



Verification of Vermont Gas Systems 2021  
Efficiency Savings Claim and Assessment of  
Performance Relative to 2021 – 2023  
Performance Period Goals

# Vermont Gas Systems EEU Savings Verification Report

Public Service Department

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# Contents

<b>Introduction</b> .....	<b>4</b>
Scope of Evaluation.....	4
<b>Summary of Results</b> .....	<b>5</b>
Quantifiable Performance Indicators .....	8
QPI Goals: Performance Compared with Expenditures.....	11
QPIs #5 Through #8.....	12
Addison County-Specific QPIs and MPR.....	13
Minimum Performance Requirements .....	14
Satisfaction of Non-Quantifiable Responsibilities of the EEU.....	15
<b>Findings and Recommendations</b> .....	<b>16</b>
<b>Conclusion</b> .....	<b>18</b>

## Introduction

This report describes the result of a two-step review process undertaken by the Department to assess the performance of the Energy Efficiency Utility (EEU) operated by Vermont Gas Systems during the 2021 program year (PY2021), the first year of the 2021 – 2023 performance period. First, with the assistance of its contractor, West Hill Energy and Computing, Inc. (WHEC), the Department verified the reported savings of the VGS EEU for PY 2021. Using those results, the Department then assessed VGS' first year performance with respect to the three-year quantifiable performance indicators (QPIs) and minimum performance requirements (MPRs) in the PUC order of October 22, 2020, as well as its qualitative obligations included in the PUC-issued *Process and Administration of an Energy Efficiency Utility Order of Appointment*.

The Department has determined that in PY2021, after an independent third-party impact evaluation and the application of the resulting realization rates, VGS was behind schedule toward meeting its three-year savings QPIs but was on track to meet all MPRs and other non-quantifiable obligations described in the Commission's October 22, 2020 order and in VGS' Order of Appointment. As evidenced by the high realization rates found during the third-party verification, VGS has shown continued competence in program implementation and savings estimation since being appointed an EEU.

## Scope of Evaluation

This report, which focuses on the first year of the 2021 – 2023 performance period, is the fulfillment of the Department's obligation to perform annual savings verifications of the natural gas EEU pursuant to Sections II.5.E and II.5.H (c) of the "Process and Administration of an Energy Efficiency Utility Order of Appointment," (revised November 26, 2019) and Section III.6.B of the "Order of Appointment for Vermont Gas Systems, Inc.," issued by the Public Utility Commission on April 17, 2015.

To carry out these verification activities the Department retained the services of a consultant, West Hill Energy and Computing, Inc. (WHEC), to provide expert review and analysis of the VGS 2021 savings claim for the Commercial and Industrial (C&I) sector programs as well as the Residential New Construction program and Custom Residential Retrofit program. WHEC also assisted Department staff in verifying the savings claim for the Residential Equipment Replacement (RER) program as well as the other subprograms in the residential sector.

The objective of savings verification is to calculate annual and peak day savings realization rates (RRs) at the program and sector levels while leveraging information garnered during the verification process to inform future program design and budgeting. Evaluation activities include review of the full database of measure data and sampled project files to accomplish the following:

- Verify that savings assumptions have been applied appropriately and calculations performed correctly
- Calculate verified savings
- Establish realization rates on a program and sector level

To accomplish these goals, this report draws upon and supplements the findings of the attached WHEC report entitled: *Verification of Vermont Gas Systems' 2021 Annual Savings Claims*.

## Summary of Results

The Department has reviewed the results of the savings verification with VGS staff and concurs with the findings of WHEC contained in the attached report entitled: *Verification of Vermont Gas Systems' 2021 Savings Claims*, with the exception of the Residential Equipment Replacement (RER) program. The reasons for this exception are described on page 7 of this report. The results of the 2021 savings verification at the sector level are summarized in Table 1, including the modified savings for the RER program:

**Table 1. VGS Sector- and Portfolio-Level Certified Savings for PY\* 2021**

Sector	2021 VGS Reported Annual Mcf	2021 Certified Annual Mcf	2021 Annual Mcf Realization Rate	2021 VGS Reported Peak Day Mcf	2021 Certified Peak Day Mcf	2021 Peak Day Realization Rate
<b>Residential Sector total</b>	<b>27,096</b>	<b>27,734</b>	<b>102%</b>	<b>249</b>	<b>251</b>	<b>101%</b>
<b>C/I sector total</b>	<b>23,923</b>	<b>19,808</b>	<b>83%</b>	<b>153</b>	<b>133</b>	<b>87%</b>
<b>Portfolio Total</b>	<b>51,019</b>	<b>47,542</b>	<b>93%</b>	<b>402</b>	<b>384</b>	<b>95%</b>

\* Program Year

The Department certifies the VGS verified savings for 2021 as shown in Table 1, above. The certified commercial and industrial (C&I) sector and residential sector verified savings at the program level are presented in Table 2, below.

