

vermont electric power company

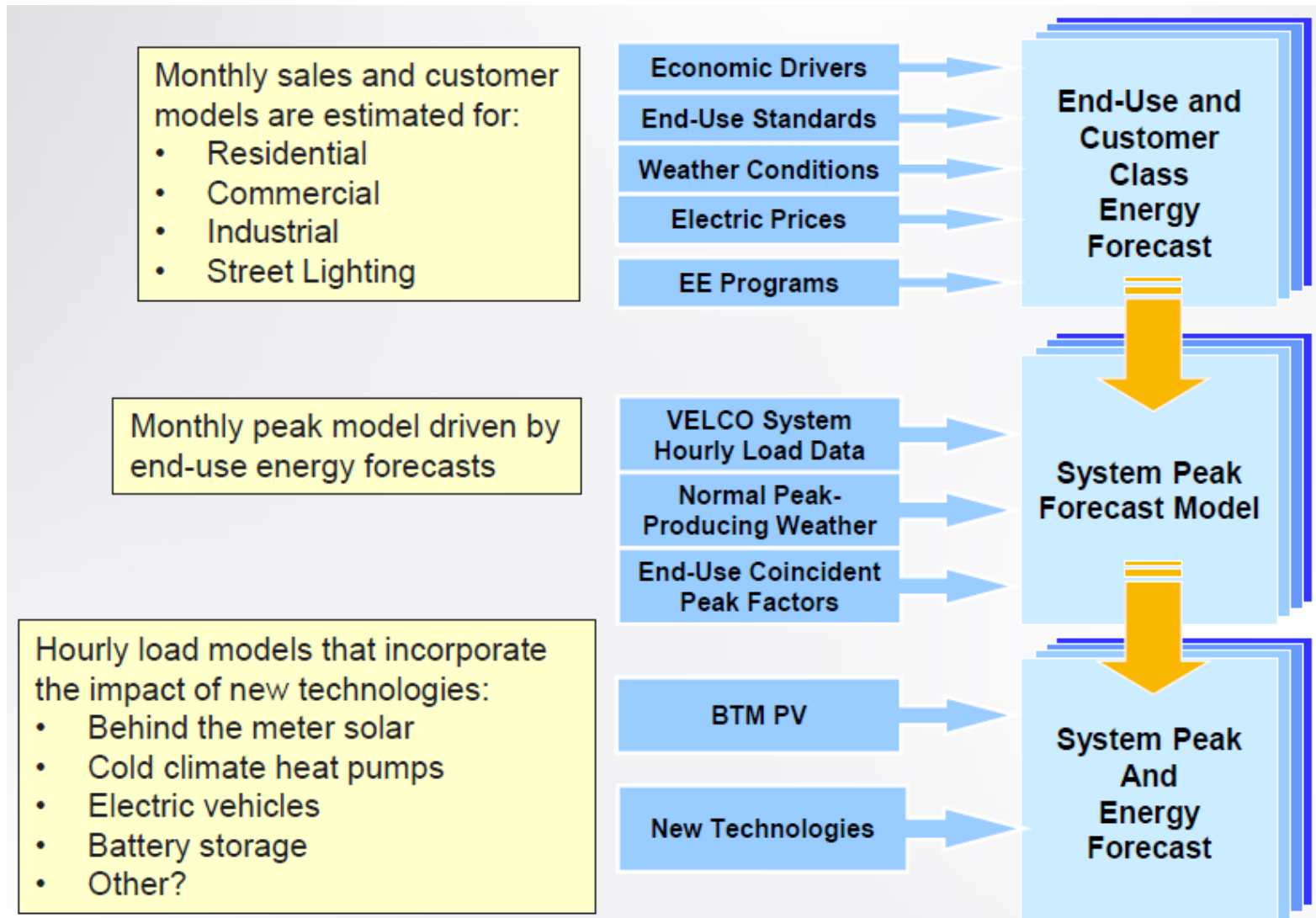


Final Load Forecast for the 2018 Vermont Long-Range Transmission Plan

Oct 18, 2017

VSPC meeting

Forecast overview diagram



From ITRON scope on VSPC Forecast Subcommittee web page 1/24/2017 documents

Chronology of subcommittee meetings

- July 13, 2016 — develop work plan
- October 5, 2016 — discuss forecast approach
- January 24, 2017 — kickoff ITRON forecast effort
- February 9, 2017 — review forecast input data needs
- March 28, 2017 — review ITRON input data and discuss additional data needs
- June 27, 2017 — review preliminary forecast
- August 2, 2017 — review preliminary forecast update
- October 5, 2017 — review final forecast and scenarios

SYSTEM PEAK DEMAND (MW)

Year	Reference	-Solar	+ HP	+ EV
2017	984.9	981.1	981.1	981.2
2018	985.2	979.8	980.5	981.0
2019	984.5	978.3	979.7	980.4
2020	982.7	972.6	974.8	975.9
2021	980.7	970.6	973.3	974.9
2022	980.0	967.6	970.7	973.0
2023	980.9	971.8	975.6	978.8
2024	981.6	971.4	976.2	980.9
2025	981.9	972.0	977.6	984.4
2026	982.1	968.2	974.6	983.0
2027	983.5	968.0	975.2	984.2
2028	985.6	971.3	979.2	991.5
2029	987.7	976.5	985.0	1,002.4
2030	989.6	979.9	989.1	1,013.3
2031	991.8	980.7	990.8	1,017.9
2032	994.1	983.3	993.7	1,025.7
2033	996.5	984.3	995.1	1,031.1
2034	999.0	988.0	999.6	1,046.1
2035	1,002.1	991.5	1,004.6	1,057.6
2036	1,005.2	995.1	1,009.6	1,072.0
2037	1,008.3	996.2	1,011.6	1,079.1
2017 - 27	0.0%	-0.1%	-0.1%	0.0%
2027 - 37	0.2%	0.3%	0.4%	0.9%
2017 - 37	0.1%	0.1%	0.2%	0.5%

