MEMORANDUM

TO	Brian Cotterill, Vermont Department of Public Service
FROM	Rich Hasselman, GDS Associates, Inc.
DATE	May 9, 2024
RE	Estimate of Residential Flexible Load Management Technical Potential

INTRODUCTION AND BACKGROUND

This memo presents an estimation of the technical potential for flexible load management to reduce demand for residential buildings and light duty electric vehicles (EVs) by the end of 2030. The estimates reflect the technical opportunity that Vermont electric utilities have to manage loads through 2030. The analysis uses Energy Efficiency Utility (EEUs) Program Achievable Potential projections[1] for residential HVAC and water heating measures and light duty EVs assuming the EV mid-range adoption growth as forecasted by the Vermont Agency of Transportation (VTRANS). The analysis is forward-looking and treats EVs somewhat differently than loads associated with residential HVAC and water heating. For EVs, the analysis includes the cumulative passenger EVs associated with the VTRANS forecast. In contrast, for residential HVAC and water heating loads, the forward look only includes the equipment expected to be installed by EEUs as forecasted in the energy efficiency potential study and does not consider equipment installed prior to that study. Furthermore, this analysis is focused on the residential sector and does not consider fleet vehicles, commercial or industrial opportunities, or other existing load management initiatives.

Estimating the potential for Flexible Load Management (FLM) resources is a new area of interest for the Department. FLM is both a well established *and* emerging subject for the electricity industry. As States and electric utilities seek to drive high penetrations of carbon-free electricity and grow electric loads through electrification efforts, both traditional demand response/load management and new forms of load management are viewed as critical components to optimize outcomes and manage ratepayer costs. Indeed, Vermont's 2022 Comprehensive Energy Plan (CEP) discusses FLM in the context of Vermont Distribution Grid Planning and in combination with related subjects, such as Smart Grid, Resilience, and Communications. Within the CEP, an evolution of the grid is viewed as an important component to meet Vermont's energy and climate goals. The current draft of VELCO's long-range transmission plan[2] identifies FLM as a necessary component to manage the electricity grid under increasing electric loads driven by electrification efforts. VELCO's draft plan does not include an analysis of FLM potential but notes its importance and ongoing initiatives in the State to address FLM opportunities.

In the CEP, FLM is envisioned as supporting demands on the electricity grid at the transmission and distribution level. FLM has the potential to optimize economics by reducing electricity demand when wholesale prices are highest, reduce or otherwise manage transmission and distribution system capacity constraints, and supply ancillary services. FLM is a form of demand response that shifts considerations for managing demand from a focus on system-level peak demand periods to a more nuanced management of demand that could occur throughout a utility's load shape and for a range of possible value propositions.

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[1] https://epuc.vermont.gov/?q=downloadfile/632187/171403

[2] 2024 VLRTP_VSPC_draft_0.pdf (vermontspc.com)

As FLM is not focused solely on system peaks, traditional metrics for demand response (i.e. system peak kW reductions) do not adequately capture the range of possible opportunities. While system peak demand is often met with inefficient peaking generators and has a higher-than-average carbon impact at the margins, supply constraints based on high levels of non-dispatchable renewable energy supply may create value at managing loads at times other than peak demand.

The electric utility industry is still evolving metrics and approaches to integrate substantial volumes of renewable energy supply and balance loads within that supply. The needs can vary across the electricity grid, indicating that avoided costs that reflect greater locational impact may be needed to accurately capture the benefits and costs of FLM at the distribution level. The CEP identify this issue by pointing to constrained transmission and distribution substations, an indication that the value proposition for FLM varies by location on the electric grid.

There is a great deal of uncertainty related to FLM operations and economics as well as the implications for Vermont utilities operating or adapting demand response programs. When coupled with the expectation that FLM could be utilized across a utility's load shape, it becomes clear that many topics need to be addressed and clarified to fully assess the Program Achievable Potential for demand response or FLM in Vermont. As such, the analysis focuses on the technical potential for residential FLM within a range of possible impacts. To create analytic focus, the estimate of residential FLM potential was narrowed to new residential HVAC and water heating measures forecasted in the Program Achievable Potential scenario of the 2022 Energy Efficiency Market Potential Study, along with estimates of EV adoptions forecasted by the Vermont Agency of Transportation (VTRANS

