

How long is a piece of string?

Karthik Suresh, committee member of the UKAEE and a director at Ameresco, discusses the art and science of checking energy savings



My colleagues and I waited for our turn with a length of green, slightly frayed string and a selection of measuring tapes. We were halfway through the second day of a course on measurement and verification delivered by Rajvant Nijjar and, for the first time, I was literally going to measure a piece of string to understand the statistical principles behind measuring energy savings, such as variance, precision and error.

We were studying for the Certified Measurement and Verification Professional (CMVP) qualification, established by the Association of Energy Engineers (AEE) and the Efficiency Valuation Organization (EVO). It is run in the UK by the Energy Services and Technology Association (Esta).

Energy savings from a project cannot be directly measured

The first thing we learned was that energy saving from a project cannot be directly measured. The savings represent a lack of use or an absence of consumption. All you can really measure is the energy use after the project has been implemented and make adjustments.

There is often confusion about how much energy has been saved

The usual starting point for any calculation of savings is to compare last year's energy use with this year's energy use and calculate the difference. One number is likely to be higher than the other, and this leads

one to draw a conclusion: energy has been saved, or it has not been saved. The project is a success, or it is a failure.

Donald J Wheeler, in his excellent book *Understanding Variation: The Key to Managing Chaos*, says this: "While it is simple and easy to compare one number with another number, such comparisons are limited and weak. They are limited because of the amount of data used and they are weak because both of the numbers are subject to the variation that is inevitably present in real world data."

Accountants use flexible budgets to explain variances

The accounting profession has the most familiarity with the process of budget setting. At the start of the



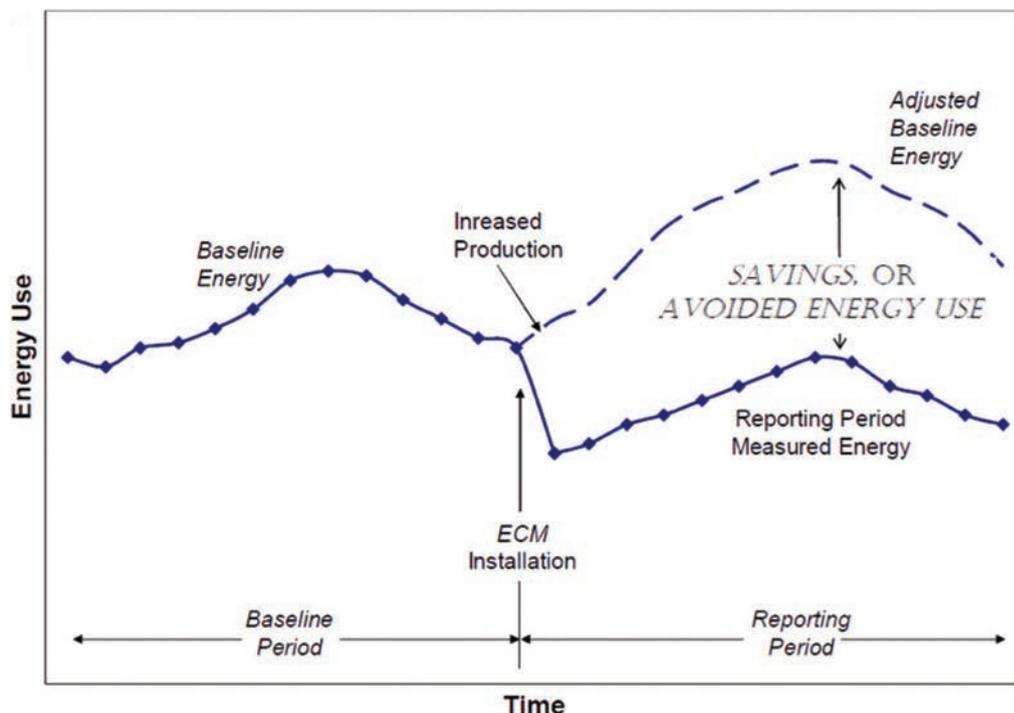
IPMVP... helps build confidence that the savings stated in the project proposal will be delivered

year, accountants create a budget, called a static budget, based on the information available at the time, such as last year's production output. At the end of the year, they compare this budget with the actual figures and analyse the variance between items. This can often lead to differences that need to be explained. Why do the actual figures not match the budget?

A flexible budget adjusts the static budget based on the actual level of output. By using this year's production output in the budget instead of last year's, the accountant can compare this year's actual figures with the adjusted budget based on the same production figures. This removes variances related to the amount of production, and allows the accountant to focus on variances that are significant, like a change in the market for the product, or an increase in material costs.

