



M & V and its Challenges

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Can energy savings be measured?

NO!

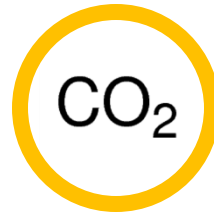
“Energy savings cannot be directly measured, since savings represents the absence of energy use.”



M&V Background



- Started during the late 1990's as a requirement for World Bank



- Measurement and Verification Protocol developed and owned by the Efficiency Valuation Organization (www.evo-world.org)

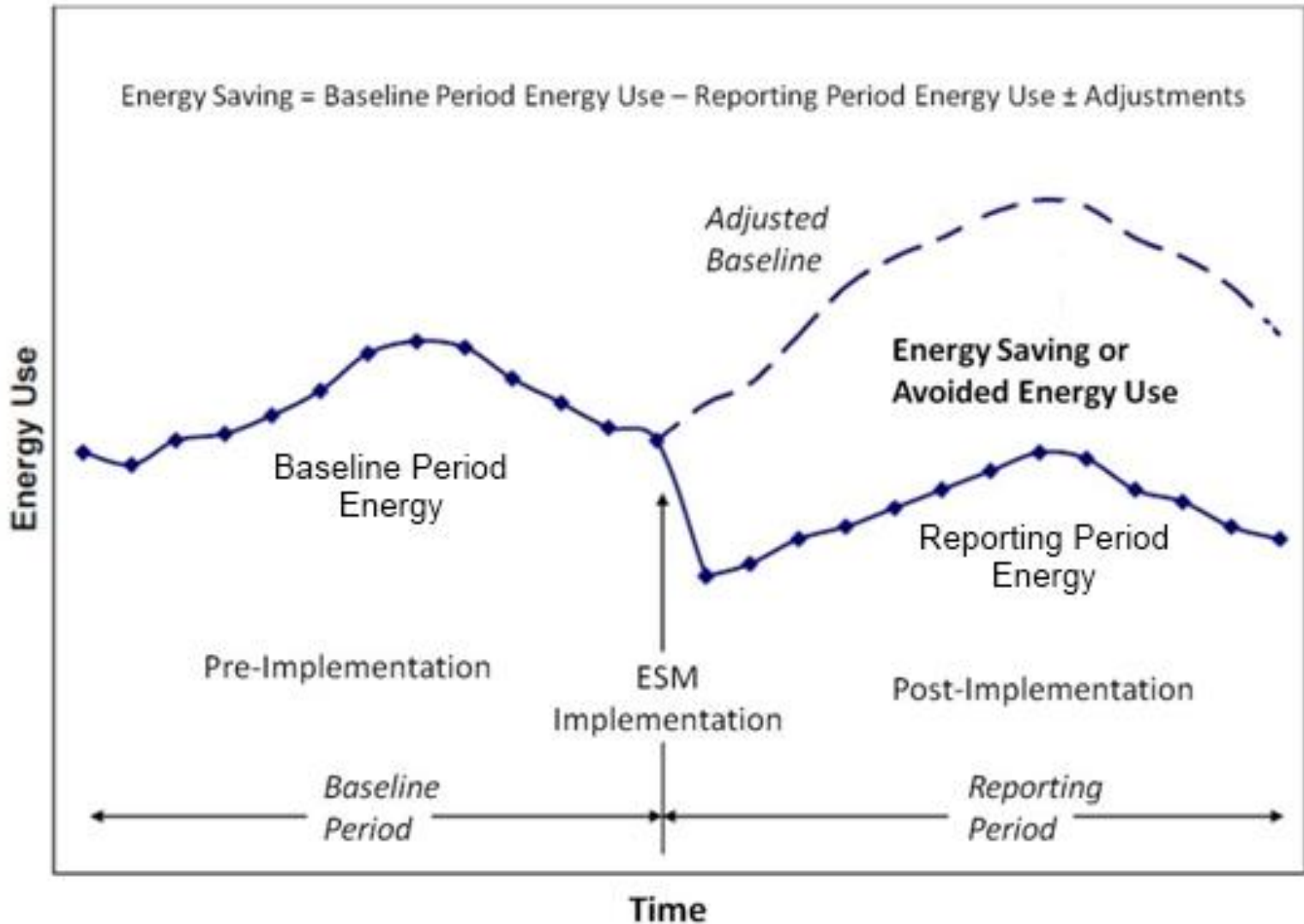


What is M&V

“The process of quantifying EE savings or the impacts by determination of actual consumption and relevant energy-governing factors, and to develop baselines and baseline adjustments”



