

**Report to the Energy Efficiency Utility  
Contract Administrator**

**Verification  
Of  
Efficiency Vermont Year 2004  
Savings and Total Resource Benefit (TRB) Claim**

**Department of Public Service**

**July 8une 30, 2005  
Revision**

## **I. Introduction**

On April 1, 2005, Efficiency Vermont ("EVT") submitted filed its "Year 2004 Preliminary Annual Report and Annual Energy Savings Claim" for its calendar year 2004 activities and results operating as the statewide energy efficiency utility ("EEU"). As provided for in the contract between Efficiency Vermont and the Vermont Public Service Board ("PSB"), the Department undertook a review of EVT's 2004 activities with the goal of verifying the the annualized MWh savings and Total Resource Benefit ("TRB") amount claimed by EVT. This report made to Michael Wickenden, Contract Administrator for the PSB, summarizes the results of that review.

The DPS provided preliminary findings to EVT and the Contract Administrator on May 24, 2005. On June 8, 2005, Efficiency Vermont provided a response to the DPS preliminary findings on items where the DPS recommended an adjustment to the 2004 savings claim. The Department's supplemental findings were provided to EVT on June 15, and EVT responded to those findings this document on June 23. A mutual agreement on savings adjustments was reached for a number of items identified in the DPS preliminary findings.

EVT has indicated it accepted all of the adjustments to the 2004 claimed savings recommended by the Department presented in this report. In some cases, EVT does not completely agree with the Department's rationale or methodology for the adjustment, and requests that the measure characterizations for 2005 be discussed more thoroughly through the ongoing DPS-EVT dialogue TAG process. the TAG process. These requests are noted under the specific measures.

Since the parties are in agreement on the magnitude of the 2004 adjustment, the issues and resolutions are briefly described. More discussion is provided for the current and ongoing issues described in Section III. For more detail about the specifics of the adjustments, please refer to the Department's preliminary and supplemental findings and EVT's responses to those documents.

\*\*\*\*\*

The Department implemented a random sampling strategy for selecting the Commercial-Industrial (C&I) projects to review for the 2004 verification. This method of sampling provides the basis for developing across-the-board adjustments to the savings from C&I projects. Since residential projects generally tend to be simpler and more straightforward, the methods for selecting and reviewing these project are similar to those used in previous years.

In past years, the Department selected C&I projects among the largest projects and those with specific applications of interest. A fundamental change for the 2004 verification process is the random selection of projects within a framework that still allows for sufficient attention to the larger, custom projects that embody greater variability and more complex methods for calculating savings.

For the BEF (business existing facilities) initiative program, seventy-four projects were identified for review out of a total of 669. Five strata were defined. The top strata consisted of the seven largest projects. Due to the size and nature of these projects, all of these projects were reviewed and adjustments are made on a project-specific basis only. Stratified random sampling was conducted to select the sample for the remaining four strata and realization rates were computed using the methodology for stratified ratio estimation described in the California Evaluation Framework.<sup>1</sup>

For the BNC (business new construction) initiative program, the stratified random sampling was based on the four initial strata, but these were later combined to two groups due to the small sample sizes. Twelve projects were reviewed out of a total of 123.

The DPS has applied a proportional adjustment to all of the savings in the C&I sector, based on the findings from our review. This sampling and adjustment method should reflect what would otherwise result from a comprehensive savings review of all C&I projects, if resources and time permitted that approach. For the BEF and the BNC, the percent reduction found among the random-selected projects was applied to all of the projects within the size category.

The Department is recommending specific adjustments based on 18 of the reviewed projects. One other project has pending adjustments relating to the TRB and lifetime energy savings. The Department has requested EVT to calculate the adjustment. Of the remaining 58 selected projects, either no problems were identified or the problems were such that the Department concluded they could be addressed on a prospective basis.<sup>2</sup> The sampling and adjustment process is described in more detail under "Sampling Methodology."

One adjustment affecting both C&I and residential measures was made outside of this sampling process. All savings associated with two measure categories were inadvertently omitted from EVT's reported net savings due to an administrative error. The Department recommends that these savings be restored and counted in the final 2004 net savings.