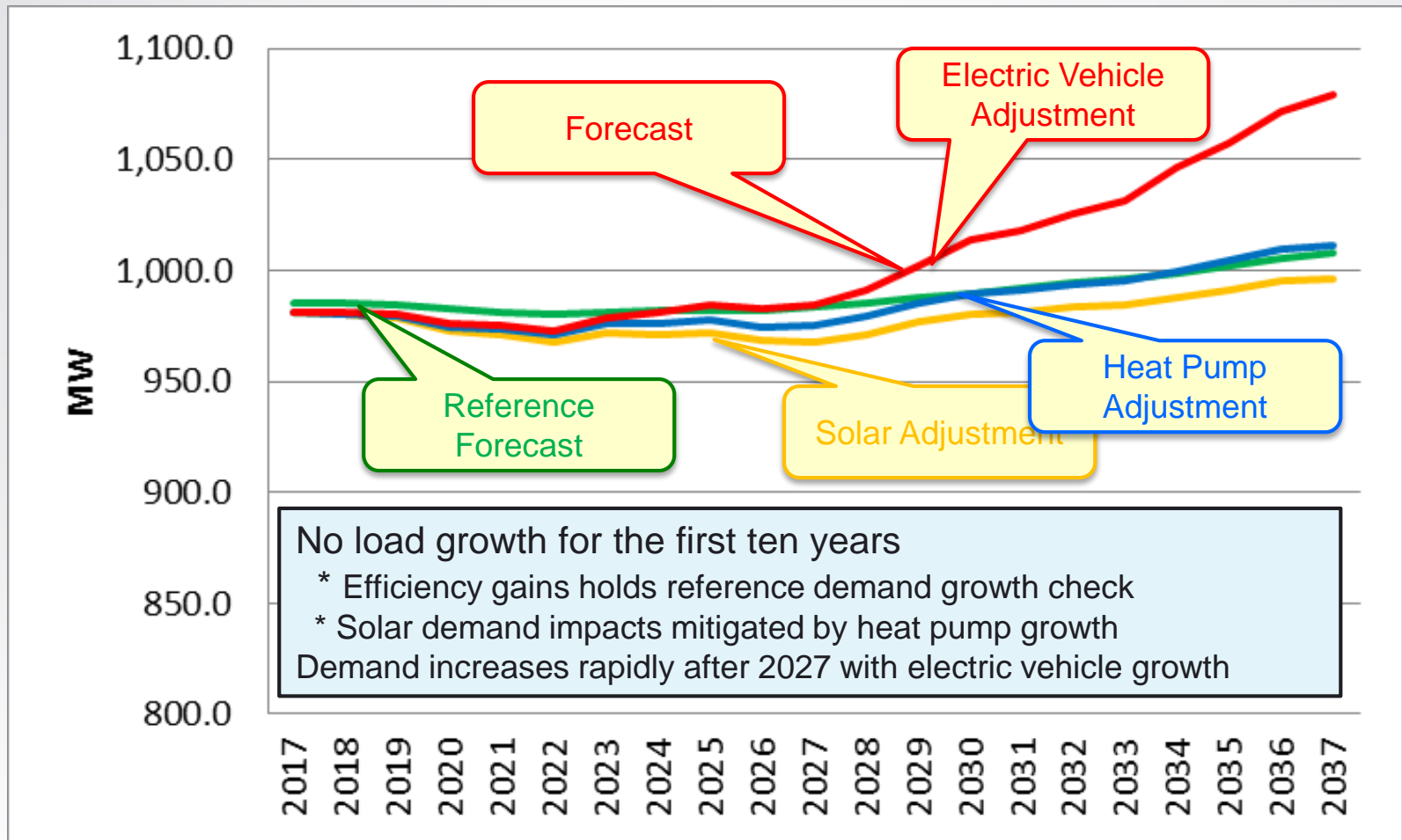
Year	Baseline	-Solar	+ HP	+ EV
2017	7/14/2017 15:00	7/14/2017 17:00	7/14/2017 17:00	7/14/2017 17:00
2018	7/2/2018 18:00	7/2/2018 18:00	7/2/2018 18:00	7/2/2018 18:00
2019	7/2/2019 18:00	7/2/2019 18:00	7/2/2019 18:00	7/2/2019 18:00
2020	7/2/2020 17:00	7/2/2020 18:00	7/2/2020 18:00	7/2/2020 18:00
2021	7/2/2021 17:00	7/2/2021 18:00	7/2/2021 18:00	7/2/2021 18:00
2022	7/14/2022 18:00	7/14/2022 18:00	7/14/2022 18:00	7/14/2022 18:00
2023	7/14/2023 15:00	7/14/2023 18:00	7/14/2023 18:00	7/14/2023 18:00
2024	7/2/2024 18:00	7/2/2024 18:00	7/2/2024 18:00	7/2/2024 18:00
2025	7/2/2025 18:00	7/2/2025 19:00	7/2/2025 19:00	7/2/2025 19:00
2026	7/2/2026 17:00	7/2/2026 19:00	7/2/2026 19:00	7/2/2026 19:00
2027	7/2/2027 17:00	7/2/2027 18:00	7/2/2027 18:00	7/2/2027 18:00
2028	7/14/2028 15:00	7/2/2028 18:00	7/2/2028 18:00	7/14/2028 18:00
2029	7/2/2029 18:00	7/2/2029 19:00	7/2/2029 19:00	7/2/2029 19:00
2030	7/2/2030 18:00	7/2/2030 19:00	7/2/2030 19:00	7/2/2030 19:00
2031	7/2/2031 18:00	7/2/2031 19:00	7/2/2031 19:00	7/2/2031 19:00
2032	7/2/2032 17:00	7/2/2032 18:00	7/2/2032 18:00	7/2/2032 18:00
2033	7/14/2033 18:00	7/14/2033 18:00	7/14/2033 18:00	7/14/2033 19:00
2034	7/14/2034 15:00	7/14/2034 18:00	7/14/2034 18:00	7/14/2034 19:00
2035	7/2/2035 18:00	7/2/2035 19:00	7/2/2035 19:00	7/2/2035 19:00
2036	7/2/2036 18:00	7/2/2036 18:00	7/2/2036 18:00	7/2/2036 19:00
2037	7/2/2037 17:00	7/2/2037 19:00	7/2/2037 19:00	7/2/2037 19:00