**Table 2. C&I and Residential PY 2021 Reported and Certified Savings**

Program	2021 VGS Reported Annual Mcf	2021 Certified Annual Mcf	2021 Annual Mcf Realization Rate	2021 VGS Reported Peak Day Mcf	2021 Certified Peak Day Mcf	2021 Peak Day Realization Rate
Commercial Equipment Replacement (CER)	7,777	6,740	86.7%	59.2	42.7	72.1%
Commercial Retrofit (CSR)	12,980	9,918	76.4%	58.7	55.3	94.2%
Commercial New Construction (CNC)	3,167	3,150	99.5%	35.2	35.1	99.8%
<b>C/I sector total</b>	<b>23,923</b>	<b>19,808</b>	<b>82.8%</b>	<b>153.1</b>	<b>133.1</b>	<b>87.0%</b>
Program	2021 VGS Reported Annual Mcf	2021 Verified Annual Mcf	2021 Annual Mcf Realization Rate	2021 VGS Reported Peak Day Mcf	2021 Verified Peak Day Mcf	2021 Peak Day Realization Rate
Residential New Construction (RNC)	5,667	6,017	106.2%	63.4	71.5	112.8%
Residential Equipment Replacement (RER)	16,159	16,619	102.8%	116.8	120.3	103.0%
Custom Residential Retrofit (RIR)	5,270	5,098	84.8%	68.6	58.8	73.7%
<b>Residential total</b>	<b>27,096</b>	<b>27,734</b>	<b>102.4%</b>	<b>248.8</b>	<b>250.6</b>	<b>100.7%</b>
<b>Portfolio total</b>	<b>51,019</b>	<b>47,542</b>	<b>93.2%</b>	<b>401.9</b>	<b>383.7</b>	<b>95.5%</b>

The residential sector verified savings are further broken out into sub-programs in Table 3.

**Table 3. VGS Residential Sector Certified Verified Savings for PY 2021**

Program	2021 VGS Reported Annual Mcf	2021 Verified Annual Mcf	2021 Annual Mcf Realization Rate	2021 VGS Reported Peak Day Mcf	2021 Verified Peak Day Mcf	2021 Peak Day Realization Rate
Residential New Construction EVT (RNC-EVT)	1,364	1,964	144%	17.2	24.7	144.0%
Custom Multifamily Residential New Construction (RNC-MF Custom)	4,303	4,053	94.2%	46.2	46.8	101.2%
<b>Residential New Construction (RNC) total</b>	<b>5,667</b>	<b>6,017</b>	<b>106.2%</b>	<b>63.4</b>	<b>71.5</b>	<b>112.8%</b>
Residential Equipment Replacement (RER)	15,621	16,081	102.9%	112.2	115.7	103.1%
Custom Multifamily Residential Equipment Replacement	538	538	100.0%	4.6	4.6	100.0%
<b>Residential Equipment Replacement (RER)</b>	<b>16,159</b>	<b>16,619</b>	<b>102.8%</b>	<b>116.8</b>	<b>120.3</b>	<b>103.0%</b>
Residential Retrofit (RIR)	2,816	2,816	100.0%	38.9	38.9	100.0%
Custom Multifamily Retrofit (RIR-MRR)	781.6	650	83.2%	9.3	2.2	23.5%
Home Performance Residential Retrofit (RIR-BPI)	396.6	397	100.0%	5.6	5.6	100.0%
Custom Low Income Retrofit (RIR-MLI)	245.5	204	83.2%	3.5	0.8	23.5%
Low Income Residential Home Retrofit (RIR-RLI)	392.8	393	100.0%	5.5	5.5	100.0%
Residential Direct Install (RIR-SLAM)	294.2	294	100.0%	1.0	1.0	100.0%
Residential Retrofit (RIR-RIN)	221.5	222	100.0%	3.1	3.1	100.0%
Residential Retrofit Energy Snap Shot (RIR-ESS)	121.8	122	100.0%	1.7	1.7	100.0%
<b>Residential Home Retrofit (RIR) total</b>	<b>5,270</b>	<b>5,098</b>	<b>96.7%</b>	<b>68.6</b>	<b>58.8</b>	<b>85.8%</b>
<b>Residential Sector total</b>	<b>27,096</b>	<b>27,734</b>	<b>102.4%</b>	<b>248.8</b>	<b>250.6</b>	<b>100.7%</b>

