

# 5

---

## Monitoring Services:

The heart of any performance-based contract is the guarantees with which it is associated. Not only the guaranteed price of the installation but the guaranteed savings generated from the installation of the energy conservation measures. While the installation guarantee is easy to track and verify, the savings guarantee is more complex, can be done in different ways, and can be left open to interpretation. However, when done correctly, not only can the savings be measured and verified, but the customer can achieve many additional benefits from the equipment installed, over and above the guaranteed savings.

The following section introduces CMS Viron's Monitoring Department, and outlines some of the services it can provide. Specifically, these topics will address:

- Monitoring Department Overview – Including its staff, experience, and capabilities.
- Measurement and Verification (M&V) of Savings – What are the options, when should they be applied, and what are the benefits of each.
- SMCCCD Specific Recommendation – Based on the parameters of this analysis, these are our recommendations for a workable M&V plan that gives the greatest ongoing benefit, and ongoing Monitoring Services. These are included in the base Monitoring fee.
- Monitoring Services – The scope of Standard Services included and Optional Extended Services from the Monitoring Department.

### Monitoring Department Overview

CMS Viron has one of the largest, most experienced Monitoring Departments in the industry. A professional engineer with 13 years in performance contracting leads a team of 27 full-time dedicated staff, with an average time in performance contracting of over 7 years each. The Monitoring Department has overseen hundreds of guarantees and currently has over 50 clients with ongoing guarantees that total over 100 million dollars.

The depth and diversity of the personnel prepares them to handle a variety of ongoing services, as detailed in this report. In general, these tasks are overseen by three divisions, each with its own area of expertise.

**Energy Accounting:** Headed by a manager who has overseen M&V of performance contracts for the last 7 years, this team oversees the guarantee portion of the monitoring contracts. They are responsible for analyzing the utility consumption, generating the monitoring reports, tracking changes to the facilities,

and maximizing the energy savings. This team includes on-site dedicated Energy Resource Managers for some of our larger contracts.

**Electronic Monitoring:** With a combined building automated control system (BACS) and buildings controls experience of over 50 year, the Electronic Monitoring division has extensive experience in commissioning, monitoring, and troubleshooting over 20 different types of BACS's. Not only are they responsible for delivering a functional system, but also they continue to train and support our customers on that system for the duration of the contract.

**Support Services:** This team of professionals handles most of the extended services detailed below, including UtilityVision<sup>SM</sup>, CMS Viron's suite of services centered around an Internet based real-time remote monitoring of metering systems. UtilityVision can integrate seamlessly throughout the Monitoring program, allowing the departments to offer a greater level of services to our Clients at a lower ongoing cost.

Most importantly, the CMS Viron Monitoring Department will work as a team to deliver a program specifically designed to meet the needs of each client.

### **Measurement & Verification of Savings**

The key to successfully achieving the predicted savings of any project will be the accuracy of the energy baselines and the measurement and verification of savings. To assure confidence in these processes, CMS Viron will follow the International Performance Measurement and Verification Protocol (IPMVP). This protocol is recognized by the National Association of Energy Service Companies (NAESCO) as the standard guideline of how savings resulting from energy conservation projects should be measured.

The IPMVP defines four broad options for measurement and verification of energy savings. Each option is applicable to specific situations; and, oftentimes, more than one option is possible. Multiple options are often implemented on a single project. The broad categories of the IPMVP lay out as follows:

- Option A – Partially Measured Retrofit Isolation – End-use measurements, some stipulations.
- Option B – Retrofit Isolation – Complete end-use measurements.
- Option C – Whole Building – Energy use analysis on multiple systems.
- Option D – Calibrated Simulation – Computer modeled building savings.

Often overlooked is the necessity of identifying the M&V plan coincidently with the project development. In some cases, it is necessary to drop or ignore a portion of savings

associated with a specific measure for the simple reason that that portion is immeasurable, or unreasonably expensive to measure.

Implementation of a verification plan for the diverse types of ECM's typically involved in a performance contract usually requires a combination of methods to successfully measure savings. Even for a given ECM, verification categories may be crossed by combining a stipulated and an end-use measurement component into the savings calculation. Factors that guide the selection of an M&V method for each ECM include:

- Cost of measurement vs. savings
- Timing of measure installation
- Likelihood of future ECM's at the same facility
- Likelihood of future construction at the facility
- Degree of sub-metering within the facility
- Level of interaction between ECM's
- Dynamics of the facility's energy baselines
- Likelihood of sustainable savings from the measures
- Likelihood of sustainable savings from the measures
- Complexity of ECM's to be installed

Due to the variables and dynamics that are unique to each performance contract, and often to each facility within a performance contract, an individual measurement and verification plan must be developed for each situation. While the specifics may vary, the general method employed will always follow one of the methods outlined in the IPMVP.

