

## Stipulations in Performance Contracting M&V: The Good, the Bad, and the Ugly.

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### ABSTRACT

Performance contractors (PC) often use stipulations for part or all of their measurement & verification (M&V) efforts. The value of stipulations are low cost and easy implementation (good). Disadvantages include uncertain savings estimates (bad) and potential for disputes and lawsuits (ugly). PCs and customers sometimes misuse or abuse stipulations either by stipulating the savings directly or stipulating parameters based on limited or unreliable information. Since the purpose of M&V is to provide assurance that project savings exist, improper and excessive reliance on stipulations may effectively nullify savings guarantees and also miss opportunities to assure measure performance by using verification data for feedback. A review of PCs in the federal sector shows significant reliance on stipulations; private-sector PCs are presumed similar. Recognized M&V guidelines such as the IPMVP, and FEMP discuss the use of stipulations. Recent changes to the IPMVP and FEMP guidelines resulted in diverging attitudes towards stipulations with the IPMVP now requiring some measurements. In response, FEMP is developing guidelines for using stipulations in federal-sector performance contracts that can be applied to private-sector PCs as well. Proper use of stipulations requires balancing costs with savings uncertainty.

### M&V IN PERFORMANCE CONTRACTING

Performance contracting is the practice of selling *energy services* that reduce the customer's utility bill; it is not just selling and installing energy-efficient equipment. Performance contracts are structured using a variety of contractual approaches- shared savings, guaranteed savings, chauffage, lease-purchase, etc. In a shared savings contract, the energy service company (ESCO) is paid a share of the verified energy and cost savings during the contract term with the customer retaining the balance. In a guaranteed savings contract, the ESCO is paid a fixed amount so long as the savings exceed a specific threshold. The customer retains savings in excess of this amount.

Measurement & verification (M&V) activities are primarily used to estimate and demonstrate to the customer that the project is working as intended and is generating savings. With a shared-savings approach, it is in the ESCO's interest to estimate the

savings with reasonable certainty (and to maximize savings) as their payments are tied to the savings. In a guaranteed savings arrangement, ESCOs have a somewhat different motivation since M&V activities only need to show that the savings guarantee has been met. These different payment schemes require different levels of M&V rigor. M&V for a shared-savings project must be rigorous enough to reliably estimate savings; M&V for a guaranteed savings project requires less rigor. In some cases, it may be in the ESCOs interest to do little or no M&V.

Owner's and ESCOs have different motivations for M&V in PC. An ESCO's primary motivation is to show that savings are meeting the contractual levels, while an owner's primary motive is to minimize project cost while assuring that the savings are actually occurring. Because of these different motivations, no matter what M&V approach is selected for a particular project, the owner needs to fully understand the M&V approach and the ramifications the approach will have on their particular PC.

Measurement & verification costs money; rigorous M&V costs more money. In an effort to reduce M&V (and therefore project) costs and to shed risk, ESCOs often resort to stipulating many of the parameters upon which the savings are based. Stipulation is the practice of holding a parameter constant during the contract term regardless of actual conditions. In some cases, it also implies that the parameter is estimated or assumed instead of measured. If all parameters are stipulated then the savings are effectively stipulated as well.

Consider a lighting retrofit that reduces energy use. The key parameters upon which energy savings depend are demand reduction (kW) and operating time (hours). Fixture power use (kW) can be measured before and after a retrofit to determine demand savings, or fixture powers can be obtained from a standard table (as is done in many utility-sponsored demand-side management programs). Likewise, operating hours can be measured with data loggers or estimated based on known schedules. For the greatest accuracy, both parameters would be measured, but at a greater cost. To simplify M&V and reduce costs, either the fixture powers or the operating hours could be stipulated while the other

parameter is measured. The ultimate simplification is to stipulate both parameters, which takes the “M” out of “M&V”.

#### PERFORMANCE CONTRACTING RISKS

One of the purposes of M&V in a performance contract is to provide the customer with ‘project insurance’. Unfortunately, design errors occur, parameters are over- or under-estimated, buildings change use or owners, projects are poorly commissioned, the baselines are poorly defined, or something happens that prevents a project from performing as expected. Performance contracts always include an element of risk that the savings will not materialize. One purpose of M&V is to identify the risk elements and allocate them to the responsible parties. Like all insurance, coverage costs money. Therefore, measurement & verification efforts should be commensurate with the perceived project risk.

