New IPMVP: Impact on Performance Contracting

Shirley J. Hansen, Ph.D.
CEO, Hansen Associates

ABSTRACT

As an engineer, how do you judge the accuracy of your predictions?

As an owner, how do you know that you are getting promised results?

As a banker or financier, how do you gauge the value of your investments? Or, as an insurance or performance assurance broker, how do you weigh risk coverage?

As an ESCO, how can you look the customer in the eye and tell him how much energy was really saved?

Without measurement, some type of yardstick, we don't know:

- where we have been;
- where we are;
- where we are going; or
- whether we have arrived at our goal.

We cannot compare results unless we have a commonly accepted yardstick… with language we all understand and can use.

The **International Performance Measurement and Verification Protocol (IPMVP)** provides us with just such a yardstick. And the revised IPMVP 2001 does it even better. Furthermore, in the IPMVP "International" is more than a word; for the IPMVP is commonly accepted

around the world.

At the same time, "international" does not make it esoteric—floating on the ethers somewhere over the Pacific. It's local. It's there every day—going hand in hand with the work everyone faces on a daily basis.

Let me bring it home to you:

- without measurement, energy managers have no *program*—just a hodgepodge of best guess opportunities;

- without measurement, engineers, who attempt to predict energy savings without measured feedback, are delusional at best and could even be engaged in fraudulent practices;

- without measurement, bankers and financiers are failing their fiduciary responsibilities;

- without measurement, owners are fools, and ESCOs are the ones fooling them.

Seem a little strong? Think about it. You are a success because you learn from your experiences, but how do you determine the value of those experiences? How do you build on them? How do you *measure* your experiences and add value to your next effort?

Meeting these critical measurement needs, the IPMVP, or MVP as it is more commonly called, has gained worldwide acceptance. The 1997 version was accepted in at least 27 countries and was translated into Bulgarian, Chinese, Czech, Japanese, Korean, Polish, Portuguese, Romanian, Russian, Spanish and Ukrainian. Institutions, such as the World Bank and International Finance Corporation, have found the Protocol beneficial and are incorporating it as a required part of new energy efficiency projects.

In 2001, a revised addition of the IPMVP was issued. It builds on the excellent history and working knowledge gained from previous editions. This new version, developed with input from hundreds of organizations, experts from over 25 countries and countless users of the protocol, will be an even more effective tool in measuring energy savings

MVP AS A WORK IN PROGRESS

Every new version of the MVP incorporates changes and improvements reflecting new research, improved methodologies and improved M&V data, so it is always a work in transition. The people involved with the MVP development intend to make greater use of the web site to provide new and/or modified content, interim revisions to the existing protocol. Comments from users are always welcome and M&V specialists are encouraged to use the web site to review drafts as they are prepared. Continued development and adoption of MVP will involve increasingly broad international participation and management of the document as well as its translation and adoption.

As the chair of the IPMVP Executive Committee, I first want to acknowledge the many hours, almost always on a volunteer basis, and the incredible work so many have put into the MVP 2001, particularly the eleven members of the Technical Committee. Many have worked hard to make the document more workable and the results more reliable. Ease of use has been greatly enhanced by dividing the 1997 edition into three separate volumes: Volume 1, Concepts and Options for Determining Savings; Volume 11, Indoor Environmental Quality (IEQ) Issues; and Volume III, Applications. We are still working on Volume 111; however, the other two volumes are available on our web site: ipmvp.org.

Before we consider the M&V options available in the MVP, there is a small semantics problem that needs our attention. I already mentioned the need for a language that is commonly understood. Unfortunately, there are a few people making a big deal out of the fact that you can't really measure what's not there—and savings are not "there." Good grief!! If you leave the house with $5, purchase something, and return home with $2 in your pocket, do you know how much you spent while you were out? Now, the $3 is not there anymore, but it does not take genius to figure out how much is not there. They taught us how to figure that in second grade. So let's not get off the track with such a silly semantics exercise.

KEEPING TRACK

Before we get into the details regarding specific 2001 revisions, it is probably advisable to discuss the general framework of the MVP.