As is noted in the attached report, there were two primary factors that drove the variance of residential programs and sub programs' realization rates: the use of gas consumption instead of thermal loads in calculating energy savings for heat and hot water measures, and failure to account for the interactive effects of heating system, thermal shell and thermostat measures. As noted in the following paragraph, the PSD has certified savings in the RER program that include the inflated savings calculated due to the first issue.

In the prescriptive RER program, faulty estimates of baseline usage for heating and hot water measures were also a significant factor in the verified RR.

For the Residential sector, the realization rate of 102% for annual incremental gas savings is largely driven by the Residential Equipment Replacement (RER) program which accounts for 60% of the sector savings. The evaluation team identified that for the RER program prescriptive heating and hot water measures, VGS “used the disaggregated consumption data as the heating [and hot water] load input to the TRM algorithm without adjusting for the efficiency of the heating [or hot water] system.”

Previous evaluations have pointed out a similar issue with custom analysis of heat and hot water systems in the C/I sector, however this misapplication of the TRM savings algorithm was not flagged in previous evaluations for the residential sector, likely due to the fact that this program uses prescriptive savings algorithms rather than custom calculations. VGS assumed that they were applying that savings algorithm correctly as the savings calculated had been verified repeatedly. Considering that, and the fact that the QPIs for the residential sector and particularly the RER program were established based on previous performance which included prescriptive savings using this same faulty methodology, the Department will certify the reported incremental savings for heat and hot water measures using unadjusted consumption in the RER program for 2021 only. Future evaluations will verify savings based on the proper application of the algorithm. The results presented in the attached WHEC verification report properly take into account the efficiency of the existing systems in the RER program.

The RR for peak day gas savings in the residential sector was similar at 101% since peak day gas savings is calculated using the annual incremental savings multiplied by a unique peak day factor for each end use technology.

If the RER savings in the WHEC report were substituted for the RER results in Table 3, the overall residential sector realization rate for annual incremental savings would drop to 88% and the RR for peak day savings would decrease to 93%. This demonstrates that the correct application of this savings algorithm results in significantly lower savings than VGS has reported in previous years. For subsequent evaluations, these incremental savings will not be certified, so VGS will either have to increase the performance of the RER program or petition the Public Utility Commission (PUC or Commission) for an adjustment in the relevant QPIs.

The Commercial and Industrial (C&I) sector annual incremental savings realization rate of 83% is a drop from the previous program year but still a respectable result for a small-scale program during the challenges of a pandemic. The WHEC report notes that the key issues that influenced this RR were incorrect inputs into savings algorithms, faulty estimates of baseline usage and inadequate documentation of a large pipe insulation project.

The peak day Mcf savings RR for the C&I sector was verified at 87%, which is a significant improvement over PY 2020. It is likely that the variation in peak day Mcf savings RR year to year is related to the participating proportion of firm rate commercial and industrial customers as opposed to interruptible rate customers, which don't accrue any peak day savings by virtue of having their gas supply subject to interruption during peak events.

## Quantifiable Performance Indicators

Section II.5.E of the *Process and Administration of an Energy Efficiency Utility Order of Appointment* requires the Department to annually certify to the Board that the natural gas EEU operated by VGS has satisfactorily achieved the performance metrics known as Quantifiable Performance Indicators (QPIs) that have been developed to assess whether the EEU is meeting established savings goals on the schedule and at the levels set by the Commission in its Order of October 21, 2020 in Case #19-3272-PET. Specifically, the Department is obligated to determine:

- (a) Whether VGS has made appropriate interim progress toward achieving QPIs;
- (b) Whether VGS is satisfactorily executing those of its responsibilities that are not directly measured by QPIs; and
- (c) Whether VGS' performance relative to its QPIs is consistent with the portion of the three-year budget that has been expended.