Below we summarize the results, followed by a presentation of major assumptions driving the estimated statewide range of FLM technical potential. Adoption of controllable HVAC and water heating measures through EEU and Tier III programs explicitly requires cost-effectiveness to be considered and is a function of Program Achievable Potential. FLM estimates for EVs are based on VTRANS/VELCO forecasts of light-duty EV adoption and does not consider the cost effectiveness of EV investments. The VTRANS/VELCO estimate is presented in the VTRANS NEVI 2023 Update.[3]

SUMMARY RESULTS FOR RESIDENTIAL SECTOR

Readers should view the potential as a maximum technical potential as if all loads were participating in a FLM program. Table 1 provides a summary of residential HVAC and water heating, and light duty EV FLM potential to reduce peak loads in 2030. It is based on the cumulative adoption forecasts of those technologies through 2030.

As modeled, the *potential* for FLM does not consider program enrollment factors, but points to the aggregate potential if the loads could be controlled. As such, the potential in 2030 is highly dependent on technology adoptions and assumes participation in programs or equivalent voluntary efforts.

Summer and winter savings vary for residential HVAC, though are constant for EVs and water heating. FLM HVAC savings in both winter and summer are driven largely by heat pump adoptions, though do include room A/C adoptions that only provide savings in the summer. FLM potential for light duty EVs assumed the mid-range forecast for cumulative EV adoptions through 2030. Further assumptions are discussed in this memo for each major end-use category.

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[3] https://vtrans.vermont.gov/sites/aot/files/planning/documents/planning/Vermont%20FFY2024%20NEVI%20State%20Plan_FINAL.pdf

Table 1 Residential FLM Technical Potential (MW)

Source	Summer High	Summer Low	Winter High	Winter Low
HVAC	67.1	6.2	43.9	4.4
Water Heating	7.4	0.8	7.4	0.8
EVs	87.2	24.6	87.2	24.6
Total	**161.7**	**31.6**	**138.5**	**29.8**

As Table 1 shows, the potential for FLM savings is substantial. In presenting the high and low ranges of technical potential savings based on forecasted technology adoption and not based on program adoption rates. The data and assumptions were derived from industry literature that assume some level of savings are available throughout the year. However, the ability to manage and control loads could be less or greater than presented in Table 1. For example, savings from residential water heaters in the middle of the night may be minimal. Savings from EVs are dependent on chargers being used and come from industry literature analyzing on-peak savings opportunities and a variety of program and market conditions. HVAC savings are dependent on heat pump adoptions and assume some level of savings opportunities in winter, potentially needing to leverage dual fuel HVAC systems to maximize savings opportunities without creating health or quality of life issues. Additionally, summer HVAC savings are dependent on the use of air conditioning, a growing but less common HVAC load in Vermont. In short, these estimates should be viewed as approximate and provide a range of possible impacts that FLM could produce at general peak times – the outcome metrics do not indicate that these savings would be equally available throughout the year and across a utility's load shape. For example, spring or fall savings for HVAC measures are dependent on heating or cooling loads, for which these seasons tend to see lower loads and subsequently would be expected to have lower FLM performance than summer or winter. Additionally, if FLM is operated as an event-based demand response during temperature extremes, the duration of the savings may be limited to several hours. EVs will need charging. Heat pumps without non-electric auxiliary options will need to provide heat, etc.

GDS recommends that further research on each major end-use be conducted with field studies with program participants to better understand how each major end-use may perform at system peak times or other times of the year. Doing so will facilitate further refinements in understanding the potential for FLM to help Vermont achieve its energy and climate policy goals.

Below we describe the major assumptions driving the summary results from each major end-use.

LIGHT DUTY EV FLM DETAILS

The adoption of Light Duty Electric Vehicles (EVs) are expected to grow substantially through 2030 and beyond. The State of Vermont Agency of Transportation (VATRANS), in their 2022 and 2023 NEVI plans, presented a forecast of EV adoptions developed by VELCO.[4] The forecast extends through 2050 and presents low, medium, and high estimates of EV adoption.

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[4] https://vtrans.vermont.gov/climate/charging/nevi

Table 2 Forecast of Vermont Light Duty EV Adoptions

Adoption Scenario, EV Count			
Year	**Low**	**Medium**	**High**
2020	4,624	4,941	5,189
2025	13,476	20,007	41,969
2030	**36,080**	**71,624**	**190,125**
2035	79,179	178,162	359,077
2040	126,184	256,417	412,689
2045	151,678	275,702	418,038
2050	159,931	278,561	418,464

In 2030, Vermont is forecasted to have between 36,000 and 190,000 EVs in service. To estimate the FLM potential, these vehicle counts are used to derive potential MW savings using the following assumptions.

