Versant Power

Integrated Grid Planning(IGP)

Forecasting & Scenario Development

11/14/2024

Agenda

- Vision & Purpose
- MPUC IGP Order Forecasting Details
- ISO-NE 2024 CELT Review
- Forecasting Details
- Forecasting Approach
- Top/Down & Bottom/Up
- Key Variables
- Example Forecast
- Looking Ahead
- Next Steps
- Questions

Vision & Purpose

- Vision:
  - Versant envisions a future electric grid that operates reliably, enables a fully decarbonized energy supply and the deployment of significant beneficial electrification technologies, leverages cost-effective solutions, and does all this while maintaining affordability for our customers.
  - Our goal for grid planning is to identify opportunities for “no regrets” investments that facilitate customer choice of modern, low-carbon technologies. We are committed to collaborating with the communities we serve and other stakeholders to enhance our infrastructure's resilience and improve our business operations.
- Purpose of this meeting:
  - Provide information on the ISO-NE CELT forecast, MPUC IGP order specifications, and Versant’s assumptions and approach to conducting the IGP forecasts.
- Goal:
  - Seek comments and feedback and incorporate into our forecasting approach.
  - Forecasting efforts have begun based on information provided in this presentation, so it is crucial that any feedback for this topic is received by 12/12/2024.

IGP Contents – Discussion Topic

- This meeting will focus on Task 3.

- 2022-00322 Attachment C
- Task 1: Vision for the Evolving Grid
- Task 2: System Overview
- Task 3: Forecasting and Scenario Development
- Task 4: System Modeling and Needs Identification
- Task 5: Solutions Identification and Evaluation
- Task 6: Technology, Integration, System Investments, and Pilot Projects
- Task 7: Environmental, Equity, and Environmental Justice
- Task 8: Assessment

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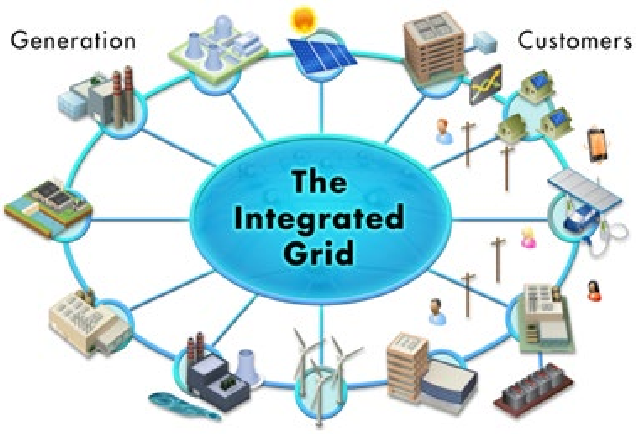
MPUC Order: Task 3 Forecasting

Task 3: Forecasting and Scenario Development

- *Two forecasts*
  - *Baseline forecast*
    - *Load forecast: most recent vintage Capacity, Energy, Loads, and Transmission (CELT) (2024) 50-50 weather year; including DG), transport, and heating electrification; disaggregated to the distribution system circuit level*
    - *Supply assumptions: most recent vintage CELT (2024)*
  - *High DER Penetration & Electrification forecast*
    - *Load forecast: most recent vintage CELT (2024) 90-10 weather year; including DG, transport, and heating electrification; disaggregated to the distribution system circuit level*
    - *Supply assumptions: most recent vintage CELT (2024)*
- *Six Snapshots of each forecast*
  - *Summer Daytime Peak Load*
  - *Summer Evening Peak Load*
  - *Winter Evening Peak Load*
  - *Daytime Minimum Load*
  - *Evening Minimum Load*
  - *Spring Minimum Load*



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CELT 2024 – ME Load Forecasts

CELT 2024 Summer Peak Projection for ME

Region	Forecast (MW)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
ME	50/50 Gross Load	2131	2147	2164	2181	2198	2213	2229	2244	2260	2276
	Heating Electrification	0	1	1	2	3	4	5	7	9	12
	Transportation Electrification	4	14	31	51	77	108	144	184	227	271
	Behind-the-meter (BTM) PV	81	87	90	92	93	93	94	94	95	95
	Energy Efficiency	100	106	112	117	110	102	94	85	76	67
	50/50 Net Load	1954	1968	1995	2025	2075	2130	2190	2256	2326	2398

CELT 2024 Winter Evening Peak Projection for ME

Region	Forecast (MW)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
ME	50/50 Gross Load	1980	1989	1992	2016	2032	2037	2048	2057	2061	2062
	Heating Electrification	39	75	127	161	208	271	333	409	498	600
	Transportation Electrification	13	31	55	87	127	174	228	286	347	407
	BTM PV	0	0	0	0	0	0	0	0	0	0
	Energy Efficiency	100	106	112	117	110	103	96	88	80	71
	50/50 Net Load	1931	1989	2063	2147	2257	2379	2514	2665	2826	2997

Source: ISO New England. (2024). 'lf2024-forecast-itemized.xlsx'

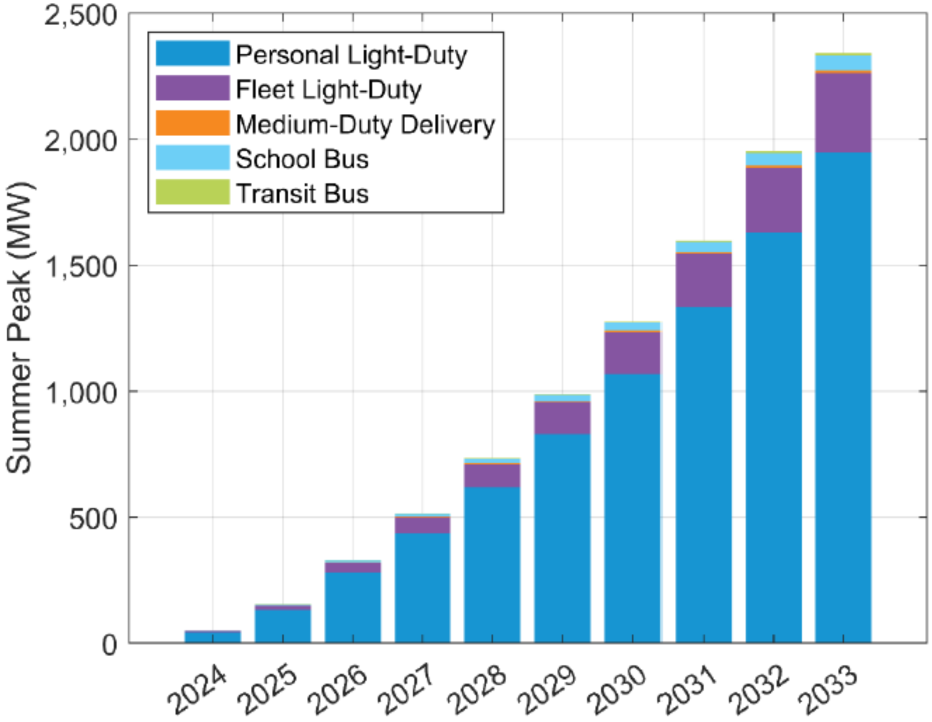
ISO Adoption

2024 Transportation Electrification Forecast

50/50 Summer Peak Demand

Summer Peak Demand (MW)							
Year	CT	MA	ME	NH	RI	VT	NE
2024	10	30	4	2	3	2	51
2025	31	89	14	7	8	6	155
2026	64	188	32	17	16	13	331
2027	98	292	53	28	25	20	517
2028	137	413	80	42	36	28	736
2029	181	551	112	59	48	38	990
2030	231	706	150	79	61	50	1,277
2031	287	879	192	101	77	62	1,598
2032	350	1,069	236	126	94	77	1,953
2033	421	1,278	282	154	112	94	2,342