As detailed in the PUC order of October 22, 2020, VGS is responsible for meeting eight QPIs and six Minimum Performance Requirements (MPR). Based on a review of VGS' savings claims including the savings verification activities described in the attached report, the Department concludes that VGS has shown satisfactory performance in achieving the PUC ordered QPI targets for the three-year performance period. Tables 4, 5, 6 and 7, below summarize VGS' performance in 2021 and over the three-year performance period with respect to QPI #1a: Annual Incremental Gas Savings, QPI #1b: GHG Emissions Reduction QPI #2: Total Resource Benefits, and QPI #3: Peak Day Gas Savings, respectively. It should be noted that individual programs in each sector may underperform with respect to the program-level target, while other programs may overperform. The PUC goal is set at the portfolio level. In the case of the Commercial Equipment Replacement (CER) program, for instance, the verified savings was 24 percent of the three-year goal due to inherent variability in participation for VGS' small commercial customer base. The COVID-19 pandemic likely suppressed participation in 2021 as well.

**Table 4. PY 2021 Performance vs. Goals – QPI #1a: Annual Incremental Mcf Savings**

Program	QPI #1a Annual Incremental Mcf Savings		
	2021-23 Annual Mcf Three-Year Goal	PY 2021 Verified Annual Mcf	2021 Verified Savings v. Three-Year Goal
Residential Home Retrofit (RIR)	15,490	5,098	33%
Residential New Construction (RNC)	41,751	6,017	14%
Residential Equipment Replacement (RER)	47,333	16,619	35%
<b>Residential Sector Total</b>	<b>104,574</b>	<b>27,734</b>	<b>27%</b>
Commercial Retrofit (CSR)	67,009	9,918	15%
Commercial New Construction (CNC)	40,206	3,150	8%
Commercial Equipment Replacement (CER)	27,862	6,740	24%
<b>C&amp;I Sector Total</b>	<b>135,077</b>	<b>19,808</b>	<b>15%</b>
<b>Portfolio Total</b>	<b>239,651</b>	<b>47,542</b>	<b>20%</b>



**Table 5: PY 2021 Performance vs. Goals - QPI #1b - GHG Emissions Reduction (metric tons)**

Program	QPI #1b GHG Emissions Reduction (metric tons)		
	2021-23 Three-Year Goal	PY 2021 Verified GHG Reduction	2021 Verified Savings v. Three-Year Goal
<b>Residential Sector Total</b>	<b>5,766*</b>	<b>1,529</b>	<b>27%</b>
<b>C&amp;I Sector Total</b>	<b>7,448*</b>	<b>1,092</b>	<b>15%</b>
<b>Portfolio Total</b>	<b>13,214</b>	<b>2,621</b>	<b>20%</b>

\*Sector-level goals and verified GHG reductions are estimated based on proportional savings goals and verified savings respectively.

**Table 6. PY 2021 Performance vs. Goals – QPI #2: TRB and Lifetime Mcf Savings**

Program	QPI #2a Total Resource Benefits			QPI #2b Lifetime Mcf Savings		
	2021-23 Three-Year TRB Goal	PY2021 Verified TRB	2021 Verified vs. Three-Year Goal	2021-23 Three-Year Lifetime Mcf Goal	PY2021 Verified Lifetime Mcf	2021 Verified vs. Three-Year Goal
Residential Home Retrofit (RIR)	\$2,696,580*	\$1,157,710	43%	271,260	107,190	40%
Residential New Construction (RNC)	\$7,268,231*	\$1,499,964	21%	731,141	127,232	17%
Residential Equipment Replacement (RER)	\$8,239,974*	\$4,013,345	49%	828,892	318,056	38%
<b>Residential Sector Total</b>	<b>\$18,204,784*</b>	<b>\$6,671,019</b>	<b>37%</b>	<b>1,831,293</b>	<b>552,478</b>	<b>30%</b>
Commercial Retrofit (CSR)	\$11,665,274*	\$1,779,428	19%	1,173,457	170,538	15%
Commercial New Construction (CNC)	\$6,999,269*	\$735,717	10%	704,085	61,372	9%
Commercial Equipment Replacement (CER)	\$4,850,361*	\$1,371,563	30%	487,918	146,856	30%
<b>C&amp;I Sector Total</b>	<b>\$23,514,905*</b>	<b>\$3,886,709</b>	<b>17%</b>	<b>2,365,460</b>	<b>378,765</b>	<b>16%</b>
<b>Portfolio Total</b>	<b>\$41,719,689</b>	<b>\$10,557,727</b>	<b>25%</b>	<b>4,196,753</b>	<b>931,243</b>	<b>22%</b>

\*Sector level goals and verified GHG reductions are estimated based on proportional savings goals and verified savings respectively.