Measurement and verification professionals determine savings using the same method but with different terminology

The crucial step in a flexible budget, as used by



Source: Concepts and Options for Determining Energy and Water Savings Volume 1 2012, IPMVP, page 7

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accountants, is determining what the budget would have been, had they known what they knew at the end of the period about the factors that could affect the budget.

Determining what would have been the energy use had the energy saving project not been implemented is the crucial step in applying the IPMVP protocol, as shown in the graph below left.

The baseline period is the time period before the energy project, referred to in the industry as an Energy Conservation Measure (ECM), has been installed. Once the ECM is installed, you can measure the actual energy usage during the reporting period. You then determine what the energy use would have been had the ECM not been installed, and the difference between these is the saving, expressed by the IPMVP's equation:

$$\text{Savings} = (\text{baseline period use or demand} - \text{reporting period use or demand}) \pm \text{adjustments}$$

What are adjustments?

Adjustments account for the difference in conditions between the baseline period and the reporting period. They correspond to the adjustments made to a static budget to create a flexible budget. The IPMVP sets out how these adjustments can be made using statistical techniques to derive relationships between energy use and factors such as weather to create an accurate, complete, conservative, relevant and transparent assessment of the energy savings from the project.

The IPMVP takes a professional approach to valuing energy savings

The IPMVP is not a prescriptive approach that just tells you how to calculate savings. An M&V plan that adheres to the IPMVP will set out an approach for determining energy savings

from a project on the basis of measurements before and after the project is implemented. This helps build confidence that the savings stated in the project proposal will be delivered.

This is particularly important when the project has been financed by a third party, such as an energy services company (Esco) that receives payments based on guaranteed savings.

Internal projects too, however, can benefit from adhering to the principles set out in the IPMVP, by demonstrating that savings are truly being delivered through an energy efficiency programme.

EVO has a library of information available for users

EVO is a group of volunteers that developed and maintain the International Performance Measurement and Verification Protocol (IPMVP). The IPMVP started life in 1996, sponsored by the US Department of Energy, and in 2002 was transferred to an independent non-profit corporation that aims to help determine energy savings from energy efficiency projects in a consistent and reliable manner.

The IPMVP framework has been applied to thousands of projects around the world, and EVO makes much of its material available through its website at <http://evo-world.org>, including the IPMVP documentation and example M&V plans.

In the UK, CMVP training is at <http://www.esta.org.uk/RESOURCES/TRAINING/teukaae.org.uk>

The UKAEE is the UK chapter of the AEE and membership of this fast growing organisation dedicated to supporting energy professionals is currently free. UKAEE provides Esos lead assessor status through the AEE's internationally recognised Certified Energy Manager (CEM) or Certified Energy Auditor (CEA) qualification



By Danny Parr (above), business improvement manager at ScottishPower

At ScottishPower, we're proud to lead the way in an ever-evolving commercial energy marketplace. For us, it's about understanding the needs of the sector and the people at the heart of it.

Working directly with our Sales Partners, we understand the integral role they play in connecting businesses with the best providers for their needs. That's why we're investing in new services, products and innovative technologies to ensure the relationship between business, Sales Partners and energy suppliers remains seamless and straightforward.

Putting you in control

ScottishPower is committed to helping our customers and intermediaries navigate and understand the industry. We regularly evaluate and update our commercial energy offering and implement new and innovative technologies to make sure our services are relevant and provide an effective resource in a growing digital landscape.

Recent research showed us that having a simple way to monitor, track and progress sales, was something both Sales Partners and customers felt was missing in the commercial energy market. We took this feedback on board

and created the ScottishPower Commercial Energy Portal, tailored to these needs. The portal allows you to view all data, sales and renewals in one place, helping you manage your portfolio needs efficiently and effectively.

Committed to customers

We have also launched a dedicated version of the online portal for our customers which gives businesses direct access to their energy consumption, bills and contract information. The portal puts the customer in control, helping them to make adjustments to benefit their business, save time and, most importantly, money.

At ScottishPower, we are at our customers' side every step of the way, both on and offline. Our strong service performance means we have an over 95% satisfaction rate among our customers. This is thanks to our team of commercial energy experts, who are on hand to support you whether you are transitioning to the new P272 requirements or need help assessing your business' energy consumption.

We will be exploring these subjects in more detail in future editions.

For information on the services available for ScottishPower commercial energy customers, please visit: www.scottishpower.co.uk/commercial-business/