*The following paragraphs detail the four potential M&V methods:*

### **Option A – Partially Measured Retrofit Isolation**

This option allows for the energy savings to be calculated using a sampling of field measurements combined with stipulated parameters. The savings, once calculated, are usually stipulated to for the life of the project. Ongoing actual measurements may or may not be used in this verification technique depending on whether the predicted savings and/or volatility of the measures implemented warrant the expenditure on additional field measurements.

A possible application for using this option would be for lighting efficiency improvements whose performance may be relatively stable and not interdependent with other measures. The savings for the lighting upgrade would be quantified by measuring before and after power consumption for a representative sample of lighting circuits and by stipulating or agreeing to the hours of operation of each circuit.

### **Option B – Retrofit Isolation**

Energy savings performance of energy conservation measures are measured and verified at the end use site. Option B techniques are designed for projects where long-term continuous measurement of performance is desired and warranted. Under Option B, individual loads are continuously monitored to

determine performance; and this measured performance is compared with a baseline to determine savings.

A possible application for Option B measurement would be for chiller efficiency improvements in a setting of continuous change at a facility. The savings for the chiller upgrade would be quantified by measuring the existing chiller's performance in kW/Ton at several points in load while maintaining steady condensing temperature. The same chiller performance curve would be developed for other steady condensing temperatures, resulting in a three-dimensional load curve for the existing chiller or chillers. After the retrofit, a similar 3-D load curve would be measured for the chiller. Instrumentation would be installed to sample the actual tonnage being delivered to the building cooling loads during the entire measurement period, and the power reduction interpolated from the before and after performance curves.

This type of measurement can be expensive and complex, but may be implemented as an alternative to Option C to ensure the long-term success of the energy conservation measures.

### **Option C – Whole Building**

Option C verification techniques measure savings by comparing the post-retrofit overall energy use in a building or facility with pre-retrofit energy baselines. Implicit in this measurement option is the necessity of identifying and accounting for the effects of changes to the facilities during the measurement period that are beyond the scope of the measures installed. The impact of building additions, changes in operating hours, remodeling projects, etc., that are implemented by the customer during the measurement period must have their energy impact accounted for if the true savings from the energy conservation measures is to be assessed. This process can be time consuming and expensive in facilities that are very dynamic.

However, there are many benefits to an Option C measurement. When significant interactions between energy consuming systems and energy conservation measures are present, and for assessing savings for measures that are not easily measured directly, Option C may be the only viable method. Option C savings calculations also most closely emulate the bills from the utility company, and the calculations are easy to understand and explain. The typical calculation of savings is as follows:

Total Energy Savings (\$) = (Energy Use Baseline – Actual Usage) \* Contractual Energy Rates

Where:

- ❖ Energy Use Base – Historical Energy consumption; modified over time to account for changes to the facility.
- ❖ Actual Usage – Actual energy usage through the meter.
- ❖ Contractual Energy Rates – Energy rates derived from current utility bills and rate structures, which are used for the calculation of savings.

### **Option D – Calibrated Simulation**

Option D verification techniques calculate savings by utilizing a carefully calibrated hourly building simulation model to examine building performance before and after the digital implementation of energy conservation measures. Obviously, a high degree of comfort in both the simulation and the operator is necessary for this method to work to the satisfaction of both parties.

### **Entirely Stipulated Savings**

While not directly defined as an IPMVP option, the protocol recognizes that there are instances when measurement and verification of the savings is not warranted. In cases where the cost of measurement is too high as compared to the savings, where the parameters preclude accurate measurements, or where the confidence of the savings projections is high, the Client and CMS Viron may agree to stipulate those projected savings for the term of the project without any additional measurement and verification of the savings.

### **Customer Benefits Associated with Savings Measurement**

While all of the Options presented above come with certain benefits for the Client, CMS Viron feels that cost and feasibility aside, Option C offers the greatest ongoing benefit to our valued customers. That is why, when the parameters allow for it, we often recommend an Option C M&V protocol. The following lists some of the main benefits associated with an Option C M&V plan.

- **Maximize the Energy Savings**  
Through careful investigation of building scheduling parameters, HVAC equipment performance, and occupancy patterns, CMS Viron's Monitoring Department is able to deliver the maximum amount of energy savings achievable using the equipment installed under the program.
- **Sustain the Energy and Operational Savings**  
Without measurement and verification, energy savings tend to erode over time. This can be due to several factors including: changes in HVAC control parameters, equipment replacement or maintenance strategies, changes in space use, and physical changes to the building structure. While some of these items are unavoidable increases in usage due to facility changes, it is vital to quantify the effects of those changes to see if the installed measures are still functioning correctly.
- **Validate the Performance Contracting Decision**  
Oftentimes the decision to enter into an energy savings performance contract (ESPC) is a difficult one involving champions and detractors within a customer's organization. Signing an ESPC can require a high level of confidence that the energy service company will honor the guarantee should a shortfall in savings result. CMS Viron's Monitoring Department works hard to ensure that all entities within each customer's organization understand the results of the measurement and verification activities. This is accomplished through periodic reporting, annual site visits, and board

presentations when desired by the customer. Finally, should the energy savings fall short of the guaranteed level, CMS Viron will make up the shortfall.