**Table 7. PY 2021 Performance vs. Goals – QPI #3: Peak Day Mcf Savings**

Program	QPI #3 Peak Day Mcf Savings		
	2021-23 Peak Day Mcf Three-Year Goal	PY 2021 Verified Peak Day Mcf	2021 Verified vs. Three-Year Goal
Residential Home Retrofit (RIR)	134	58.8	44%
Residential New Construction (RNC)	390	71.5	18%
Residential Equipment Replacement (RER)	372	120.3	32%
<b>Residential Sector Total</b>	<b>897</b>	<b>250.6</b>	<b>28%</b>
Commercial Retrofit (CSR)	130	55.3	43%
Commercial New Construction (CNC)	224	35.1	16%
Commercial Equipment Replacement (CER)	106	42.7	40%
<b>C&amp;I Sector Total</b>	<b>459</b>	<b>133.1</b>	<b>29%</b>
<b>Portfolio Total</b>	<b>1,356</b>	<b>383.7</b>	<b>28%</b>

QPI #4 is intended to ensure that VGS’ residential single-family energy efficiency initiatives are designed and implemented to acquire comprehensive savings rather than just the most cost-effective measures. QPI #4 is divided into two parts. The first part sets a performance goal for conversion of energy audits into energy saving improvements. The target set by the PUC for the 2021-2023 performance period was an overall 30% conversion rate. VGS achieved a 53% conversion rate in PY 2021, 23 percentage points above the goal.

The second part of QPI #4 sets a target percentage of all cost-effective measures as well as those measures recommended by the audit that are installed by the customer within 12 months of the audit. The PUC set a goal of 70% of auditor recommended cost-effective measures installed within a year of the initial audit. VGS achieved an average of 96% install rate for recommended cost-effective measures in PY 2021, which is 26 percentage points better than the target set by the PUC.

VGS’ achievements regarding QPIs #1 through #4 are summarized in Table 8, below.

**Table 8. PY 2021 Performance vs. Three-Year Goals - QPIs #1 through #4**

QPI #	Title	Performance Indicator	2021-2023 Three-Year Target	PY 2021 Reported	PY 2021 Achieved	Achieved vs. Three-Year Target
1	Natural Gas Savings	a. Annual incremental net Mcf savings	239,650	51,019	47,542	20%
		b. Greenhouse Gas Emissions	13,214	2,802	2,587	20%

2	Lifetime Natural Gas Savings	a. Present worth of lifetime natural gas avoided costs	\$41,719,689	\$11,162,751	\$10,557,727	25%
		b. Lifetime Mcf savings	4,196,753	978,950	931,243	22%
3	Peak Day Natural Gas Savings	Peak day incremental Mcf savings	1,356	402	384	28%
4	Residential Single-Family Comprehensiveness	a. Percent of home energy audits converted to a measure installation within 12 months	30%	42%	53%	On Track
		b. Average percentage of auditor-recommended cost-effective measures that are installed by the customer within 12 months	70%	96%	96%	On Track

### QPI Goals: Performance Compared with Expenditures

Table 9, below, compares performance on the three-year QPI #1 - #3 goals with the percentage of the budget expended by program and sector over the performance period. For the residential sector, 2021 expenditures were 29% of the three-year budget, while the verified performance for QPIs #1, #2 and #3 were 27%, 30% and 28% of the three-year goals, respectively. For the Commercial and Industrial sector, expenditures for 2021 were only 15% of budget and performance vs. goals for QPIs #1, and #2 were proportionate at 15% and 16% of the three-year goal, respectively. The three-year verified peak day savings in the C&I sector, however, was 29% of the three-year QPI #3 goal. This disproportionate performance may be due in part to a larger proportion of projects at firm rate commercial and industrial customers as opposed to interruptible rate customers, which don't accrue any peak day savings by virtue of having their gas supply subject to interruption during peak events.

In 2021 for QPI #1, performance was slightly below the budgeted yield for the residential sector, where 29% of three-year sector budget was spent to achieve 27% of the three-year QPI #1 savings goal. In the C&I sector, spending of 15% of the three-year budget yielded 15% of the three-year sector goal for QPI #1, exactly on par with the budgeted yield. Yields for QPI #2b (lifetime Mcf savings) were on par with the three-year goals for both the residential C&I sectors. For QPI #3, peak day Mcf savings, the residential sector slightly underperformed based on spending, while the C&I sector significantly overachieved in peak day savings compared to spending levels.

