3.93
Salem Harbor Station NGCC	60903 [1]	Essex County, MA	399.1 [0.56]	12H	2072	0.42	0.06	0	3.97
Schiller	2367 [CT1]	Rockingham County, NH	21.3 [0.4]	12H	2024	0.78	25.56	0.01	13.27
Schiller	2367 [6]	Rockingham County, NH	50 [0.55]	12H	2030	1.23	2.82	9.97	6.7
Schiller	2367 [4]	Rockingham County, NH	50 [0.54]	12H	2027	1.26	3.14	10.77	6.76
Schiller	2367 [5]	Rockingham County, NH	50 [0.87]	12H	2000	1.54	1	0.01	12.79

Facility name	Facility [unit] ID	Location	Nameplate capacity (MW) [capacity factor]	Ramp	Retirement year	CO2 tons MW^{-1}	NOx lbs. MW^{-1}	SO2 lbs. MW^{-1}	Heat input MMBtu MW^{-1}
Stony Brook Energy Center	6081 [4]	Hampden County, MA	85 [0.48]	10M	2030	1.07	15.82	0.01	6.39
Stony Brook Energy Center	6081 [5]	Hampden County, MA	85 [0.48]	10M	2030	1.1	16.24	0.01	6.55
Stony Brook Energy Center	6081 [2]	Hampden County, MA	190 [0.32]	10M	2030	0.85	1.89	0	3.69
Stony Brook Energy Center	6081 [3]	Hampden County, MA	190 [0.33]	10M	2030	0.77	1.9	0	3.92
Stony Brook Energy Center	6081 [1]	Hampden County, MA	190 [0.34]	10M	2030	0.77	2.02	0	3.97
Tiverton Power, LLC	55048 [1]	Newport County, RI	272.5 [0.83]	12H	2055	0.42	0.08	0	5.82
Torrington Terminal	565 [10]	Litchfield County, CT	21.8 [0.5]	10M	2024	0.78	17.23	0.01	7.23
Wallingford Energy, LLC	55517 [CT01]	New Haven County, CT	50 [0.74]	1H	2056	0.47	0.08	0	5.82
Wallingford Energy, LLC	55517 [CT07]	New Haven County, CT	50 [0.69]	1H	2072	0.5	0.1	0.01	5.83
Wallingford Energy, LLC	55517 [CT02]	New Haven County, CT	50 [0.73]	1H	2056	0.48	0.09	0	5.86
Wallingford Energy, LLC	55517 [CT03]	New Haven County, CT	50 [0.7]	1H	2056	0.5	0.09	0.01	5.86
Wallingford Energy, LLC	55517 [CT05]	New Haven County, CT	50 [0.73]	1H	2056	0.48	0.08	0	5.86
Wallingford Energy, LLC	55517 [CT06]	New Haven County, CT	50 [0.7]	1H	2072	0.51	0.1	0.01	5.97
Wallingford Energy, LLC	55517 [CT04]	New Haven County, CT	50 [0.74]	1H	2056	0.48	0.08	0.01	5.98

Facility name	Facility [unit] ID	Location	Nameplate capacity (MW) [capacity factor]	Ramp	Retirement year	CO2 tons MW^{-1}	NOx lbs. MW^{-1}	SO2 lbs. MW^{-1}	Heat input MMBtu MW^{-1}
Waterbury Generation	56629 [10]	New Haven County, CT	96 [0.69]	1H	2064	0.47	0.14	0.02	5.47
Waters River	1678 [1]	Essex County, MA	21.3 [0.68]	1H	2026	0.78	5.47	0.01	7.97
Waters River	1678 [2]	Essex County, MA	49.9 [0.49]	1H	2026	0.75	3.39	0.01	5.64
Waterside Power, LLC	56189 [4]	Fairfield County, CT	23.2 [0.92]	1H	2059	0.78	0.1	0.01	13.17
Waterside Power, LLC	56189 [5]	Fairfield County, CT	23.2 [0.92]	1H	2059	0.78	0.1	0.01	13.17
Waterside Power, LLC	56189 [7]	Fairfield County, CT	23.2 [0.92]	1H	2061	0.78	0.1	0.01	13.17
Westbrook Energy Center	55294 [2]	Cumberland County, ME	379.7 [0.59]	12H	2056	0.38	0.1	0	3.76
Westbrook Energy Center	55294 [1]	Cumberland County, ME	379.7 [0.59]	12H	2056	0.38	0.1	0	3.78
White Lake	2369 [CT1]	Carroll County, NH	18.6 [0.42]	10M	2024	0.78	23.01	0.01	12.95
William F Wyman	1507 [2]	Cumberland County, ME	50 [0.17]	OVER	2013	1.35	3.97	10.65	2.62
William F Wyman	1507 [1]	Cumberland County, ME	50 [0.24]	OVER	2012	1.22	3.45	9.63	3.34
William F Wyman	1507 [3]	Cumberland County, ME	213.6 [0.18]	OVER	2020	0.9	1.6	7.09	1.92
William F Wyman	1507 [4]	Cumberland County, ME	649.1 [0.35]	OVER	2030	0.87	1.75	6.52	3.54

Table S4: Externally derived parameters for the generation expansion model

Description	Probabilistic treatment	Calculation method or source
Electricity demand	Deterministic	Data provided by ISO-NE (Commonwealth of Massachusetts, 2020).
Nuclear, hydropower and biomass capacity factors	Deterministic	Data provided by ISO-NE (Commonwealth of Massachusetts, 2020).
Solar PV, onshore wind and offshore wind capacity factors	Empirical distributions (1st to 99th percentiles)	Non-parametric bootstrap sample year provided by ISO-NE (2024a).; linear regression employed to compute missing percentiles ranging from 1 to 99.
Energy storage operating constrains	Deterministic	Data provided by ISO-NE (Commonwealth of Massachusetts, 2020).
Electricity imports from other jurisdictions	Empirical distributions (1st to 99th percentiles)	Empirical distributions for percentiles ranging from 1 to 99 were simulated using historical data provided by ISO-NE (2024b).
Fossil fuel facility data (e.g., nameplate capacity, stack heights, age and planned retirements)	Deterministic	Data provided by U.S. EPA CAMPD API. eGrid and EIA Form 860 were consulted to cross reference CAMPD data. (U.S. EIA 860, 2023; U.S. EPA CAMPD, 2024; U.S. EPA eGrid, 2022).
Fossil fuel hourly generation data	Empirical distributions (1st to 99th percentiles)	Empirical distributions for percentiles ranging from 1 to 99 were simulated using historical data provided by U.S. EPA CAMPD (2024).
	Uniform distributions from available estimates	If no historical data was available, data from a specific facility with highly reliable U.S. EPA CAMPD data was used.
Fossil fuel hourly emissions data (CO_2, SO_2 and NO_x)	Empirical distributions (1st to 99th percentiles)	Empirical distributions for percentiles ranging from 1 to 99 were simulated using historical data provided by U.S. EPA CAMPD (2024).
	Uniform distributions from available estimates	If no historical data was available, data from a specific facility with highly reliable U.S. EPA CAMPD data was used.

Table S5: Externally derived parameters for cost calculations

Description	Probabilistic treatment	Calculation method or source	Location in the manuscript
CAPEX, FOM and VOM costs	Uniform distributions from available estimates	Data provided by NREL (2024).	section 2.3.1
Fossil generation fuel costs	Uniform distributions from available estimates	Data provided by NREL (2021).	section 2.3.1
Non-fossil generation fuel costs	Uniform distributions from available estimates	Data provided by NREL (2024).	section 2.3.1
Electricity import costs	Uniform distributions from available estimates	Imports from Canada provided by Calder et al., (2022) and imports from NYISO provided by DeSantis et al., (2021).	section 2.3.1
GHG (CO_2, CH_4 and N_2O) emissions economic valuation	Uniform distributions from available estimates	Data provided by Calder et al., (2022).	section 2.3.2
GHG (CH_4 and N_2O) emission factors	Uniform distributions from available estimates	Data provided by U.S. EPA GHGRP (2024) to identify the $CO2_{eq}$ of CH_4 and N_2O emissions for different fuel type.	section 2.3.2
Air emissions (SO_2, NO_X, VOC, $PM_{2.5}$ and PM_{10}) economic valuation	Deterministic valuations based on stack height	Data provided by AP3 model (Muller, 2022).	section 2.3.3
CO emissions economic valuation	Uniform distributions from available estimates	Data provided by Calder et al., (2022).	section 2.3.3
Ambient air pollutant (CO, TPM and VOC) emission factors	Uniform distributions from available estimates	EIA 923 (2023) data was pooled to calculate TPM for each facility and U.S. EPA AP-42 (2024) guidelines were used to estimate VOC and CO emissions.	section 2.3.3
Unmet demand penalty	Uniform distributions from available estimates	EVOLL model used by ISO-NE (Potomac Economics, 2024).	section 2.3.4
New hydroelectric dam in Canada emission factors and costs	Uniform distributions from available estimates	CAPEX was estimated using (Commonwealth of Massachusetts, 2020; Hollmann et al., 2014). FOM was estimate using IEA (2010). CH_4 emissions were estimated using Delwiche et al., (2022) and Canadian dams as a reference.	section 2.3.5
CPI factors	Deterministic	Data provided by U.S. Bureau of Labor Statistics (2024) API.	section 2.3.6

Table S6: Summary of fuel-specific emission factors, including non-biogenic CO_2-eq for CH_4 and N_2O emissions, PM rates and ratios, and estimated CO and VOC emissions. Details on sources for these estimates is provided in SI Table S5.

