



Making every day a better day

Dispute Mitigation:
Standardization of M&V
Protocol in ESCO
Agreement

ESCO Project: Identify the FERTILE EGG !!

Not all energy efficiency initiatives may qualify for a viable ESCO project. ideally a project with quantifiable but simple **Monitoring & Verification (M&V) methodology** would best qualify for an ESCO project.

M&V: Count your Chicken before they are hatched !!

Though ESCO project is primarily an engineering intervention, commercial aspects MUST be the KEY focus of an ESCO contract. The M&V proposed in the agreement should be **accurate** and **consistent** enough to ensure the expected projected cash flow for the ESCO with minimum deviation. It should also consider all **relevant** variables which may affect the estimated energy cost savings.



“You can not manage what you can not measure” - Jack Welch, CEO General Electric

Arguably the two most essential elements for a successful ESCO agreement are **Monitoring & Verification**. Most ESCO agreements are drafted based on **International Performance Measurement & Verification Protocol** (IPMVP). The protocol states

“The long term success of energy management projects is often hampered by the inability of the project partners to agree on an accurate, successful M&V plan..... M&V protocol discusses procedures that, when implemented, help buyers, sellers and financiers of energy projects to agree on an M&V plan and quantify savings from energy conservation measure (ECM) projects.” - [\(IPMVP, Volume I, March 2002\)](#)



PRINCIPLES OF M&V

Accurate *M&V* reports should be as accurate as the *M&V* budget will allow.

Complete The reporting of *energy savings* should consider all effects of a project. *M&V* activities should use measurements to quantify the significant effects, while estimating all others.

Conservative Where judgments are made about uncertain quantities, *M&V* procedures should be designed to under-estimate *savings*.

Consistent The reporting of a project's *energy* effectiveness should be consistent between:
different types of *energy* efficiency projects; □ different *energy* management professionals for any one project; □
different periods of time for the same project; and □ *energy* efficiency projects and new *energy* supply projects.

'Consistent' does not mean 'identical,' since it is recognized that any empirically derived report involves judgments which may not be made identically by all reporters. By identifying key areas of judgment, IPMVP helps to avoid inconsistencies arising from lack of consideration of important dimensions.

Relevant The determination of *savings* should measure the performance parameters of concern, or least well known, while other less critical or predictable parameters may be estimated.

Transparent All *M&V* activities should be clearly and fully disclosed.

HURDLES FACED: INDUSTRY EXPERIENCE

Following factors should be considered while drafting a new ESCO M&V contract to reduce dispute.

- ☐ **Commitment from Client**
- ☐ **Factors Affecting Savings Performance**
- ☐ **Evaluating Savings Uncertainty**
- ☐ **Minimum Operating Conditions**
- ☐ **Energy Prices**
- ☐ **Verification by a Third Party**
- ☐ **Baseline Adjustments (Non-Routine)**
- ☐ **Balancing Uncertainty and Cost**



COMMITMENT FROM CLIENT

The most important component of any ESCO contracting process does not even involve the ESCO, but rather precedes the contract. All areas of the company (client) who will be effected by the initiatives under the ESCO contract must be a part of the complete process.

As ESCO contracts are primarily commercial documents, Engineering & Facility personals are not the key to the success of the project even though they are very important. The actual KEY areas that must be included from the very start are Chief Executive Officer (CEO), Chief Financial Officer (CFO) and legal counsel representative.

The reason for the importance of CEO, CFO & legal counsel at the inception of the discussion/planning stage is they will be signatories to or approve directly any ESCO request for proposal (RFP)/ contract that is structured. Engineering and Facility personal are certainly key to any successful ESCO contract however there is technical as opposed to functional as far as contract structure is concerned.

