



POWER
Low Carbon Economies



INTERREG IVC
INNOVATION & ENVIRONMENT
REGIONS OF EUROPE SHARING SOLUTIONS



European Union
European Regional Development Fund

ANNEX 2
Best practice Identified and transferred
Best Practice n. 5

Section	Indication of content
1 Title of the best practice	Detailed and justified analysis of the distribution of energy consumption between the different systems in the building (cooling, heating, lighting, equipment).
2 Precise theme/issue tackled by the practice	The practice suggests how to tackle the problem of distinguishing the different energy consumption end uses, particularly when only one electric meter is available and several loads (cooling, heating, lighting, equipment) are connected to it.
3 Objectives of the best practice	The best practice objective is to provide suggestions to energy auditors on the easiest solutions for separating the different loads.
4 Location	<ul style="list-style-type: none"> - Italy - Province of Modena - All project partner regions
5 Detailed description of the best practice	<p>The metered electric data is usually available on a monthly basis. Using this data it is possible to distinguish the summer cooling (AC) from all other loads by comparing the load in the months when AC is on with the load in the months when AC is off. This simple approach has some limits: if in summer there are variations of the basic loads (for example decreased artificial lighting due to more daylight) the value obtained for the difference may be false.</p> <p>The separation of the other electric loads (lighting, equipment, cooking, etc), may only be achieved by calculating analytically their single amount, for example summing up all lighting equipment power and estimating the hours of operation, adding then all these loads and comparing the obtained total with the actual consumption data. Iteratively the theoretical values are adjusted until convergence is obtained.</p> <p>Another method is to use standard tables providing the</p>

	<p>percentage of the different type of loads in respect to the total electric load for different building end uses, then to verify the absolute values with the existing information.</p> <p>Much better information can be obtained if short interval electric data become available; this can be obtained in two ways:</p> <ul style="list-style-type: none"> i) installing additional electric meters connected to a data logger; ii) asking the electricity supplier, if the new electronic (“smart”) meters are installed. In Italy the electric suppliers are obliged by the Electric Authority to provide these data to final users with contracts exceeding 50 kW, by written request of the user. <p>The timescale of this analysis should be at least 3-4 months, covering for example spring and summer months.</p> <p>Data should be sampled at intervals of 15 minutes in order to be sufficient for a satisfactory analysis. The data are supplied free of charge in excel format, and are available on a password-protected internet page. The process requires simply producing monthly graphs of power vs. time. To speed up the production of graphs, a Microsoft Access database has been created, so that graphs are automatically produced fixing the desired time interval. Examples of these graphs are shown on pages 4-7.</p>
<p>6 Evaluation</p>	<p>The graphs provide a clear indication of the behavior of load on daily, weekly and monthly timescales.</p> <p>The main success factor is the possible differentiation of the different uses: air conditioning is identified in summer as a fluctuating band of on-off signals; the daytime load mixes lighting and office equipment, the baseline indicates the sum of all equipment used 24 hours a day, or other devices (e.g. air handling units - AHU, coffee machines, drinks refrigerators) which are kept on all the time.</p> <p>There are difficulties in separating electric lighting from office equipment, when they are operated at the same time during office/activity time.</p>
<p>7 Lessons learnt from the best</p>	<p>This method allows an analysis of electric load in a cost-effective and effective way. Using the obtained</p>

practice	information the energy auditor can clarify the distribution of the main electric uses, identify energy waste and suggest interventions and improvements.
8 Contact information	- Marco Chiozzi (mchiozzi@aess-modena.it) - Website: www.environmentcentre.com/GENERATION/BestPractice
9 Other possible interesting information	- Some graphs are included as examples in the following pages.
10. Best practice transferred	The Modena energy agency AESS is transferring the best practice to the Municipalities where it cooperates and to a wider audience via the project dissemination and capacity building events. The best practice is also published on the GENERATION website.

Annexes: graphs presenting examples of electric load analysis.