Table 3 Key Assumptions to Estimate EV FLM Potential

Assumption	Metric	Source
Share of EVs with L2 Chargers	0.60	GDS Assumption
Per Vehicle kW savings – Low	0.49	Vermont TRM
Per Vehicle kW savings – High	1.74	National Grid[5]

GDS found that per vehicle kW savings varied substantially in the industry literature. The Vermont TRM provides for a lower savings value per vehicle. The high savings assumption was derived from a study in Massachusetts in which National Grid actively managed charging during peak periods, with savings reflecting "event participating EVs." GDS made the assumption that three quarters of EVs would have access to a Level 2 charger that would be suitable for managing charging behavior. While EV technology is evolving and many EVs have on-board chargers, controls for charging are also possible through vehicle telemetry. The exact disposition of charging technology and methods to manage charging in 2030 are unknown, but GDS assumes methods will be similar to what is currently available at the present time.

Using the medium forecast for EV adoption and the assumptions presented in Table 3, the following FLM savings potential is calculated by multiplying the forecasted vehicles with the share of those vehicles having Level 2 chargers and the low and high estimate of per-vehicle savings. Actual FLM potential will be impacted by the types of charge management programs, share of plug-in hybrids, types of charging technology employed by vehicle owners, and methods to physically manage the charging.

Table 4 2030 EV FLM Technical Potential Savings Estimates, Medium EV Adoption Forecast

Savings Scenario	MW Savings
Low	24.6
High	87.2

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[5] https://ma-eeac.org/wp-content/uploads/MA-EV-Managed-Charging-Comparison-Memo-2022-12-11-Final.pdf

There is one caveat to the savings estimate. The per-vehicle savings, whether using the low or high assumption, is based on system peak performance. The opportunity to shift EV loads during off-peak times is a topic that requires further research. In general, on-peak times will be in the late afternoon or evening. Nevertheless, the National Grid research indicates that with demand response event participation, managing EV charging can provide substantial on-peak load relief. However, the results also indicate a relatively low coincidence factor in EV charging, which limits per vehicle savings to substantially less than the capacity of an individual charger. For example, if a vehicle with Level 2 charging at 11 kW is the norm, a low coincidence factor reflects that charging loads are spread out over time and not all occurring at the same time. For EVs, this can be driven by when vehicles are connected to a charger, but also the behavior of the vehicle charging system. Typically, an EV charges most rapidly between approximately 20 and 80 percent of the battery's full-charge state. Hence, load diversity is also impacted by the overall market blend of EVs that are plugged in for charging and their average state of charge. Under the low or high metrics for per-vehicle FLM savings, the results are well under the general capacity of maximum charging rate for EVs on Level 2 chargers, resulting in a low coincidence factor and subsequently low FLM impact. The low coincidence factor suggests that EV loads, while manageable, have limitations for addressing peak loads. However, the low coincidence also indicates that FLM efforts to move loads from one time of day to another, is broadly possible, though with limited impact per EV in the market.

RESIDENTIAL WATER HEATING FLM DETAILS

Residential electric water heaters that can contribute to FLM performance come in two forms – adoptions of Smart Domestic Water Heater Tank Controls (STC), and heat pump water heaters (HPWH). In general, HPWH are all available with CTA-2045 ports that facilitate load management. Electric resistance water heaters can be managed through STC. The estimate of residential water heater FLM potential is based on the forecasted adoptions of STC and HPWH through EEU programs as presented in the 2022 Energy Efficiency Market Potential Program Achievable Potential.

Per-water heater FLM savings assumptions for STC and HPWH are derived from an analysis of Massachusetts residential water heating FLM performance for HPWH and electric resistance storage water heaters.[6] This same file was used to develop the Vermont TRM residential water heater savings. Table 5 presents the TRM assumptions and high/low assumptions regarding FLM potential. The high/low FLM estimates reflect the highest hour and lowest hour of performance from the Massachusetts study. In contrast, the TRM values reflect the average of hourly performance across all hours and months of the year. No differentiation was made for seasonal effects to inform the high/low values to be consistent with the Vermont TRM approach.