Fuel category	**non-biogenic CH_4-to-CO_2 (ratio %)**	**non-biogenic N_2O-to-CO_2 (ratio %)**	**PM (lbs MMBtu^{-1})**	**$PM_{2.5}$-to-PM (ratio %)**	**PM_{10}-to-PM (ratio %)**	**CO (tons MMBtu^{-1})**	**VOC (tons MMBtu^{-1})**
Oil	9.66E-04	2.62E-03	2.45E-02	69%	31%	1.67E-05	4.29E-06
Gas (combined cycle)	4.91E-04	6.55E-04	1.09E-02	100%	0%	1.50E-05	1.05E-06
Gas (combustion turbine)	5.26E-04	7.27E-04	1.71E-02	100%	0%	1.50E-05	1.05E-06
Coal	3.13E-03	5.48E-03	1.09E-02	32.5%	67.5%	9.62E-06	1.09E-06
Wood	n/a	n/a	2.94E-03	100%	0%	3.00E-04	8.50E-06

Table S7: Facility specific social costs of air emissions (2024-USD tonne^{-1}). Details on sources for these estimates is provided in SI Table S5.

					Social cost (2024-USD tonne^{-1})					
Facility name	**Facility [unit] ID**	**Location**	**Primary fuel type**	**Stack height (ft)**	**NO_x**	**SO_2**	**VOC**	**CO**	**$PM_{2.5}$**	**PM_{10}**
Alfred L Pierce Generating Station	6635 [AP-1]	New Haven, CT	Pipeline Natural Gas	120	85.28	3095.76	1152.24	1406.75	10322.52	1378.32
Bellingham	10307 [1]	Norfolk, MA	Pipeline Natural Gas	120	97.18	3639.16	1503.26	1653.25	13582.89	2084.34
Bellingham	10307 [2]	Norfolk, MA	Pipeline Natural Gas	120	97.18	3639.16	1503.26	1653.25	13582.89	2084.34
Bellingham Power Generation LLC	55211 [1]	Norfolk, MA	Pipeline Natural Gas	120	97.18	3639.16	1503.26	1653.25	13582.89	2084.34
Bellingham Power Generation LLC	55211 [2]	Norfolk, MA	Pipeline Natural Gas	120	97.18	3639.16	1503.26	1653.25	13582.89	2084.34
Berkshire Power	55041 [1]	Hampden, MA	Pipeline Natural Gas	120	77.34	2306.45	765.51	1048.7	6613.95	1070.92
Blackstone Power Generation LLC	55212 [1]	Worcester, MA	Pipeline Natural Gas	120	45.61	4620.84	1455.66	2098.57	12803.49	2135.9

					Social cost (2024-USD tonne^{-1})					
Facility name	**Facility [unit] ID**	**Location**	**Primary fuel type**	**Stack height (ft)**	**NO_x**	**SO_2**	**VOC**	**CO**	**$PM_{2.5}$**	**PM_{10}**
Blackstone Power Generation LLC	55212 [2]	Worcester, MA	Pipeline Natural Gas	120	45.61	4620.84	1455.66	2098.57	12803.49	2135.9
Bridgeport Energy	55042 [BE1]	Fairfield, CT	Pipeline Natural Gas	120	255.83	4616.87	1786.86	2096.77	15996.44	2298.52
Bridgeport Energy	55042 [BE2]	Fairfield, CT	Pipeline Natural Gas	120	255.83	4616.87	1786.86	2096.77	15996.44	2298.52
Bridgeport Harbor Station	568 [BHB5]	Fairfield, CT	Pipeline Natural Gas	298	27.76	2389.75	840.87	1086.48	6970.92	1003.5
Burgess BioPower	58054 [ST01]	Coos, NH	Wood	120	65.45	938.05	160.64	427.95	1245.45	202.29
Canal Station	1599 [2]	Barnstable, MA	Residual Oil	498	277.65	1021.34	243.93	465.73	1572.67	212.2
Canal Station	1599 [3]	Barnstable, MA	Pipeline Natural Gas	498	277.65	1021.34	243.93	465.73	1572.67	212.2
Cleary Flood	1682 [9]	Bristol, MA	Pipeline Natural Gas	187	93.21	2980.74	1021.34	1354.57	9057.24	1346.59
Cos Cob	542 [13]	Litchfield, CT	Other Oil	120	144.77	4273.78	1437.82	1941.13	12839.19	1733.31
Cos Cob	542 [14]	Litchfield, CT	Other Oil	120	144.77	4273.78	1437.82	1941.13	12839.19	1733.31

					Social cost (2024-USD tonne^{-1})					
Facility name	**Facility [unit] ID**	**Location**	**Primary fuel type**	**Stack height (ft)**	**NO_x**	**SO_2**	**VOC**	**CO**	**$PM_{2.5}$**	**PM_{10}**
CPV Towantic Energy Center	56047 [1]	New Haven, CT	Pipeline Natural Gas	150	85.28	3095.76	1152.24	1406.75	10322.52	1378.32
CPV Towantic Energy Center	56047 [2]	New Haven, CT	Pipeline Natural Gas	150	85.28	3095.76	1152.24	1406.75	10322.52	1378.32
Dartmouth Power	52026 [1]	Bristol, MA	Pipeline Natural Gas	120	93.21	2980.74	1021.34	1354.57	9057.24	1346.59
Dartmouth Power	52026 [2]	Bristol, MA	Pipeline Natural Gas	120	93.21	2980.74	1021.34	1354.57	9057.24	1346.59
Devon	544 [10]	Fairfield, CT	Other Oil	340	27.76	2389.75	840.87	1086.48	6970.92	1003.5
Devon	544 [11]	Fairfield, CT	Pipeline Natural Gas	340	27.76	2389.75	840.87	1086.48	6970.92	1003.5
Devon	544 [12]	Fairfield, CT	Pipeline Natural Gas	340	27.76	2389.75	840.87	1086.48	6970.92	1003.5
Devon	544 [13]	Fairfield, CT	Pipeline Natural Gas	340	27.76	2389.75	840.87	1086.48	6970.92	1003.5
Devon	544 [14]	Fairfield, CT	Pipeline Natural Gas	340	27.76	2389.75	840.87	1086.48	6970.92	1003.5

					Social cost (2024-USD tonne^{-1})					
Facility name	**Facility [unit] ID**	**Location**	**Primary fuel type**	**Stack height (ft)**	**NO_x**	**SO_2**	**VOC**	**CO**	**$PM_{2.5}$**	**PM_{10}**
Devon	544 [15]	Fairfield, CT	Diesel Oil	340	27.76	2389.75	840.87	1086.48	6970.92	1003.5
Devon	544 [16]	Fairfield, CT	Diesel Oil	340	27.76	2389.75	840.87	1086.48	6970.92	1003.5
Devon	544 [17]	Fairfield, CT	Diesel Oil	340	27.76	2389.75	840.87	1086.48	6970.92	1003.5
Devon	544 [18]	Fairfield, CT	Diesel Oil	340	27.76	2389.75	840.87	1086.48	6970.92	1003.5
Dighton	55026 [1]	Bristol, MA	Pipeline Natural Gas	120	93.21	2980.74	1021.34	1354.57	9057.24	1346.59
Exelon West Medway II	59882 [J4]	Norfolk, MA	Pipeline Natural Gas	120	97.18	3639.16	1503.26	1653.25	13582.89	2084.34
Exelon West Medway II	59882 [J5]	Norfolk, MA	Pipeline Natural Gas	120	97.18	3639.16	1503.26	1653.25	13582.89	2084.34
Fore River Energy Center	55317 [11]	Norfolk, MA	Pipeline Natural Gas	255	49.58	2010.96	654.45	914.65	5310.99	811.13
Fore River Energy Center	55317 [12]	Norfolk, MA	Pipeline Natural Gas	255	49.58	2010.96	654.45	914.65	5310.99	811.13
Granite Ridge Energy	55170 [1]	Hillsborough, NH	Pipeline Natural Gas	120	77.34	3058.08	795.26	1389.66	6828.13	1189.92
Granite Ridge Energy	55170 [2]	Hillsborough, NH	Pipeline Natural Gas	120	77.34	3058.08	795.26	1389.66	6828.13	1189.92