New England (July)



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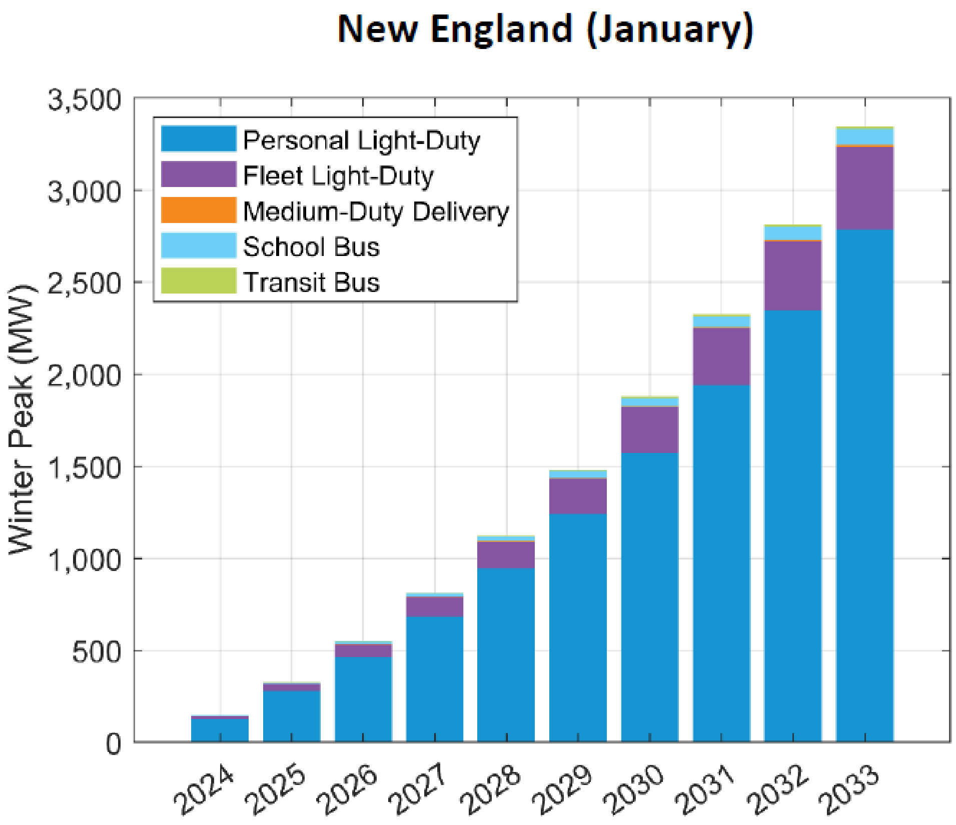
Source: ISO New England. (2024). Final 2024 Transportation Electrification Forecast (Slide 35).

ISO Adoption

2024 Transportation Electrification Forecast

50/50 Winter Peak Demand

Winter Peak (MW)							
Year	CT	MA	ME	NH	RI	VT	NE
2024	30	84	13	7	8	6	147
2025	64	184	31	17	16	14	326
2026	104	308	56	30	26	23	547
2027	152	454	87	47	39	34	813
2028	206	623	126	68	53	47	1,123
2029	267	814	173	93	70	62	1,479
2030	336	1,027	226	121	89	79	1,878
2031	414	1,263	284	154	109	98	2,322
2032	501	1,523	345	190	132	121	2,811
2033	599	1,807	406	230	157	146	3,345



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Source: ISO New England. (2024). Final 2024 Transportation Electrification Forecast (Slide 36).

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Final 2024 Heating Electrification Forecast

Winter (January) Demand, 50/50

	Winter Peak (MW)									
Year	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33	2033-34
Connecticut	37	74	122	163	212	261	323	401	497	609
Massachusetts	92	192	324	446	603	773	956	1,178	1,425	1,689
Maine	39	75	127	161	208	271	333	409	498	600
New Hampshire	13	27	44	58	75	96	118	145	172	204
Rhode Island	9	20	32	44	57	72	89	111	137	167
Vermont	15	33	56	75	103	139	179	225	276	334
Total	**206**	**421**	**705**	**946**	**1,258**	**1,612**	**1,998**	**2,469**	**3,005**	**3,604**

Notes:

1. State values are at the time of New England coincident peak loads.
2. State values may not sum to the total region values due to rounding.

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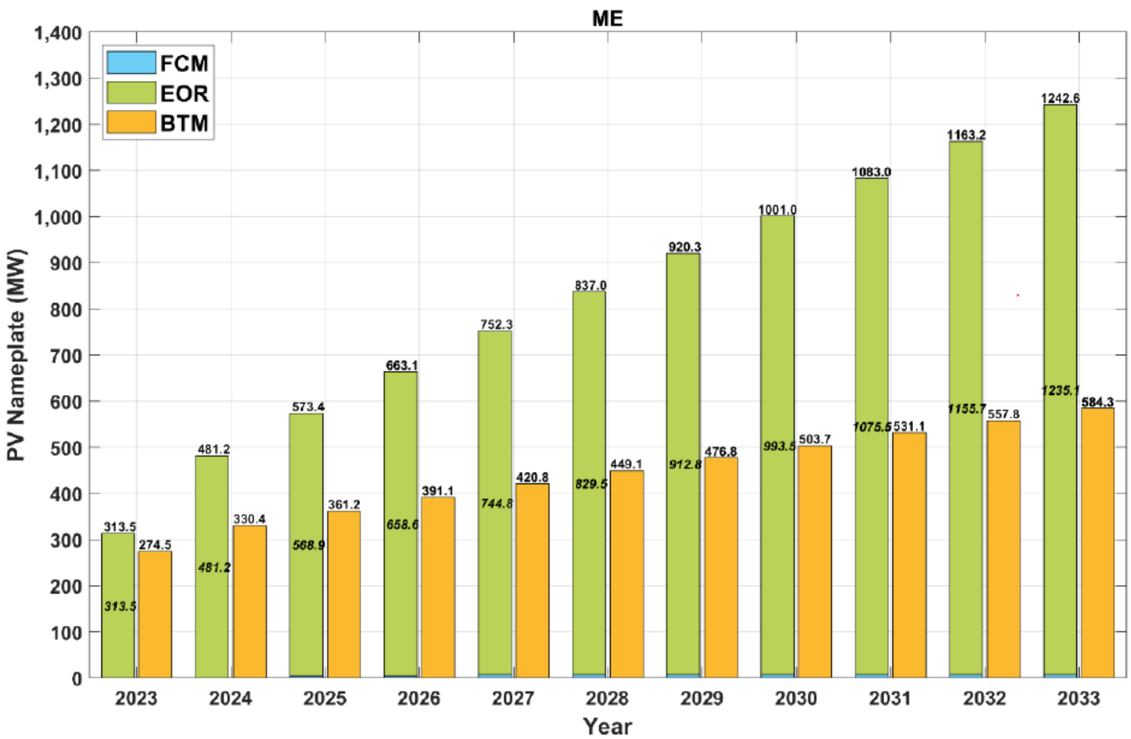
Source: ISO New England. (2024). Final 2024 Heating Electrification Forecast (Slide 23).