- **Identify Additional Opportunities**

During the comprehensive energy analysis (CEA) phase of a project, ECM's are identified based on existing technology and operating parameters of the facilities. After the project has been implemented, new technology may arise, or operating parameters of the facilities may change, creating new opportunities for additional ECM's to be implemented. In these cases, CMS Viron's Monitoring Department will continue to investigate further opportunities for energy savings, from changes in the operation and maintenance of the facilities to further projects that will increase comfort and reduce energy consumption.

- **On-Going Training and a Consistent Knowledge Base**

Over the years, if facility personnel change, CMS Viron will be there to train the new Client employees on issues specific to the Client's facilities. With a staff of professionals who know not only systems and control in general, but the details of the Clients facilities, CMS Viron has the ability to bring new staff up-to-speed quickly and shorten the learning process time.

- **Forecast Changes in Energy Consumption and Making Energy Smart Choices**

As facilities equipment and usage change, so does the energy usage. The Monitoring Department at CMS Viron will be in a position to quantify that change, enabling the Client to more accurately budget for the required energy. In addition, CMS Viron is available to help our Clients make informed decisions about the proposed changes at their facilities, giving them the necessary tools to fully evaluate the long-term energy impact of different buying choices.

- **Identify Utility Billing Errors**

As part of many performance contracts, Client utility bills are collected on an ongoing basis for the purpose of determining savings. During the process of examining and entering the data, and comparing the usage to expected usage, utility-billing errors are detected.

## **Recommended Program**

For the San Mateo County Community College District, CMS Viron recommends a hybrid M&V protocol utilizing UtilityVision monitoring of a selection of main gas and electric meters at each campus, Option C analysis method for verifying savings, baseline adjustments (described below), and sub-metering new buildings to ensure adequate accounting of new electric and gas loads. The Energy Conservation Measures which would be included in the guaranteed savings package are: M1, M2, M3, M4, M7, M8, M10, M14, L1, L2, L3, L4, L5, L6, L7, L8, C1, and the Fall 2001 Lighting Project. Distributed generation measures, such as DG-1, are not included in CMS Viron energy savings guarantees.

**Electric and Natural Gas M&V Plan:** For the main electric and natural gas accounts and some of the larger individual meters, Option C is recommended. Stipulated savings are recommended for smaller buildings that are not on the main meter but are included in the scope.

### **Baseline Adjustments:**

We anticipate a number of baseline adjustments based on our engineering analysis during the CEA process and based on discussions with SMCCCD staff regarding new buildings, major renovation of existing buildings, and space use changes such as switching Building 13 at Cañada College to an administration building with a student services area. The probable and/or possible baseline adjustments that we have identified are:

- **Cañada College ventilation system re-scheduling:** The air handling systems at Cañada College currently run only 30 minutes of every hour. Code requires fan system to operate continuously during occupied hours. The baselines will have to be increased to reflect the additional run-time.
- **Cañada College air conditioning:** If the District decides to add air conditioning to Cañada College, the baselines will have to be increased to account for the additional usage.
- **College of San Mateo air conditioning:** If the District decides to add air conditioning to the College of San Mateo, the baselines will have to be increased to account for the additional usage.
- **New buildings:** The baselines will have to be adjusted to account for the increased usage.
- **Existing buildings to be demolished:** The baselines will have to be adjusted to account for the decreased usage.
- **Major remodel buildings:** The baselines may have to be adjusted if the occupancy or usage of a building changes dramatically.

## **Electric and Gas M&V Option C**

CEA Baselines have been developed for the Option C sites and are presented in Section 2, Historical Energy Consumption, of this report. These baselines will be reviewed at the start of monitoring using data up to the start of construction. During the Construction and Monitoring period, for the duration of the guarantee, it will be necessary to update and adjust the baselines to account for changes at the facilities outside the scope of the program. Not only is this required to accurately calculate the savings achieved from the ECM's installed, but also it can be a valuable tool for the SMCCCD to budget and manage its energy consumption for additions and modifications to their facilities.

The calculations of savings for these meters are as follows:

$$\text{Total Energy Savings} = (\text{Energy Use Base} - \text{Actual Usage}) * \text{Energy Rates}$$

Where:

Energy Use Base = The historical energy consumption per energy type. See Section 2 for the baseline details.