M&V Approach

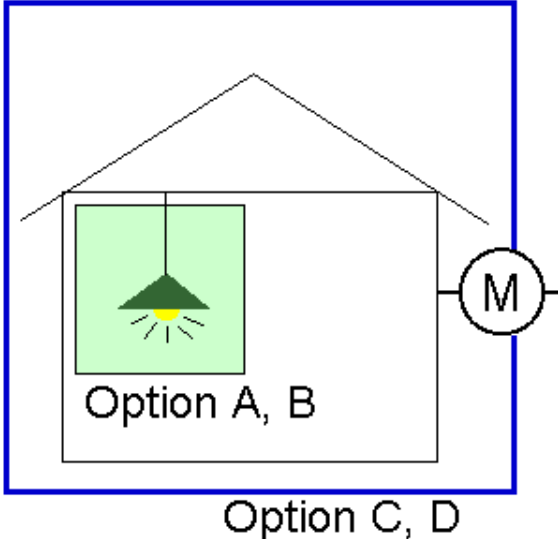


Option A Key parameter measurement – where only key parameters relating to the energy governing factors or the energy use or both are measured.

Option B All parameter measurement – where all parameters relating to the energy governing factors and the energy use are measured.

Option C Whole facility. Usually using the utility meters. Generally, the overall level of savings must be more than 10% of total metered usage for this method to be effective. Analyses usually consider changes in weather, occupancy, load, and operations and adjust the baseline accordingly. Option C cannot verify the performance of individual measures

**Option D -Calibrated simulation
This option is typically used if baseline or reporting period data are unreliable or unavailable.**



Adjustments

Routine adjustments: - where energy-governing factors changes routinely, e.g. weather/production conditions.

Non-routine adjustments: provides for changes in facility size, changes in shifts, changes in occupation, etc.