					Social cost (2024-USD tonne^{-1})					
Facility name	**Facility [unit] ID**	**Location**	**Primary fuel type**	**Stack height (ft)**	**NO_x**	**SO_2**	**VOC**	**CO**	**$PM_{2.5}$**	**PM_{10}**
J C McNeil	589 [1]	Chittenden, VT	Wood	120	63.46	997.55	226.08	454.94	1743.23	311.36
Kendall Green Energy LLC	1595 [4]	Middlesex, MA	Pipeline Natural Gas	120	107.09	5289.18	1889.98	2401.74	16980.1	2718.96
Kendall Green Energy LLC	1595 [S6]	Middlesex, MA	Diesel Oil	120	107.09	5289.18	1889.98	2401.74	16980.1	2718.96
Kleen Energy Systems Project	56798 [U1]	Middlesex, CT	Pipeline Natural Gas	215	69.41	1897.92	592.97	863.37	5154.32	763.53
Kleen Energy Systems Project	56798 [U2]	Middlesex, CT	Pipeline Natural Gas	215	69.41	1897.92	592.97	863.37	5154.32	763.53
Lake Road Generating Company	55149 [LRG1]	Windham, CT	Pipeline Natural Gas	120	148.74	2901.41	767.5	1318.59	6689.31	1068.94
Lake Road Generating Company	55149 [LRG2]	Windham, CT	Pipeline Natural Gas	120	148.74	2901.41	767.5	1318.59	6689.31	1068.94
Lake Road Generating Company	55149 [LRG3]	Windham, CT	Pipeline Natural Gas	120	148.74	2901.41	767.5	1318.59	6689.31	1068.94
Maine Independence Station	55068 [1]	Penobscot, ME	Pipeline Natural Gas	120	29.75	374.82	57.51	172.45	412.5	71.39
Maine Independence Station	55068 [2]	Penobscot, ME	Pipeline Natural Gas	120	29.75	374.82	57.51	172.45	412.5	71.39

					Social cost (2024-USD tonne^{-1})					
Facility name	**Facility [unit] ID**	**Location**	**Primary fuel type**	**Stack height (ft)**	**NO_x**	**SO_2**	**VOC**	**CO**	**$PM_{2.5}$**	**PM_{10}**
Manchester Street Station	3236 [10]	Providence, RI	Pipeline Natural Gas	120	113.04	3143.36	1118.52	1428.34	9824.74	1642.08
Manchester Street Station	3236 [11]	Providence, RI	Pipeline Natural Gas	120	113.04	3143.36	1118.52	1428.34	9824.74	1642.08
Manchester Street Station	3236 [9]	Providence, RI	Pipeline Natural Gas	120	113.04	3143.36	1118.52	1428.34	9824.74	1642.08
MBTA South Boston Power Facility	10176 [A]	Suffolk, MA	Other Oil	120	93.21	3716.5	1753.14	1688.33	15883.39	2427.43
MBTA South Boston Power Facility	10176 [B]	Suffolk, MA	Other Oil	120	93.21	3716.5	1753.14	1688.33	15883.39	2427.43
Medway Station	1592 [J1T1]	Norfolk, MA	Diesel Oil	120	97.18	3639.16	1503.26	1653.25	13582.89	2084.34
Medway Station	1592 [J1T2]	Norfolk, MA	Diesel Oil	120	97.18	3639.16	1503.26	1653.25	13582.89	2084.34
Medway Station	1592 [J2T1]	Norfolk, MA	Diesel Oil	120	97.18	3639.16	1503.26	1653.25	13582.89	2084.34
Medway Station	1592 [J2T2]	Norfolk, MA	Diesel Oil	120	97.18	3639.16	1503.26	1653.25	13582.89	2084.34
Medway Station	1592 [J3T1]	Norfolk, MA	Diesel Oil	120	97.18	3639.16	1503.26	1653.25	13582.89	2084.34
Medway Station	1592 [J3T2]	Norfolk, MA	Diesel Oil	120	97.18	3639.16	1503.26	1653.25	13582.89	2084.34
Merrimack	2364 [1]	Merrimack, NH	Coal	445	243.93	1483.43	362.92	675.35	2572.2	414.49

					Social cost (2024-USD tonne^{-1})					
Facility name	**Facility [unit] ID**	**Location**	**Primary fuel type**	**Stack height (ft)**	**NO_x**	**SO_2**	**VOC**	**CO**	**$PM_{2.5}$**	**PM_{10}**
Merrimack	2364 [2]	Merrimack, NH	Coal	445	243.93	1483.43	362.92	675.35	2572.2	414.49
Middletown	562 [12]	Middlesex, CT	Diesel Oil	266	251.87	1223.63	351.03	557.5	2500.81	374.82
Middletown	562 [13]	Middlesex, CT	Diesel Oil	266	251.87	1223.63	351.03	557.5	2500.81	374.82
Middletown	562 [14]	Middlesex, CT	Diesel Oil	266	251.87	1223.63	351.03	557.5	2500.81	374.82
Middletown	562 [15]	Middlesex, CT	Diesel Oil	266	251.87	1223.63	351.03	557.5	2500.81	374.82
Middletown	562 [4]	Middlesex, CT	Residual Oil	266	251.87	1223.63	351.03	557.5	2500.81	374.82
Milford Power Company LLC	55126 [CT01]	New Haven, CT	Pipeline Natural Gas	120	85.28	3095.76	1152.24	1406.75	10322.52	1378.32
Milford Power Company LLC	55126 [CT02]	New Haven, CT	Pipeline Natural Gas	120	85.28	3095.76	1152.24	1406.75	10322.52	1378.32
Milford Power, LLC	54805 [1]	Worcester, MA	Pipeline Natural Gas	120	45.61	4620.84	1455.66	2098.57	12803.49	2135.9
Millennium Power	55079 [1]	Worcester, MA	Pipeline Natural Gas	120	45.61	4620.84	1455.66	2098.57	12803.49	2135.9
Montville	546 [6]	New London, CT	Residual Oil	249	148.74	3270.29	928.13	1485.92	8053.75	1253.38

					Social cost (2024-USD tonne^{-1})					
Facility name	**Facility [unit] ID**	**Location**	**Primary fuel type**	**Stack height (ft)**	**NO_x**	**SO_2**	**VOC**	**CO**	**$PM_{2.5}$**	**PM_{10}**
New Haven Harbor	6156 [NHB1]	New Haven, CT	Residual Oil	389	339.13	1659.93	521.58	755.42	4077.45	563.23
New Haven Harbor	6156 [NHHS2]	New Haven, CT	Diesel Oil	389	339.13	1659.93	521.58	755.42	4077.45	563.23
New Haven Harbor	6156 [NHHS3]	New Haven, CT	Diesel Oil	389	339.13	1659.93	521.58	755.42	4077.45	563.23
New Haven Harbor	6156 [NHHS4]	New Haven, CT	Diesel Oil	389	339.13	1659.93	521.58	755.42	4077.45	563.23
Newington	8002 [1]	Rockingham, NH	Residual Oil	410	160.64	1495.33	442.25	680.75	3323.83	517.61
Newington Energy	55661 [1]	Rockingham, NH	Pipeline Natural Gas	150	69.41	2812.17	872.6	1278.1	7674.96	1209.75
Newington Energy	55661 [2]	Rockingham, NH	Pipeline Natural Gas	150	69.41	2812.17	872.6	1278.1	7674.96	1209.75
Ocean State Power	51030 [1]	Providence, RI	Pipeline Natural Gas	120	113.04	3143.36	1118.52	1428.34	9824.74	1642.08
Ocean State Power	51030 [2]	Providence, RI	Pipeline Natural Gas	120	113.04	3143.36	1118.52	1428.34	9824.74	1642.08
Ocean State Power II	54324 [3]	Providence, RI	Pipeline Natural Gas	120	113.04	3143.36	1118.52	1428.34	9824.74	1642.08
Ocean State Power II	54324 [4]	Providence, RI	Pipeline Natural Gas	120	113.04	3143.36	1118.52	1428.34	9824.74	1642.08

					Social cost (2024-USD tonne^{-1})					
Facility name	**Facility [unit] ID**	**Location**	**Primary fuel type**	**Stack height (ft)**	**NO_x**	**SO_2**	**VOC**	**CO**	**$PM_{2.5}$**	**PM_{10}**
Pittsfield Generating	50002 [1]	Berkshire, MA	Pipeline Natural Gas	120	105.11	2193.41	624.71	997.42	5269.34	777.41
Pittsfield Generating	50002 [2]	Berkshire, MA	Pipeline Natural Gas	120	105.11	2193.41	624.71	997.42	5269.34	777.41
Pittsfield Generating	50002 [3]	Berkshire, MA	Pipeline Natural Gas	120	105.11	2193.41	624.71	997.42	5269.34	777.41
Rhode Island State Energy Center	55107 [RISEP1]	Providence, RI	Pipeline Natural Gas	185	113.04	3143.36	1118.52	1428.34	9824.74	1642.08
Rhode Island State Energy Center	55107 [RISEP2]	Providence, RI	Pipeline Natural Gas	185	113.04	3143.36	1118.52	1428.34	9824.74	1642.08
Rumford Power	55100 [1]	Oxford, ME	Pipeline Natural Gas	120	77.34	967.8	164.61	441.44	1336.67	210.22
Salem Harbor Station NGCC	60903 [1]	Essex, MA	Pipeline Natural Gas	230	69.41	2322.32	874.59	1055.89	7760.23	1183.97
Salem Harbor Station NGCC	60903 [2]	Essex, MA	Pipeline Natural Gas	230	69.41	2322.32	874.59	1055.89	7760.23	1183.97
Schiller	2367 [4]	Rockingham, NH	Coal	226	69.41	2812.17	872.6	1278.1	7674.96	1209.75