VELCO note:

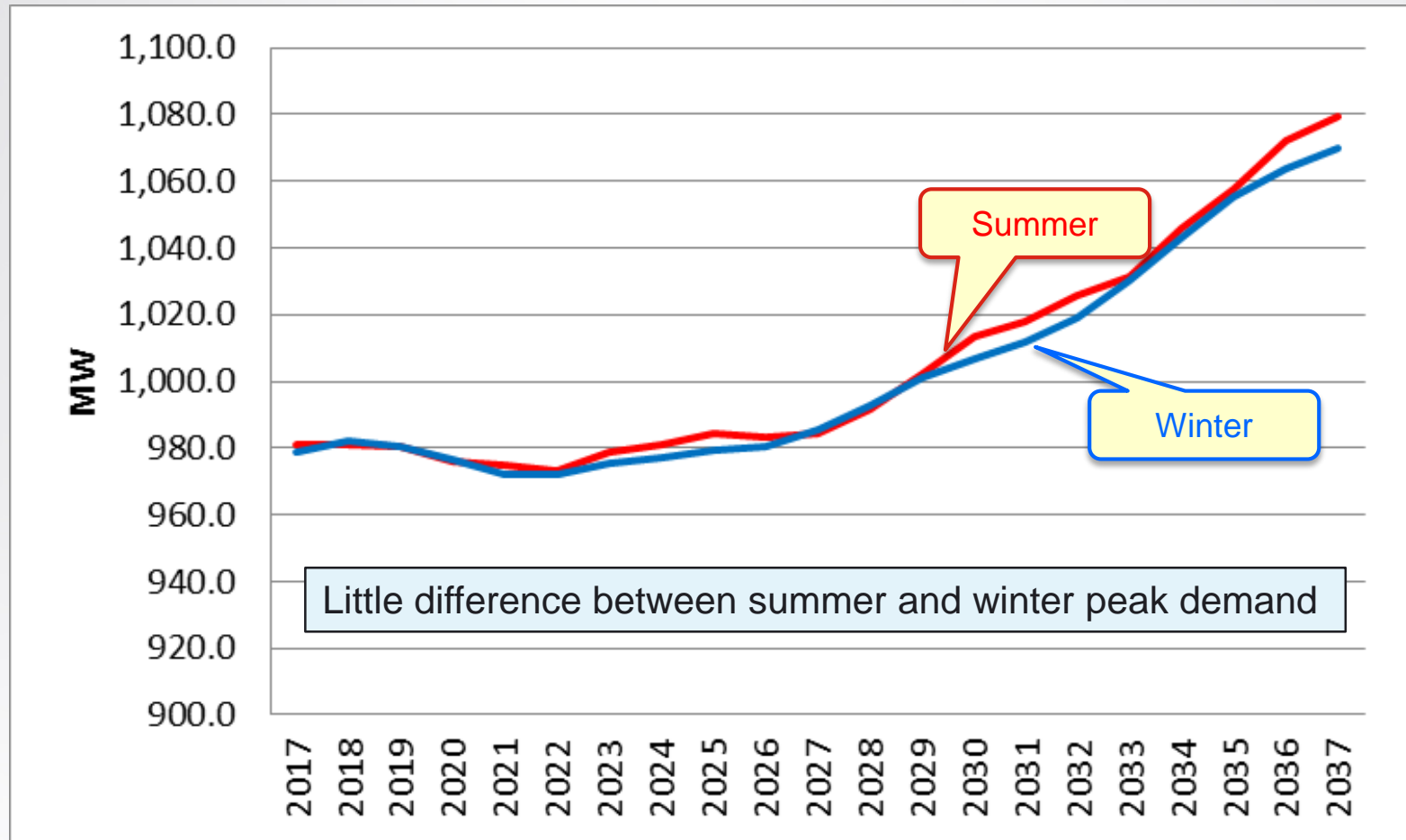
Translates into 100 MW between 2017 and 2037

These are 50/50 load forecasts, i.e., 50% chance of being exceeded

PEAK DEMAND FORECAST



SUMMER AND WINTER DEMAND FORECAST (MW)