REAL LIFE EXPERIENCE: CONTRACT WAS
REJECTED AS IT WAS NOT SIGNED BY
APPROPRIATE AUTHORITY
RESULT: TERMINATION W/O COMPENSATION



FACTORS AFFECTING SAVINGS PERFORMANCE

Since parameters within ESCO project boundary are mostly dynamic. Following factors direct or indirect impact on the performance of the equipment and achievement of savings. Hence, when planning an M&V process, consideration should be given to 1) **predictability**, 2) **measurability** and 3) **likely impact of all plausible factors** in each category below:

- a. Weather
- b. Occupancy level, schedule
- c. Installed equipment intensity, schedule
- d. Occupant or user demand for services (e.g. space temperature, plant throughput)
- e. Ability of the ECM as designed to achieve the intended savings
- f. ECM implementation effectiveness in meeting the design intent
- g. Occupant or operator cooperation in using ECM related equipment in accordance with direction
- h. Occupant or operator cooperation in using non-ECM related equipment in accordance with direction
- i. Equipment deterioration, both ECM related equipment and non-ECM related
- j. Equipment life, both ECM and non-ECM related

**REAL LIFE EXPERIENCE: REAL SAVINGS
DEVIATES FROM ESTIMATED SAVINGS AS
DEGREE DAYS WERE NOT CONSIDERED FOR
SPACE HEATING PROJECT
RESULT: DISPUTE & LOSS OF REVENUE**

EVALUATING SAVINGS UNCERTAINTY

The measurement of any physical quantity includes errors because no measurement instrument is 100% accurate. Errors are the differences between observed and true *energy* use. In a *savings*-determination process, errors prevent the exact determination of *savings*. Equation usually involves at least two such measurement errors (*baseline* and *reporting period energy*), and whatever error exists in the computed adjustments. To ensure that the resultant error (uncertainty) is acceptable to the users of a *savings* report, be certain to manage the errors inherent in measurement and analysis when developing and implementing the *M&V Plan*.

Characteristics of a savings determination process which should be carefully reviewed to manage accuracy or uncertainty are:

- ☐ Instrumentation
- ☐ Modelling
- ☐ Sampling
- ☐ Interactive effects
- ☐ Estimation

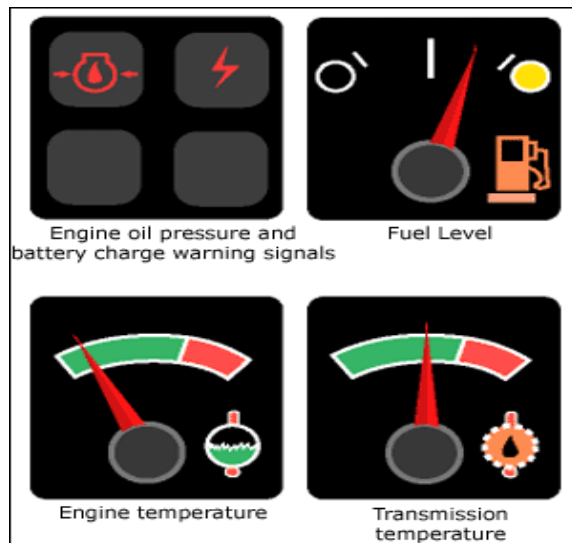
REAL LIFE EXPERIENCE: UNCALIBRATED EQUIPMENT
USED FOR BASELINE MEASUREMENT; SAMPLE EVENT
NOT REPRESENTING THE WHOLE POPULATION – HIGH
UNCERTAINTY.
RESULT: DISPUTE WITH CLIENT



MINIMUM OPERATING CONDITIONS

An energy efficiency program should not compromise the operations of the facility to which it is applied without the agreement of the facility users, whether building occupants or industrial process managers. Key user parameters may be: light level, temperature, ventilation rate, compressed air pressure, steam pressure and temperature, water flow rate, production rate, etc.

Therefore the M&V Plan should record the agreed conditions that will be maintained.