**Table 9. PY 2021 Expenditures vs. Budget and Performance vs. Goals QPIs #1, #2 and #3**

Program	Budget and Expenditures			QPI #1: Annual Incremental Mcf Savings	QPI #2b: Lifetime Natural Gas Savings	QPI #3: Peak Day Mcf Savings
	2021-23 Three-Year Budget	PY 2021 Expenditures	PY 2021 Expenditures as % of Three-Year Budget	PY 2021 Incremental Mcf Savings as % of Goal	PY 2021 Lifetime NG Savings as % of Goal	PY 2021 Peak Day Mcf Savings as % of Goal
Residential Home Retrofit	\$4,727,593	\$1,530,615	32%	33%	40%	44%
Residential New Construction	\$1,128,978	\$245,199	22%	14%	17%	18%
Residential Equipment Replacement	\$3,951,421	\$1,020,564	26%	35%	38%	32%
<b>Residential Sector Total</b>	<b>\$9,807,992</b>	<b>\$2,796,378</b>	<b>29%</b>	<b>27%</b>	<b>30%</b>	<b>28%</b>
Commercial Retrofit	\$1,693,466	\$315,352	19%	15%	15%	43%
Commercial New Construction	\$1,411,222	\$147,563	10%	8%	9%	16%
Commercial Equipment Replacement	\$1,199,539	\$186,856	16%	24%	30%	40%
<b>C&amp;I Sector Total</b>	<b>\$4,304,227</b>	<b>\$649,771</b>	<b>15%</b>	<b>15%</b>	<b>16%</b>	<b>29%</b>
<b>Portfolio Total</b>	<b>\$14,112,219</b>	<b>\$3,446,149</b>	<b>24%</b>	<b>20%</b>	<b>22%</b>	<b>28%</b>

### QPIs #5 Through #8

The PUC order of October 22, 2020 approving VGS' DRP included eight QPIs. VGS' performance regarding the first four QPIs was discussed above. VGS' progress toward meeting QPIs #5 through #8 is summarized in Table 10, below.

**Table 10. PY 2021 Verified Performance for QPIs #5 Through #8**

QPI #	Title	Performance Indicator	2021-2023 Three-Year Requirement	2021 Verified Performance	Performance vs. Requirement
5	Residential Audits	Energy audits completed including comprehensive, home performance, customer, energy snap shots, low income,	600 Annually	706	Satisfactory

		condominiums and mobile homes			
6	Long-term Market Transformation	Offer energy efficiency training for contractors	Two Per Year	Two	Satisfactory
7	Business Comprehensive ness of Savings	Diversity of measures implemented in commercial retrofit projects	A minimum of measures installed during the prior 12-months will be: 5% control-related, 20% heating systems, heat recovery or domestic hot water systems, 5% process-related and 15% shell or other-related	12% control-related, 21% heating systems, heat recovery or domestic hot water systems, 12% process-related and 55% shell or other-related	On Track
8	Administrative Efficiency	Administrative Cost reductions as a percent of total budget – proposal reflects 5% reduction goal	\$87,165 reduction	\$21,325	24% of goal

VGS had some difficulty meeting the exacting requirements of the “Business Comprehensive ness of Savings” QPI in the previous performance period. In a mature program with a relatively small population of commercial customers, variability in such measure distributions is expected. Accordingly, the minimum requirements for two measure categories have been reduced for the current 2021 -2023 performance period. Judging from the PY 2021 results, VGS is on track to meet this modified QPI for the three-year period.

VGS is also slightly behind schedule in meeting the administrative efficiency requirements of MPR #8. This is not an immediate concern but warrants close monitoring for the remaining months of the performance period.

### Addison County-Specific QPIs and MPR

Pursuant to the Commission order dated October 22, 2020 in Case # 19-3272-PET, VGS is required to track and report progress toward meeting QPIs #4a., #4b., #7 and MPR #14 for Addison County portion of VGS’ expanded territory. The Addison-specific results for those QPIs are presented in Table 11, below. The performance results regarding MPR #14 are included in Table 13 in the next section of this report.