					Social cost (2024-USD tonne^{-1})					
Facility name	**Facility [unit] ID**	**Location**	**Primary fuel type**	**Stack height (ft)**	**NO_x**	**SO_2**	**VOC**	**CO**	**$PM_{2.5}$**	**PM_{10}**
Schiller	2367 [6]	Rockingham, NH	Coal	226	69.41	2812.17	872.6	1278.1	7674.96	1209.75
Stony Brook Energy Center	6081 [1]	Hampden, MA	Pipeline Natural Gas	120	77.34	2306.45	765.51	1048.7	6613.95	1070.92
Stony Brook Energy Center	6081 [2]	Hampden, MA	Pipeline Natural Gas	120	77.34	2306.45	765.51	1048.7	6613.95	1070.92
Stony Brook Energy Center	6081 [3]	Hampden, MA	Pipeline Natural Gas	120	77.34	2306.45	765.51	1048.7	6613.95	1070.92
Stony Brook Energy Center	6081 [4]	Hampden, MA	Diesel Oil	120	77.34	2306.45	765.51	1048.7	6613.95	1070.92
Stony Brook Energy Center	6081 [5]	Hampden, MA	Diesel Oil	120	77.34	2306.45	765.51	1048.7	6613.95	1070.92
Tiverton Power, LLC	55048 [1]	Newport, RI	Pipeline Natural Gas	120	97.18	2231.09	763.53	1014.51	6578.25	981.68
Wallingford Energy, LLC	55517 [CT01]	New Haven, CT	Pipeline Natural Gas	120	85.28	3095.76	1152.24	1406.75	10322.52	1378.32
Wallingford Energy, LLC	55517 [CT02]	New Haven, CT	Pipeline Natural Gas	120	85.28	3095.76	1152.24	1406.75	10322.52	1378.32
Wallingford Energy, LLC	55517 [CT03]	New Haven, CT	Pipeline Natural Gas	120	85.28	3095.76	1152.24	1406.75	10322.52	1378.32

					Social cost (2024-USD tonne^{-1})					
Facility name	**Facility [unit] ID**	**Location**	**Primary fuel type**	**Stack height (ft)**	**NO_x**	**SO_2**	**VOC**	**CO**	**$PM_{2.5}$**	**PM_{10}**
Wallingford Energy, LLC	55517 [CT04]	New Haven, CT	Pipeline Natural Gas	120	85.28	3095.76	1152.24	1406.75	10322.52	1378.32
Wallingford Energy, LLC	55517 [CT05]	New Haven, CT	Pipeline Natural Gas	120	85.28	3095.76	1152.24	1406.75	10322.52	1378.32
Wallingford Energy, LLC	55517 [CT06]	New Haven, CT	Pipeline Natural Gas	120	85.28	3095.76	1152.24	1406.75	10322.52	1378.32
Wallingford Energy, LLC	55517 [CT07]	New Haven, CT	Pipeline Natural Gas	120	85.28	3095.76	1152.24	1406.75	10322.52	1378.32
Waterbury Generation	56629 [10]	New Haven, CT	Pipeline Natural Gas	120	85.28	3095.76	1152.24	1406.75	10322.52	1378.32
Waters River	1678 [1]	Essex, MA	Pipeline Natural Gas	120	69.41	2322.32	874.59	1055.89	7760.23	1183.97
Waters River	1678 [2]	Essex, MA	Pipeline Natural Gas	120	69.41	2322.32	874.59	1055.89	7760.23	1183.97
Westbrook Energy Center	55294 [1]	Cumberland, ME	Pipeline Natural Gas	120	101.14	1447.73	329.21	659.16	2784.4	444.24
Westbrook Energy Center	55294 [2]	Cumberland, ME	Pipeline Natural Gas	120	101.14	1447.73	329.21	659.16	2784.4	444.24
William F Wyman	1507 [4]	Cumberland, ME	Residual Oil	320	243.93	926.15	220.13	422.55	1330.72	210.22

Table S8: Methane emissions from Canadian reservoirs and relevant facilities. Total reservoir capacity 7,892 MW and hydroelectric capacity factor of 65%. Details on sources for these estimates is provided in SI Table S5.

Reservoir	Facility	Emissions [mg CH_4-C $(m^2 day)^{-1}$]	Area (km^2)	Emissions [mg CH_4-C $(day)^{-1}$]	Capacity (MW)	Emissions [mg CH_4-C $(MW\ day)^{-1}$]	Emissions [mg CH_4-C $(MW\ year)^{-1}$]	Emissions [kg CH_4-C $(MWh)^{-1}$]
Eastmain Reservoir	Eastmain-1	9.43	602.9	5.69E9	480	4.07E6	714.22	**0.26**
	Eastmain-1-A				768			
	Sarcelle				150			
Laforge-1 Reservoir	Laforge-1	13	1,288	1.67E10	878	1.91E7	3349.24	**1.22**
Robert-Bourassa Reservoir	Robert-Bourassa	5	2,835	1.42E10	5,616	2.52E6	443.28	**0.16**

Table S9: Net present value of costs (in billions of 2024 USD, discounted at 1.5%) across eight decarbonization pathways (A, B1, B2, B3(1), B3(2), C1, C2, C3, D). Costs are disaggregated into capital expenditures (CAPEX), fixed and variable operations and maintenance (O&M), fuel, imports, greenhouse gas (GHG) and air emissions, and unmet demand penalties; values in parentheses indicate uncertainty ranges, and the "Sum" row shows total costs. Pathway B3 compares two cost-accounting methods for new hydroelectric development in Canada: B3(1) assumes U.S.-only costs (infrastructure plus imported power), while B3(2) captures total social costs by also accounting for generation-side impacts (e.g., reservoir methane emissions). Upper and lower bounds in brackets show the 90% CI considering NREL cost various scenarios.

	A	**B1**	**B2**	**B3(1)**	**B3(2)**	**C1**	**C2**	**C3**	**D**
CAPEX	0 (0-0)	200.89 (159.72-248.41)	225.98 (179.33-279.84)	189.21 (150.58-233.78)	238.76 (179.99-303.47)	226.19 (114.01-342.26)	223.33 (170.27-283.01)	202.96 (157.74-254.17)	79.95 (67.23-94.83)
Fixed O&M	46.38 (40.76-51.44)	79.56 (67.56-91.97)	85.24 (72.66-98.35)	76.94 (65.21-89.03)	131.65 (87.31-176.36)	90.88 (72.59-115.43)	86.21 (72.57-101.15)	81.22 (68.43-94.94)	63.84 (54.9-72.77)
Variable O&M	7.71 (7.27-8.11)	3.59 (3.21-3.93)	3.93 (3.55-4.27)	3.59 (3.21-3.93)	3.59 (3.21-3.93)	10.23 (8.98-11.25)	4.65 (4.16-5.08)	4.01 (3.56-4.4)	9.2 (8.73-9.63)
Fuel	53.73 (53.73-53.73)	21.79 (21.79-21.79)	25.56 (25.56-25.56)	21.72 (21.72-21.72)	21.72 (21.72-21.72)	50.02 (47.31-52.81)	27.55 (27.2-27.91)	22.61 (22.38-22.84)	74.58 (74.58-74.58)
Imports	21.88 (10.97-32.8)	74.49 (37.4-111.59)	28.26 (14.15-42.37)	94.7 (47.56-141.84)	17.84 (8.91-26.76)	21.88 (10.97-32.8)	28.26 (14.15-42.37)	74.49 (37.4-111.59)	74.49 (37.4-111.59)
GHG emissions	629.96 (629.96-629.96)	197.62 (197.62-197.62)	237.72 (237.72-237.72)	196.72 (196.72-196.72)	204.07 (198.37-209.76)	192.35 (192.35-192.35)	218.75 (218.75-218.75)	181.3 (181.3-181.3)	780.83 (780.83-780.83)
Air emissions	1.45 (1.45-1.45)	0.68 (0.68-0.68)	0.78 (0.78-0.78)	0.67 (0.67-0.67)	0.67 (0.67-0.67)	0.62 (0.62-0.62)	0.73 (0.73-0.73)	0.63 (0.63-0.63)	1.35 (1.35-1.35)
Unmet demand penalty	488.85 (488.85-488.85)	5.39 (5.39-5.39)	11.97 (11.97-11.97)	4.56 (4.56-4.56)	4.56 (4.56-4.56)	5.52 (5.52-5.52)	6.81 (6.81-6.81)	3.23 (3.23-3.23)	2.34 (2.34-2.34)
Sum	1249.95 (1232.98-1266.33)	584.01 (493.37-681.37)	619.44 (545.73-700.85)	588.11 (490.23-692.25)	622.86 (504.75-747.23)	597.68 (452.36-753.03)	596.28 (514.64-685.8)	570.46 (474.68-673.11)	1086.59 (1027.37-1147.93)