MVP General Framework

The framework is built around four M&V options. Those options are:

Option A. Partially Measured Retrofit Isolation

Savings are determined by partial field measurement (some, but not all, parameters may be stipulated) of the energy use of the system(s) to which an energy efficiency measure (EEM) is applied, separate from the energy use of the rest of the facility. Measurements may be either short-term or continuous. This option involves the isolation of the energy use of the equipment/system affected by an EEM from the rest of the facility.

Option B. Retrofit Isolation

The savings determination techniques of Option B are identical to those of Option A except that no stipulations are allowed under B. Full measurement is required. Savings are determined by field measurement of the energy use of the systems to which the EEM is applied, separate from the energy use of the rest of the facility. Short-term or continuous measurements are taken throughout the post-retrofit.

Option C. Whole Building

Option C is often referred to as the "Whole Building" approach; however, this option can be used for part of a building. It determines the collective savings of all EEMs applied to that part of the facility monitored by a single meter, Short-term or continuous measurements are taken throughout the post-retrofit period. Option C usually relies on continuous measurement of whole-facility energy use and electric demand for a specific time before retrofit (base year) and continuous measurement of the whole-facility energy use and demand, post-installation. Measurements may be taken on a periodic basis if acceptable to all parties involved.

Option D. Calibrated Simulation

Savings are determined through computer-based simulation of the energy use of components of the whole facility. Simulation routines must be calibrated so they predict an energy use and demand pattern that reasonably matches actual energy consumption. Caution is warranted, as this option typically requires considerable skill in calibrated simulation and considerable data input; so the process can be quite costly.

CHANGES IN THE IPMVP 2001 VERSION

Based on extensive user feedback, the new version provides greater internal consistency and more precise definitions of M&V Options. The MVP Executive Committee felt so strongly about some definitive adherence language that the group took it upon itself to draft that part of the new document. Several major changes have been made which could have a big impact on how savings are calculated and reported.

In addition to the fact that the 2001 version is now presented in three volumes, which should make the options selection much easier, new features include:

- Adherence language with specific steps to follow for a contractor to claim adherence to the MVP; Guidance in using the basic approach and preparing a good M&V plan; Clarification of the term "stipulation" and its acceptable use within the MVP framework;

- How to establish the base year and further guidance regarding "adjustment" to bring energy/demand baseline to the same set of conditions for pre- and post-retrofit;

- A new Volume II on improving indoor environmental quality while implementing energy efficiency measures; and

- Greater internal consistency and clearer directions for using the Options, particularly Option A.

CAUTIONS RELATED TO OPTIONS A AND B

In the 1997 MVP version, Option A allowed significantly more latitude than the new version permits. The 2001 version has significantly tightened the measurement requirements. Some, but not all, parameters can be stipulated under Option A.

Wherever a parameter is not measured in the facility for the base year or post-retrofit period, it should be treated as a stipulated value and the impact of possible error in the stipulation assessed relative to the expected savings. The decision of which parameters to measure and which to stipulate should consider the significance of the impact of all such stipulations on the over all reported savings. Stipulated values and the planned engineering procedures to analyze their significance should now be included in the M&V Plan.

Caution should be used in making comparisons with the results of Options A and B. They are intended to measure the energy use of each *separate* ECM. **The calculated savings from a combination of measures are not additive**. Each time a measure is implemented the total energy consumption "pie" is reduced and the successive measure(s) will have proportionately less potential to save. If Options A and B are used to validate engineers' predictions which have been calculated in combination, the measures must be considered in the same order as used by the engineer in making his/her predicted savings calculations.

Similarly, some measures have interactive potential with other measures. The classic example is the shift away from incandescent lamps. Over the years, we have described incandescent lamps as heat sources that just happened to give off light; so it is very obvious that changing out those lamps is going to affect the heating and cooling loads in a facility. When engineers are doing a quality audit, an Investment Grade Energy Audit, and calculate aggregate savings, they must take this into consideration. Any M&V comparisons to the engineer's work must also take this into account.

IMPACT ON PERFORMANCE CONTRACTING

The MVP is a guidance document. Other than a reference point representing industry consensus as to standards of practice, it does not have the legal standing. Its legal impact is rooted in any reference to it

in a performance contract. For that reason, one of the key revisions is the adherence language in section 3.5. If the contract calls for MVP compliance, or a contractor claims MVP compliance, this sections spells out exactly what is required to assure that compliance.