Elements of project risk can be broadly categorized as *performance risk* and *usage risk*. Both performance and usage need to be known in order to estimate savings. Equipment performance is usually expressed in terms of the rate of energy consumption or efficiency- kW, kW/ton, Btu/hr or similar figure of merit. Performance alone is usually insufficient to estimate savings. Equipment usage also needs to be known and is often expressed in terms of hours, ton-hours, or therms or other defining factor.

When equipment or systems don’t perform as intended, savings will be less than anticipated. Typically, the ESCO is responsible for ensuring that equipment and systems work as intended through careful equipment selection, sufficient design work, and commissioning activities. Measurements should be used to verify baseline and installed equipment performance. If things go wrong, the ESCO must work to correct the problem to ensure that equipment performance is satisfactory. If measurements are not taken, performance problems can go unidentified and savings may not be realized.

On the other hand, the customer typically controls equipment usage. Therefore, building schedules determine lighting operating hours; thermostat setpoints affect heating and cooling loads; widgets produced affect motor or boiler loads; etc. The ESCO usually has no control over these parameters, yet savings depend on them. If usage decreases, savings will decrease (or sometimes increase) through no fault of the ESCO. However, both the ESCO and the owner have responsibility to accurately assess and account for usage parameters.

If usage is stipulated instead of measured, there is an unmitigated risk to the owner that the project will not achieve the estimated savings. ESCOs may lean toward overestimating usage as they try to develop a large, economically attractive, project. In spite of these caveats, usage is often stipulated, since it is usually appropriate for the customer to accept this risk.

Measurement & verification activities need to consider the types of risks and to allocate them to the appropriate parties. Performance contracts often guarantee a set level of performance but base savings on a minimum amount of equipment usage. This makes the ESCO responsible for factors they can control but insulates them from factors they can’t. Using stipulations in M&V plans serves two key purposes: 1) they shift risk to the appropriate party and 2), they reduce project costs. Proper use of stipulations therefore requires balancing the cost of M&V activities while allocating risk to the appropriate party.

Measurement & verification activities for guaranteed savings projects only need to show that the savings guarantee has been met. This reduces the certainty level required since the ‘actual’ savings only need exceed the estimated (or guaranteed) savings levels. However, if all parameters have been stipulated (performance *and* usage), the guarantees have little value since all risk has been transferred to the customer. Whether this is appropriate depends on the project size, type, and the customer’s risk tolerance. To paraphrase Humpty-Dumpty in *Through the Looking Glass*<sup>1</sup>, guaranteed savings values based on stipulated values are just what the ESCO wants them to be, neither more nor less. Without measurements, it is impossible to challenge the validity of the claimed savings amount.

#### CURRENT M&V PRACTICES

In a recent study of federal sector performance contracts, seven projects were examined to see how the savings were to be verified. Of the 31 individual measures that required savings verification, 18 used a partially measured, partially stipulated approach and an additional 8 others relied entirely on stipulations (no measurements). Therefore, more than 80 percent of the measures relied on stipulation as the primary savings verification approach, with long term verification being conducted through periodic inspection instead of measurements (verifying the *potential to perform*). Whereas performance contracts

<sup>1</sup> The actual quote is “When I use a word, it means just what I choose it to mean— neither more nor less.”

at federal facilities are required by law to demonstrate that (guaranteed) savings are being achieved, projects in the private and nonfederal public sectors are even more likely to rely on stipulated values where periodic measurement verification activities are not legally required.

#### CURRENT M&V GUIDELINES

Recent developments in M&V guidelines show different and changing attitudes towards the use of stipulations. The *International Performance Measurement and Verification Protocol* (IPMVP) defines four different M&V approaches, known as Option A through D. Option A is the simplest approach, which attempts to verify performance of an end-use technology without necessarily quantifying savings. The 1997 IPMVP explains that “Option A emphasizes verification of performance factors and involves determining long-term savings through the liberal use of stipulations for operational factors.” In other words, the 1997 IPMVP Option A methods calls for verifying the *potential to perform* but allows considerable flexibility in deciding what parameters to measure. However, it does encourage measuring the performance factors (kW, kW/ton, etc.) while stipulating the usage factors (hours, ton-hours, etc.). It is possible to stipulate all parameters (effectively stipulating the savings) under the 1997 IPMVP, Option A.

In the 2000 (October) version of the IPMVP (now known as the MVP), Option A is now called ‘partially measured retrofit isolation’ and emphasizes the need for measurements. Specifically, “partial measurement means that *some* but *not all* parameter(s) may be stipulated, if the total impact of possible stipulation error(s) is not significant to the resultant savings” (emphasis added.) To be compliant with MVP Option A requires measuring *at least one* parameter, preferably the one that contributes the greatest uncertainty to the savings estimate. Stipulating all parameters or stipulating the savings directly is expressly forbidden. Additionally, the term stipulate as used in the 2000 MVP indicates that a parameter has been estimated *but not measured*. This represents a significant change of thinking with respect to the meaning and use of the term ‘stipulation’.