Table S10: Net present value of costs (in billions of 2024 USD, discounted at 2%) across eight decarbonization pathways

	A	B1	B2	B3(1)	B3(2)	C1	C2	C3	D
CAPEX	0 (0-0)	188.41 (149.78-232.99)	211.75 (167.98-262.31)	177.49 (141.26-219.29)	226.35 (170.26-288.03)	210.25 (106.23-317.81)	209.44 (159.68-265.42)	190.63 (148.12-238.77)	74.75 (62.84-88.67)
Fixed O&M	43.57 (38.34-48.29)	73.9 (62.84-85.34)	79.11 (67.52-91.18)	71.5 (60.68-82.64)	122.33 (81.22-163.77)	83.89 (67.14-106.33)	79.97 (67.4-93.71)	75.43 (63.64-88.07)	59.56 (51.3-67.82)
Variable O&M	7.23 (6.82-7.6)	3.41 (3.06-3.72)	3.73 (3.38-4.05)	3.41 (3.06-3.72)	3.41 (3.06-3.72)	9.47 (8.34-10.41)	4.39 (3.94-4.78)	3.79 (3.38-4.16)	8.56 (8.12-8.95)
Fuel	50.33 (50.33-50.33)	20.8 (20.8-20.8)	24.33 (24.33-24.33)	20.76 (20.76-20.76)	20.76 (20.76-20.76)	46.72 (44.25-49.25)	26.18 (25.86-26.51)	21.54 (21.34-21.76)	69.01 (69.01-69.01)
Imports	20.58 (10.31-30.84)	69 (34.64-103.36)	26.42 (13.23-39.6)	87.3 (43.84-130.75)	16.62 (8.3-24.93)	20.58 (10.31-30.84)	26.42 (13.23-39.6)	69 (34.64-103.36)	69 (34.64-103.36)
GHG emissions	369.28 (369.28-369.28)	116.5 (116.5-116.5)	139.91 (139.91-139.91)	116.03 (116.03-116.03)	121.34 (117.22-125.46)	114.03 (114.03-114.03)	129.01 (129.01-129.01)	107.04 (107.04-107.04)	455.51 (455.51-455.51)
Air emissions	1.35 (1.35-1.35)	0.65 (0.65-0.65)	0.74 (0.74-0.74)	0.64 (0.64-0.64)	0.64 (0.64-0.64)	0.6 (0.6-0.6)	0.7 (0.7-0.7)	0.61 (0.61-0.61)	1.27 (1.27-1.27)
Unmet demand penalty	443.32 (443.32-443.32)	4.98 (4.98-4.98)	11.04 (11.04-11.04)	4.22 (4.22-4.22)	4.22 (4.22-4.22)	5.3 (5.3-5.3)	6.32 (6.32-6.32)	2.99 (2.99-2.99)	2.2 (2.2-2.2)
Sum	935.67 (919.77-951.02)	477.64 (393.24-568.33)	497.04 (428.14-573.17)	481.34 (390.49-578.06)	515.68 (405.69-631.53)	490.84 (356.19-634.58)	482.42 (406.13-566.05)	471.03 (381.75-566.74)	739.86 (684.9-796.79)

Table S11: Net present value of costs (in billions of 2024 USD, discounted at 2.5%) across eight decarbonization pathways

	A	B1	B2	B3(1)	B3(2)	C1	C2	C3	D
CAPEX	0 (0-0)	176.98 (140.69-218.89)	198.74 (157.61-246.27)	166.75 (132.73-206.03)	214.95 (161.33-273.83)	195.66 (99.08-295.45)	196.71 (149.98-249.29)	179.32 (139.31-224.63)	69.99 (58.83-83.03)
Fixed O&M	41 (36.12-45.4)	68.76 (58.54-79.31)	73.54 (62.84-84.67)	66.55 (56.56-76.84)	113.85 (75.67-152.32)	77.56 (62.19-98.1)	74.3 (62.71-86.95)	70.17 (59.28-81.82)	55.67 (48.02-63.3)
Variable O&M	6.79 (6.41-7.13)	3.24 (2.92-3.53)	3.55 (3.22-3.84)	3.25 (2.92-3.54)	3.25 (2.92-3.54)	8.79 (7.75-9.65)	4.15 (3.73-4.52)	3.6 (3.21-3.93)	7.97 (7.57-8.34)
Fuel	47.23 (47.23-47.23)	19.87 (19.87-19.87)	23.2 (23.2-23.2)	19.85 (19.85-19.85)	19.85 (19.85-19.85)	43.71 (41.47-46.02)	24.91 (24.61-25.21)	20.56 (20.37-20.75)	63.96 (63.96-63.96)
Imports	19.38 (9.72-29.05)	64.02 (32.14-95.9)	24.74 (12.39-37.09)	80.6 (40.48-120.73)	15.51 (7.75-23.27)	19.38 (9.72-29.05)	24.74 (12.39-37.09)	64.02 (32.14-95.9)	64.02 (32.14-95.9)
GHG emissions	226.1 (226.1-226.1)	71.74 (71.74-71.74)	86.01 (86.01-86.01)	71.48 (71.48-71.48)	75.52 (72.39-78.64)	70.62 (70.62-70.62)	79.47 (79.47-79.47)	66.01 (66.01-66.01)	277.48 (277.48-277.48)
Air emissions	1.27 (1.27-1.27)	0.62 (0.62-0.62)	0.71 (0.71-0.71)	0.62 (0.62-0.62)	0.62 (0.62-0.62)	0.58 (0.58-0.58)	0.67 (0.67-0.67)	0.58 (0.58-0.58)	1.2 (1.2-1.2)
Unmet demand penalty	402.36 (402.36-402.36)	4.6 (4.6-4.6)	10.2 (10.2-10.2)	3.91 (3.91-3.91)	3.91 (3.91-3.91)	5.09 (5.09-5.09)	5.88 (5.88-5.88)	2.77 (2.77-2.77)	2.06 (2.06-2.06)
Sum	744.13 (729.21-758.54)	409.84 (331.12-494.46)	420.69 (356.17-492)	413.03 (328.56-503)	447.47 (344.45-555.99)	421.39 (296.49-554.56)	410.82 (339.44-489.08)	407.02 (323.66-496.39)	542.35 (491.26-595.27)

Table S12: Net present value of costs (billions of 2024 USD, discounted at 2%) for All-Options Pathway, as estimated by ISO-NE's Massachusetts Decarbonization Roadmap study (Commonwealth of Massachusetts, 2020, Figure 62). We excluded behind the m3eter, demand side and distribution cost items from the total cost estimate presented by ISO-NE, since we do not consider these costs in our study.

Cost group	All-Options	
Demand-side costs	$	-
Electricity storage	$	0.31
Electricity distribution	$	-
Electricity transmission	$	4.22
Gas pipelines	$	1.89
Gas power plants	$	0.21
In-state fuels production	$	0.67
Biomass power plants	$	0.09
Ground-mounted solar	$	1.46
Rooftop solar	$	-
Offshore wind	$	3.04
Hydro purchases	$	0.91
Zero carbon liquid imports	$	1.53
Zero carbon gas imports	$	0.14
Natural gas	$	0.23
Oil products	$	1.34
Other	$	1.05
Total (mean annualized costs 2024-bUSD for 2025-2050)	**$**	**17.08**
NPV 2024-bUSD (2% discount rate)	**$**	**343.57**

Table S13: Net present value of air emission costs (in millions of 2024 USD, discounted at 1.5%) across eight decarbonization pathways. Each cell reports the mean cost estimate along with its corresponding uncertainty bounds (in parentheses, 90% CI and NREL cost scenarios), facilitating a comparative assessment of financial implications by pathway and location in the region.