The adherence language speaks specifically to the method, the plan and calculation details needed. The new MVP spells out more completely factors to consider in the approach and in the plan. For reference, the critical ingredients of the Basic Approach and the M&V Plan are presented in Attachments A and B.

The revisions most apt to impact performance contracting include:

1. ESCO customers have better information and guidance. The Basic Approach and the M&V Plan directions will discourage some M&V specialists inclination to "embellish" the process, which has happened too often in the past.

2. Adherence language will help ESCOs *and their customers* understand exactly what is required to fully comply with the MVP.

3. Regarding the more technical aspects, Option A has tighter requirements. ESCOs, which have often relied too heavily on stipulations in the past, will be required to provide some measurements.

4. The calculation of savings depends on a clearly defined reference point. More specific directions as to how the base year should be established and the annual baseline adjusted will avoid the 20/20 hindsight problems that have too often sought resolution in court. A clear distinction is made between the historical base year and the annually adjusted *baseline*.

5. The M&V guidelines, regarding the Basic Approach, the M&V Plan outline, and the adherence language, will bring consistency across the industry as to what is required when using the MVP and what the results really represent. For example, the anticipated error in stipulation procedures must be part of the M&V Plan.

6. All parties using the revised MVP will be able to place more confidence in the results.

7. ESCOs will be less inclined to go with the excessive M&V plans offered by some M&V "specialists"; e.g., some M&V people suggest they should be involved in the initial planning before energy efficient measurements are even known and/or want to develop a base year for the entire facility even if it means gathering data that won't be needed for the project.

8. A weakness in the MVP will also impact ESCOs—in a negative sense. In fact, it is most apt to hurt the more effective ESCOs, who offer key services, if care is not exercised. The MVP focuses on specific measures. Services related to these measures need to be incorporated into the calculations process. Measuring savings from procedures outside specific energy efficiency measures, such as more energy efficient O&M practices on energy-related equipment, must be conscientiously treated in some fashion.

WHEN M&V JUST ISN'T WORKING

The best laid plans of mice and men… happen in M&V, too. When it does, the first step is for the parties involved to sit down calmly and discuss it. If a good communications plan has been effectively implemented, this is the time when it really pays off. Too often, some rather hysterical circular finger pointing gets started and nothing is resolved.

First of all, be realistic about the accuracy of the M&V procedures offer. Some Options only offer ±10-20% accuracy. Do not expect more than the plan promised to deliver.

Experience suggests that if the M&V is not yielding the expected results, the most likely culprit is the original base year calculations and/or the baseline adjustment provisions. Next on the list is a search to determine if any modifications in the facility or procedures, which affect energy consumption, have been made and not reported. An examination of operations and maintenance practices and any changes that may have been implemented could be crucial.

After these more sweeping possibilities have been eliminated, an examination of the individual energy efficiency measures (EEMs) should be made. If whole building Options C or D have been used, then isolating suspected EEMs and measuring the respective consumption might be warranted.

The M&V procedures are designed to tell you how much the EEMs saved, or didn't save. **It is not within the M&V report's purview to discuss why the measure did not perform as predicted**. Some "M&V specialists," trying to get M&V business (or related engineering business) tell horror stories about performance contracting or M&V. They often mix up the two procedures. M&V is one thing; an engineering analysis of why it didn't work as predicted is something else. It is possible for the same person, or firm, to perform both services; but it is in the best interests of the owner and the ESCO to keep the processes separated—and avoid the horror peddlers.

If all else fails, it is just possible that the M&V program itself has not done the job. The 8 steps "common to all good savings determination" as outlined in MVP 3.2 may not have been followed. The M&V specialist may not have performed adequately. Getting a *certified* M&V Professional (a program to do this was put in place in April 2002) will be an important precaution.

In summary, M&V protocol may seem complex, but it has a logical order. With a little homework, the process can easily be mastered. It is worth the effort.

TOO MUCH OF A GOOD THING

In considering all these revisions, there is once more the opportunity to get carried away, or for an M&V consultant to get carried away, and engage in more M&V than the project can afford or justify.

In the final analysis, anything can be measured and any savings can be verified if one spends enough money. There is an inclination to overplay M&V aspects, which in turn places a burden on the project. If M&V becomes too costly, the measure will no longer make economic sense. It is always a question of cost vs. accuracy. The owner, contractor (and perhaps the financier) should sit down and agree on what constitutes a *reasonable* level of accuracy. The bottom line is: Just how much accuracy can the project afford and the owner/contractor/financier justify? "*No more than 10 percent of the construction cost*" is a good guideline for M&V. Seldom does a project justify a higher M&V allocation.