ISO Adoption

Final 2024 PV Forecast – Maine

Cumulative Nameplate by Category, MW_{ac}



VERSANT POWER Source: ISO New England. (2024). Final 2024 Photovoltaic (PV) Forecast (Slide 36).

ISO Adoption

Incremental Annual Energy, Summer Peak, and Winter Peak Savings

Annual Energy Savings (GWh)							
	NE	CT	MA	ME	NH	RI	VT
2024	605	147	299	37	40	50	32
2025	605	147	299	37	40	50	32
2026	605	147	299	37	40	50	32
2027	605	147	299	37	40	50	32
2028	636	161	344	17	30	44	40
2029	577	147	313	15	26	40	37
2030	519	132	281	14	23	36	33
2031	459	114	250	12	20	32	30
2032	402	98	220	11	18	30	27
2033	347	83	191	9	16	24	24
Total (2024-2033)	5,360	1,323	2,795	226	293	406	319

Summer Peak Demand Savings (MW)							
	NE	CT	MA	ME	NH	RI	VT
2024	99	25	49	6	6	8	5
2025	99	25	49	6	6	8	5
2026	99	25	49	6	6	8	5
2027	99	25	49	6	6	8	5
2028	172	33	108	3	8	12	9
2029	157	30	98	3	7	11	9
2030	141	27	88	3	6	9	8
2031	125	23	78	3	5	8	7
2032	110	20	69	2	5	7	7
2033	95	17	60	2	4	6	6
Total (2024-2033)	1,196	250	697	40	59	85	66

Winter Peak Demand Savings (MW)							
	NE	CT	MA	ME	NH	RI	VT
2024	93	23	46	6	6	8	5
2025	93	23	46	6	6	8	5
2026	93	23	46	6	6	8	5
2027	93	23	46	6	6	8	5
2028	150	30	91	4	7	10	8
2029	136	27	82	3	6	9	8
2030	122	24	74	3	6	8	7
2031	109	21	66	3	5	8	6
2032	95	18	60	2	4	7	6
2033	82	15	50	2	4	6	5
Total (2024-2033)	1,066	227	607	41	56	80	60

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Source: ISO New England. (2024). Final 2024 Energy Efficiency Forecast (Slide 25).

Load vs. Generation

- It is important to note how load and generation are included in the CELT load forecasts.
- Gross load:
  - Also referred to as native load, Is all traditional load with the behind the meter generation removed.
- Net load:
  - Is the total of traditional load minus all behind the meter generation, resulting in a smaller value than gross load. DER results in masking of traditional load leading to net load.
- The PV forecasts for front of the meter and behind the meter are inputs used in the CELT:
  - In the CELT, 2024 gross load forecast reflects loads without behind the meter PV load reductions.
  - PV does not reduce winter peak loads, which occur after sunset.

Source: ISO New England. (2024). Final 2024 Photovoltaic (PV) Forecast (Slide 2).

ISO Adoption

- ISO-NE 2023 CELT overestimated EV's in New England and adjusted 2024 CELT for some states but not Maine.
- 50/50 and 90/10 scenarios in ISO-NE 2024 CELT only change the weather factors. Adoption of all categories remains unchanged.

Historical Electric Vehicle Adoption

2023 Adoption of Personal LDVs

- Recent personal light-duty EV adoption data suggests that the CELT 2023 forecast may reflect an overly optimistic EV adoption outlook, especially in the near-term

Growth in Personal Light-Duty Vehicles							
	NE	CT	MA	ME	NH	RI	VT
Actual*	51,173	11,762	27,187	3,378	3,487	2,818	2,541
CELT 2023	85,901	20,844	48,107	4,634	2,251	5,461	4,604
Difference	+34,728	+9,082	+20,920	+1,256	-1,236	+2,643	+2,063
Difference (%)	+68%	+77%	+77%	+37%	-35%	+94%	+81%

- For the CELT 2024 the ISO is discounting personal light-duty EV adoption figures for CT, MA, RI, and VT by the following amounts:

Year	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Discount (%)	15	14	13	12	10	9	8	7	6	5

**Source: S&P Global*

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Source: ISO New England. (2024). Final 2024 Transportation Electrification Forecast (Slide 12).

Maine Energy Goals Alignment

- The ISO-NE 2024 CELT data references various sources that align with the State of Maine's clean energy goals.

- It incorporates Maine Won't Wait and state policy.
  - Achieve emissions-reduction goals by putting 41,000 light-duty EVs on the road in Maine by 2025 and 219,000 by 2030
  - Install at least 100,000 new heat pumps in Maine by 2025, and an additional 175,000 by 2027.

Maine

EV Adoption Forecast Assumptions

- "Full Electrification" scenario
  - Assumes all state and local policy, programs, goals and announcement targets are achieved in the listed timeframe solely through the adoption of electric vehicles
- "CELT 2024" scenario
  - Aligns closely with the "Full Electrification" scenario and state confidence that the goals it reflects will be achieved

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Source: ISO New England. (2024). Final 2024 Transportation Electrification Forecast (Slide 47).
Maine Climate Council (2020). Maine Won't Wait.
Maine Climate Council (2023). Annual Report.

