

DATA LOGGER INSTRUCTIONS

Short Term Energy Savings Analysis Procedure using Data Loggers

The DOE IPMVP, Department of Energy, International Performance Measurement and Verification Protocol (MVP) provides an overview of current best practice techniques available for verifying results of energy efficiency, water efficiency, and renewable energy projects. It may also be used by facility operators to assess and improve facility performance. Energy conservation measures (ECM's) covered include: fuel saving measures, water efficiency measures, load shifting and energy reductions through installation or retrofit of equipment, and/or modification of operating procedures.

Energy or demand savings are determined by comparing measured energy use or demand before and after implementation of an energy savings program. In general:

$$\text{Energy Savings} = \text{Base Year Energy Use} - \text{Post-Retrofit Energy Use} + \text{Adjustments}$$

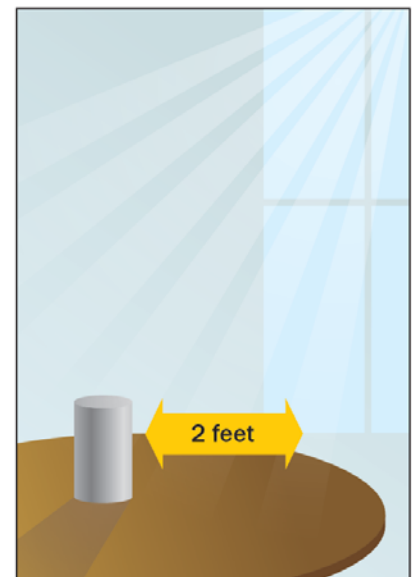
The "Adjustments" term in this general equation brings energy use in the two time periods to the same set of conditions. Conditions commonly affecting energy use are weather, occupancy, plant throughput, and equipment operations required by these conditions. Adjustments may be positive or negative.

Option B of the IPMVP is described in the program as:

B. Retrofit Isolation - Savings are determined by field measurement of the energy use of the systems to which the ECM was applied, separate from the energy use of the rest of the facility. Short-term or continuous measurements are taken throughout the post-retrofit period.

UTILIZING MADICO'S DATA LOGGERS TO ACHIEVE REAL WORLD DATA

1. Two or more areas of similar dimensions, with equal areas of glass facing the same direction relative to the sun, should be chosen for this evaluation. These areas should have similar furnishings and similar floor coverings.
2. All environmental control devices must be turned off or otherwise disabled. There must be no outside influence other than solar energy affecting the climate within these test spaces.
3. One sample space shall have the entire glass area left as is for use as a control area.
4. One or more areas shall have the desired ECM (Energy Conservation Measure), in this case solar control window film, installed on all glass surfaces subject to solar energy.
5. USB Temperature Data Logger's manufactured by TIP TEMPerature Products shall be used to monitor temperature over time in each of the



Place Data Logger in direct sunlight and at least 2 feet from window.

test areas. Information on the data loggers and their operation is attached to this document.

6. Using software supplied with the data loggers, the devices should be programmed to record temperature readings hourly. Each logger must be properly labeled to ensure the location from which the data is acquired. This can be done via software while programming each logger.
7. It is recommended that two data loggers be placed in each test area, at least two feet from the filmed glass. One should be placed outside of direct sunlight to record actual room temperature. A second logger should be placed in an area of direct sunlight. This logger will accurately depict the actual solar energy being transmitted through the glass.
8. It is critical that the loggers in direct sunlight be placed on identical substrates. The ability of the substrate to absorb solar energy will have a direct effect on the temperature readings. If no identical substrates are available, a black body surface should be used under these loggers e.g. black cloth.
9. Test areas must remain closed off and unused during the rest cycle.
10. A 7 day test cycle is recommended to achieve a minimal data set for analysis.
11. Temperature readings are to be downloaded to computer for analysis.

Analysis:

Periodic temperature readings will be available for comparison for each test area. The data acquired from the logger outside of direct sunlight is to be used to prove the energy savings potential of the installed film. The data loggers in direct sunlight behind unfilmed glass are used as a control.

It is important to note that the only proper way to determine actual energy savings is to monitor energy usage before and after an ECM is installed, generally for multiple years. This is because environmental conditions are constantly changing and never equal year to year.

Short term analysis as outlined above should only be used to determine the effectiveness of the installed film.

Computer modeling of potential energy savings with the installation of an ECM should also be considered as an accurate method of calculating savings. These models are based on averaging 10 years of environmental conditions in a specific geographical area.

OPERATING THE DATA LOGGER

1. Install the software using the Installation Wizard.
2. Connect the logger to your PC's USB port after installing the software.
3. Launch the TIPTEMP EasyLog Software and follow the instructions to program the sampling Rate, Deg. C or F and Alarm set point.
4. Disconnect the logger and place in your desired environment.
5. When logging is over re-connect USB logger to computer and launch TIPTEMP EasyLog Software.
6. Follow the simple instructions to extract data, a graph will appear.
7. Save data file to PC's hard drive for archiving and to open in Excel.
8. Re-program logger for use again.
9. When down loading data again, don't forget to create a **new data file name** or you will erase the previous one.