The Federal Energy Management Program (FEMP) *M&V Guidelines* are based on the IPMVP and are intended to be compatible with it. Version 2.2 was also released in 2000 (July). Several Option A methods are described that allow all parameters to be estimated (from reliable data sources) and then stipulated. It is possible to comply with the FEMP

M&V guidelines without taking a single measurement! While this may be appropriate in some cases, it is no longer MVP-compliant. Part of reason for the difference in the two guidelines is that the 2000 MVP was completed after the FEMP guidelines (2.2) were released. During this time, the definition and intended use of stipulations diverged during this period with the MVP placing a greater emphasis on measurements. The other reason is that the MVP describes M&V methods that seek to reduce uncertainty in the savings estimates while the FEMP guidelines are designed for projects with guaranteed savings, thus reducing emphasis on the need to reduce overall uncertainty. The need for flexibility and cost reduction in FEMP are the reasons why the total use of stipulations are still allowed.

However, excessive reliance on Option A with the totally stipulated parameters has prompted the development of the FEMP *Option A Detailed Guidelines*. These new guidelines are intended to supplement to the current FEMP *M&V Guidelines* by discussing when and how to apply stipulations to federal energy projects. Their primary requirement is that all sources of information used for stipulated values be well-documented and prohibits the use of undocumented assumptions, rules-of-thumb, and results from ‘similar’ facilities. It encourages (but does not require) measuring parameters instead of using other information sources. These Guidelines will move the FEMP M&V guidelines closer to MVP compliance. It is anticipated that future versions of the FEMP Guidelines will attempt to be MVP-compliant by possibly requiring that at least one parameter be measured.

The draft version of ASHRAE’s 14-P (April 2000) does not allow stipulating key parameters. It has no equivalent of IPMVP and FEMP’s Option A methods and recognizes only continuous or periodic measurements of all relevant parameters.

#### APPROPRIATE USE OF STIPULATIONS

Measurement & verification in energy projects is intended to determine the ESCO’s payment in shared-savings contracts or to demonstrate that savings guarantees have been met. Project costs and savings can vary from very small projects in offices or schools to millions of dollars per year (\$12 million per year in reduced costs at the Military District of Washington<sup>2</sup>). No single M&V approach can satisfy

<sup>2</sup> Encompasses five U.S. Army bases in the Washington, D.C. area: Ft. A.P. Hill, Ft. Belvoir, Ft. Meade, Ft. Myer, Ft. McNair. Viron/Pepco is implementing a performance contract under the

this range of projects because of the range of issues involved. Project types, savings uncertainty, the customer's risk tolerance, M&V costs, and contract types all vary. Developing M&V plans requires flexibility in order to balance these competing interests.

Measurement & verification activities add to a project's cost, either indirectly through increased overhead expenses or directly as a line-item annual expense. However, the cost of M&V activities should not be the only criteria used to determine what M&V efforts are implemented. Measurement and monitoring information can add value to a project by providing performance feedback. This information can be used to optimize system performance, for Continuous Commissioning<sup>SM3</sup> activities, diagnostics, maintenance scheduling, or to identify additional projects. M&V should not be considered only as an 'added cost' element to be minimized or avoided.

In spite of the value of measuring key parameters, there is always pressure to reduce M&V costs in order to make a project more attractive or to increase profit margins. Effective use of stipulations are one way to reduce project costs provided all parties fully understand the consequences. Partial or total use of stipulations may be appropriate where one or more of the following conditions exist:

- Annual savings or project costs are small enough not to justify rigorous M&V activities. At \$80 per hour and 40 hours for an M&V specialist, the bare minimum effort might cost \$3,200 to develop a site-specific M&V plan and take baseline measurements. For projects costing less than \$32,000, this level of effort would exceed 10% of the project cost and possibly make the project uneconomical.
- Project is assured to generate savings (low risk). An example of such a project would be a lighting retrofit where the baseline has been properly defined and the operating hours are both long and stable. Under these conditions, the resulting risk mitigation may not justify the measurement cost. However, such projects should still include annual inspections and utility bill comparisons as part of the process.
- Stipulations shift usage risk to the customer. Operating hours, production or occupancy rates, and

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DOE's Energy-Saving Performance Contracting (ESPC) program.