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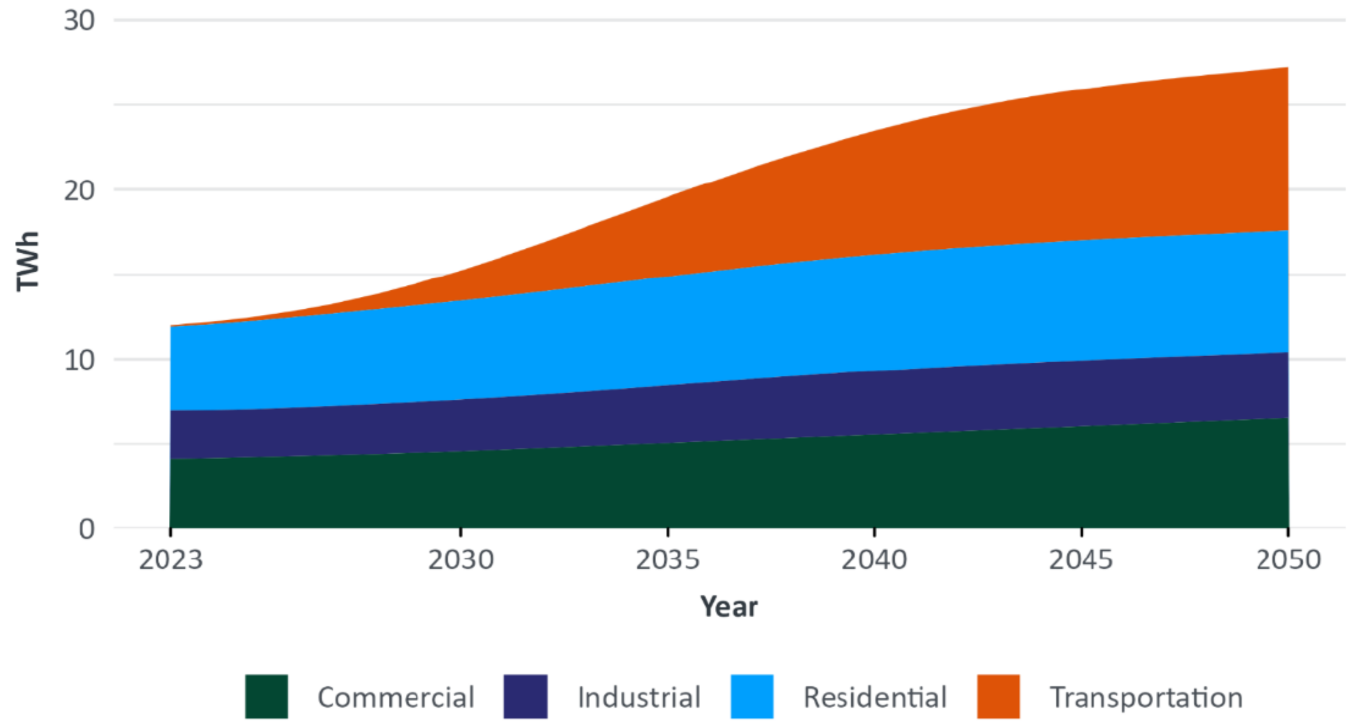
Maine Energy Goals Alignment

- Based on Maine Pathways to 2040, Maine now aims to achieve 100% clean energy by 2040, advancing its original target, signed in 2019, by a decade to meet critical energy needs and capitalize on new opportunities.
- By 2050, about 60% of Maine's electricity demand growth is expected to come from transportation electrification, as the state shifts from fossil fuel-powered vehicles to EVs.

FIGURE ES-1: ELECTRICITY CONSUMPTION IN MAINE BY SECTOR, CORE PATHWAY



Source: Maine Governor's Energy Office (2024). Maine Pathways to 2040: Analysis and Insights

Forecasting Clarifications

- The purpose of developing these IGP forecasts is to provide inputs to be used during the modeling and analysis tasks.
- The forecasts should reflect a potential future state based on the adoption rates of key parameters such as, transportation electrification, heating electrification, and DER adoption, etc.
- Why develop multiple forecasts?
  - By adjusting the key parameters, multiple forecasts show a range of the future state. This range can help illustrate higher certainty and lower certainty, and account for the inherently dynamic and unpredictable nature of load and technology adoption.
- Baseline forecast: This forecast should serve as the average forecast for a probable adoption scenario.
  - The CELT 2024 50/50 weather year forecast illustrates peak load based on weather assumptions that are likely to occur(once every 2 years).
  - This includes the heating and transportation electrification goals(load) as specified by the MWW.
- High DER Penetration & Electrification forecast: This forecast should serve as the boundary case for higher adoption.
  - The CELT 2024 90/10 weather year forecast illustrates peak load based on weather assumptions that are less likely to occur(once every 10 years).
  - This includes the heating and transportation electrification goals(load) as specified by the MWW.

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Forecasting Clarifications

- Different snapshots or scenarios can be derived from the initial forecasts.
- The purpose of these scenarios is to illustrate the further variance between seasonal and temporal impacts and determine what the boundary cases are to determine the system constraints.
- The system must be able to meet demand under extreme conditions which is why determining the boundary cases is a crucial step.
  - Summer Daytime Peak Load: This is **not** typically a boundary case.
  - Summer Evening Peak Load: This is typically a boundary case.
  - Winter Evening Peak Load: This is typically a boundary case.
  - Daytime Minimum Load: This is **not** typically a boundary case.
  - Evening Minimum Load: This is **not** typically a boundary case.
  - Spring Minimum Load: This is typically a boundary case.
  - The above identifies 3 scenarios as the boundary cases. Any additional scenarios are likely to be less constraining, therefore having limited benefit. However, additional scenarios can potentially help later in the solutions tasks, by illustrating limited time constraints leading to solutions accounting for that.
- The seasons and times associated with each of the above scenarios are shown below:

Season	Winter	Spring	Summer	Fall
Months	DEC-FEB	MAR-APR	MAY-SEPT	OCT-NOV
Daylight Hours	8am-4pm	7am-7pm	6am-8pm	8am-6pm
Evening Hours	4pm-7pm	7pm-10pm	8pm-11pm	6pm-9pm

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Forecasting Clarifications

- It is important to note that the ISO-NE 2024 CELT report, the 50/50 and 90/10 scenarios only adjust for weather factors, while adoption rates for all other categories remain unchanged.
    - This limitation hinders the study of the impact of varying transportation and heating electrification adoption on the forecasted distribution circuit load.
    - The base, high, and any other forecasts should use different input assumptions to show the effects.
- The ISO- NE CELT forecast represents a regional system coincident peak, whereas localized non-coincident peaks at each distribution substation are typically used for distribution planning.
    - The timing of peak and minimum loads may differ across circuits and the overall system. This mismatch can lead to underestimation of the circuit peak and overestimation of the circuit minimum load.
- For these reasons we have decided to include a third forecast that will reflect a bottom/up, non-coincident peak case.

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Forecasting Clarifications

- Since this is the first IGP we are undertaking, we also believe it is important to view the forecasting and scenarios as broadly as possible.
    - This outcome should result in multiple forecasts and scenarios to give us a range or guardrails to where the actual data will result in-between.
- This will further allow us to set thresholds and identify where we are on track or not on track with forecasts, and this info can then be used to refine future forecasts.
- The overall goal of this will be to view as many forecasts and scenarios as realistically possible, and identify which ones are impactful. In future forecasting efforts these most impactful forecasts and scenarios could then be used, and any that are less impactful could not be developed in the future to focus efforts on meaningful scenarios.
- It is also important to note that forecasting technology adoption is an exercise in “what if” scenarios. Historical data and trends may not be as useful due to the unprecedented nature of the technology adoption and expected load growth. Historical data and trends may however be used in some manner to establish baseline and reference points.

