



Co-funded by the European Community Horizon 2020 Program

Project Title:

ORganizational Behaviour improvement for Energy Efficient administrative public offices



OrbEEt

Grant Agreement No: 649753

Collaborative Project

Public Summary

Deliverable No.	D1.2 Energy Measurements Methodology
Workpackage	WP1 Requirements – Specification & Modelling
Task	T1.2 Systematic & enhanced Rating Models Specification
Lead beneficiary	HYPERTECH



1. PUBLISHABLE PUBLIC SUMMARY

To achieve energy efficiency in the public sector it is essential that occupants, professional managers of buildings, local utility companies and other stakeholders understand how energy is consumed. They also need to be aware of the benefits and methods of energy conservation and the influence they can have on energy efficiency. **Understanding energy consumption** builds the foundation for any measure to save energy or any investment to improve the energy performance of a building.

This document aims to provide the methodological framework and further the detailed auditing procedure at pilot premises towards the concrete estimation of the project baseline. A detailed description of the baseline approach is provided, considering different levels of granularity of measurements (spatial and temporal), what can be measured, what needs to be calculated based on measurements etc... The document is an extra deliverable providing “*clear description of the methodology used to measure energy savings in pilot sites. It describes the baselines, duration of measurements – taking in account seasons affecting heating systems, duration of the validation phase, the manner to measure thermal and visual comfort before and after the ORBEET interaction*”

Following the purpose of the document, to wit, to provide the detailed methodological framework to measure energy savings and further the outcomes of the work of the project up to M18, we define the following sections: Section 2 is a reference to the methodological framework for energy savings measurement;

It is clear that a mixed and dynamic approach should be considered for OrbEEt project, towards baseline definition at the different phases of the project.

Mixed → To cope with the need for a low cost and un-intrusive technological infrastructure as well as optimal fit of the approach to the varying characteristics and requirements of the OrbEEt framework and the core human factor.

Dynamic → To cope with the need for varying measurement periods for different loads as well as for establishing a real time monitoring but also triggering approach following closely both building conditions/operations but also behavioural trends. In addition, the availability of information at the different stages of the project (early beginning: energy bills at building level, later: simulations by incorporating building contextual and organizational data end: real time sub metering information) mandates for a dynamic approach.

Section 3 presents briefly the status of the project and further extends the work, by taking into account sub metering data retrieved from pilot premises. More specifically, section 3 describes the baselines calculation and the duration of measurements for all pilot sites – taking in account seasons affecting heating systems. The analysis aims to provide an accurate calculation of baseline of energy consumption that will further enable the implementation of demonstration and evaluation activities of the project. The overall baseline calculation in line with the duration of the validation phase.

We are starting the analysis with the **TOP DOWN APPROACH** which is performed once at the auditing period, and maybe further repeated after long periods (e.g. annually). The main characteristics of this approach (Option C & Option D) of OrbEEt M&V methodology are:

- Measurement and Verification based on **billing information** (annual)
- Concrete assumptions and methodology for **baselining extrapolation** at different building and organizational levels

- Towards a concrete **baselining extrapolation**, a calibrated simulation at device (sub metering) level should be performed.
- **Adjustments of baseline** by taking into account actual occupancy data collected from the buildings during organizational modelling, weather conditions etc...

This methodological approach is applicable for **project impact assessment analysis** considering the annual validation period of OrbEEt framework in premises (we can have intermediate – monthly– measurements just for intermediate comparison purposes during pilot trials).

In addition to energy consumption baselining, the framework for measuring baseline comfort levels in premises is documented in Section 4. We have highlighted the importance of occupants' comfort analysis in OrbEEt framework as the Human Preferences Model (HP) is a part of the building's Physical Sub-System, describing the contextual framework of the premises which is further aligned to occupants' preferences. For our scope, the HP handles building *environmental conditions*: temperature, humidity, luminance levels, and further associates these with specific BPM parameters, e.g. occupant density, presence/absence, number of active concurrent business activities; towards the extraction of levels of preference & non preferences. The next chapter presents the overall methodological and calculation framework for the extraction of comfort parameters, while later we are presenting the baseline calculations performed in pilot premises.