Actual Usage = Actual energy usage measured at the meters during construction and after the installation of the energy conservation measures during the baseline period, through the use of utility billing data and UtilityVision<sup>SM</sup> remote metering.

Energy Rates = See descriptions of energy rates provided in Section 2.

## **Operational Schedules & Setpoints**

The following tables show the operational schedules and temperature setpoints that will become the foundation of the savings guarantee once the implementation of the Energy Conservation Measures is complete:



**Table 5-1: San Mateo CCCD - Operational Schedules & Setpoints**

**College of San Mateo**

Bldg #	Building Name	Number of Occupants			Hours of Operation				Temperature Setpoints	
		Peak	Avg	Off-Pk	Mon - Thurs	Fri	Sat	Sun	Htg	Clg
1	Admin	100	80	5	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	74 - 78
2	Music	250	50	3	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a
3	Theatre	450	50	2	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Special Events	68 - 72	74 - 78
4	Art	230	60	2	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a
5	Student Center	2000	300	20	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	74 - 78
6	Journalism	500	50	2	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a
7	Maintenance	20	10	3	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a
8	Gymnasium	2000	400	40	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Special Events	68 - 72	n/a
9	Library	1000	300	20	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	74 - 78
10	Life Science	380	200	10	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a
11	Science Lecture	550	280	5	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a
12	Physical Science	320	180	10	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a
13	Planetarium	75	30	2	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Special Events	68 - 72	n/a

**Table 5-2: San Mateo CCCD - Operational Schedules & Setpoints**

**College of San Mateo**

Bldg #	Building Name	Number of Occupants			Hours of Operation				Temperature Setpoints	
		Peak	Avg	Off-Pk	Mon - Thurs	Fri	Sat	Sun	Htg	Clg
14	South Hall	750	400	10	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a
15	Faculty Offices	70	50	20	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a
16	Central Hall	650	350	10	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a
17	Faculty Offices	70	50	20	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a
18	North Hall	650	260	30	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	74 - 78
19	Engineering	400	180	20	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a
20	Horticulture	75	40	2	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a
30	Team House	150	60	0	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Special Events	68 - 72	n/a
31	Ticket Booth	20	5	0	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Special Events	68 - 72	n/a
32	Tennis Building	2	1	0	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Special Events	68 - 72	n/a
33	Child Dev Center	80	60	3	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a
34	KCSM Radio/TV	100	50	10	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a
HQ	District HD	120	75	5	8 AM - 6 PM	Closed	Closed	Closed	68 - 72	74 - 78

**Table 5-3: San Mateo CCCD - Operational Schedules & Setpoints**

**Cañada College**

Bldg #	Building Name	Number of Occupants			Hours of Operation				Temperature Setpoints	
		Peak	Avg	Off-Pk	Mon - Thurs	Fri	Sat	Sun	Htg	Clg
1	Phys Ed	1600	80	5	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Special Events	68 - 72	n/a
2	Bookstore	95	40	2	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a
3	Fine Arts	1200	200	12	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Special Events	68 - 72	74 - 78
5	Student Center	1000	300	20	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a
6	Library	200	100	10	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a
8	Administration	50	30	5	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a
13	Academic Bldg	1100	600	20	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	74 - 78
16	Science	180	100	15	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a
17	Science	380	200	10	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a
18	Science	250	150	10	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a
99	Port Childcare	50	30	2	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a

**Table 5-4: San Mateo CCCD - Operational Schedules & Setpoints**

**SKYLINE COLLEGE**

Bldg #	Building Name	Number of Occupants			Hours of Operation				Temperature Setpoints	
		Peak	Avg	Off-Pk	Mon - Thurs	Fri	Sat	Sun	Htg	Clg
1	Fine Arts	1800	200	20	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Special Events	68 - 72	n/a
2	Campus Center	1000	300	20	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a
3	Phys Ed	1800	200	20	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Special Events	68 - 72	n/a
4	Bookstore	40	20	2	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a
5	Library/LRC	1000	250	4	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a
7	Science	650	300	10	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a
8	Academic Bldg	1000	350	10	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a
9	Automotive Lab	80	40	2	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a
10	Automotive	70	50	2	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a
11	Warehouse	0	0	0	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a
12	Maint Office	6	4	0	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a
13	Maint Garage	6	4	0	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a
16	Port Childcare	40	30	2	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a
99	Port 3A - 3F	360	200	5	8 AM - 10 PM	8 AM to 1 PM	9 AM to 4 PM	Closed	68 - 72	n/a

## Monitoring Services

The long-term success of any performance contract relies on the continued efforts of the owner and the Energy Service Company. To this end, CMS Viron offers a monitoring service as part of the guarantee that focuses on the measurement, verification, and the maintenance of the energy savings. This section describes the standard and optional services usually provided. However, it is understood that the needs of our clients vary; and every effort will be made to meet any additional needs that may arise.