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Forecasting Approach

Based on the previous clarifications Versant will move forward with the below assumptions:

- Top/down Baseline Forecast:
  - As required by the MPUC, we will use the 2024 CELT 50/50.
- Top/down High Adoption Forecast:
  - As required by the MPUC, we will use the 2024 CELT 90/10.
- Bottom/up forecast:
  - Will use localized data, ISO-NE forecasts, and state policy to develop targets for base load, heating electrification, transportation electrification, DER adoption, and energy efficiency forecasts.
- Scenarios:
  - As required by the MPUC, we will develop the 6 required scenarios for each of the Top/down forecasts.
  - Additionally, we will develop 126 scenarios for the Bottom/up forecast.
  - While time-consuming, the bottom-up approach enables us to create comprehensive forecasting scenarios and identify true boundary cases for modeling analysis.

- Note that only the boundary cases that cause system constraints will be used during the system needs assessment and modeling, likely to be:
  - Summer Evening Peak Load
  - Winter Evening Peak Load
  - Spring/Fall Minimum Load

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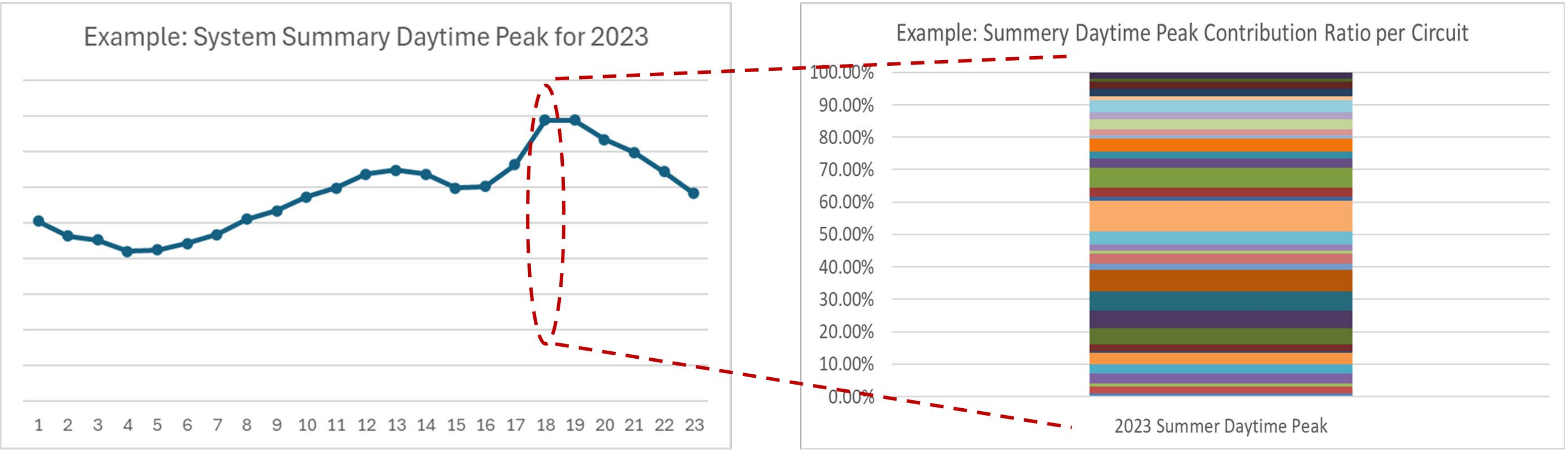
Top-down Forecast Methodology

Develop transmission level forecast for the 6 scenarios using CELT 2024 hourly forecasts and allocate results to each distribution circuit based on historic trends.

- Note the first step is to allocate the Versant Power Bangor Hydro district portion of the CELT (apply similar ratios to the Maine Public district).
- Calculate contribution ratio for each distribution circuit based on the 6 scenarios and 2022 & 2023 system profiles/transformer rating data.
- Scale each distribution circuit based on transmission level forecast and ratios from the first and second steps.
- Example (Artificial data):



Each color represents the contribution of one distribution circuit to the coincident system peak.

Bottom/Up Forecast Details

6 Scenarios

- Summer Daytime Peak
- Summer Evening Peak
- Winter Evening Peak
- Daytime Mini-Load
- Evening Mini-Load
- Spring Mini-Load

7 Case Studies per Scenarios

- No EV, No DER, Medium HP
- Low EV, No DER, Low HP
- Medium EV, No DER, Medium HP
- High EV, No DER, High HP
- Low EV, High DER, Low HP
- Medium EV, Medium DER, Medium HP
- High EV, Low DER, High HP

3 Weather Conditions

- Mild Weather (CELT 10/90)
- Reference Weather (CELT 50/50)
- Hotter/Colder Weather (CELT 90/10)

For each circuit, the proposed bottom-up framework produces a total of 126 (i.e., 6x7x3) different combinations of results.
EV=Electric Vehicle, DER=Distributed Energy Resources, HP=Heat Pump Electrification, EE=Energy efficiency

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Bottom/Up Forecast Details

- Each of the below key variables are separately allocated to each distribution circuit.
  - Traditional load growth
  - Transportation electrification
  - Heating electrification
  - DER front of the meter generation
  - DER behind the meter generation
  - Energy efficiency
  - Weather
- It is important to note that not all circuits will see average adoption, therefore the forecast algorithm will be developed to allow these variables to be easily revised as required.
- This allows flexibility and fine tuning of variables to achieve more accurate forecasts.
- Furthermore, the low/base/high scenarios should be sufficient to capture the range of probable adoption rates.

Bottom-Up Forecast Methodology

Parameter Example (Hampden HM4):

Recommended Values	Parameters	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
105.43%	Local EV Adoption Rate/ME EV Adoption Rate from CELT	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
28.11%	Daytime Minimum Ratio/Peak	28%	28%	28%	28%	28%	28%	28%	28%	28%	28%
31.43%	Evening Minimum Ratio/Peak	31%	31%	31%	31%	31%	31%	31%	31%	31%	31%
30.23%	Spring Minimum Ratio/Peak	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%
98.67%	.ocal BTM PV Rate/ME PV Adoption Rate from CELT (Summe	98.67%	98.67%	98.67%	98.67%	98.67%	98.67%	98.67%	98.67%	98.67%	98.67%
Forecasting Model Results	Traditional Load Growth	5.43%	2.06%	2.00%	1.95%	1.90%	1.86%	1.81%	1.77%	1.73%	1.69%
100.00%	Local Heat Electrification Rate/ME HE Rate from CELT	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
100.00%	Local Energy Efficiency/ME Energy Efficiency from CELT	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
N/A	Historical FTM PV Peak Generation (MW)	0									
10%	Growth Gap in Low/Mid/High EV Case Studies	10%									
10%	Growth Gap in Low/Mid/High PV Case Studies	10%									

Values for each parameter per year, adjustable

Recommended values for each parameter based on local historical datasets (i.e., zip-code EV number and circuit-level BTM PV nameplate)

For each category (EV, HP, EE, PV), we use CELT's prediction profile as a reference. The parameter value is set to 100% if we believe the category's adoption on the target circuit closely matches CELT's predicted profile. If we expect the local adoption rate to grow faster/slower than CELT's prediction based on local historical data, the parameter value will be greater/less than 100%.