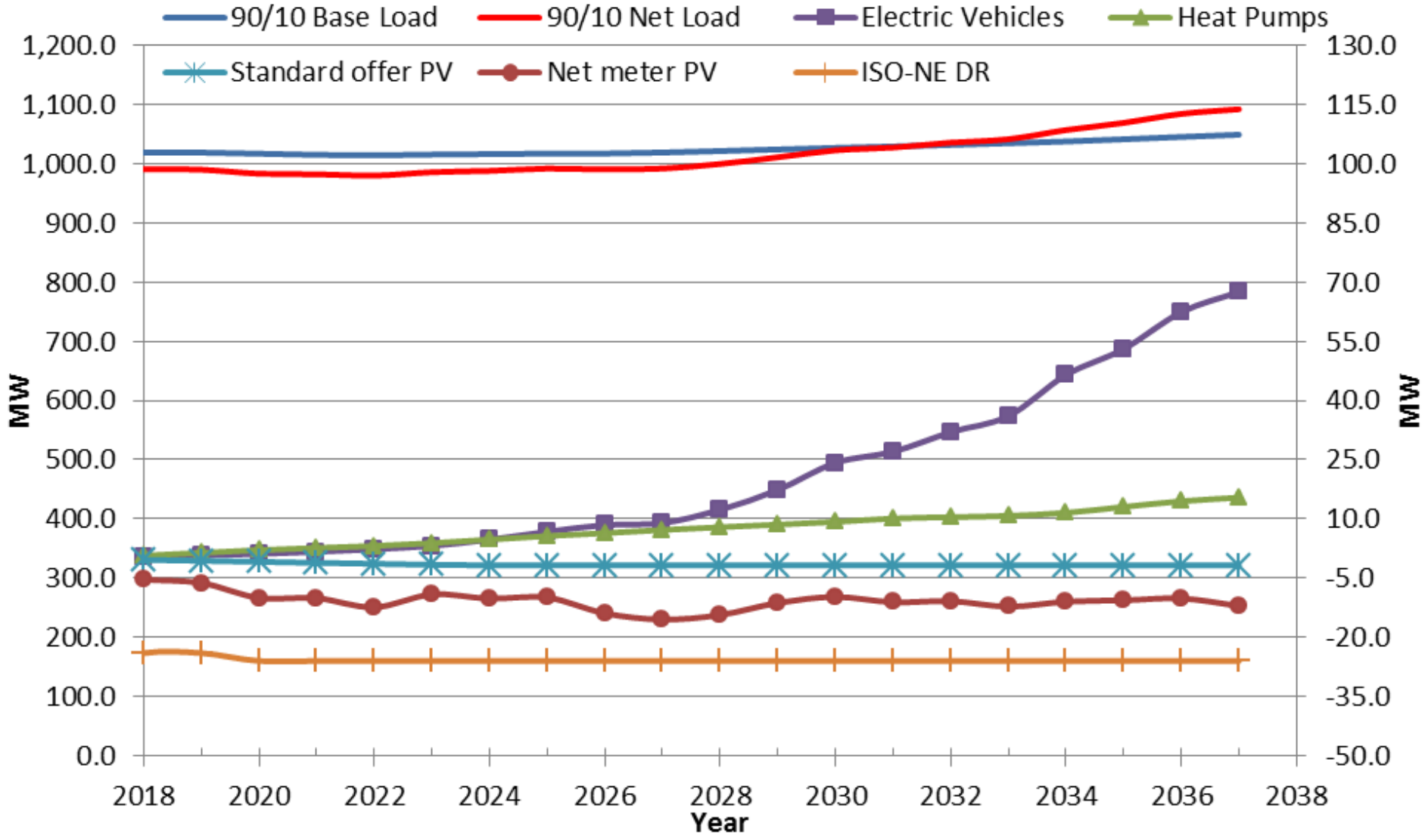
VELCO adjustments

- Calculate 90/10 loads from 50/50 load forecast
 - Based on adjustment factors ITRON presented at Aug 2 forecast subcommittee meeting
 - Increase peaks by roughly 4% in summer and 1% in winter
- Include effect of additional standard offer
 - Add 70 MW at established annual growth rate of 7.5 MW to 10 MW per year, and hold constant at 127.5 MW after reaching program end
- Include effect of ISO-NE demand response that has cleared forward capacity market
 - Roughly 26 MW held constant after last FCM commitment period in 2021

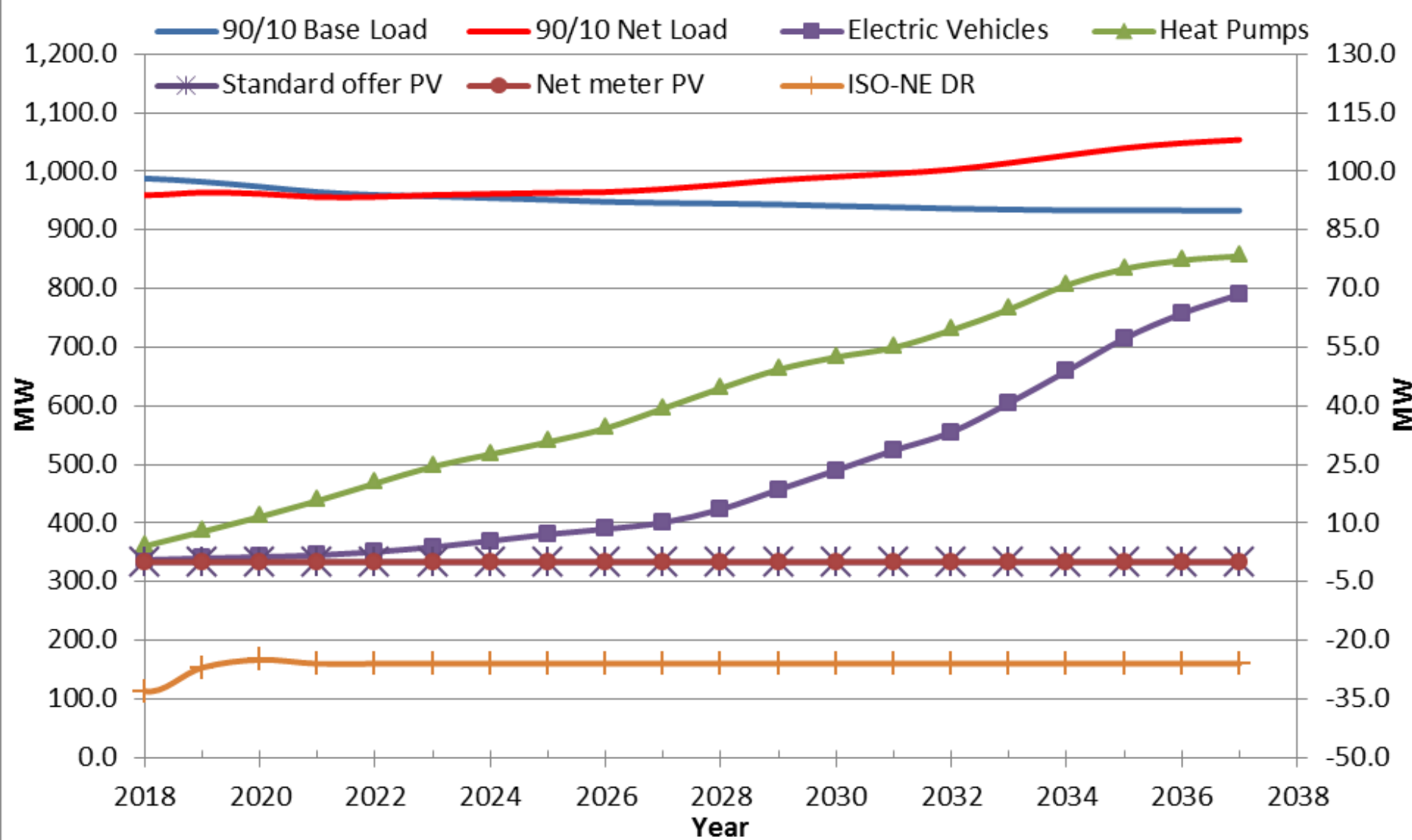
50/50 = 50% chance that the load forecast will be exceeded