<sup>3</sup> Continuous Commissioning is a registered service mark of the Energy Systems Laboratory, Texas A&M University.

weather all affect savings. However, these factors are beyond the ESCO's control. Using stipulations protects the ESCO from reduced savings due to factors beyond their control. When using stipulations to protect the ESCO from potential usage changes, the customer needs to be fully aware of and agree to their risks and responsibilities.

- Customer has a high tolerance for risk. Savvy or sophisticated customers may choose to minimize ESCO's M&V efforts (and cost) and rely instead on internal expertise and understanding of energy-efficiency projects.
- Energy savings are not the primary project motivation. Some customers use performance contracts as a way of obtaining new equipment to replace old and failing equipment. These customers have less incentive to document their energy savings and instead are happy to have functional equipment and improved facility conditions.
- Key parameters are stable. Implicit in all cases is that key parameters remain stable during the contract term. System performance, operating hours, building schedules, production rates, etc. should have a stable history and reasonable expectation of remaining so.

Even when stipulations are used in the preceding cases, it is still good practice (and an MVP and FEMP requirement) to verify a project's *potential to perform* through periodic inspections or other verification activity. Using stipulations does not remove the ESCO's responsibility to maintain and guarantee the project.

#### SITUATIONS TO AVOID

Because stipulations are easily-applied and low-cost, there is a tendency to use them too liberally. Both customers and ESCOs are enticed by the prospect of reducing project costs, but failure to understand the risks has caused significant heartburn among owners and ESCOs when savings don't materialize. Disputes and lawsuits result when the two parties cannot reconcile their differences. Skimping on M&V costs is no bargain when forced to confront unhappy customers and mounting legal fees. (Rock climbers don't buy second-hand ropes to save money- they're not much of a bargain because the cost of failure is so high.)

Stipulations shift risk to the customer, which is appropriate when usage risk is being shifted to the customer. Two major causes of customer dissatisfaction (or worse) are that the customer did not understand the implications of stipulations or that

the baseline was poorly defined. When savings don't materialize or cannot be shown conclusively, problems arise. It is therefore the ESCO's responsibility to educate and explain to the customer what the risks of stipulation are and why such parameters are being stipulated. Baseline conditions and savings estimates must also be based on reliable and realistic information. Properly documenting this information can assist the ESCO and the customer understand whether savings materializing or not. Stipulations should be avoided (or used only with great care) in the following cases:

- Annual savings or project cost is high. When annual savings or project costs are high, so is risk. M&V efforts serve as insurance to protect against risk and M&V costs become a small part of the overall project.
- Project is technically complicated; usage parameters are difficult to quantify or are not stable. Examples of such projects include installing variable frequency drives on fans and pumping systems. Defining usage characteristics and relevant variables is not a trivial task.
- Stipulations shift performance risk to the customer. A very powerful marketing tool is to guarantee the savings. However, if equipment performance is stipulated, then the customer assumes responsibility for such performance. This reduces a performance contract to a design-build deal with a veneer of guaranteed energy-efficiency.
- Customer is not technically sophisticated. Problems arise when customers do not fully understand the contractual arrangement and associated risks, and terms such as "guaranteed savings" and "shared savings" are being used. Their M&V expertise is often limited to comparing this February's utility bill to last February's.
- Customer is risk-averse. Some customers want the assurance that energy-savings are materializing because they have limited budgets

and cannot afford to take chances. Customers in this category may not be sophisticated either

- Monitoring information is readily available. An existing or proposed EMCS could be used to collect time-series data on relevant equipment and used for M&V purposes at little added cost. Additionally, continuous performance monitoring of key parameters adds value. In addition to demonstrating performance, such information can also be used for commissioning and diagnostic purposes, increasing the value of the project by maximizing savings and signaling problem conditions.
- Utility bill analysis provides a reliable savings estimate. Using utility bill analysis by correcting for weather and other relevant factors can be applied to facilities with stable operating hours and projects where estimated savings for each measure are not required.

If any of these conditions exist, using stipulations in M&V plans may not be in the ESCO's or the customer's best interest.

#### CONCLUSION

Properly used, stipulations can reduce M&V costs and simplify procedures. Improperly used, they can give M&V results an undeserved aura of authority. Deciding which parameters should or should not be stipulated requires understanding how they will affect savings, judging their affect on reliability and uncertainty of results, and balancing agency desires with the costs, risks, and goals of the project. Key to successful use of stipulations include understanding the customer's needs, as well as educating the customer about what to expect from the project and how savings will be verified. M&V during contract negotiation is usually discussed last but is often the first point of disagreement. ESCOs can protect themselves from bad or ugly situations by being careful what they promise and diligent about how they show it.

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