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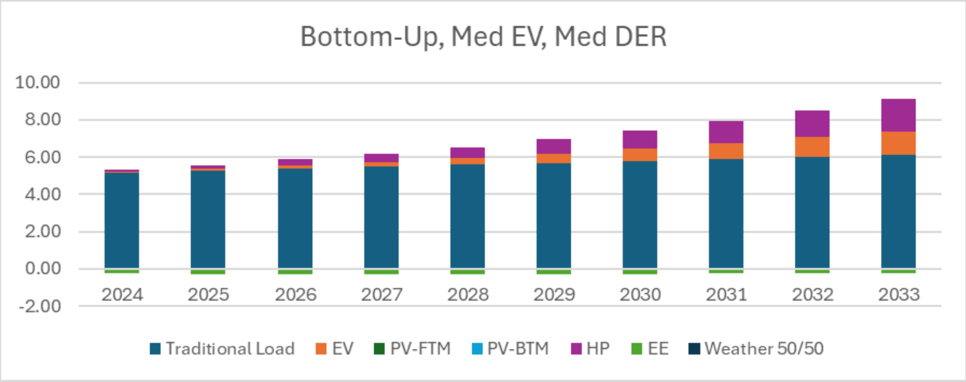
Bottom-Up Forecast Methodology

- Develop distribution circuit level forecast based on local data.
  - Scale each category based on local EV/HP/PV/EE data and design multiple case studies to investigate the impact of EV and PV penetration. Use CELT 2024 EV/HP/PV/EE as a reference.
  - Include the impacts of weather.
  - Example (Hampden HM4, Winter Evening Peak, Medium EV, Medium DER, Medium HP, EE):

Year	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Traditional Load	5.16	5.27	5.37	5.48	5.58	5.68	5.79	5.89	5.99	6.09
EV	0.04	0.09	0.16	0.25	0.37	0.51	0.68	0.86	1.06	1.27
PV-FTM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PV-BTM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HP	0.10	0.20	0.34	0.44	0.57	0.76	0.94	1.17	1.45	1.77
EE	-0.26	-0.28	-0.30	-0.32	-0.30	-0.29	-0.27	-0.25	-0.23	-0.21
Weather 50/50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Weather 10/90	-0.08	-0.08	-0.10	-0.12	-0.14	-0.16	-0.19	-0.21	-0.24	-0.28
Weather 90/10	0.15	0.18	0.22	0.27	0.33	0.41	0.49	0.60	0.73	0.88
Net Load - 50/50	5.04	5.27	5.57	5.84	6.22	6.66	7.13	7.67	8.27	8.92
Net Load - 10/90	4.96	5.19	5.47	5.73	6.08	6.51	6.95	7.46	8.03	8.65
Net Load - 90/10	5.18	5.45	5.79	6.12	6.55	7.07	7.63	8.27	9.00	9.80



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Bottom-Up Forecast Methodology

Example (Hampden HM4, Winter Evening Peak, Medium EV, No DER, Medium HP, EE):

Year	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Traditional Load	5.16	5.27	5.37	5.48	5.58	5.68	5.79	5.89	5.99	6.09
EV	0.04	0.09	0.16	0.25	0.37	0.51	0.68	0.86	1.06	1.27
PV-FTM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PV-BTM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HP	0.10	0.20	0.34	0.44	0.57	0.76	0.94	1.17	1.45	1.77
EE	-0.26	-0.28	-0.30	-0.32	-0.30	-0.29	-0.27	-0.25	-0.23	-0.21
Weather 50/50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Weather 10/90	-0.08	-0.08	-0.10	-0.12	-0.14	-0.16	-0.19	-0.21	-0.24	-0.28
Weather 90/10	0.15	0.18	0.22	0.27	0.33	0.41	0.49	0.60	0.73	0.88
Net Load - 50/50	5.04	5.27	5.57	5.84	6.22	6.66	7.13	7.67	8.27	8.92
Net Load - 10/90	4.96	5.19	5.47	5.73	6.08	6.51	6.95	7.46	8.03	8.65
Net Load - 90/10	5.18	5.45	5.79	6.12	6.55	7.07	7.63	8.27	9.00	9.80

Example (Hampden HM4, Summer Evening Peak, High EV, No DER, High HP, EE):

Year	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Traditional Load	4.49	4.58	4.67	4.76	4.85	4.94	5.03	5.12	5.21	5.30
EV	0.01	0.03	0.08	0.13	0.20	0.28	0.38	0.49	0.61	0.73
PV-FTM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PV-BTM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HP	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.03
EE	-0.21	-0.23	-0.24	-0.26	-0.24	-0.23	-0.21	-0.19	-0.18	-0.16
Weather 50/50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Weather 10/90	-0.19	-0.19	-0.21	-0.21	-0.22	-0.23	-0.24	-0.25	-0.26	-0.27
Weather 90/10	0.25	0.26	0.27	0.28	0.29	0.30	0.32	0.33	0.35	0.36
Net Load - 50/50	4.29	4.39	4.51	4.64	4.81	5.00	5.21	5.43	5.66	5.90
Net Load - 10/90	4.10	4.19	4.30	4.43	4.59	4.77	4.97	5.18	5.40	5.63
Net Load - 90/10	4.54	4.65	4.78	4.92	5.10	5.31	5.53	5.76	6.01	6.27