90/10 = 10% chance that the load forecast will be exceeded

Summer Peak forecast



Winter Peak forecast



SCENARIOS

1. The Electrification Scenario

- Heat pump unit sales increase by 400 per year starting in 2021 over the base case. By 2035 heat pump saturation reaches 40% vs. 23% in the Base Case.
- Stronger electric vehicle sales. EV projections based on the “medium” scenario. 171,000 registered EVs by 2035, compared to 107,000 EVs in the Base Case.

2. Strong Solar Growth Scenario

- 1,000 MW of solar capacity by 2025 vs. 375 MW in the Base Case

ELECTRIFICATION SCENARIO COMPARISON

Energy Forecast (MWh)		
Year	Basecase	Alternative EV/HP
2017	5,942,188	5,942,368
2018	5,893,236	5,894,002
2019	5,834,094	5,835,548
2020	5,778,237	5,781,091
2021	5,726,890	5,732,418
2022	5,702,135	5,712,210
2023	5,697,105	5,713,800
2024	5,700,860	5,726,538
2025	5,705,723	5,742,927
2026	5,712,528	5,764,148
2027	5,729,696	5,799,105
2028	5,755,534	5,846,940
2029	5,784,188	5,902,769
2030	5,813,459	5,962,317
2031	5,846,167	6,027,978
2032	5,882,747	6,099,661
2033	5,926,661	6,183,469
2034	5,978,851	6,281,420
2035	6,033,105	6,377,975
2036	6,082,611	6,464,512
2037	6,124,404	6,535,525
2017 - 27	-0.4%	-0.2%
2027 - 37	0.7%	1.2%
2017 - 37	0.2%	0.5%

Summer Peak Forecast (MW)		
Year	Basecase	Alternative EV/HP
2017	981	981
2018	981	981
2019	980	981
2020	976	977
2021	975	977
2022	973	976
2023	979	983
2024	981	987
2025	984	993
2026	983	994
2027	984	997
2028	992	1,008
2029	1,002	1,024
2030	1,013	1,041
2031	1,018	1,050
2032	1,026	1,062
2033	1,031	1,073
2034	1,046	1,097
2035	1,058	1,117
2036	1,072	1,142
2037	1,079	1,158
2017 - 27	0.0%	0.2%
2027 - 37	0.9%	1.5%
2017 - 37	0.5%	0.8%

Winter Peak Forecast (MW)		
Year	Basecase	Alternative EV/HP
2017	979	979
2018	982	982
2019	980	981
2020	976	977
2021	972	973
2022	972	975
2023	975	981
2024	977	986
2025	979	992
2026	980	998
2027	985	1,010
2028	993	1,025
2029	1,001	1,043
2030	1,007	1,059
2031	1,012	1,073
2032	1,019	1,091
2033	1,030	1,114
2034	1,043	1,143
2035	1,056	1,171
2036	1,064	1,192
2037	1,070	1,206
2017 - 27	0.1%	0.3%
2027 - 37	0.8%	1.8%
2017 - 37	0.4%	1.1%

» Significant impact on peaks and energy. Shift to winter peaking.