Overall, DPS recommends that gross, annualized electric savings (kWh savings at the customer's meter) be adjusted downward by about 5,963 MWh, or 12.1 % of EVT's initial claim. The reduction in net energy savings will be partially offset by the increase of approximately 450,000 kWh resulting from the accidental omission of the two measure categories. The realization rate for the BEF program is 96.3% with a margin of error of 1.0%. For the BNC program, the realization rate is 84.7% with a margin of error of 5.7%. The relative precision is about 2% for BEF and 11% for the BNC, at the 90% confidence level.

The adjustments to gross, annualized savings for all sectors are summarized in Table 1.

---

<sup>1</sup> TecMarket Works, et. al. The California Evaluation Framework. Project Number: K2033910. Prepared for the California Public Utilities Commission and the Project Advisory Group. June, 2004.

<sup>2</sup> Eight of these projects were prescriptive lighting projects which were not reviewed by agreement between the DPS and EVT, due to difficulties with obtaining the files.

All adjustments are presented in gross, annualized kWh. The Department requests EVT to calculate the adjustments to the TRB, demand savings and lifetime energy savings.

Table 1: Summary of Adjustments to Gross, Annualized Energy Savings

	# of Projects	Total Savings (MWh)	Realization Rate	Adjustment (MWh)	% Reduction
BEF - Top 7	7	5,755	61.1 2%	2,206	38.3 %
BEF	662	13,575	96.31 %	501	3.7 %
BNC	123	10,744	84.765 %	1,649	15.3 %
Residential		19,35524,7 31	91.73.50 %	1,607	8.36.5 %
Totals		49,42858,3 65	87.9 %	5,963	12.1 %

EVT continues to provide Vermont with a valuable resource and has made progress in increasing the efficiency of our homes and businesses. The Department would like to thank the many staff members at Efficiency Vermont who coordinated the verification review, in particular, Dave Cawley and Erik Brown. The DPS would also like to thank EVT for its willingness to work within the new framework and for its suggestions for improving the statistical methods.

The remainder of this report is divided into three sections. Section II details the project and measure-level issues that provide the basis for the adjustments shown in Table 1 above. In Section III is a discussion of , we discuss specific issues with program year 2004 (PY04) projects and measures, and other assumptions and concerns to be addressed on a prospective basis. The final section describes the sampling methodology in more detail.

**II. Projects with Agreed-Upon Adjustments**

**A. Cross-Sector Adjustment**

Tracks: 6013CUST, 6014NANC, 6036EPEP

Measures: Industrial Variable Frequency Drives,FD’s, fan/light fixtures

Due to an administrative error, free rider and spillover adjustments were set to 0 for 167 records in the Efficient Products (EP) initiative and nine records in the BEF and BNC initiatives.

These records represent 224 installations with gross energy savings of 448 MWh. The result of this error means is that the net savings for these measures were reported as zero. The error appears to have resulted from the lack of a corresponding measure code for these measures in the free rider table. Free rider and spillover numbers were subsequently verified to fall within an acceptable range (spillover greater than or equal to 1, free rider factors between 0 and 1) for all records in the data set. Measure records were checked against the values in the free rider table. No other errors were found. EVT should properly recalculate the net savings to include these measures and revise the report numbers accordingly.

**B. Top 7 BEF Projects with Specific Adjustments**

1. Champlain Water District Pumps

Initiative: Business Existing Facilities  
Project ID: J00000016797  
MAS90: 6013-2677

File documentation did not include certain many critical pieces of information, e.g. include pressure and flow measurements. The savings calculation incorrectly used different annual flow conditions in determining the overall pump efficiency. From the available information, the Department could not be able to ascertain whether this installation would be likely to achieve any savings, at all. For this reason, the Department recommends that the savings for this project should be removed. This adjustment comes to a reduction of 953,665 gross, annualized kWh.

2. Champlain Water District Variable Frequency Drives (VFD's)

Initiative: Business Existing Facilities

In this project, the existing condition was a process that ran either on or off. on/off. The measure claimed as savings, the addition of the VFD's, may be desirable to the participant for non-energy reasons, but the actual electric use at the plant will likely remain unchanged because of the VFD installations. probably increase after the VFD's are installed. The claimed savings for this project are approximately 480 MWh, though and the Department expects that the actual impact could be an increase in use.