Table 5 Residential Water Heater FLM Savings Assumptions, kW per water heater

Technology	Vermont TRM	Low Estimate	High Estimate
HPWH	0.17472	0.051	0.240
STC (Electric Resistance)	0.40931	0.052	0.580

In general, FLM savings for water heaters are highest during the morning and evening hours. Early morning hours (midnight until 7am) reflected the lowest performing hours. At hours with the lowest demand there is nearly no differentiation between HPWH and electric resistance water heater savings potential.

The adoption of efficient water heating technology through EEU programs drives the estimate of 2030 FLM residential watering FLM savings potential. Table 6 summarizes the count of each technology type forecasted from the Program Achievable Potential adoptions through EEU program by the end of 2030.

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[6] waterheating-flexloadpotential-xlsx - provided by Vermont Department of Public Service

Table 6 Counts of EEU Residential Water Heating Equipment, Program Achievable

Technology	Cumulative 2030 Adoptions
HPWH	5,772
STC	10,297

Using the forecasted EEU adoptions of residential water heating technology, the following savings potential for residential water heating was developed by multiplying the adoptions and the ranges of seasonal high and low savings estimates.

Table 7 2030 Residential Water Heating Technical Potential FLM Savings Potential, MW

Technology	Summer High	Summer Low	Winter High	Winter Low
HPWH	1.385	0.294	1.385	0.294
STC	5.973	0.535	5.973	0.535
Total	7.358	0.830	7.358	0.830

As shown in Table 7, Smart Tank Controls on electric resistance water heaters offer substantial FLM opportunities. However, that opportunity is also driven by underlying higher energy demand, compared to HPWH.

RESIDENTIAL HVAC FLM DETAILS

Residential HVAC FLM savings potential comes from two general measures included in the 2022 Energy Efficiency Market Potential Study – cold climate heat pumps (CCHP) and room air conditioners (RAC). The potential study only included room air conditioners for the Efficiency Vermont program potential, though both electric EEUs were included for CCHP potential. RACs can only provide FLM savings during the cooling season, while CCHPs could provide FLM savings during heating and cooling times throughout the year.

To develop the range of possible FLM savings from CCHPs and RACs, GDS utilized the DPS Demand Response Catalog (2017), assumptions supporting the Vermont TRM heat pump measure savings, and incorporated additional assumptions. These are described below for each measure type, below.

Room Air Conditioners (RACs)

The DPS Demand Response Catalog (the DR Catalog) includes demand response savings for RAC switches. Switches to control RACs are one demand response option. Modern RACs can also be controlled via CTA-2045B or OpenADR 2.0B standards, based on manufacturer designs. The DR Catalog presents RACs as offering 0.504 kW of demand response potential during summer peaks. This value is assumed to represent the high end of FLM RAC savings. The low-end, which could reflect a need to manage RACs at times of low air conditioner use, is assumed to be ten percent of the peak, or 0.0504 kW. This lower range may capture off-peak load diversity, though still represents times when air conditioners would be expected to be used. Air conditioner use, particularly room air conditioners, may be driven more by end-user behaviors and preferences than a central system that utilizes a thermostat. As such, more detailed savings may require a study to better understand how Vermonters may be using their RACs, and under what conditions, to narrow the range of possible FLM savings.

By the end of 2030, RAC adoptions are expected to total 29,133 units through the Efficiency Vermont programs.

Cold Climate Heat Pumps (CCHPs)

The 2022 potential study included several types of CCHPs. These CCHPs included single- and multi-head variable speed mini-split heat pumps (SHMS and MHMS), and central air-source heat pumps (CHP). Over 90 percent of these heat pumps were included as Tier III savings opportunities, reflecting fuel switching and sources of *new electric load*. The remaining heat pumps were treated as electric-to-electric savings opportunities. The specific effect on net utility peak loads between these two treatments of heat pumps was not explored in this analysis or the potential study. However, it is important to note that the large majority of FLM heat pump savings opportunities are expected to come from new electric loads and are not reflected in current electric utility summer or winter peak loads.

CCHP Units and Capacities

GDS utilized the following assumptions for unit-level capacities and peak kW loads, derived from the Efficiency Vermont analysis of CCHPs.[7] Table 8 summarizes the analysis and FLM assumptions. GDS assumed that SHMS and all multifamily applications of ASHPs would utilize the same average capacities. In the potential study, MHMS were only applied to single family homes, with MHMS and single-family applications of ASHP sharing the same average load assumptions. Summer and winter kW peak load assumptions utilized the Vermont TRM EFLH and Efficiency Vermont kW heating and cooling penalty assumptions to arrive at a per average unit kW loads for summer and winter. The unit counts are the 2030 Cumulative Program Achievable Potential from the 2022 potential study.