ATTACHMENT A

Basic Approach

Built on the premise that proper savings determination is a necessary part of good design of the savings program itself, the MVP offers a step-by-step basic approach to M&V and clear guidance on how a plan should be developed. While the Basic Approach (Section 3.2) is treated in greater depth in the guidelines, the defined steps, which are closely linked with program design, are:

1. Select the IPMVP Option that is consistent with the project scope;

2. Gather relevant energy and operating data (base year);

3. Design the energy savings program;

4. Prepare a Measurement Plan and a Verification Plan if necessary (See M&V Plan discussed in Attachment B);

5. Design, install, and test any special measurement equipment;

6. Inspect installed equipment and operating procedures to assure conformation with design intent;

7. Gather post-retrofit energy and operating data; and

8. Compute and report savings in accordance with the M&V Plan.

[Steps 7 and 8 are to be repeated periodically when a savings report is needed.]

ATTACHMENT B

The M&V Plan

Of particular importance to ESCOs and their potential customers is the increased detail in preparing an M&V Plan. The Plan is central to proper savings determination and the basis for verification. Advance planning ensures that all data needed for proper savings determination will be available after implementation of the energy savings program, and conducted within an acceptable budget.

An M&V Plan should include the following items. For greater detail see section 3.3 in the MVP.

- Procedures for establishing and preserving base year data; i.e., documentation of the facility's base year conditions and resultant base year energy data. (A walk-through scoping energy audit is definitely not adequate.)

- An identification of any planned changes to conditions of the base year; e.g., intention to change the maintained night time temperatures.

- A description of the energy efficiency measures (EEMs) and the intended results.

- An identification of the boundaries of the savings determination; i.e., flow through a pipe or the total energy use of one or many buildings.

- Identification of the post-retrofit period.

- The set of conditions to which all energy measurements will be adjusted.

- Design intent of the EEMs and the commissioning procedures that will be used to verify successful implementation of each EEM.

- Specify which Option(s) will be used to determine savings. If more than one Option is used, describe procedures to eliminate the double counting of savings.

- Specify data analysis procedures, algorithms and assumptions.

- Specification of any metering points, period(s) or metering, meter characteristics, meter reading and witnessing protocol, meter commissioning procedure, routine calibration process and method(s) of dealing with lost data.

- For Option A, report the values to be used for any stipulated parameters. Show the overall significance of these parameters to the total expected savings and describe the uncertainty inherent in the stipulation.

- For Option D, report the name and version number of the simulation software to be used.

- Specify the quality assurance procedures to be used.

- Document the expected accuracy associated with the measurement, data capture and analysis. Also describe qualitatively the expected impact of factors affecting the accuracy of results but which cannot be quantified.

- Specify how results will be reported and documented.

- Specify the data which will be available for another party to verify, if needed.

- For anticipated future changes, indicate methods for making relevant nonroutine baseline adjustments.

- Define the budget and resource requirements for the prescribed savings determination. Specify initial setup costs and ongoing costs for the indicated port-retrofit period.

While the list seems extensive and detailed, complying with these recommended M&V Plan guidelines will avoid difficulties and misunderstandings later.

The comments presented in this article are personal observations and do not necessarily represent positions taken by the IPMVP.

ABOUT THE AUTHOR

Shirley Hansen, Ph.D., is increasingly active in the international ESCO world, having now worked in 22 countries in the past 7 years. But she finds time to keep tabs on ESCO activities in the U.S. and is particularly intrigued by the "rereg" scene and its impact on ESCOs. Shirley is executive vice president of Kiona International and CEO of Hansen Associates. Both firms specialize in all facts of performance contracting.

Dr. Hansen serves as chair of the executive committee of the International Performance Measurement and Verification Protocol. (Her comments do not necessarily represent the position of the IPMVP.)

Shirley J. Hansen, Ph.D.; Executive Vice President; Kiona International; 8506 Shawnee Place, N.W., Gig Harbor, WA 98335; (253) 265-3150; fax 3152; kionaintl@aol.com