The Department recommends that the savings be removed in their entirety, resulting in a decrease of 479,900 gross, annualized kWh.

3. Shaw's - Eight Former Grand Union GU Stores

Measure: "Parasense Smart E"

Initiative: Business Existing Facilities

The Parasense Smart E system was installed in six of the eight Shaw's (formerly Grand Union) supermarkets incorporated into this project. According to EVT, the system "notifies a central dispatch site whenever a load is outside of its identified parameters (such as a non-security lighting circuit on in the middle of the night, or a refrigeration unit that hasn't cycled for a certain period given the ambient conditions). The dispatch office then sends a technician and/or if appropriate, notifies the store manager."

Given the high degree of uncertainty associated with this measure, the Department recommends that EVT should reduce the customer provided savings estimates by an additional claim only 50% of the estimated kWh savings for the Parasense measures, resulting in a reduction of 200,000 annualized kWh.

4. Walloomsac

Measure: Space and water heating fuel switching, comprehensive treatment

ProjectID: J00000008332

MAS90: 6017-2031

Total project savings for this fuel switching project were seem to be substantially overstated, based on the pre-installation electric use for this project.

The Department recommends a reduction of 75 MWwh (about 12.5%) of the total annualized MWwh for all measures installed in PY 2004.

5. Rock Tenn

Initiative: Business Existing Facilities

Measures: Custom Motor & Custom VFD

Project IDs:

MAS90: 6013-2536

The Department recommends reductions in savings for two measures: custom VFD and custom motor. The savings for the VFD were incorrectly calculated using EVT's "standard" VFD spreadsheet. Hand-written (correct) calculations of pre- and post-retrofit

horsepower in the file were not used to compute savings. The Department recommends a reduction to gross, annualized savings of 473,858 kWh/yr for this measure.

The documentation for the custom motor was not sufficient to support the savings claimed by EVT. Based on savings results for this type of motor application, documented in a published paper, the Department recommends that savings be based on lowering use by 25% of pre-retrofit usage, leading to a reduction of 77,831 gross kWh/yr.

**C. Randomly-Selected C&I Projects and Measures with Specific Adjustments**

1. Oxbow Union High School - Transformers

Initiative: Business Existing Facilities  
Projectid: J00000007792  
MAS90 Project: 3002  
MAS90 Job: 6013

Transformer savings were overestimated for this project. The total energy savings of the two measures should equal the difference between the annual losses of the 1500 kVA "standard" transformer and the annual losses of the 500 kVA Energy Star transformer, or 19,112 kWh per year.

The DPS recommends a reduction in gross, annual savings of 9,726 kWh.

2. Project: National Hanger

Initiative: Business Existing Facilities  
Projectid: J00000204571  
MAS90: 6013-3595

An all-electric injection molding machine was installed in this plastics manufacturing plant. The savings for this measure were overstated due to incorrect inputs into the engineering algorithms and incorrect reliance on the results of a "generic" mold test. The Department recommends a reduction of 58,528 gross, annualized kWh.

3. C.E. Bradley Labs, Inc., Bond Auto Parts

Initiative: Business Existing Facilities  
Measure: Prescriptive Lighting, T-8's  
Projectid: J00000205464 & J00000206350  
MAS90 Project: 6013-3649 & 3680

The savings for these two prescriptive lighting projects were calculated using outdated assumptions from the TRM. The Department recommends reductions of 3,247 (CE Bradley) and 772 (Bond) gross annualized kWh.

4. Collins Perley Ice Rink

Initiative: Business New Construction  
Projectid: J00000007801  
MAS90: 6014-1396

The Department has concluded that electric savings were overstated for two measures: roof insulation and dessiccant dehumidification. Natural gas savings were understated for the roof insulation. The Department recommends that Ffurther research should be conducted to improve the methodology used to calculate the savings from desiccant dehumidification in cold climate ice rinks.

These adjustments result in a reduction of 19,999 gross, annualized kWh for the roof insulation, and 100,995 kWh for the dessiccant dehumidification, and an increase in natural gas savings of 254 MMBtu.