### **Included Services:**

- **UtilityVision** – *Most often included in the standard project. Brings the greatest level of value with a reduced ongoing Monitoring cost.*
- Guaranteed Energy Savings Monitoring Reports.
- Energy Baselines Maintenance.
- Electronic Monitoring of Building Automated Control Systems (BACS).
- Toll-free Access to BACS Help Desk.
- Periodic Site Visits.
- BACS Operator Training.

### **Optional Extended Services:**

- **Energy Resource Manager** – *On-site dedicated Monitoring Professional to oversee the daily impacts of the program and maximize the program savings and on-going services.*
- BACS Scheduling and Alarms
- Expanded UtilityVision Submetering
- Energy Awareness and Education Program
- O&M Training
- Building Automated Control System Warranty
- Extended Equipment Warranties and Programs
- Other Monitoring Services

## Proposed Included Services

### UtilityVision<sup>SM</sup>

As part of our base Performance Monitoring package, CMS Viron will install UtilityVision, an on-line energy information system. The recommended base program includes all of the campus utility meters utilized in the Option C M&V plan (10 electric meters and 11 gas meters). The SMCCCD will be able to view real-time energy information, as well as view 15-minute load profile data and graphs for each meter on the web site [www.utilityvision.com](http://www.utilityvision.com) with a valid password. The meters included in this proposal are specified at the end of this section.

The primary electric and gas load profiles can be used to spot energy demand peaks as they occur, and the electric and steam sub-meter load profiles will assist the SMCCCD in determining exactly where and when those peaks occur. Once known, it is possible to program the building automated control system to reduce the peak demand at these critical times. The net effect should be a reduction in the average equivalent energy rate.

*While this comprehensive audit and the installation of the energy conservation measures recommended will meet many of SMCCCD's stated objectives for this program, through the ongoing Monitoring Services, and specifically the installation of UtilityVision, will meet additional objectives and expend on the ones already addressed. These include:*

- **Establishing accurate energy use profiles for campus facilities in 15-minute increments.**
- **Assist SMCCCD in managing its total energy demand and daily profiles; also generate valuable information for future electricity purchases.**

### Monitoring Reports – Utility Bill Derived

Subtracting the actual energy consumption from the historical energy baseline, and multiplying by the contractual energy rates typically accomplishes the calculation of energy savings. This calculation is done monthly for each building on a monitoring report supplied to the Client. Other savings calculation methodologies, as identified in the program, will also appear on these reports. The total savings for the month and year-to-date are summarized and compared against a prorated portion of the guarantee so the progress of the program can be tracked.

At year-end, the savings, including any adjustments, will be compiled; and CMS Viron will issue a final year-end report for acceptance by the Client. The savings as reported will be used to fulfill the requirements under the guarantee. Any changes to the baseline or savings adjustments will be included, in detail, with the monitoring reports.

Monthly activity includes:

- Receiving and compiling energy bills or other data needed for the M&V process.
- Analyzing utility bills for errors or irregularities.

- Creating and printing report.
- Analyzing monthly performance and summarizing in letter format.

Year-end reports include:

- Final savings calculations and adjustments, if any, for Client review and approval.
- Overall analysis of facility energy performance.
- Graphs comparing current usage versus baseline usage, on a facility-by-facility basis.

Reports can be modified to meet the needs of the Client, often without additional expense.

### **Monitoring Reports – With UtilityVision<sup>SM</sup>**

UtilityVision<sup>SM</sup> is an Internet-based energy information platform consisting of hardware located on the customer's premises, and user authenticated software executed using a standard web browser over the Internet. The most significant customer benefit associated with UtilityVision is the dramatic reduction in energy savings reporting cycle time as compared with utility bill based reporting.

Without UtilityVision, customers must send CMS Viron copies of their monthly utility bills. The meter reading process, utility invoicing process, and other delays introduced in the copying and forwarding of utility bills by our customers typically result in a delay of at least 60 days from the last day of a reporting month to the date a customer receives a savings monitoring report.

With UtilityVision installed, energy consumption information is read automatically at each site, and is uploaded to our Internet servers on a daily basis. Monthly energy savings reports are available within 24 hours of the end of the calendar month, and partial month reports are available for the current month. Energy savings are measured in the same way as with paper bills — the information is just available much sooner.

At year-end, the annual energy savings, including any adjustments, are compiled; and CMS Viron will issue a final year-end report in paper format for acceptance by the Client. The savings as reported will be used to fulfill the requirements under the guarantee. Any changes to the baseline or savings adjustments will be included, in detail, with the final monitoring reports, as well as being reflected on the customer's UtilityVision site.