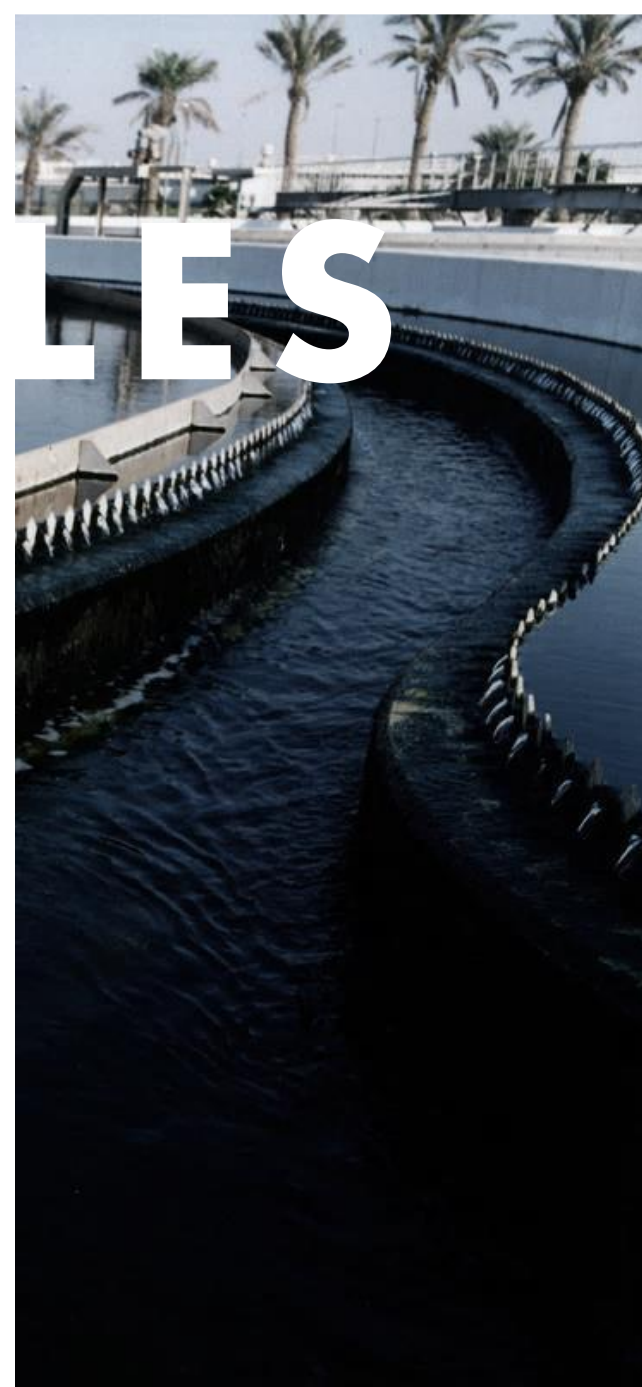
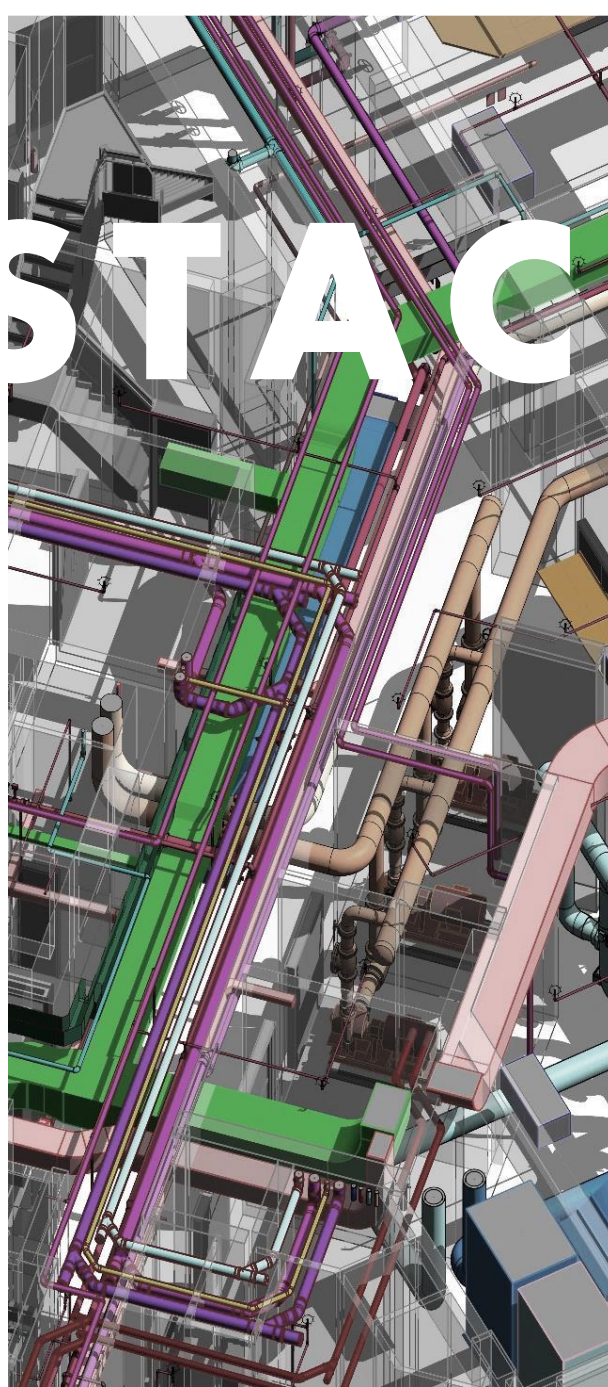


Typical M&V Cost

- **Can be claimed back as an expense**
- **To be considered in context of wider benefits**
- **Proposed as guidance $\pm 5\%$ of project cost, but could be anything dependent on the project scope, complexity and additional benefits**



OBSTACLES



Lack of Expertise !