5. Equinox Terrace

Initiative: Business New Construction  
Measure: Lighting Power Density, Interior  
Projectid: J00000017106  
MAS90 Project: 6019-1026

The Department concluded that EVT overstated savings due to two errors: 1) an erroneous input and 2) selecting the incorrect baseline for the power lighting density calculation. EVT agrees to the adjustment, and requests that the identification of the correct baselines be discussed further in the Technical Advisory Group (??? TAG) process.

These corrections result in a reduction of 29,959 gross annualized kWh.

6. Highgate Apartments 3, Old Windsor Village, Equinox Terrace II, and Northern Meridian 2, Meadows A/B, Pallisades, 4 Shafter St.

Initiative: Business Existing Facilities and Business New Construction  
Measure: Custom Lighting

Projectid: J00000024907, J00000024033, J00000017106, J00000025345,  
J00000014864, J00000023704, J00000018406  
MAS90 Project: 6017-2177 & 2165, 6019-1026 & 1053, 6019- 1022,  
6018-2106, 6017-2033

Savings are overstated for lighting installed in many multifamily buildings, possibly due to excessively high “hours of use” assumptions. This reduction is based on an average overstatement of about 25% for all lighting measures in these projects. The total reduction comes to 38,290 annualized, gross kWh.

7. Hannafords-Middlebury

Initiative: Business New Construction  
Measures: Commissioning (CSX) and Interactive Effects  
MAS90: 6014-4971

In its preliminary findings, the Department requested that EVT reviewed its application of various savings adjustments to this project. at the Department’s request EVT , and found that two errors: 1) the commissioning adjustment was incorrectly omitted from the VFD and variable speed condensing fan and 2) the compressor savings did not include the additional savings due to the reduction in waste heat. The net effect of these two adjustments is an increase in savings of 307 kWh.

8. Middle Road Market and Sonnax Industries

Initiative: Business Existing Facilities  
Projectid: J00000207408 & J00000024685  
MAS90 Project: 6013-3739 & 3135

The measure life in the Technical Resource Manual (TRM) for this application is 15 yrs, but 20 years was used. EVT has recalculated the TRB and lifetime energy savings, as shown below.

	Middle Road Market 6013-3739	Sonnax Industries 6013-3135
Original project TRB	\$11,428	\$56,326
Adjusted project TRB	\$11,193	\$50,266
TRB reduction	\$235	\$6,060
Original project lifetime MWh	255.9	831.9
Adjusted project lifetime MWh	246.2	688.4
Lifetime MWh reduction	9.7	143.5

**A. Residential Projects and Measures with Adjustments**

1. Measure: Business Customer Lighting

Initiative: Efficient Products Program

The Department has concluded that the assumptions used for estimating savings from business purchases in this program results in has led to an overstatement of savings for these measures. EVT applies an’s in-service rate of 1.0, reflecting the assumption that every purchase is actually installed and in use. EVT applies a waste- heat factor, assuming that every facility has air conditioning, although little is known about the actual deploymentdisposition of these bulbs. Also, The Department also asserts that the change in wattage should be the same for residential and commercial applications, since survey-based studies have been conducted for the residential sector and we have no evidence to suggest that the commercial and residential sectors are different in this regard. (This last modification results in higher savings for some specific lighting measures and lower savings for others.). The Department accepts EVT’s assumption that the hours of use are higher in commercial applications and does not recommend any change to the hours of use.

The Department’s recommendasation an adjustment for 2004, based on review of independent studies, is that assuming anthe in-service rate of be lowered to .90, applying

the waste heat factor be applied to 50% of the facilities and setting the change in wWatts be set at the values used in the residential sector. These modifications result in a reduction in savings of 1,448,659 gross kWh/yr.

EVT accepts the adjustment for 2004, and requests that these issues be taken up in the TAG process to develop mutually acceptable values for 2005.