**Table 11. Addison County PY 2021 and Three-Year Verified Performance for QPIs #4a, #4b, and 6**

QPI #	Title	Performance Indicator	2021-2023 Three-Year Target	2021 Achieved	Performance vs. Requirement
4	Residential Single-Family Comprehensiveness	a. Percent of home energy audits converted to a measure installation within 12 months	30%	50%	Only 2 audits so progress unclear
		b. Average percentage of auditor-recommended cost-effective measures that are installed by the customer within 12 months	70%	100%	Exceeds Target
7	Business Comprehensiveness of Savings	Diversity of measures implemented in commercial retrofit projects	A minimum of measures installed during the prior 12-months will be: 5% control-related, 20% heating systems, heat recovery or domestic hot water systems, 5% process-related and 15% shell or other-related	0% control-related, 14% heating systems, heat recovery or domestic hot water systems, 0% process-related and 86% shell or other-related	Unclear

### Minimum Performance Requirements

According to the PUC order of October 22, 2020, VGS is also responsible for meeting certain Minimum Performance Requirements for the three-year performance period as described in Table 12. The Department has determined that VGS is on track toward satisfying each of these MPRs.

VGS is also slightly behind schedule in meeting the administrative efficiency requirements of MPR #8. This is not an immediate concern but warrants close monitoring for the remaining months of the performance period.

**Table 12. PY 2021 Performance vs. 2021-23 Three-Year Minimum Performance Requirements**

MPR #	Title	Performance Indicator	2021-2023 Three-Year Requirement	2021 Verified Performance	Performance vs. Requirement
9	Minimum Natural Gas Benefits (Equity for All Natural Gas Ratepayers)	Total natural gas energy efficiency benefits divided by total utility costs	Equal or greater than 1.2 cost benefit ratio	2.98	Satisfactory
10	Equity for Residential Ratepayers	A minimum level of overall efficiency efforts, as reflected in spending, will be dedicated to residential customers	A minimum 10% control-related, 20% heating systems, heat recovery or domestic hot water systems, 10% process-related and 30% shell or other-related measures installed during the prior 12 months	13% control-related, 46% heating systems, heat recovery or domestic hot water systems, 13% process-related and 28% shell or other-related measures installed	Satisfactory
11	Equity for Low-income Customers	A minimum level of overall efficiency efforts, as reflected in spending, will be dedicated to Low-income customers	\$267,354	\$97,439	On track - 36% of 3-year minimum spend
12	Equity for Small Business Customers	Percent of commercial (non-residential) installed end uses that are classified as Rate G1 or G2 (use 600 Mcf/yr. or less)	30%	64%	On track
13	Total Resource Benefits	Track and report non-natural gas TRB	Report annually	\$46,157	Satisfactory
14	Addison County Aggressive DSM	Meet minimum energy efficiency program participation rate for customers in Addison County	Achieve 30% energy efficiency participation in Addison County by Year 3	34.1%	On track

### Satisfaction of Non-Quantifiable Responsibilities of the EEU

As described in its Order of Appointment, the VGS EEU is required to meet certain other responsibilities beyond QPIs or MPRs. The Department’s qualitative assessment of the performance of the natural gas EEU, conducted through our review of reports and communications between staff and the EEU during the

three-year period, confirms that VGS is also satisfactorily meeting those responsibilities. The PSD review has concluded that VGS continues to meet each of the following non-quantifiable responsibilities described in its Order of Appointment:

- Assist other Vermont Utilities in connection with the performance of Distributed Utility Planning and transmission planning.
- Provide technical support and training regarding the development and implementation of state energy codes and standards.
- Implement marketing to promote customer participation in and market awareness of EEU services and initiatives; increase consumer demand for energy-saving products and services; and affect consumer decision-making in consumer-driven energy efficiency choices.
- Provide: a toll-free number for its customers; a web page describing services available to customers; and effective customer response and referral procedures.
- Provide general information to the public to:
  - Increase consumer awareness and understanding of the benefits of reducing energy use;
  - Inform consumers of the best technologies available to them; and
  - Refer consumers to information and service resources other than the EEU.
- Assist the PUC and/or the Department in developing and implementing any Self-Administered or Managed Energy Efficiency Programs for eligible gas EEU customers.

## Findings and Recommendations

The Department concurs with the findings and recommendations included in the attached report prepared by WHEC, *Verification of Vermont Gas Systems' 2021 Savings Claims*. Among the findings that are important to reiterate here are:

- Project Documentation: “The verification process was hampered by missing project-level documentation. For 9 of the 19 sites selected for desk review, the West Hill Energy team had to request additional documentation to determine key inputs into the saving algorithms. Twelve of the 19 sites were missing proof of installation for some measures. The West Hill Energy team recognizes that COVID-19 may be contributing factor to difficulties with collecting on-site photos or documentation.”
- Heating Load vs. Consumption: “The West Hill Energy team identified several errors associated with the heating load and input and output capacity in VGS’s calculations and analysis tools.” WHEC also observed that heating and hot water measures in the RER program used disaggregated consumption rather than loads which account for the inefficiency of the existing equipment.
- Standardize Analysis Methods: “VGS appears to be using a combination of the VGS TRM, EVT TRM, TRMs from other jurisdictions, custom tools, and TRM algorithms with custom inputs. ... This array of analysis strategies complicated the review process.”
- VGS TRM Review and Update: “Some VGS TRM measure characterizations may be incorrect, open to alternative interpretations” or inconsistent with the Vermont TRM.
- Update Weather Normalization Procedure: “Currently VGS uses typical meteorological year (TMY) 3 weather data to normalize all weather dependent calculations. Due to climate change,



TMY3 30-year data (1976-2005) is not the best available information that represents future climate conditions for measures going forward.”

- Internal Savings Calculation Quality Control: Some calculation mistakes discovered during this evaluation appear to “result from simple errors that could be prevented with additional quality control.”
- Whole Building Analysis and Interactive Effects: Whole building analysis, especially for projects where multiple measures are installed at the same site will account for interactive effects. This issue may be exacerbated when measures installed at the same site are assigned to different programs.

To address these issues as well others encountered during the evaluation, the WHEC report includes the following recommendations:

- VGS should improve project-level documentation by providing more detailed description of the project files and analysis tools. Specific items to include in the project files include the following:
  - A project overview that describes the installed energy efficiency measures, the baseline and efficient operating conditions, applicable building energy code and project timeline.
  - Clear reference to the VGS TRM measure or other source to identify the analysis method
  - Sources of all inputs to the savings algorithm in the analysis spreadsheet; specifically any inputs that are different from the TRM defaults.
  - Proof of installation such as itemized invoices, inspection reports, clear photos of nameplate information and/or installation photos.
- For RER heating system and hot water system replacements, VGS should adjust the disaggregated consumption data by multiplying by the efficiency of the existing heating system. The resulting value can then be used as the heating load input to the TRM algorithm.
- The analysis tool for commercial shell measures should be modified to calculate heating load rather than consumption to calculate energy savings.
- VGS should review all of its tools and other calculations to ensure that the heat load and capacity are correctly defined and used.
- VGS should continue to use site-specific inputs and/or custom approaches where appropriate and when the sources of the inputs can be properly documented. However, when alternative approaches are necessary, VGS should develop a clear and consistent strategy for selecting among those alternatives.
- VGS, WHEC and the Department should undertake a complete review of the VGS TRM. All VGS TRM measures should be reviewed to check for ambiguities or errors and to ensure consistency with the Vermont TRM where applicable. WHEC and the Department also recommend adding the peak day multiplier by end use to the TRM.
- VGS should adopt the most recent 6 to 10-year local weather data to normalize heating usage and savings estimates. This change should be consistent with the other EEU's, so it should be presented to the Technical Advisory Group for adoption.
- VGS' internal QC process should be improved to include a comprehensive review of project documentation and savings calculations. Topics to cover include the following:
  - Check that the analysis file savings match the program tracking database.
  - Sanity checks on the magnitude of savings, using billing data if available.

- Check that the peak day factor matches the end use and/or standardize the approach to assigning the peak day multiplier to the end use.
- Check for interactive effects between measures.
- When possible, all measures at a specific site should be assigned to a single program to facilitate the verification review process and reduce the likelihood of missing interactive effects.

The Department concurs with the above recommendations and notes that some are similar to the recommendations in the 2020 and previous savings verification reports. The Department proposes to work with VGS and WHEC in the interim between evaluations to bring these recommendations to fruition.

## Conclusion

VGS has continued to provide excellent program delivery, service quality and the accuracy of savings estimates as evidenced by the respectable and consistently solid realization rates across programs. Relative to the three-year goals for the 2021-2023 performance period, VGS is significantly behind schedule after the first year. The Department understands the challenges posed by the ongoing pandemic, rising prices and workforce shortages in meeting the goals established in 2020. The recommendations included in this report should help VGS to meet those challenges while improving performance over the remainder of the current performance period. The Department concludes that VGS is in a challenging position to meet its QPI targets and minimum performance requirements for the 2021 -2023 performance period. However, recognizing the demands of ramping up program performance during a pandemic, and with the knowledge that the PY 2022 and 2023 savings verification will no longer certify heating or hot water equipment replacement savings calculations using energy consumption rather than loads, VGS may want to consider petitioning the PUC for an adjustment of its QPIs for the remainder of the performance period.