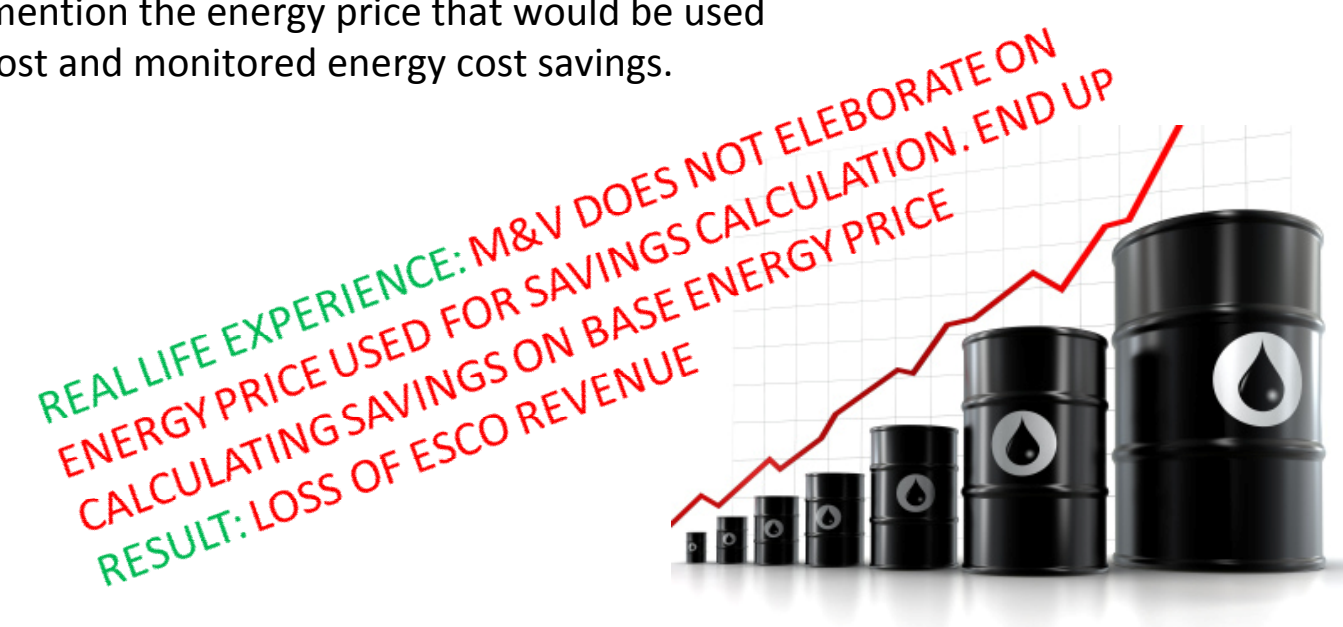


**REAL LIFE EXPERIENCE: M&V DOES NOT RECORD
BASELINE OPERATING CONDITIONS. CLIENT SAYS
ESCO PROJECT CHANGED OPERATING
CONDITION, HAMPERS PROCESS.
RESULT: DISPUTE WITH CLIENT, HURDLE IN ESCO
CASH FLOW**

ENERGY PRICES

Energy cost savings may be calculated by applying the price of each energy or demand unit to the determined savings. The price of energy should be the energy provider's rate schedule or an appropriate simplification thereof. Appropriate simplifications use marginal prices which consider all aspects of billing affected by metered amounts, such as consumption charges, demand charges, transformer credits, power factor, demand ratchets, early payment discounts.

M&V should clearly mention the energy price that would be used for baseline energy cost and monitored energy cost savings.



VERIFICATION BY A THIRD PARTY

An energy performance contract requires that both parties (Client & ESCO) believe the information on which the payments are based is valid and accurate. An experienced third party may be helpful to ensure agreement of measurement validity. Should conflicts arise over the course of the project payback period, this third party can help to resolve differences. Third party savings verifiers are typically engineering consultants with experience and knowledge in verifying Energy Conservation savings, Energy Conservation technologies and, where relevant, energy performance contracting. Many are members of industry professional societies, though there is not yet any accreditation program for M&V professionals.