Daily activity includes:

- Receiving and compiling energy consumption data from UtilityVision hardware.
- Exception alarming for sites whose consumption exceeds expected values.

Monthly activity includes:

- Analyzing savings reports for errors or irregularities with any recommended actions being submitted to the client in letter format.

Year-end reports include:

- Final savings calculations and adjustments, if any, printed for Client review and approval.
- Overall analysis of facility energy performance.
- Printed graphs comparing current usage versus baseline usage, on a facility-by-facility basis.

Additional benefits associated with UtilityVision are the ability for CMS Viron and the Customer to analyze building or equipment load profiles on 15-minute intervals. Building load profiles have proven extremely valuable in maximizing energy savings at many customer sites. Real-time demand and consumption rates can also be viewed, as well as user-defined aggregations of multiple facilities. Customers find UtilityVision's load profiling and aggregation tools to be invaluable when negotiating for the most attractive rate structure in both regulated and de-regulated energy environments. UtilityVision also provides for a simple but powerful interface through which manual energy curtailment initiatives can be managed without having to be fluent with multiple building automated control systems.

UtilityVision is an Internet-based platform that requires hardware to get the information out to the Internet. Information will be based back and forth between this local hardware, the UtilityVision web server, and users who access the information. The details of the connectivity needs for this system can be found below:



## IT and Firewall Port Requirements for UtilityVision<sup>SM</sup>

### Daily / On-Demand Requirements

#### Energy Information System

Port	Used By	In	Out	Reason / Use
21	FTP		X	Daily transfer of trended data (File size is about 6 KB per meter for 15-minute interval data) To CMS Viron Web Server

#### Real Time Data

Port	Used By	In	Out	Reason / Use
80	WWW	X	X	Provide real time meter data

#### Periodic Access by CMS Viron

All processes below would be from a CMS Viron Workstation

Port	Used By	In	Out	Reason / Use
21	FTP	X	X	Upload configuration files and images. Download modified files for off-site bacSMCCCDp.
23	Telnet	X		Configuration and maintenance.
5001/5002	Proprietary UI	X	X	Maintenance, programming, system restoration.
10000 to 10999	Proprietary UI		X	Process status communication.

*Note:*

*CMS Viron Web Server and CMS Viron Workstation can be configured for point-to-point communication with meter platform via registered IP address to allow "trusted site" implementation on firewall.*

### Connectivity Requirements

1. Provide a 10BaseT Ethernet connection on the LAN for each UtilityVision panel
2. Assign a static internal IP address (10 dot) for each UtilityVision panel.
3. Assign a public IP address each metering panel.
4. Provide the default Gateway IP Address and the Net Mask Size.

## Summary Table

Port	Used by	In	Out	Reason / Uses
21	FTP	X	X	<p><b>Inbound</b> communications are used for:</p> <ul style="list-style-type: none"> <li>• Configuration files and images.</li> </ul> <p><b>Outbound</b> communications are used for:</p> <ul style="list-style-type: none"> <li>• Send out accumulated trend data at regular intervals. (Daily is typical)</li> <li>• For daily transfer of data trended in 15-minute intervals, file size is in the range of 6 KB per meter (Note: Meter platform may support multiple meters. Multiply 6 KB by the number of meters monitored by the platform to obtain nominal file size)</li> </ul>
23	Telnet	X		System configuration and maintenance. Necessary for moving and editing configuration files, setting parameters, editing web page files, and viewing error log files for system troubleshooting.
80	WWW	X	X	<p><b>Inbound</b> communications are used for:</p> <ul style="list-style-type: none"> <li>• Meter platform system configuration.</li> </ul> <p><b>Outbound</b> communications are used for:</p> <ul style="list-style-type: none"> <li>• Provide real time meter data.</li> </ul>
5001	Meter Platform Proprietary Interface Software	X	X	<p><b>Inbound</b> and <b>Outbound</b> communications are used for:</p> <ul style="list-style-type: none"> <li>• Meter platform system configuration and maintenance.</li> <li>• Custom system programming.</li> <li>• Meter platform system bacSMCCCDp and restore.</li> </ul>
5002	Meter Platform Proprietary Interface Software	X	X	<p><b>Inbound</b> and <b>Outbound</b> communications are used for:</p> <ul style="list-style-type: none"> <li>• Meter platform system configuration and maintenance.</li> <li>• Custom system programming.</li> </ul>

**Summary Table (concluded)**

Port	Used by	In	Out	Reason / Uses
10000 to 10999	Meter Platform Proprietary Interface Software		X	Communication from custom system processes providing information about process operation and status.