Table 8 CCHP Average Peak Loads by Equipment and Customer Type, Projected Units

CCHP Type	Customer Type	kW Summer	kW Winter	2030 Cumulative Units
SHMS	SF, MF	0.90	1.82	61,982
MHMS	SF	2.48	4.10	7,250
ASHP	MF	0.9	1.82	3,082
ASHP	SF	2.48	4.10	17,367

Table 8 summer and winter kW values indicate the maximum demand that may occur on-peak. The ability to manage loads via FLM programs is dependent on a range of factors, including demand diversity at peak and the behaviors of Vermont's residents. To avoid overstating the potential GDS made the following assumptions to derive high and low FLM savings potentials for CCHPs.

- For the high savings potential:
    - Assumed that 50 percent of summer peak cooling load could be managed,
    - Assumed that 20 percent of winter peak heating load could be managed (per GMP's 2021 IRP),[8]
- Assumed that the low-end of the of the savings potential was 10 percent of the high range, reflecting FLM savings relative to the high estimate of:
    - Five percent of the peak cooling demand, and
    - Two percent of the peak heating demand

The range allows for variability across hours of the day, weather conditions, and maintenance of occupant comfort or safety. The low end is intended to allow for possible off-peak savings that could occur across an annual load profile. Additionally, CCHPs and their opportunity for providing FLM savings in the winter may also be dependent on the presence and ability to leverage dual-fuel heating systems. In cases where dual-fuel

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[7] evt-cchp-mop-and-retrofit-analysis-sept-2021-xlsx

[8] https://greenmountainpower.com/wp-content/uploads/2021/12/2021-Integrated-Resource-Plan.pdf

systems are present and could be utilized to support FLM, winter peak savings could be the full heating capacity. However, the specific count of or ability to control these dual-fuel systems is not known at this point.

The duration of heating or cooling FLM impacts is dependent on the underlying coincident loads at the time of load management efforts. During times of extreme weather, coincident heating or cooling loads are likely to be highly coincident. As such, attempting to control all heating or cooling loads at the same time will be limited without risking health or comfort (notwithstanding dual fuel opportunities). In general, savings during extreme weather may only be viable for up to several hours in a given day. Care will also be needed to avoid creating new peaks due to snapback effects. Duration of FLM events could be substantially longer if the events occur during times when equipment is not expected to be operating at full loads. In those cases, the strategy for FLM may be to avoid coincident operations but may also allow for full load control with less risk of health and safety. Further research is needed to understand the opportunities for FLM operations outside of extreme conditions, along with research to confirm how extreme conditions may impact the duration of load management impacts.

Table 9 summarizes the residential HVAC FLM savings potential, differentiating by RAC and CCHP systems.

Table 9 2030 Residential HVAC Technical Potential FLM Potential, MW*

Technology	Summer High	Summer Low	Winter High	Winter Low
RAC	7.341	0.073	0.0	0.0
CCHP	59.752	6.174	43.864	4.386
Total	67.094	6.248	43.864	4.386

**numbers may not sum exactly due to rounding*

CCHPs provide substantial FLM savings opportunities. However, the range of potential savings throughout the year can be expected to vary considerably. Additionally, program designs and technologies to manage heat pump or air conditioning loads will require significant enrollment for these savings to be achieved.

Conclusions and Recommendations

The analysis presented in this memo indicates a substantial technical potential opportunity for FLM in the residential sector. While the technical potential is substantial, the estimated range of technical potential is similarly substantial – the high estimate is roughly five times the low estimate. Regardless, the results indicate a technical potential ranging from 30 MW to 150 MW. In these estimates, GDS is not considering the question of program design or adoption. While the metrics come from industry literature, including evaluation studies, the use of those studies misses two critical components of FLM.

1) Specific program designs and known impacts relevant for Vermont for each end-use,
2) The value of FLM for different outcome goals across a load profile.

Vermont's energy policies are focused on developing renewable energy supplies, reducing or removing fossil fuels, and on optimizing the energy efficiency of energy consumption. The outcome is a strong and ongoing effort to electrify loads to utilize renewable electricity, while also continuing with Vermont's long history of efficiency. Electrification is leading to load growth which will change the overall load profile of electricity consumption in Vermont while also potentially creating risks for having adequate available electricity transmission or distribution capacity. FLM is an essential element to help Vermont meet its energy policy goals and optimize costs.