	A	B1	B2	B3	C1	C2	C3	D
Barnstable, MA	22.31 (21.82-23.18)	4.67 (4.44-5.17)	4.82 (4.57-5.31)	4.71 (4.48-5.06)	5.32 (5.12-5.67)	4.9 (4.68-5.41)	4.71 (4.48-5.06)	19.97 (19.35-21.06)
Berkshire, MA	2.95 (1.58-3.13)	0.38 (0.27-0.49)	0.6 (0.44-0.76)	0.38 (0.28-0.5)	0.58 (0.43-0.72)	0.52 (0.37-0.67)	0.31 (0.22-0.41)	1.42 (1.15-1.68)
Bristol, MA	25.05 (5.91-25.96)	18.44 (6.23-19.1)	20.3 (19.55-20.98)	18.24 (17.47-19.07)	13.5 (1.17-14.13)	19.02 (18.3-19.65)	17.09 (16.29-17.8)	24.08 (3.67-26.07)
Chittenden, VT	16.87 (16.13-17.67)	3.76 (3.58-4.27)	3.8 (3.6-4.33)	3.76 (3.58-4.35)	3.86 (3.69-4.25)	3.81 (3.65-4.37)	3.76 (3.58-4.35)	17.11 (16.42-17.88)
Coos, NH	23.43 (22.71-24.26)	30.16 (29.29-30.84)	31.38 (30.6-32.29)	29.66 (28.85-30.37)	19.37 (18.17-20.16)	30.26 (29.42-30.87)	28.72 (27.72-29.62)	23.46 (22.74-24.29)
Cumberland, ME	94.13 (29.89-96.68)	37.76 (18.04-39.58)	40.56 (18.12-42.32)	37.68 (36.06-39.37)	34.74 (20.18-36.64)	39.16 (37.79-40.87)	36.45 (17.8-38.07)	96.77 (72.41-103.08)
Essex, MA	24.28 (1.16-28.26)	21.38 (0.07-22.55)	23.96 (0.08-25.23)	21.12 (19.98-22.14)	15.91 (0.09-17.23)	22.33 (0.08-23.52)	19.67 (0.07-20.67)	28.93 (0.8-31.88)
Fairfield, CT	100.72 (0.04-105.52)	57.47 (0.11-60.03)	67.37 (1.25-69.83)	57.1 (53.34-59.54)	49.93 (48.63-50.95)	61.85 (50.9-64.12)	52.28 (20.91-54.69)	176.41 (80.9-178.3)
Hampden, MA	16.97 (12.58-18.5)	12.89 (12.04-13.5)	14.46 (9.81-15.11)	12.72 (11.89-13.39)	9.65 (9.14-10.15)	13.34 (12.59-13.94)	11.83 (11.09-12.51)	16.88 (14.44-19.17)
Hillsborough, NH	43.36 (40.81-45.51)	7.35 (5.39-9.27)	12.16 (9.26-14.69)	7.27 (5.42-9.25)	9.67 (7.7-11.81)	10.05 (7.63-12.4)	6.11 (4.46-7.87)	23.29 (2.66-27.28)
Litchfield, CT	0.26 (0.25-0.26)	0.05 (0.04-0.05)	0.05 (0.05-0.05)	0.05 (0.05-0.05)	0.06 (0.06-0.07)	0.05 (0.05-0.05)	0.05 (0.05-0.05)	0.2 (0.11-0.21)
Merrimack, NH	70.62 (61.88-71.75)	18.09 (17.89-18.41)	18.28 (18.05-18.73)	18.15 (17.93-18.53)	18.75 (16.42-19.24)	18.37 (18.15-18.81)	18.15 (17.93-18.53)	69.51 (68.74-70.68)
Middlesex, CT	41.77 (0.01-44.73)	15.84 (13.68-17.64)	20.67 (18.39-22.36)	15.69 (13.67-17.46)	15.27 (14.33-16.03)	18.41 (16.28-19.87)	14.07 (12.17-15.74)	40.83 (38.7-42.46)
Middlesex, MA	39.75 (38.71-40.74)	10.45 (10.08-11.11)	10.36 (10.02-10.96)	10.36 (10.04-10.83)	10.22 (9.95-10.49)	10.28 (9.99-10.59)	10.36 (10.04-10.83)	39.44 (38.38-40.41)

	A	B1	B2	B3	C1	C2	C3	D
New Haven, CT	188.75 (36.73-195.24)	147.91 (143.55-151.06)	158.86 (154.82-161.83)	146.45 (142.53-149.18)	123.34 (122.31-124.62)	150.62 (75.49-153.11)	140.37 (40.52-143.22)	250.92 (60.09-254.62)
New London, CT	24.08 (23.53-25.03)	1.09 (0.98-1.18)	1.16 (1.06-1.25)	1.11 (1.01-1.2)	1.33 (1.23-1.46)	1.19 (1.09-1.29)	1.11 (1.01-1.2)	17.74 (16.83-18.79)
Newport, RI	14.17 (13.68-14.74)	13.75 (13.35-14.15)	14.75 (14.39-15.1)	13.54 (13.14-13.9)	9.38 (9.17-9.63)	13.86 (13.55-14.28)	12.89 (12.5-13.28)	22.44 (21.95-24.29)
Norfolk, MA	139.72 (30.38-146.15)	73.54 (29.6-78.51)	87.34 (28.42-92.66)	73.06 (66.86-78.09)	72.05 (28.81-74.73)	80.7 (74.71-85.37)	68.44 (29.97-73.01)	124.91 (30.41-130.22)
Oxford, ME	2.77 (2.65-3.18)	2.62 (2.48-2.76)	2.92 (2.79-3.08)	2.59 (2.45-2.72)	1.92 (1.82-2.04)	2.72 (2.59-2.86)	2.42 (2.28-2.52)	3.36 (3.07-3.67)
Penobscot, ME	1.69 (1.58-1.8)	0.22 (0.16-0.27)	0.36 (0.16-0.45)	0.21 (0.16-0.27)	0.3 (0.23-0.37)	0.3 (0.22-0.37)	0.18 (0.13-0.23)	0.74 (0.61-0.88)
Providence, RI	155.66 (54.62-161.63)	85.08 (51.56-90.5)	100.14 (58.36-106.62)	84.71 (78.94-89.84)	82.23 (78.76-85.37)	92.86 (86.42-98.6)	79.45 (48.35-84.13)	241.53 (92.83-248.91)
Rockingham, NH	215.91 (118.4-221.38)	47.93 (19.91-50.4)	53.96 (20.84-56.58)	48.08 (45.5-50.54)	51.99 (50.55-53.39)	52.21 (40.66-54.41)	46.22 (20.1-48.73)	240.21 (66.34-244.53)
Suffolk, MA	9.71 (9.28-10.18)	3.9 (3.85-3.94)	3.85 (3.78-3.91)	3.89 (3.84-3.94)	3.59 (3.44-3.71)	3.83 (3.74-3.89)	3.89 (3.84-3.94)	13.2 (12.87-13.52)
Windham, CT	57.98 (54.7-60.91)	23.34 (18.67-26.79)	31.95 (26.68-35.24)	23.13 (18.61-26.45)	23.6 (21.41-25.14)	28.04 (23.34-31.1)	20.5 (16.41-23.62)	81.04 (51.57-84.08)
Worcester, MA	109.49 (47.81-114.19)	38.35 (30.78-43.62)	53.09 (1.14-59.23)	38.01 (30.87-43.23)	40.14 (35.61-43.69)	46.47 (38.87-51.85)	33.5 (0.74-38.51)	88.71 (43.48-95.3)

Table S14: Net present value of air emission costs (in millions of 2024 USD, discounted at 2%) across eight decarbonization pathways

	A	B1	B2	B3	C1	C2	C3	D
Barnstable, MA	20.92 (20.46-21.73)	4.6 (4.37-5.08)	4.74 (4.5-5.23)	4.63 (4.41-4.98)	5.23 (5.03-5.57)	4.81 (4.6-5.32)	4.63 (4.41-4.98)	18.75 (18.17-19.78)
Berkshire, MA	2.73 (1.48-2.91)	0.36 (0.26-0.46)	0.57 (0.41-0.73)	0.36 (0.26-0.47)	0.56 (0.41-0.7)	0.5 (0.36-0.64)	0.3 (0.21-0.4)	1.32 (1.06-1.56)
Bristol, MA	23.52 (5.52-24.37)	17.6 (5.97-18.21)	19.31 (18.62-19.95)	17.42 (16.7-18.21)	13.09 (1.15-13.7)	18.16 (17.49-18.75)	16.36 (15.6-17.03)	22.65 (3.46-24.52)
Chittenden, VT	15.86 (15.16-16.62)	3.7 (3.53-4.21)	3.74 (3.54-4.27)	3.7 (3.53-4.29)	3.8 (3.64-4.19)	3.75 (3.6-4.3)	3.7 (3.53-4.29)	16.09 (15.44-16.82)
Coos, NH	22.03 (21.35-22.81)	28.55 (27.76-29.17)	29.65 (28.93-30.48)	28.11 (27.36-28.75)	18.7 (17.54-19.44)	28.65 (27.88-29.2)	27.23 (26.32-28.06)	22.07 (21.38-22.84)
Cumberland, ME	88.43 (29.19-90.81)	36.53 (17.74-38.29)	39.16 (17.82-40.85)	36.48 (34.91-38.11)	33.85 (19.84-35.7)	37.9 (36.6-39.58)	35.33 (17.5-36.9)	90.98 (68.07-96.91)
Essex, MA	22.81 (1.09-26.55)	20.39 (0.07-21.5)	22.79 (0.08-23.99)	20.17 (19.1-21.14)	15.42 (0.09-16.7)	21.32 (0.08-22.44)	18.82 (0.07-19.77)	27.2 (0.75-29.98)
Fairfield, CT	94.6 (0.03-99.1)	54.94 (0.11-57.36)	64.18 (1.2-66.48)	54.66 (51.09-56.97)	48.47 (47.23-49.44)	59.21 (48.64-61.34)	50.17 (20.06-52.45)	163.24 (76.09-165.01)
Hampden, MA	15.9 (11.83-17.34)	12.29 (11.49-12.86)	13.74 (9.49-14.34)	12.14 (11.36-12.77)	9.36 (8.86-9.83)	12.73 (12.03-13.29)	11.32 (10.62-11.94)	15.86 (13.58-18.01)
Hillsborough, NH	40.3 (37.84-42.38)	6.96 (5.09-8.8)	11.5 (8.75-13.92)	6.9 (5.13-8.8)	9.4 (7.48-11.49)	9.58 (7.26-11.85)	5.81 (4.23-7.51)	21.65 (2.59-25.42)
Litchfield, CT	0.24 (0.24-0.24)	0.05 (0.04-0.05)	0.05 (0.05-0.05)	0.05 (0.04-0.05)	0.06 (0.06-0.06)	0.05 (0.05-0.05)	0.05 (0.04-0.05)	0.19 (0.1-0.2)
Merrimack, NH	66.39 (58.62-67.46)	17.79 (17.59-18.1)	17.98 (17.75-18.42)	17.84 (17.64-18.22)	18.44 (16.17-18.91)	18.06 (17.85-18.49)	17.84 (17.64-18.22)	65.37 (64.65-66.47)
Middlesex, CT	39.14 (0.01-41.92)	15.18 (13.12-16.9)	19.72 (17.56-21.33)	15.06 (13.13-16.75)	14.88 (13.97-15.61)	17.69 (15.66-19.09)	13.54 (11.73-15.15)	38.33 (36.3-39.87)
Middlesex, MA	37.38 (36.39-38.3)	10.28 (9.91-10.93)	10.19 (9.85-10.78)	10.19 (9.88-10.65)	10.05 (9.78-10.32)	10.11 (9.82-10.41)	10.19 (9.88-10.65)	37.09 (36.1-38.01)
New Haven, CT	177.27 (34.84-183.33)	140.71 (136.63-143.64)	150.84 (147.09-153.6)	139.45 (135.77-142.01)	118.61 (117.62-119.85)	143.44 (71.54-145.75)	133.79 (38.59-136.48)	234.34 (56.35-237.83)
New London, CT	22.49 (21.96-23.37)	1.09 (0.98-1.17)	1.15 (1.05-1.24)	1.1 (1-1.19)	1.33 (1.22-1.45)	1.19 (1.08-1.28)	1.1 (1-1.19)	16.61 (15.75-17.58)