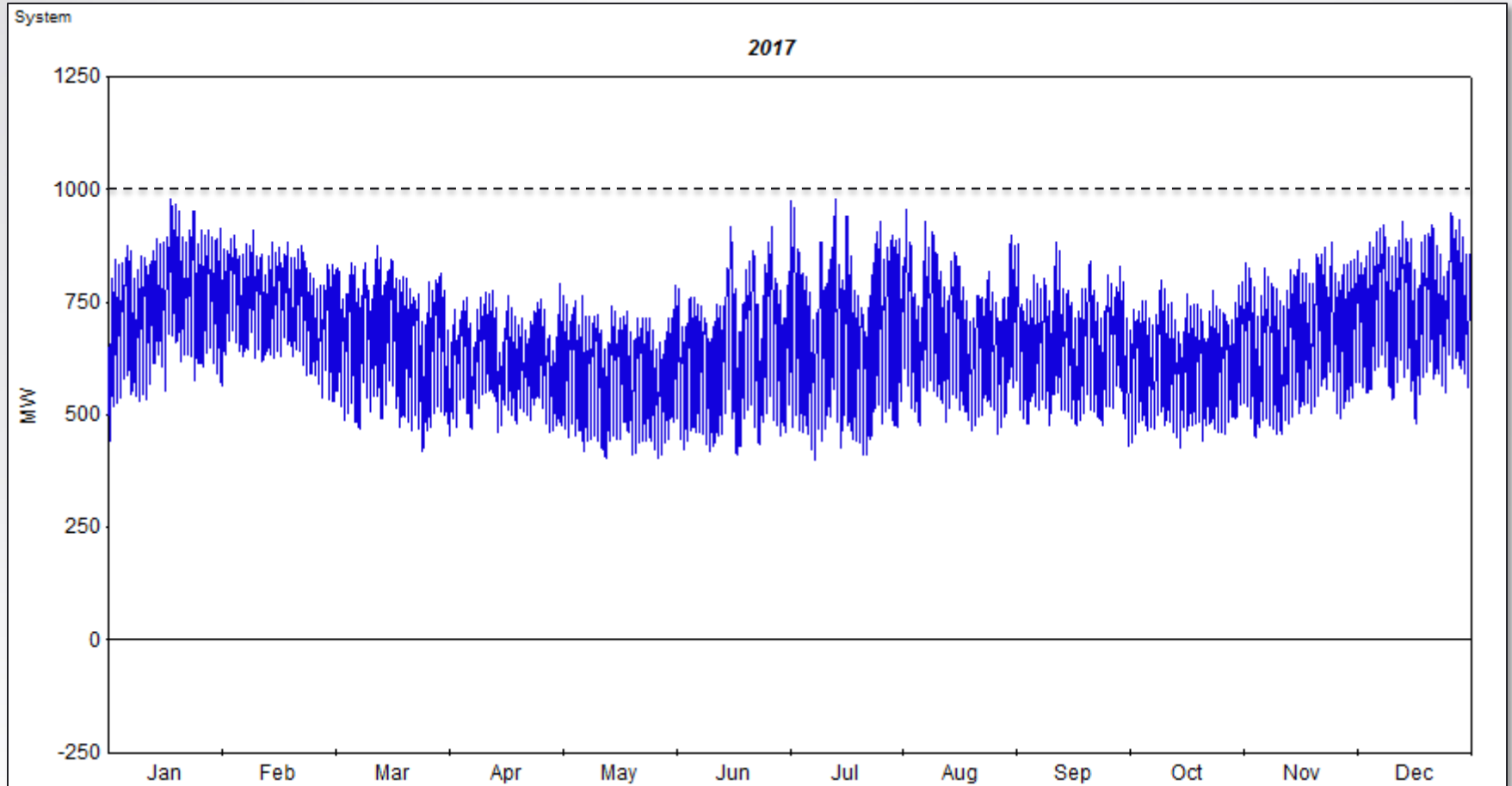
SOLAR SCENARIO COMPARISON

Energy Forecast (MWh)		
Year	Basecase	Alternative Solar
2017	5,942,188	5,880,256
2018	5,893,236	5,552,661
2019	5,834,094	5,294,669
2020	5,778,237	5,116,377
2021	5,726,890	5,016,934
2022	5,702,135	4,961,379
2023	5,697,105	4,935,082
2024	5,700,860	4,930,593
2025	5,705,723	4,930,050
2026	5,712,528	4,933,733
2027	5,729,696	4,945,468
2028	5,755,534	4,967,677
2029	5,784,188	4,991,684
2030	5,813,459	5,018,097
2031	5,846,167	5,045,302
2032	5,882,747	5,076,434
2033	5,926,661	5,113,336
2034	5,978,851	5,159,127
2035	6,033,105	5,206,031
2036	6,082,611	5,249,511
2037	6,124,404	5,285,600
2017 - 27	-0.4%	-1.7%
2027 - 37	0.7%	0.7%
2017 - 37	0.2%	-0.5%