This analysis is only an initial step. GDS recommends that Vermont stakeholders do the following, as a general roadmap:

1) Develop a framework for FLM impacts and costs to be valued for the multiple possible value propositions FLM offers. While the value propositions could stack, not all are easily quantifiable or necessarily rely on the same metrics. In some cases, there is a risk of double-counting impacts. These include:
    a. Managing peak loads to reduce demand on the transmission system and associated avoided costs,
    b. Valuing the distribution system benefits that can come from targeted efforts to reduce, delay, or otherwise manage new investments in the distribution system.
    c. The value of optimizing electricity loads to maximize the use of available renewable energy resources.
    d. The value of emergency load management assets on the grid.
    e. Consider the appropriate use of non-energy impacts that FLM may create that are unique to FLM and not counted elsewhere.[9]
    f. Develop end-use load profiles for technologies and market segments that capture how FLM-controllable technologies may operate absent FLM (e.g. 8760 loadshapes for average or extreme conditions).
    g. Develop the control options and loadshape impacts that address the type of FLM being contemplated (e.g. coincident peaks, renewable energy integration).
    h. Any value associated with having an FLM-capable technology in place even if there is no current means to actually manage the load.
    i. The market value of ancillary services (e.g. grid voltage or frequency)
    j. Consider the relative importance of direct control by or on behalf of distribution utilities versus indirect control via rates or other voluntary methods. Rate structures may create a permanent load shift, which may or may not meet FLM priorities.

2) Consider how the mix of possible value propositions should be prioritized for near-term or long-term benefits. The approach to value propositions may inform program design or how programs are operated or delivered. Prioritization will help facilitate moving forward, allowing for more difficult value propositions to be addressed in the future. These priorities could include:
    - Transmission system value and avoided capacity costs
    - Distribution system value and known or expected capacity constraints
    - Renewable energy growth in supply, particularly for non-dispatchable resources
    - Emergency response to address grid emergencies

3) Identifies where benefits accrue, how costs are paid, how programs operated, and the allocation of benefits and costs to ratepayers.
    - VELCO
    - Distribution utilities
    - EEUs
    - FLM device vendors/installers
    - The role of FERC 2222 and non-utility load management aggregator

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[9] Double counting NEIs is a risk if NEIs associated with the EEU efficiency measure may also be relevant for the use of that equipment for FLM. Examples of an incremental FLM NEI are 1) valuing resiliency of the electricity system that FLM may create at extreme conditions, 2) the value of being able to integrate greater volumes of renewable electricity to meet renewable energy goals.

- Voluntary efforts by customers responding to rates, calls for curtailment, or other motivations.

4) Decides on the right timing for more formalized and in-depth potential analyses.
    a. Demand response, and by extension, FLM potential studies typically are organized by programs and program designs that target various end-uses. Outside of peak-load management, there is little data on how FLM may perform using historical or general industry literature. As such, a near-term study may require focusing on existing programs in the region. Those programs may or may not align with the FLM priorities and longer-term perspective.
    b. A study team will need clarity on the purpose and focus of FLM (per the first category, above), along with associated avoided cost or other cost-effectiveness factors that align with those purposes. An interim study to establish the priorities, use cases, and avoided costs for FLM may be needed in order to confidently estimate the cost-effectiveness and impact of FLM. If the primary interest in FLM is to manage monthly or annual peak loads, then the avoided cost structure of the energy efficiency potential study may be adequate.
    c. As part of the study, or in preparation for it, Vermont should consider what load shapes for demand response or FLM are available to generate Vermont-specific performance results. These data could come from utility results or formal evaluation studies. While demand response and FLM load shapes may be available from other jurisdictions, having local data will help ensure potential modeling reflects Vermont's experience in the results.

In moving from technical potential to an achievable potential estimate, the outcome will reduce the uncertainty of the estimated potential. Depending on the priorities and use-cases for FLM, the range of savings may or may not narrow, largely depending on whether FLM is intended to operate throughout the year or is focused on ISO-NE peak times. In general, demand response program adoptions are able to acquire between 20 percent and one-third of eligible customers over the long-term. Vermont's experience may differ and there may be differences across end-uses. However, regardless of the approach, Vermont has substantial opportunities for FLM to be a meaningful resource to help Vermont achieve its energy goals.