**Baseline Maintenance**

One common reason that energy savings can appear to decrease over time is due to a dynamic facility. Adjustments must be made to the baseline if the true savings derived from the ECM's are to be accounted for when a facility is modified for reasons outside the scope of the performance contract. Typical changes to facilities include (but are not limited to):

- Occupancy Schedule Changes
- HVAC Schedule Changes
- Additional Miscellaneous Equipment (e.g., computers, copiers, lab equipment)
- New HVAC Equipment
- Additions to Buildings
- Remodeled Buildings
- Demolished Building

As the Client informs CMS Viron of any changes to the facility that may affect energy use, CMS Viron will quantify the effects of the changes on the overall energy use of the facility. The additional calculated monthly usage will be presented to the Client for review and approval, and then added to the baselines for use in the savings calculations.

If excess time is required to calculate the effect of large scale changes, the Client may be asked to pay for the time involved or, alternatively, agree to another form of savings calculations for the areas affected by the change. CMS Viron's Capitalized Monitoring Fee includes the cost of calculating baseline adjustments for 6 demolished buildings, 4 new buildings, 6 major remodel buildings, the Cañada College ventilation adjustment, and the addition of cooling at one campus.

**Electronic Monitoring of Building Automated Control System (BACS)**

Remote electronic monitoring of a client's BACS is the only pro-active mechanism available to detect and prevent increasing energy consumption. Therefore, it is a very important part of CMS Viron's Guaranteed Savings Program.

Start-up activity includes:

- Software and hardware setup

- Data logging report

Monthly activity includes:

- Review temperature trends
- Review digital inputs
- Review week schedules
- Review holidays and daylight savings time changes
- Phone calls

The overall purpose of the call-up is to help ensure the correct operation of the BACS. Our technicians look for changes to the program outside the current scope or areas that are not achieving the expected temperatures or setbacks, which may indicate BACS or HVAC equipment failure. When differences or difficulties are found, they will notify the Client and work with them to make any necessary corrections.

### **Toll-Free Access to BACS Help Desk**

Each Client will have at least one Monitoring Technician who is very familiar with their particular BACS and facility. Most of CMS Viron's Clients use the expertise of these technicians to help them with questions about or problems with their BACS. The technicians can also help with physical and program changes or expansions to the system.

### **Site Visits**

In addition to the continued presence of the Energy Resource Manager, additional CMS Viron personnel will perform regular site visits. This is our opportunity to interface with the administrative, maintenance, and custodial staff face-to-face to see firsthand how the energy program is operating. It also gives us an opportunity to look for additional ECM's.

Some of the services performed by the ERM and other personnel during our time on-site may include:

- Review project status with client
- Give presentations to Boards
- Inquire re: past and future changes
- Inspect all ECM's
- Provide additional BACS operator training
- Take quantitative measurements
- Look for additional ECM's
- Review and inspect O&M's

## Optional Extended Services

### BACS Scheduling and Alarms

One of the more extensive optional services that could be of great benefit to the SMCCCD is to have CMS Viron handle its BACS scheduling and Alarms. Under a variety of scenarios, schedule changes to the BACS could be handled centrally from CMS Viron's Remote Monitoring Center. Changes due to class schedules would be input at the start of each semester, as well as a defined number of changes each month to handle changes and special events. In addition, CMS Viron will assist the SMCCCD in creating an Energy Help Desk. SMCCCD students, staff, and patrons can call or email the Energy Help Desk to report energy related problems, temperature problems, equipment problems, or schedule changes to the buildings.

Another possibility would be for our trained technicians to receive BACS alarms and perform the first analysis of the alarm to check for severity and attempt a remote diagnosis. Once filtered, SMCCCD personnel would be notified immediately as to the nature and, hopefully, potential solution, to the problem. SMCCCD personnel can spend their time fixing the problems, not searching for them.

*The Recommended Base includes many services that will be a benefit to the SMCCCD and help ensure the long-term success of this program. CMS Viron's Monitoring Department has additional offerings that the SMCCCD may benefit from as well, some of which will help to meet additional stated goals.*

- **The training of SMCCCD Staff and their efficiency with the newly installed equipment may be enhanced by filtering alarms and EMS schedule changes through CMS Viron's Remote Monitoring Center.**
- **A detailed Energy Awareness Plan could be enhanced through the offering of educational programs and the development of an Energy Help Desk.**

### Energy Resource Manager

As part of the ongoing commitment to our customers, CMS Viron Energy Services assists in reducing energy costs by actively monitoring the installed ECM's along with facilities operations and energy consumption. We can maximize this goal by adding an on-site Energy Resource Manager (ERM), dedicated to the SMCCCD and this program.

The ERM will work in conjunction with CMS Viron's centralized Monitoring Department to ensure that the buildings are operating properly and that energy savings are realized. While facility staff is usually focused on occupant comfort, the ERM will also focus on ensuring that equipment is turned off when not needed, and will work with the SMCCCD to investigate and resolve heating and cooling problems.