REAL LIFE EXPERIENCE: M&V DOES CONSIDER
THIRD PARTY VERIFICATION. DISAGREEMENT WITH
CLIENT ON MONITORED SAVINGS
RESULT: CUMBERSOME LEGAL LITIGATION

BASELINE ADJUSTMENTS (NON-ROUTINE)

Conditions, which vary in a predictable fashion and are significant to *energy* use within the *measurement boundary*, are normally included within the mathematical model used for *routine adjustments*. Where unexpected or one-time changes occur in conditions within the *measurement boundary*, which are otherwise static (*static factors*), *non-routine adjustments*, also called *baseline adjustments*, must be made.

Non-routine adjustments are needed where a change occurs to equipment or operations within the *measurement boundary* after the *baseline period*. Such change occurs to a *static factor* not to *independent variables*.

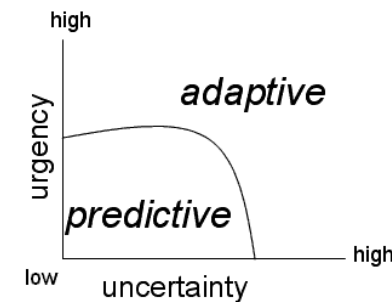
For example, an *ECM* improved the efficiency of a large number of light fixtures. When more light fixtures were installed, after *ECM* installation, a *non-routine adjustment* was made. The estimated *energy* of the extra fixtures was added to the *baseline energy* so that the *ECM's true savings* were still reported.

REAL LIFE EXPERIENCE: CLIENT PROCESS
REQUIREMENT IS DYNAMIC. NON ROUTINE BASE
LINE ADJUSTMENT NOT CONSIDERED IN M&V
CONTRACT
RESULT: REDUCTION IN ESCO SAVINGS

BALANCING UNCERTAINTY AND COST

The acceptable level of uncertainty required in a savings calculation is a function of the level of savings and the cost-effectiveness of decreasing uncertainty. For example, suppose a project has an expected savings of Rs.100,000 per year and that a basic M&V approach had an accuracy no better than $\pm 25\%$ with 90% confidence, or Rs. 25,000 per year. To improve the accuracy to within Rs.10,000 it may be seen as reasonable to spend an extra Rs. 5,000 per year on M&V but not Rs. 30,000 per year. The quantity of savings at stake therefore places limits on the target expenditure for M&V.

Discussions and definitions of site-specific M&V plans should include consideration of accuracy requirements for M&V activities and the importance of relating M&V costs and accuracy to the value of ECM savings. However it should be recognized that not all uncertainties can be quantified. Therefore both quantitative and qualitative uncertainty statements must be considered when considering M&V cost options for each project.



**REAL LIFE EXPERIENCE: M&V COST IS
NOT LINKED TO ENERGY COST SAVINGS
RESULT: LIMITS ESCO CASH FLOW**

“Forget about all the permutations, mutations, clones and other not helpful explanations and life forms of what an ESCO is supposed to be. In my opinion an ESCO is simply a firm that convinces a client from industry or commerce to let the ESCO (i) conduct an energy audit, (ii) prepare an investment grade paper and strategy on how to reduce energy cost in a firm, and (iii) invest in the firm to implement the recommendations, and (iv) prove the energy cost reduction to get paid” - Albrecht Kaupp

Shubhashis DEY

Sr. Manager - Energy

Knowledge Management Cell

Sodexo Food, Facilities & Project Management Services

Reference:

- International Performance Measurement and Verification Protocol Concepts and Options for Determining Energy and Water Savings Volume 1, April 2007
- International Performance Measurement and Verification Protocol Concepts and Options for Determining Energy and Water Savings Volume 1, March 2002
- ESCO: Energy Services Handbook – John M Studebaker, PhD