- **Huge capacity gap exists GLOBALLY of not being able to measure and verify EE savings**
- **The M&V Gap is primarily caused by a lack of experts who have the capability to develop or evaluate M&V plans or energy savings calculations**
- **Solution is not more protocols**
- **Need M&V experts with in experience/capability to estimate and measure & verify EE Project savings**



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Case Study

- Initial reporting period consumption : 1,000,000 kWh
- Initial average temperature : 20 °C
- Post retrofit consumption : 1,005,000 kWh
- Post retrofit average temperature : 22 °C
- No other adjustments

- ESCO claims that baseline temperature setpoint adjustments due to change of temperature from 24 °C as projected to 22 °C are 300,000 kWh

- Adjusted baseline 1,300,000 kWh

- 30% Savings !!!!



Recommendations

- Budget for M&V**
- Employ a third party experienced M&V Auditor**
- Select M&V options suitable for the ECMS**



Advanced M&V Methods, M&V

2.0:

Application

The increasing prevalence of Information and Communication Technologies like high-resolution smart meters, communicating smart thermostats and non-intrusive load-submetering devices are changing the way energy efficiency projects and programs are measured.

- A. Availability of hourly data allows more granular analytic approaches that can estimate impacts by time of day.**
- B. Automated Analysis Emerging, often cloud-based, software can use improved data access and advanced analytics to automate and accelerate the M&V process.**
- C. These tools are advancing M&V by enabling ongoing monitoring and estimating of energy savings in near-real time, both for individual premises and for portfolios of homes or businesses.**
- D. Together with higher resolution data and multiparameter models, these methods can capture the impact of efficiency on building load shape more accurately.**
- E. These approaches are intended to be conducted more quickly, more accurately, at lower cost, and with greater value than nonautomated methods.**



Advanced M&V Methods, M&V

2.0:

Potential

- A. In the context of energy efficiency programs, M&V activities often do not start until there is a substantial amount of program activity. The time lag between program implementation and evaluation limits both the use of savings estimates to inform potential changes to program design and the ability to make timely performance-based payments to contractors and aggregators.**
- B. Advanced M&V can alleviate this problem by enabling savings forecasts from a partial post-treatment period. This can accelerate program feedback.**
- C. With respect to estimating demand savings, there is often a considerable lack of insight into the time-of-day or grid-level location of savings that can be used for demand response, transmission, and distribution planning. The application of M&V 2.0 techniques offers the dual promise of accelerating evaluation processes and providing more detailed evaluation and implementation feedback.**



Advanced M&V Methods, M&V

2.0:

Benefits to Stakeholders


- A. ESCOs benefit from earlier and time-based feedback on savings performance for individual installations. This may help them to identify and correct problems and achieve higher performance payments, where applicable.**
- B. Third-party evaluators can benefit by having usage data earlier, which facilitates the ability to provide early indicators of savings and enables them to provide evaluation results more quickly.**
- C. Grid planners can benefit from opportunities created by M&V 2.0 to target and deliver locational and temporal confirmation of energy efficiency impacts. As the industry seeks to increase reliance on energy efficiency as a grid resource, grid planners need to predict short-term demand.**