In addition, the ERM will have the time, opportunity, and in-depth knowledge of the buildings and systems that will facilitate ongoing recommendation for energy savings opportunities, whether it be additional installed equipment or behavioral modifications.

The ERM typically has the following duties and responsibilities depending on what the customer's needs are:

- Continually monitoring the ECM's installed to ensure proper operation.
- Identify additional energy savings opportunities. Promote general energy awareness and behavioral modification strategies to generate additional savings.
- Track and quantify changes to the facility energy consumption for baseline maintenance.
- Promote the program within the SMCCCD and to the community and beyond.
- Assist customer maintenance staff in troubleshooting HVAC and control failures both from the BACS operator workstations and on-site.
- Optimize operating sequences for energy savings. Field test control points as necessary to verify ongoing proper operation.
- Coordinate training and education for District HVAC staff and District teachers and students relating to the Energy Conservation Measures installed, and to general energy conservative behaviors.

### **BACS Operator Training**

CMS Viron has observed that turnover in facilities management personnel can lead to an incongruity in the degree of utilization of building automated control systems installed as part of performance contracts and, in fact, presents a threat to sustained energy savings. To hedge this risk, CMS Viron will provide the Client with supplemental annual BACS Operator training through the Monitoring Department.

Newer Client personnel will be trained on the more basic aspects of the automation system installed, and its specific application to the Client's facilities. This training may be performed off-site at the automation system vendor's training facilities. In this case, course fees and travel per-diem will be paid by CMS Viron.

More experienced facility management staff will be progressively trained on the more complex and esoteric aspects of their automation system, targeting ways to improve the efficiency with which they perform their day-to-day duties. This training will typically be performed by CMS Viron personnel at the Client's facility for up to 3 operators.

It has been our experience that performance contracts with customers who take an interest in their automation system and strive to maximize its utilization exceed performance expectations.

## **Energy Awareness and Education Program**

CMS Viron has proposed an Energy Resource Manager, (ERM) under the base M&V program. In addition to this individual's performance monitoring responsibilities, the ERM would work with CMS Viron's Education Manager to coordinate the implementation of an Energy Awareness and Education program. CMS Viron would work with the SMCCCD to establish energy guidelines and policies that will promote positive energy and environmental ethics at SMCCCD. This program will help increase monetary savings through involvement of a "people program" creating a positive environmental benefit by using less energy consumption, creating less pollution, improving the working and teaching/learning conditions in the facilities. Viron will assist SMCCCD in producing informational publications to educate and inform the community about progress.

## **O&M Training**

This training program is directed toward the Client's maintenance and custodial staff, to encourage their active participation in the energy conservation program. Hardware improvements such as a BACS or a lighting project save a tremendous amount of energy; however, there is a portion of savings that exists during the occupied times that can be achieved through occupant participation.

The first step of this training program is to form an Energy Team comprised of representatives of the Client's administration, teachers' union, maintenance, and custodial personnel, and a representative of CMS Viron. To initiate the formation of this Team, CMS Viron typically needs to bring two or three key Client representatives to our office for two to three days. This training meeting will cover the formation of the Energy Team, supplemental BACS training, review of installed ECM's and associated parameters such as night setback schedules, O&M management, and monitoring procedures. This training includes participation from CMS Viron's Project Team as well as Monitoring personnel.

Start up activity includes:

- Bringing 2-3 designated client personnel to CMS Viron for training
- Supplying floor plans with HVAC and controls to custodians
- Development of temperature and schedule standards
- Formation of a client energy team (usually consisting of a representative from Administration, Maintenance, Custodial, Teachers' Union, and CMS Viron)
- Set up meetings with Maintenance/Custodial/Teachers

Annual activity includes:

- Review of custodial forms
- Present project results to Energy Team

## **Building Automated Control System Warranty**

We have offered many of our past clients a BACS labor and material warranty for the duration of the program. The warranty can be fit to the needs of the Client.

Some examples include :

- BACS full extended warranty
- BACS material only extended warranty
- BACS recommissioning every 2 years

### **Extended Equipment Warranties and Programs**

Like the BACS, CMS Viron has extended warranties and maintenance programs on HVAC equipment.

Some examples include:

- Boiler and peripheral equipment extended warranty
- Boiler chemical treatment
- Chiller preventative maintenance only
- Chiller and peripheral equipment extended warranty
- Cooling tower chemical treatment

### **Other Monitoring Services**

CMS Viron's Monitoring Department is outfitted with the equipment and expertise necessary to perform a multitude of functions outside the traditional scope listed above. If the Client has a special need, we encourage them to ask us first. If it is a service that we cannot provide, we would be happy to refer them to someone else who can meet that particular need.

Examples of service include:

- Natural gas bulk purchase consulting
- Bill payment service