2. Measures: All Lighting

Initiative: Residential New Construction (RNC)

The Department has concluded that EVT's process of claiming prescriptive savings for each installed lighting fixture per fixture installed produces is leading to unrealistically high savings per home. EVT has been successful in promoting high efficiency lighting in this program, and an average of over 12 lighting products were installed in each home during 2004. However, EVT's process of claiming prescriptive savings for each installed lighting fixture produces very high savings per home. The average per household savings claim is came to 1,307 kWh per year and ten percent of the participants are expected to save over 2,400 kWh per year. Residential lighting studies suggest that 25% of the fixtures in a home account for 75% of the lighting use. Accordingly, when over 12 lighting products are installed in each home, it seems reasonable to assume that some of them will be installed in low- use locations with minimal savings.

The Department adjusted RNC lighting savings to reflect average household savings of 1,000 kWh per year. This adjustment comes to 143,676 gross annualized kWh.

EVT accepts the adjustment for 2004, but does not agree with the DPS conclusions. Further,. However, EVT has concerns about impacts on program implementation and requests that these issues be taken up in the TAG process to develop mutually acceptable values for 2005. The Department acknowledges the difficulties in developing a workable process for claiming lighting savings in this program, and agrees that these issues should be further discussed in the TAG process.

3. Project: J00000205868

Initiative: Low Income Single Family

Measure: Water Leak

This home had a substantial hot water leak. While the Department agrees with EVT's decision to fix the leak, the Department recommends that the a five-year measure life is

inappropriate and should be reduced to 6 months. EVT has requested to make this adjustment by taking half of the savings for a one-year measure life.

This translates to The Department recommends a reduction of 5,974 gross, annualized kWh for a one year measure life. of one year.

4. Project: J00000205212

Initiative: Low Income Single Family  
Measure: Space Heat Fuel Switching  
MAS90: 6034-6354

The Department concluded that the fuel switching savings were overstated for this project and recommends a reduction of 4,843 gross, annualized kWh.

5. Project: J00000206165

Initiative: Low Income Single Family  
Measure: Early Replacement Refrigerator  
MAS90: 6034-1072

The Department identified a data entry errors in the savings for refrigerator replacements in this program. This adjustment results in an increase ins savings of 3,900 gross kWh per year.

- III. **Current and Ongoing IssuesPY04 C&I Issues** A number of other issues with C&I projects were identified outside of the review of the random projects. In combination with the systematic problems found with the randomly-selected projects, the net effect suggests that both case-by-case and systematic problems exist throughout the range of C&I projects. Explicit adjustments are not proposed to account for these problems. Item 1 below discusses the range of systematic issues found in the PY04 review, and the following paragraph discusses issues with a custom project identified outside of the random sample.PY04 Systematic Problems A number of the issues described above in categories 3 and 4 point to the systematic overstatement of savings for some measures. Consequently, savings for these measures are likely to be overestimated in many projects that were not reviewed. These measures include the following:  
some prescriptive lighting, specifically metal hallide pulse starts and 4- lamp T-8'scustom lighting in multifamily projectspower lighting density calculations (baseline values)process VFDs

Westminster Family Housing

Measure: Space Heat Fuel Switching  
Projectid: J00000024737  
MAS90 Project: 6017-2175

Westminster Family Housing consists of two houses and one barn that have been converted into 9 apartment units. EVT, in conjunction with the low-income Weatherization Program (WAP), provided numerous efficiency measures including converting the heat and DHW from electric to oil, insulation and air sealing, ventilation, energy star refrigerators and lighting.

The DPS noted several problems with the analysis of the fuel switching measure and claimed savings. EVT increased the savings estimated from the billing history by 25% to account for “underheating,” despite the fact that this issue was raised in the 2003 verification process and EVT and the DPS reach agreement that fuel switching savings would not be increased in this manner. The DPS only supports such increases when there is a realistic expectation that electric heating use would increase, e.g. as in the case of a customer no longer being able to use supplemental wood heat due to illness.

EVT also extrapolated usage for two of the nine units. It is unclear why this course of action was taken. However, using the actual consumption reduces the annual consumption by approximately 10,000 kWh a year. Lastly it appears that savings and costs from the air sealing and insulation were never booked into the system as they are recorded as “1” with a note that “Savings TBD post WAP treatment.”

The 25% overstatement of the fuel switching savings came to about 35 MWh.