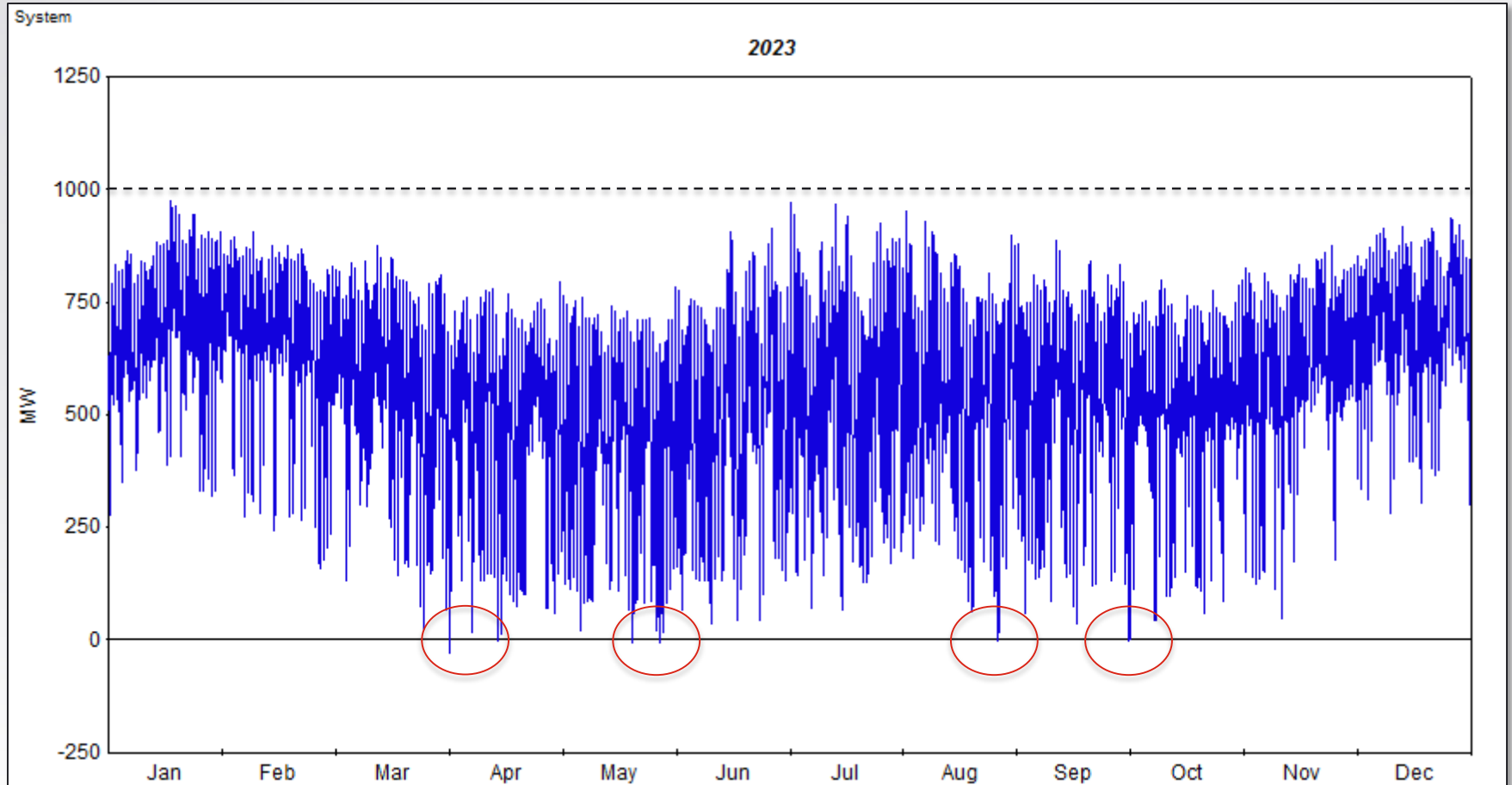
Summer Peak Forecast (MW)		
Year	Basecase	Alternative Solar
2017	981	976
2018	981	977
2019	980	975
2020	976	969
2021	975	968
2022	973	968
2023	979	974
2024	981	977
2025	984	981
2026	983	981
2027	984	981
2028	992	989
2029	1,002	1,000
2030	1,013	1,012
2031	1,018	1,014
2032	1,026	1,022
2033	1,031	1,028
2034	1,046	1,045
2035	1,058	1,055
2036	1,072	1,070
2037	1,079	1,077
2017 - 27	0.0%	0.0%
2027 - 37	0.9%	0.9%
2017 - 37	0.5%	0.5%

» Significant impact on energy, no impact on peaks.