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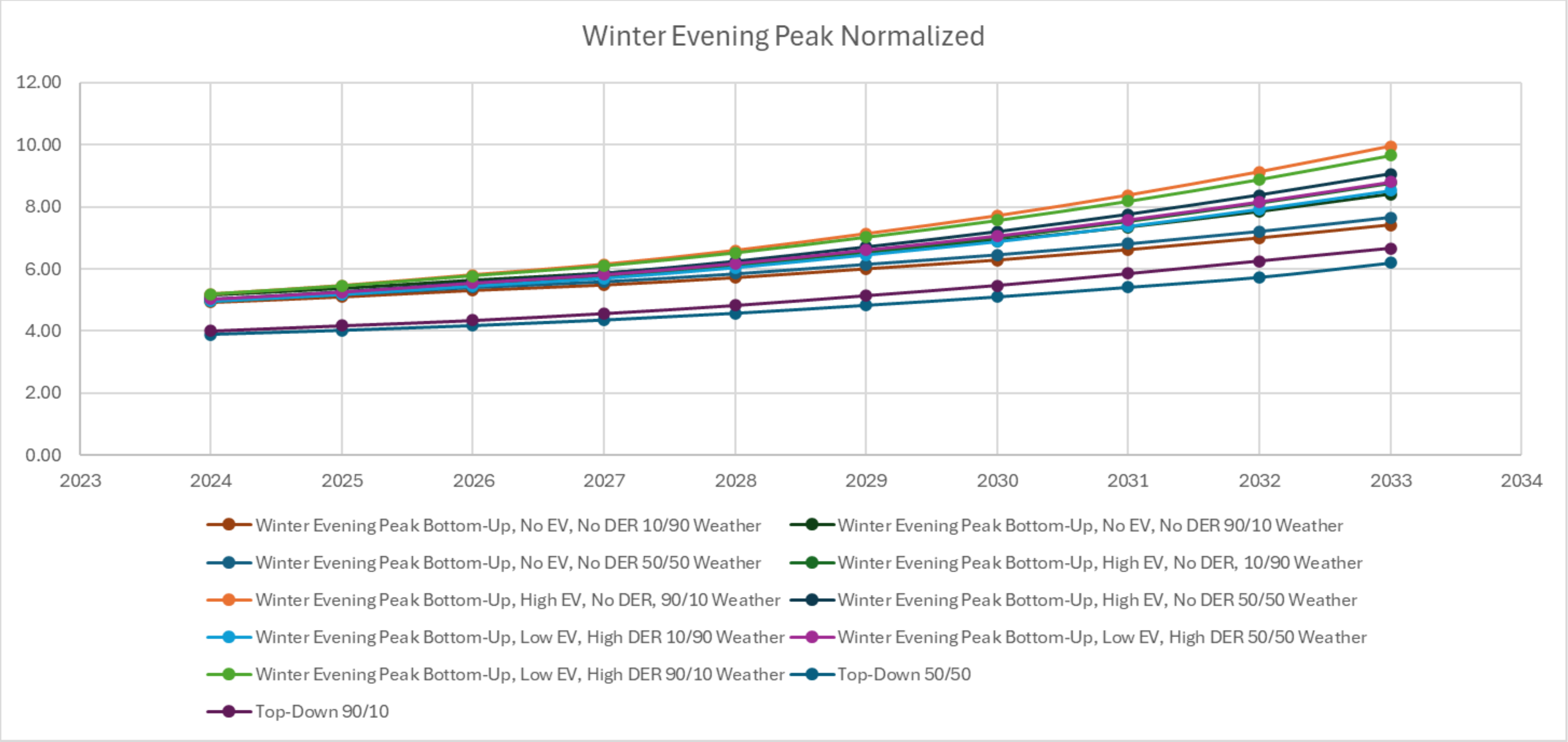
Example of Results (Hampden HM4)



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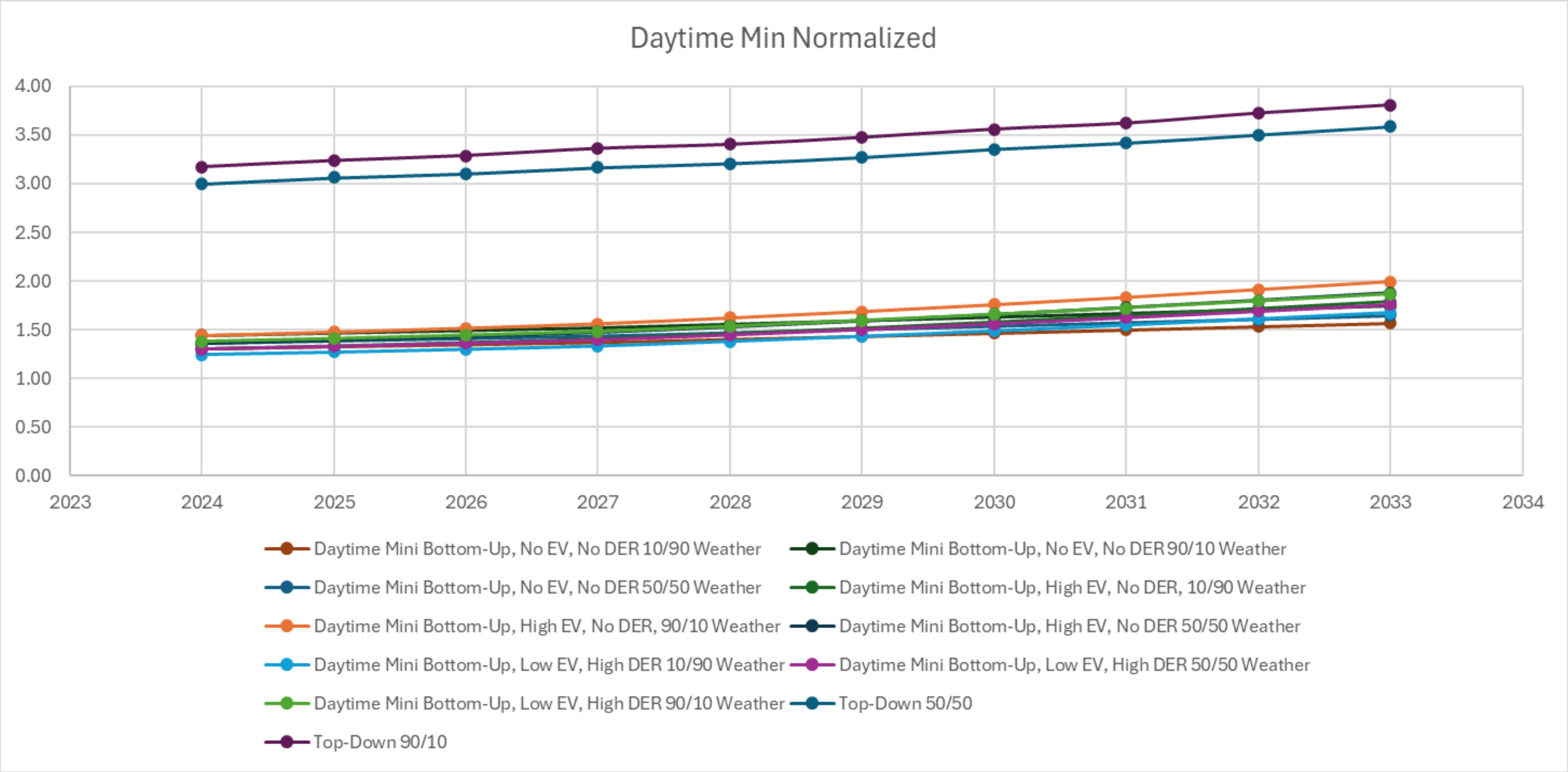
Example of Results (Hampden HM4)