#### **A. Issues to be Referred to TAG**

1. All Commercial Prescriptive Lighting Measures  
Tracks: 6013PRES  
Issue: Waste Heat Factor (WHF) and In-service rate (ISR)

*Description of EVT's Approach:* EVT is applying waste heat factors to all lighting measures installed in this initiative. The default assumption in the TRM for almost all of the prescriptive lighting measures is that the space is cooled as well as heated. EVT does not have a method to determine if the commercial spaces are actually cooled. EVT also applies an in-service rate of 1 to all lighting products in this initiative.

*DPS Comments:* Vermont has a relatively low cooling load and many small and home based businesses do not have mechanical cooling. In addition, many types of businesses do not use air conditioning simply due to the nature of the business (e.g. rental units, warehouse, garages, small manufacturers). Some lighting technologies are more likely to be installed in unconditioned spaces and although the waste heat factors are prescriptive,

in reality there are many factors that affect the impact of lighting retrofits on heating and cooling loads.

With an in-service rate of 1.0, EVT is assuming that every single product purchased installed through this component of the program is installed. This assumption is questionable. Studies in the residential sector have provided some guidance for this sector. Even in the absence of concrete data to support a specific value for the in-service rate in the C&I sector, the strong likelihood that some purchases will never make it to the intended installation cannot be ignored.

*Recommended Action:* Reconsideration of the across-the-board application of waste heat savings adjustments and ISR's for all commercial lighting measures should be undertaken in the TAG process.

2. Measure: Bulk Purchase of CLF Bulbs

Track: 6013PRES

Issue: Application of standard assumptions

Description of EVT's Approach: Using Through the prescriptive forms, some participants are purchasing large quantities of CFL bulbs (200 to 500). EVT is applying a single set of assumptions, regardless of the number of bulbs purchased. These assumptions include an ISR of 1.0, change in wattage, and across-the-board application of the waste heat factor.

DPS Comments: The Department is concerned that these bulk purchases are fundamentally different in nature than smaller-scale sales. The standard assumptions may not fit well to these circumstances. For example, the possibility that businesses are stockpiling CFL's seems high, suggesting that a lower in-service rate would be appropriate. Further, a fraction of the bulbs may be installed outside the state. The Department also questions whether CFL bulbs are really the best technology for all these applications.

Recommended Action: These issues should be addressed through the TAG process.

3. Measures: Economizers and Evaporator Fan Motor Controls

Track: 6013PRES

Issue: Interactive Effects

*DPS Comments:* These measures are interactive, since the economizer will reduce the number of hours that the evaporator fan runs. When these measures are installed together in prescriptive applications, the measures interact, and tracking the interactive effects

through the calculations is complex and time-consuming. In sum, the interactive nature of certain measures impacts how much energy is saved.

*Recommended Action:* There are a number of approaches to this issue that should be addressed through the TAG process. One possibility would be to characterize a combined measure where the economizer and evaporator fans are both installed. Another approach may be to include "Interactivity" as a measure. If there is no interactivity in a given project, this measure would be zero, but it would help to remind project engineers that the interactivity of the measures needs to be considered. If there is interactivity, this measure could be used to capture the reduction that needs to be applied to any of the TRM calculations.

4. Industrial Process Measures  
Issue: Down-time

*DPS Comments:* From both the 2003 and 2004 verification process, it appears that EVT's estimates of savings for industrial process measures often assume the equipment will be operating 100% of the time. This assumption fails to reflect estimated down time for product specification changes, routine maintenance, or scheduled and unscheduled shutdowns. In projects where adjustments were made for downtime, the documentation was often unclear.

*Recommended Action:* EVT should establish a method for insuring that the savings for industrial process measures are consistently adjusted to reflect periods of time when the equipment is out of service. This adjustment should be sufficiently documented in each file to allow reviewers to identify and fully understand how down-time is incorporated into the analysis.

5. Commercial Lighting  
Initiative: Business Existing Facilities  
Track: 6012CNIR  
Measure: T-8' lamps

The Department noticed that over 500 MWH of savings in the "Shaw's - Eight Former GU Stores" project were claimed from the installation of T-8's at these stores, and that EVT paid significant incentives for this measure. The Department questions whether incentives should be paid for this commonly-installed measure. Free ridership, baseline assumptions, and incentive levels for T-8's should be revisited through the TAG process.