	A	B1	B2	B3	C1	C2	C3	D
Newport, RI	13.32 (12.87-13.86)	13.05 (12.68-13.42)	13.97 (13.64-14.29)	12.87 (12.49-13.2)	9.07 (8.87-9.3)	13.16 (12.88-13.55)	12.26 (11.9-12.62)	21.05 (20.59-22.79)
Norfolk, MA	130.66 (28.31-136.65)	70 (28.08-74.76)	82.97 (26.97-88.03)	69.62 (63.69-74.44)	69.42 (27.38-72.06)	77.03 (71.29-81.49)	65.31 (28.43-69.7)	117.09 (28.53-122.14)
Oxford, ME	2.61 (2.49-2.99)	2.5 (2.37-2.63)	2.77 (2.65-2.92)	2.47 (2.34-2.59)	1.86 (1.76-1.98)	2.59 (2.48-2.73)	2.31 (2.18-2.41)	3.16 (2.89-3.45)
Penobscot, ME	1.56 (1.46-1.67)	0.2 (0.15-0.26)	0.34 (0.16-0.43)	0.2 (0.15-0.26)	0.29 (0.23-0.36)	0.28 (0.21-0.35)	0.17 (0.12-0.21)	0.69 (0.57-0.82)
Providence, RI	145.74 (51.3-151.33)	80.91 (48.93-86.1)	95.11 (55.36-101.28)	80.64 (75.1-85.57)	79.12 (75.71-82.19)	88.55 (82.37-94.05)	75.72 (45.92-80.23)	223.01 (87.16-229.99)
Rockingham, NH	202.71 (111.23-207.79)	46.75 (19.64-49.12)	52.46 (20.54-54.96)	46.92 (44.45-49.3)	51.02 (49.61-52.38)	50.93 (39.59-53.04)	45.18 (19.82-47.6)	223.91 (61.35-227.98)
Suffolk, MA	9.12 (8.72-9.56)	3.83 (3.78-3.87)	3.79 (3.72-3.84)	3.83 (3.78-3.87)	3.52 (3.38-3.65)	3.77 (3.68-3.83)	3.83 (3.78-3.87)	12.41 (12.1-12.71)
Windham, CT	54.32 (51.29-57.08)	22.3 (17.84-25.6)	30.42 (25.4-33.53)	22.14 (17.81-25.33)	22.97 (20.84-24.46)	26.89 (22.4-29.82)	19.68 (15.75-22.68)	75.21 (48.24-78.11)
Worcester, MA	102.34 (44.76-106.73)	36.61 (29.38-41.65)	50.51 (1.09-56.35)	36.36 (29.53-41.36)	39.05 (34.65-42.51)	44.53 (37.27-49.68)	32.14 (0.72-36.95)	83.07 (40.82-89.32)

Table S15: Net present value of air emission costs (in millions of 2024 USD, discounted at 2.5%) across eight decarbonization pathways

	A	B1	B2	B3	C1	C2	C3	D
Barnstable, MA	19.64 (19.21-20.4)	4.52 (4.3-5)	4.66 (4.42-5.14)	4.55 (4.34-4.9)	5.14 (4.95-5.47)	4.73 (4.53-5.23)	4.55 (4.34-4.9)	17.64 (17.09-18.61)
Berkshire, MA	2.53 (1.38-2.71)	0.34 (0.24-0.44)	0.54 (0.39-0.69)	0.34 (0.25-0.45)	0.54 (0.4-0.68)	0.48 (0.34-0.61)	0.28 (0.2-0.38)	1.22 (0.98-1.46)
Bristol, MA	22.12 (5.17-22.92)	16.81 (5.74-17.38)	18.4 (17.75-18.99)	16.66 (15.99-17.41)	12.7 (1.13-13.3)	17.36 (16.74-17.92)	15.67 (14.96-16.31)	21.34 (3.25-23.1)
Chittenden, VT	14.94 (14.28-15.65)	3.65 (3.48-4.15)	3.69 (3.49-4.21)	3.65 (3.48-4.22)	3.75 (3.58-4.13)	3.7 (3.55-4.24)	3.65 (3.48-4.22)	15.15 (14.55-15.84)
Coos, NH	20.75 (20.11-21.48)	27.06 (26.34-27.64)	28.06 (27.38-28.82)	26.67 (25.99-27.26)	18.07 (16.94-18.77)	27.16 (26.47-27.67)	25.87 (25.03-26.62)	20.79 (20.14-21.52)
Cumberland, ME	83.21 (28.51-85.44)	35.38 (17.45-37.08)	37.84 (17.53-39.47)	35.35 (33.84-36.92)	33 (19.51-34.81)	36.73 (35.49-38.36)	34.28 (17.21-35.8)	85.67 (64.1-91.25)
Essex, MA	21.47 (1.02-24.98)	19.48 (0.07-20.52)	21.7 (0.07-22.83)	19.29 (18.29-20.21)	14.95 (0.09-16.18)	20.38 (0.08-21.45)	18.03 (0.07-18.93)	25.62 (0.71-28.23)
Fairfield, CT	89 (0.03-93.23)	52.59 (0.1-54.87)	61.23 (1.15-63.38)	52.39 (49-54.58)	47.08 (45.89-48)	56.76 (46.53-58.75)	48.19 (19.27-50.36)	151.3 (71.67-152.97)
Hampden, MA	14.92 (11.14-16.28)	11.73 (10.98-12.26)	13.07 (9.19-13.63)	11.6 (10.87-12.19)	9.08 (8.6-9.54)	12.17 (11.51-12.68)	10.84 (10.18-11.42)	14.92 (12.79-16.95)
Hillsborough, NH	37.51 (35.14-39.53)	6.6 (4.81-8.37)	10.89 (8.27-13.22)	6.56 (4.86-8.39)	9.14 (7.27-11.18)	9.15 (6.93-11.34)	5.54 (4.02-7.18)	20.16 (2.53-23.72)
Litchfield, CT	0.23 (0.22-0.23)	0.05 (0.04-0.05)	0.05 (0.05-0.05)	0.05 (0.04-0.05)	0.06 (0.06-0.06)	0.05 (0.05-0.05)	0.05 (0.04-0.05)	0.18 (0.1-0.19)
Merrimack, NH	62.52 (55.61-63.53)	17.5 (17.3-17.8)	17.68 (17.46-18.12)	17.55 (17.34-17.92)	18.13 (15.93-18.6)	17.76 (17.55-18.19)	17.55 (17.34-17.92)	61.57 (60.9-62.61)
Middlesex, CT	36.74 (0.01-39.35)	14.56 (12.6-16.2)	18.84 (16.78-20.37)	14.48 (12.63-16.1)	14.51 (13.62-15.22)	17.01 (15.07-18.35)	13.06 (11.32-14.59)	36.03 (34.1-37.5)
Middlesex, MA	35.2 (34.27-36.07)	10.11 (9.75-10.75)	10.02 (9.69-10.6)	10.02 (9.71-10.48)	9.88 (9.62-10.15)	9.94 (9.66-10.24)	10.02 (9.71-10.48)	34.94 (34.01-35.81)
New Haven, CT	166.75 (33.11-172.42)	134.05 (130.22-136.78)	143.43 (139.95-146.01)	132.97 (129.51-135.37)	114.18 (113.22-115.37)	136.78 (67.89-138.93)	127.7 (36.8-130.23)	219.21 (52.92-222.5)
New London, CT	21.03 (20.53-21.86)	1.08 (0.97-1.16)	1.14 (1.05-1.23)	1.1 (0.99-1.18)	1.32 (1.22-1.44)	1.18 (1.07-1.27)	1.1 (0.99-1.18)	15.57 (14.76-16.48)