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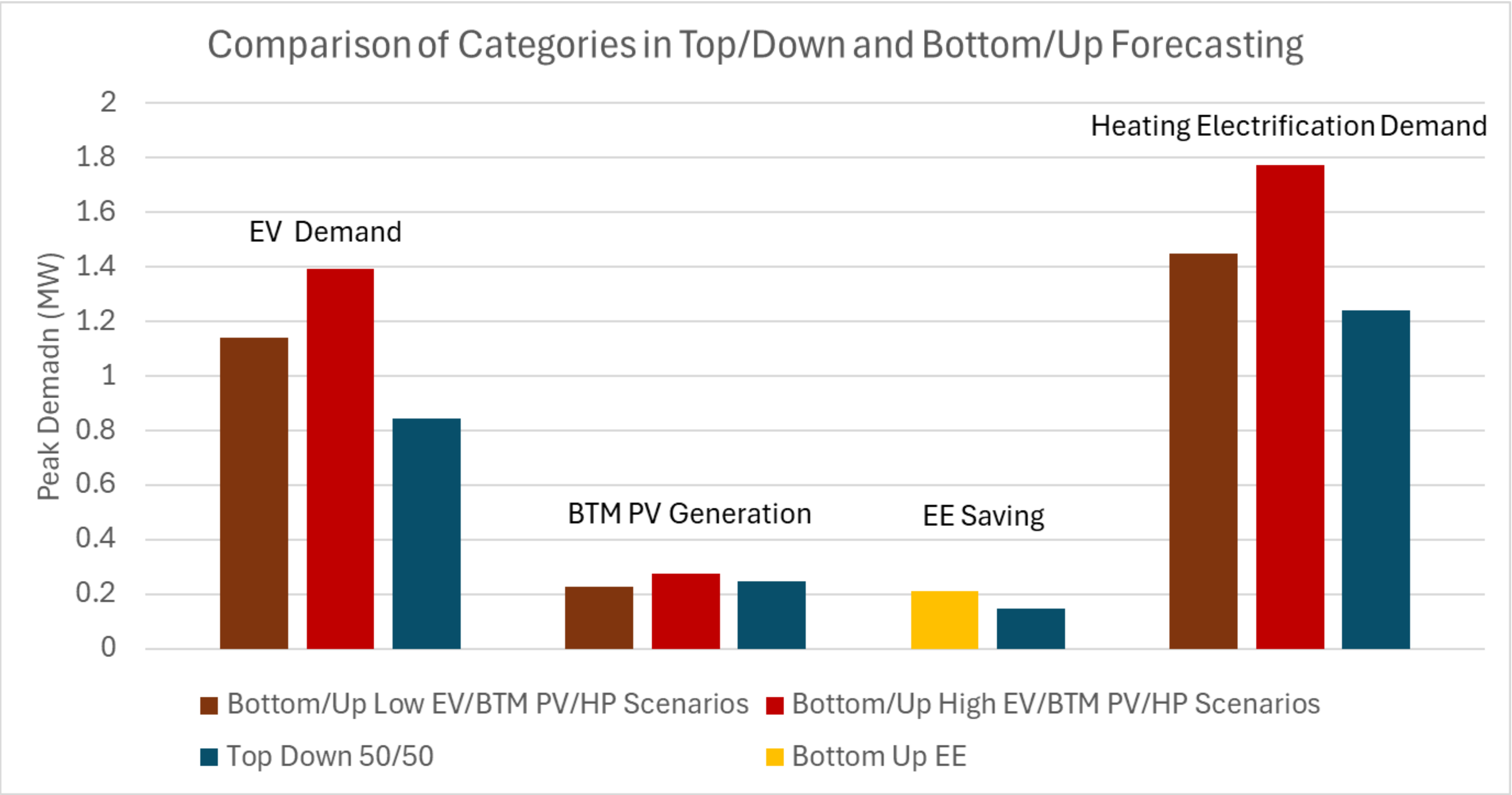
Example Results Summary

- For HM4, Top/Down vs. Bottom/Up net load results (MW) in 46.05% difference for peak scenarios and 102.76% difference for minimum scenarios.
- For HM4, Bottom/Up results in an EV electrification adoption range of [94.89%, 115.9%] of CELT results.
- For HM4, Bottom/Up results in a DER adoption range of [88.8%, 108.5%] of CELT results.
- This example shows the Bottom/Up forecasts are critical in determining the impact on the distribution system.
- The range of scenarios allows for more insight into probable outcomes.
- Further analysis in the modeling and solutions tasks will reference all scenarios in determining system constraints and solutions.

Example Results Summary



Note: All results for EV, EE, and HP for circuit HM4 are from the 2033 Winter Evening Peak scenario, while all results for BTM PV are from the 2033 Summer Daytime Peak scenario.

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Looking Ahead

- **Reliability and resilience improvements:**
  - Multiple forecast scenarios will help determine system constraints and ensure areas are appropriately targeted for no regrets improvements to ensure reliability is improved or maintained.

- **Promote flexible management of consumers' resources and energy consumption:**
  - Customer load profiles are expected to change significantly.
  - Ensuring that the grid can accommodate transportation electrification, heating electrification, and DER growth in the right place at the right time is crucial to attaining the state's climate and GHG reduction goals, while also maintaining affordability.

Forecasting Approach Summary

- Versant will be developing 3 forecasts:
  - The Top/Down base forecast as specified by the MPUC.
    - With 6 scenarios as specified by the MPUC.
  - The Top/Down high forecast as specified by the MPUC.
    - With 6 scenarios as specified by the MPUC.
  - The Bottom/Up forecast, to supplement required forecasts.
    - With 126 scenarios, to supplement required scenarios.
- Versant will be using ISO-NE 2024 CELT adoption rates for transportation electrification, heating electrification, and DER adoption as reference data in the forecasts.

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Next Steps

- Forecasting efforts continue November through January.
- Once forecasting is complete, the next task is modeling and analysis using the forecasts that were developed.
- First required stakeholder engagement meeting will be held shortly after forecasting is complete, targeting mid February.
- Any comments or feedback for the modeling task is encouraged to be submitted prior to that meeting so it can be more easily considered and incorporated.
- That meeting will follow a similar format to this meeting, and be focused on reviewing the developed forecasts, and discussing the next steps and approach to modeling and analysis.

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Questions for Stakeholders

- What snapshots/scenarios are most beneficial to develop for both grid constraints and grid solutions?

- Should utilities use the ISO-NE CELT adoption rates as the baseline (100%) and the low and high scenarios use 90% and 110% respectfully?

- How should utilities prioritize which scenarios to use in the modeling and analysis tasks?

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How can you get involved in planning efforts?

1. Take our surveys
2. Check our web page for updates
3. Sign up for email updates
4. Submit comments
5. Join our discussions

gridandclimate@versantpower.com

at versantpower.com:
Energy Solutions →
Connecting Renewable Resources → Grid and Climate Planning

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Thank you!

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