6. Dryer Fuel Switching  
Initiative: Business New Construction  
Tracks: 6018LINC, 6018LIRH, 6019MFNC

Measure: Dryer Fuel Switching  
Issue: Free Rider Rate

DPS Comments: EVT is applying a free rider factor of 1.0 to this measure, i.e., effectively assuming that all dryers installed in the MFB new construction and renovation/rehab markets outside of EVT's program are electric. When asked about the rationale for this decision, EVT did not provide any concrete support for this decision .

This premise does not square with DPSour knowledge about other parts of the residential new construction market. The Department's baseline study for the single- family market indicated that about 33% of the market installed gas dryers. In the absence of more definitive information, the Department cannot see any reason to assume that the MFB market is substantially different in this respect, particularly in VGS territory.

Recommended Action: AEVT should use a free rider factor should be developed that better reflects current available Vermont residential and multi-family housing market information. not greater than .85 for this measure.

## **B. Other Issues to be Addressed on a Prospective Basis**

1. Measures: VFD's (MTCPRVD)  
Initiative: Business New Construction

EVT calculates estimated savings for each measure using a variety of engineering calculations and software tools. For installations that are not commissioned, savings should be reduced by 10%. This agreement between EVT and the DPS is recorded in the TRM.

It is unclear from our review of various VFD projects if the commissioning adjustment has been applied to appropriate measures (e.g., non-HVAC motors and motors larger than 10 hp). The Department recommends that EVT develop and implement a consistent clear and transparent method of documenting these adjustments.

2. Measures: Economizers, demand controlled ventilation, lighting controls, EMS (multiple point control systems)  
Initiative: Business New Construction

EVT calculates estimated savings for each measure using a variety of engineering calculations and software tools. These adjustment factors are documented in the TRM.

It is unclear from the DPS our review of various projects involving economizers, demand controlled ventilation, lighting controls and EMS systems if the appropriate OTF adjustment factor has been applied to applicable measures. Notes included in the CAT tool for economizers and demand controlled ventilation often indicate that adjustments have been made but determining where the actual adjustments were applied is not obvious. The Department recommends that EVT develop and implement a consistent, clear and transparent method of documenting these adjustments.

3. EVT Project Documentation and Review

Since the verification of savings for Program Year PY 2003, EVT has seems to have taken a number of steps toward improving file documentation and project review. The noteworthy addition of the project description memo, which gives a snapshot of an individual project, speeds review of complex projects. The peer-to-peer review also seems to have enhanced accuracy of savings claims in many projects. In some instances, post- installation metering EEM's was used by EVT to refine savings estimates. All of these are positive developments.

Unfortunately, due to the magnitude of the problems found in this review, it appears that EVT still needs to improve their internal procedures. This review revealed significant errors in engineering calculations for large projects that apparently escaped the internal review process. Checks for reasonableness for claimed savings in excess of historical usage, assignment to the correct track and appropriate use of vendor estimates were insufficiently reviewed. These issues need to be effectively addressed by EVT.

The Department recommends that EVT take the following steps to mitigate future problems:

- hire third-party expertise to validate savings when needed on complex engineering projects or when new technology is involved,
- review the savings associated with comprehensive projects or sites that have multiple projects in the context of historical consumption,

- monitor the pre- and post-installation consumption for large projects as a reality check for savings, as mentioned in the 2003 verification report and discussed in the TAG meetings, and
- establish guidelines for peer review, particularly methods for assessing whether the savings claims are reasonable.

1. Use of Vendor Estimates

The Department noticed that EVT sometimes relies on vendor estimates for claimed savings. In some of the projects reviewed by the Department, EVT has arbitrarily adjusted vendor savings “to be conservative.” However, absent the details of the vendor estimates are based on erroneous assumptions or incorrect calculations, there is no way to ascertain if whether EVT’s adjustment is conservative, or even whether any savings at all may be expected to accrue from the installation. The Department recommends that EVT consistently estimate energy savings using engineering methods that will stand up to peer review.