	A	B1	B2	B3	C1	C2	C3	D
Newport, RI	12.54 (12.12-13.05)	12.41 (12.07-12.74)	13.24 (12.94-13.53)	12.24 (11.9-12.54)	8.77 (8.58-8.99)	12.51 (12.25-12.86)	11.68 (11.35-12.01)	19.77 (19.33-21.4)
Norfolk, MA	122.37 (26.43-127.97)	66.72 (26.68-71.27)	78.92 (25.61-83.74)	66.43 (60.74-71.05)	66.96 (26.05-69.54)	73.6 (68.11-77.88)	62.4 (27.01-66.63)	109.93 (26.81-114.75)
Oxford, ME	2.45 (2.34-2.81)	2.38 (2.26-2.51)	2.64 (2.52-2.78)	2.36 (2.24-2.47)	1.8 (1.71-1.92)	2.48 (2.37-2.6)	2.21 (2.09-2.31)	2.98 (2.72-3.25)
Penobscot, ME	1.45 (1.35-1.55)	0.19 (0.14-0.24)	0.33 (0.15-0.4)	0.19 (0.14-0.24)	0.29 (0.22-0.35)	0.27 (0.2-0.34)	0.16 (0.11-0.2)	0.64 (0.53-0.76)
Providence, RI	136.68 (48.27-141.92)	77.04 (46.5-82.03)	90.45 (52.59-96.34)	76.86 (71.53-81.61)	76.21 (72.85-79.22)	84.55 (78.6-89.83)	72.25 (43.68-76.61)	206.27 (81.94-212.89)
Rockingham, NH	190.63 (104.66-195.36)	45.62 (19.37-47.91)	51.05 (20.26-53.43)	45.82 (43.45-48.12)	50.08 (48.71-51.41)	49.71 (38.57-51.75)	44.19 (19.55-46.53)	209.09 (56.87-212.93)
Suffolk, MA	8.59 (8.21-9)	3.77 (3.72-3.81)	3.72 (3.66-3.78)	3.76 (3.71-3.81)	3.47 (3.32-3.58)	3.7 (3.62-3.77)	3.76 (3.71-3.81)	11.69 (11.39-11.97)
Windham, CT	50.97 (48.17-53.58)	21.33 (17.06-24.5)	29 (24.21-31.95)	21.22 (17.07-24.28)	22.36 (20.29-23.8)	25.81 (21.51-28.62)	18.91 (15.14-21.8)	69.9 (45.19-72.66)
Worcester, MA	95.8 (41.98-99.93)	35 (28.09-39.83)	48.12 (1.05-53.68)	34.82 (28.27-39.61)	38.02 (33.73-41.37)	42.72 (35.77-47.65)	30.86 (0.69-35.5)	77.91 (38.38-83.86)

Table S16: Environmental impact metrics of energy technologies across scenarios B1–B3, C1–C3 and D. Values reported are the means, with 90% CI shown in brackets.

		Pathway						
Technology	**Unit**	**B1**	**B2**	**B3**	**C1**	**C2**	**C3**	**D**
Bird mortality								
On-shore wind	million bird deaths	0.01 (0.00-0.02)	0.01 (0.00-0.02)	0.01 (0.00-0.02)	0.00 (0.00-0.00)	0.01 (0.00-0.02)	0.01 (0.00-0.02)	0.00 (0.00-0.01)
	million bat deaths	0.08 (0.02-0.16)	0.08 (0.02-0.16)	0.08 (0.02-0.16)	0.00 (0.00-0.00)	0.08 (0.02-0.16)	0.08 (0.02-0.16)	0.03 (0.01-0.07)
Solar	million bird deaths	0.21 (0.01-0.43)	0.21 (0.01-0.43)	0.21 (0.01-0.43)	0.00 (0.00-0.00)	0.21 (0.01-0.43)	0.21 (0.01-0.43)	0.05 (0.00-0.10)
Sum	million avian deaths	0.29 (0.05-0.78)	0.29 (0.05-0.78)	0.29 (0.05-0.78)	0.00 (0.00-0.00)	0.29 (0.05-0.78)	0.29 (0.05-0.78)	0.08 (0.02-0.20)
Land use								
Hydropower reservoirs	million hectares	0.00 (0.00-0.00)	0.00 (0.00-0.00)	0.35 (0.20-0.50)	0.00 (0.00-0.00)	0.00 (0.00-0.00)	0.00 (0.00-0.00)	0.00 (0.00-0.00)
Natural gas	million hectares	0.00 (0.00-0.00)	0.00 (0.00-0.00)	0.00 (0.00-0.00)	0.00 (0.00-0.00)	0.00 (0.00-0.00)	0.00 (0.00-0.00)	0.00 (0.00-0.00)
On-shore wind	million hectares	0.00 (0.00-0.00)	0.00 (0.00-0.00)	0.00 (0.00-0.00)	0.00 (0.00-0.00)	0.00 (0.00-0.00)	0.00 (0.00-0.00)	0.00 (0.00-0.00)
Small modular nuclear	million hectares	0.41 (0.17-0.69)	0.42 (0.17-0.73)	0.41 (0.18-0.70)	0.00 (0.00-0.00)	0.41 (0.18-0.71)	0.41 (0.17-0.69)	0.18 (0.08-0.29)
Solar	million hectares	0.23 (0.10-0.37)	0.23 (0.11-0.38)	0.22 (0.10-0.36)	0.00 (0.00-0.00)	0.22 (0.11-0.36)	0.23 (0.10-0.38)	0.05 (0.02-0.08)
Sum	million hectares	0.63 (0.31-1.03)	0.65 (0.31-1.10)	0.99 (0.59-1.47)	0.00 (0.00-0.00)	0.64 (0.31-1.10)	0.63 (0.30-1.07)	0.23 (0.10-0.40)
View shed								
High-voltage transmission to/from Hydro-Québec	million people within viewshed	0.20 (0.07-0.39)	0.00 (0.00-0.00)	0.19 (0.10-0.33)	0.00 (0.00-0.00)	0.00 (0.00-0.00)	0.23 (0.11-0.38)	0.27 (0.07-0.80)
High-voltage transmission to/from NYISO	million people within viewshed	0.90 (0.18-2.38)	0.29 (0.08-0.61)	0.79 (0.08-2.61)	0.00 (0.00-0.00)	0.76 (0.21-2.63)	0.68 (0.08-1.33)	0.64 (0.05-2.17)
Off-shore wind	million people within viewshed	6.52 (3.47-8.58)	6.16 (3.58-9.82)	3.84 (1.96-6.26)	0.00 (0.00-0.00)	6.48 (3.52-10.61)	3.60 (1.71-5.91)	0.63 (0.00-2.06)

		Pathway						
Technology	**Unit**	**B1**	**B2**	**B3**	**C1**	**C2**	**C3**	**D**
Solar	million people within viewshed	3.88 (3.46-4.49)	4.31 (3.35-4.99)	4.20 (3.34-5.52)	0.00 (0.00-0.00)	4.01 (3.43-4.35)	4.32 (3.43-5.49)	0.80 (0.58-1.11)
Sum	million people within viewshed	11.51 (7.19-15.85)	10.77 (7.01-15.42)	9.01 (5.49-14.71)	0.00 (0.00-0.00)	11.24 (7.17-17.59)	8.83 (5.33-13.11)	2.34 (0.71-6.14)
Water withdrawals for thermal generation								
Natural gas – dry-cooled	trillion gallons	0.00 (0.00-0.00)	0.00 (0.00-0.00)	0.00 (0.00-0.00)	2.57 (2.57-2.57)	0.33 (0.33-0.33)	0.21 (0.21-0.21)	0.00 (0.00-0.00)
Small modular nuclear – water-cooled	trillion gallons	0.00 (0.00-0.00)	0.00 (0.00-0.00)	0.00 (0.00-0.00)	0.00 (0.00-0.00)	0.00 (0.00-0.00)	0.00 (0.00-0.00)	0.05 (0.05-0.05)
Sum	trillion gallons	0.00 (0.00-0.00)	0.00 (0.00-0.00)	0.00 (0.00-0.00)	2.57 (2.57-2.57)	0.33 (0.33-0.33)	0.21 (0.21-0.21)	0.05 (0.05-0.05)

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