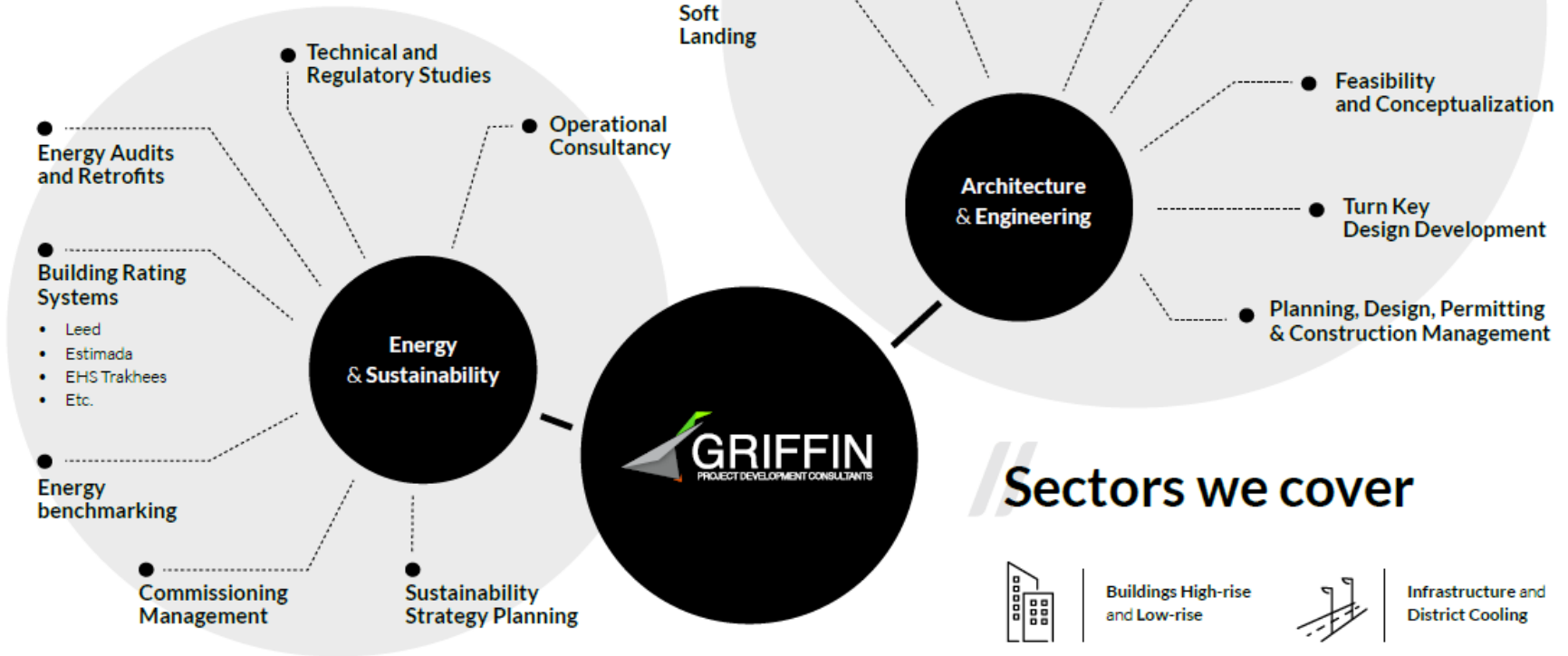


Advanced M&V Methods, M&V

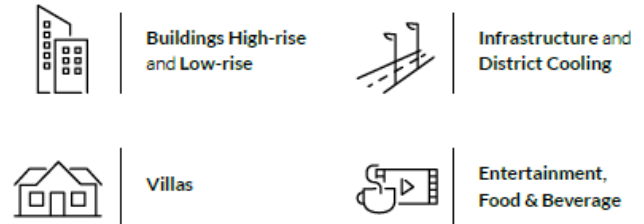
2.0:

Benefits to Stakeholders

- D. The investment community seeks to reduce risk in energy efficiency investments. investors would welcome accelerated delivery of final savings verification, which could be facilitated through M&V 2.0.**
 - E. Facility owners and operators can benefit by gaining an understanding of how specific interventions affect facility energy use in a near real-time basis, and by receiving early warnings of installation problems so that anticipated savings can be more reliably achieved.**
 - F. M&V service providers can benefit if M&V 2.0 tools provide enhanced capabilities and value, resulting in greater demand for M&V services.**
 - G. M&V models created using daily interval data, instead of monthly billing data, tend to be more robust, improving their accuracy and the ability to verify the combined savings from new measures and from measures yielding more nominal impacts, such as behavioral changes and operational improvements.**
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Sectors we cover



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