2. Correct Classification of Projects

The Collins Perley Ice Rink project was a renovation of an existing facility. Although this project is a retrofit, it was tracked as new construction. As discussed in the Department’s 2003 verification report, correct categorization of projects by EVT for reporting purposes directly effects issues of equity and the application of free-rider and spillover adjustment factors. The result of applying these factors correctly in this project would have been a further reduction in savings.

3. Reporting of Savings Claimed by Other Entities

The Department understands that reports published issued by EVT, Vermont Gas systems (VGS) and the Office of Economic Opportunity (OEO) sometimes report savings estimates for the same measure. This could be misleading to anyone interested in looking at total estimated energy efficiency initiatives statewide. The overlap in claimed savings is not readily apparent from EVT’s reports. EVT’s report should include a statement, perhaps a footnote somewhere, that quantifies the savings estimates that may also be reported by another entity.

4. Correct Installation Dates

As part of the discussion of the Champlain Water District pump replacements, the Department learned that the installation of the four pumps in this project occurred over a period of approximately one year. However, the installation dates in the tracking data are identical. While the Department does not expect EVT to necessarily report savings on partially completed projects, there is an expectation that the install dates in the tracking

system accurately reflect when equipment is put into service. This information is needed for reviewing consumption data and evaluating the overall impact of projects.

#### **IV. 2004 Sampling Methodology**

An ongoing source of differing opinion has been tension is created by the desire for statistical precision juxtaposed with the need to keep the sample sizes small in order to be able to complete the review within the budget and the specified two-month review period. The C&I sample methodology was designed with a number of objectives in mind: random selection, a sufficient sample of large projects to cover a variety of technologies and applications, and a sample size that could reasonably be reviewed in the two-month time period assigned to this task. Approximately 800 projects were completed under the Business New Construction and Business Existing Facilities programs. Eighty projects (10%) were selected for review, and sampling was conducted separately for the BNC and BEF projects. All projects were assigned a random number and also assigned to a size category. Four size categories were defined according to the total annualized kWh savings associated with the project. We set the number of projects selected from each group, weighting the sample toward larger projects.

After receiving input from EVT and the Contract Administrator, the Department modified the sampling strategy for BEF by creating a fifth group containing the seven large projects with total project savings greater than 400 MWH per year. All projects in this group were reviewed and adjustments for this group were made on a project-specific basis only.

Certain Some of the characteristics of the resulting sample are discussed below.

- All program tracks are represented in the sample.
- The sample reflects a wide range of technologies and applications, from prescriptive and custom lighting and refrigeration to a number of industrial process applications (including injection molding and water supply pumps).
- For the Business Existing Facilities (BEF) program (74 projects), the mean annual savings for the sample within each size group are generally within the 90% confidence intervals for all projects within that group.
- In the Business New Construction (BNC) initiative, a total of 123 projects were completed and 12 were selected for review; although these projects were also selected randomly within the size groups, the sample size was insufficient to establish a clear pattern within each group; for this reason, these groups were compressed from four to two.

The process consists of adding all the adjustments found among the randomly-selected projects, and comparing the adjustment to the total savings among the sampled projects in a specified group to determine the realization rate by group. These values were then weighted to develop a program-level realization rate using a common method for stratified ratio estimation, as described in the California Evaluation Framework. The resulting realization rates and statistical precision are given in the introduction.

Table 2: Summary of Adjustments by Group

Program	Group	All # of Projects	Project Size (MWH/yr)	Sample # of Projects	Sample Verified Savings (MWH/yr)	Sample EVT Claimed Savings (MWH/yr)
BEF	A	60	57.0-400	20	2,353	2,411
BEF	B	101	16.2-57.0	14	394	424
BEF	C	335	1.2-16.2	23	111	114
BEF	D	166	<1.2	10	4	4
BNC	1	32	70-1,320	7	1,247	1,382
BNC	2	91	<70	5	64	98

The Department and EVT are in agreement that this approach is appropriate for verification purposes. The Department prefers this approach to the more project-specific adjustments made in previous years for two primary reasons: 1) the Department relied on an objective, unbiased process for selecting the projects to review and 2) careful sampling allows for a reasonably representative selection of the projects in EVT's portfolio.