IMPACT ON SYSTEM MINIMUM LOADS

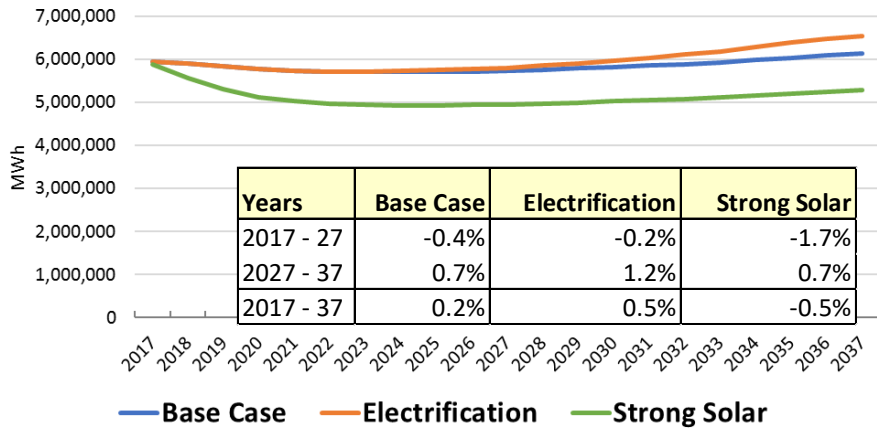


IMPACT ON SYSTEM MINIMUM LOADS

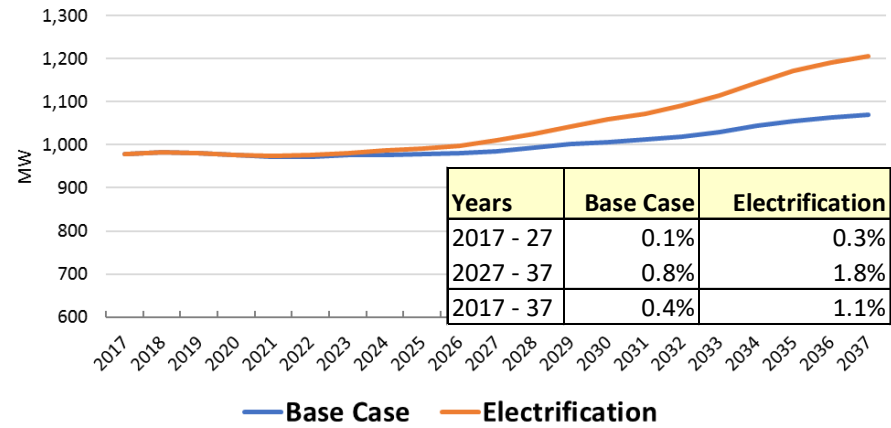


SCENARIO COMPARISONS

Energy

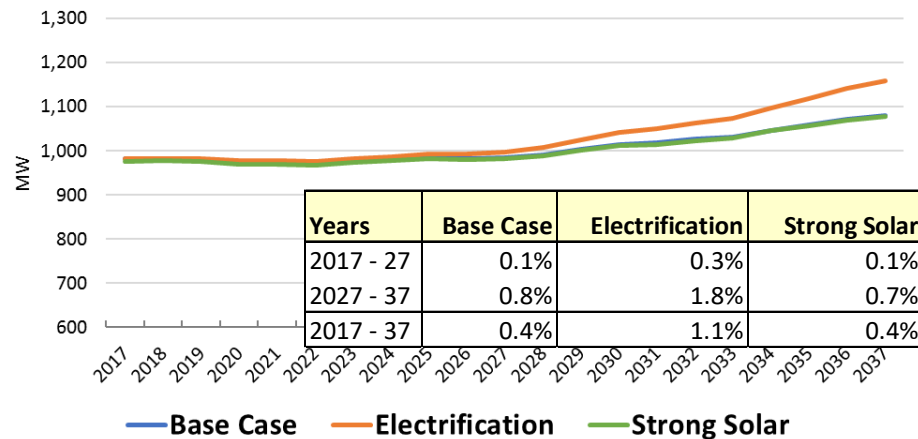


Winter Peak



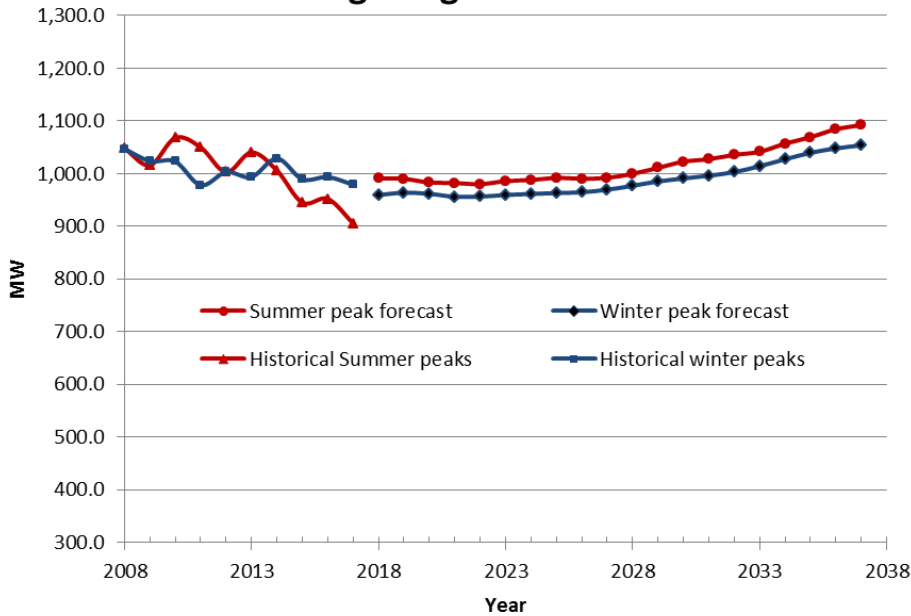
VELCO Note:
These are 50/50
load forecasts

Summer Peak

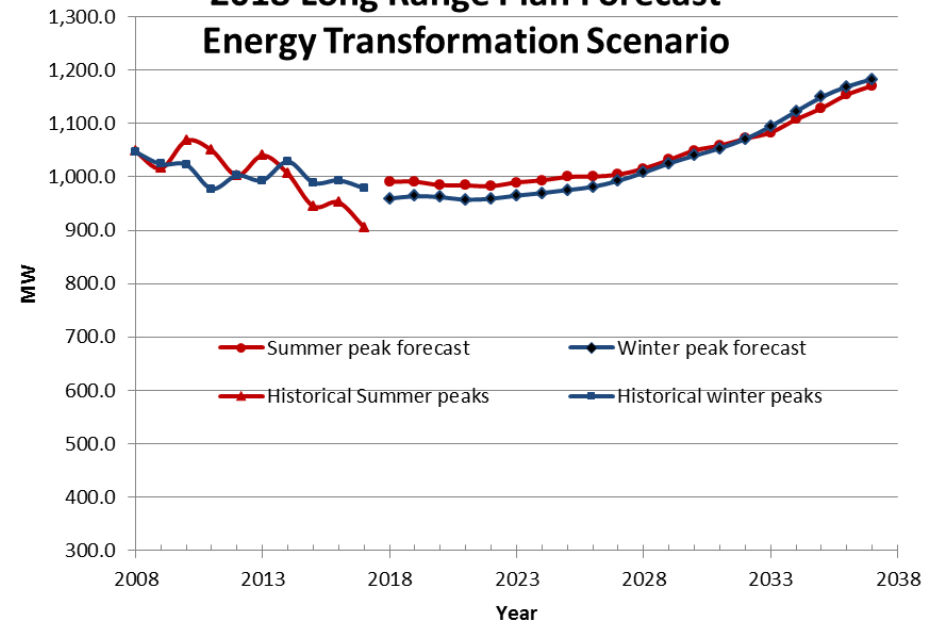


Peak load forecast comparison — as tested

2018 Long Range Plan Forecast



2018 Long Range Plan Forecast Energy Transformation Scenario



Graphs include additional effects of extreme weather (90/10), Standard Offer and ISO-NE demand response on load forecasts