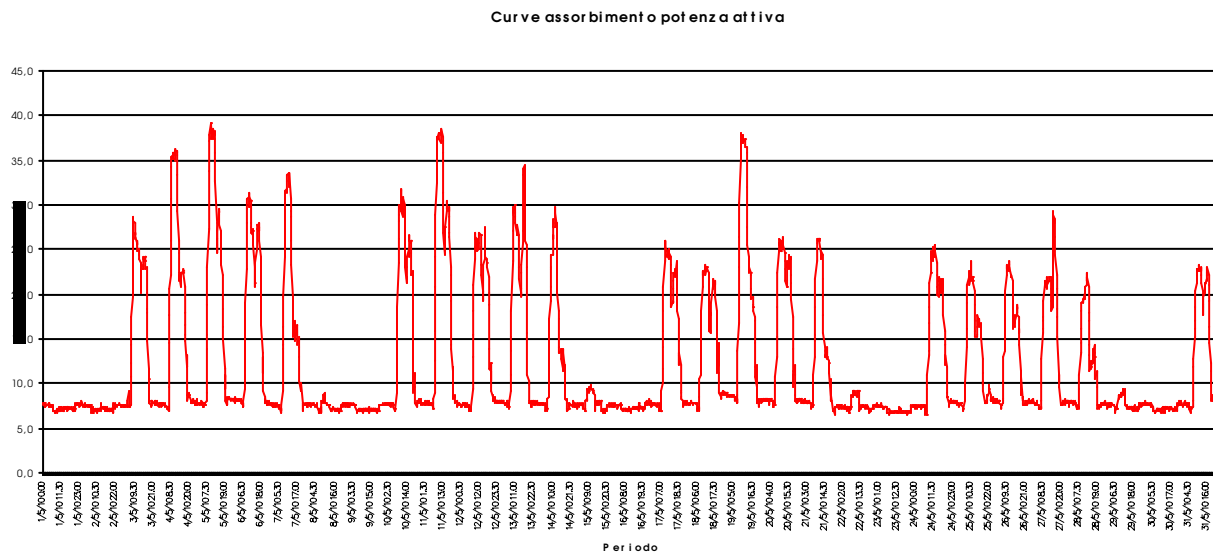


Figure 1: Electric power in kW in the Office building of Via Barozzi, managed by Modena province, in the month of May 2010.

Figure 1 shows that a baseline consumption of about 8 kW is absorbed at all times. The existing constant loads were detected in the computer room, with 4 servers and a cooling unit always switched on. In addition, the UPS, the telephone exchanger and 2 PCs used for civil protection purposes 24 hours a day were also switched on. As this did not fully account for the detected amount, coffee machines and drinks refrigerators were found to have high loads (not paid for by the company providing the service), and the correct control of the Air Handling Unit was signalled to the O&M service provider, to identify whether a suitable control was cutting useless night ventilation.

The decrease of peak consumption is attributed to the increase of daylight as the month progresses.

Curve assorbimento potenza attiva

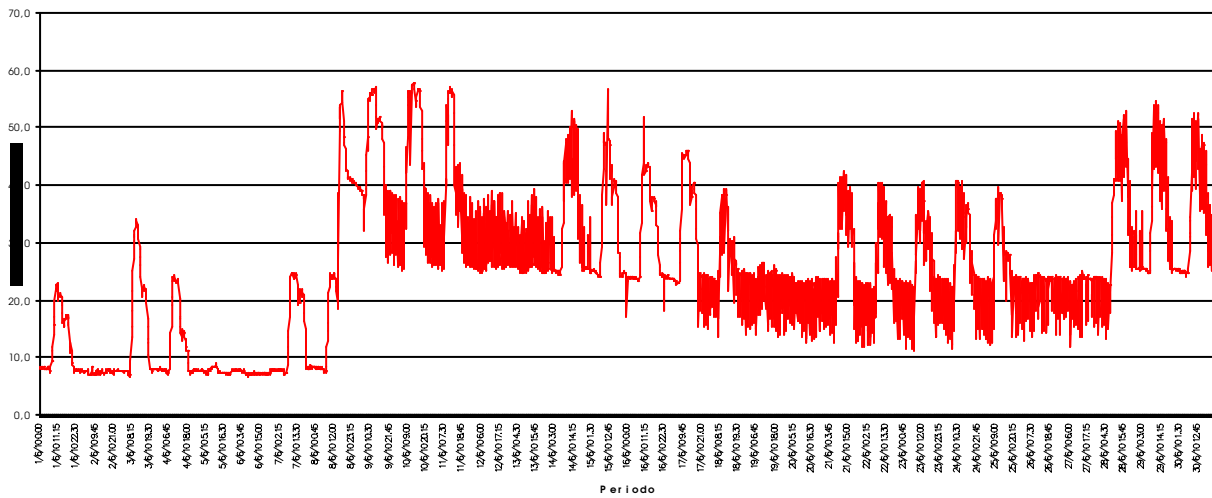


Figure 2: Electric power in kW in the Office building of Via Barozzi, managed by Modena province, in the month of June 2010.

Figure 2 shows that Air Conditioning was switched on in the second week of June (AC has a typical on-off function, appearing in the picture as a red wide band superimposed to a fixed step, depending on climatic conditions). During week ends, artificial lighting and equipment is off, AC remains on, so the width of the on-off band remains almost the same (about 8 kW) and the fixed AC step varies from a maximum of 16 kW to a minimum of 5 kW, probably depending on external climatic conditions.

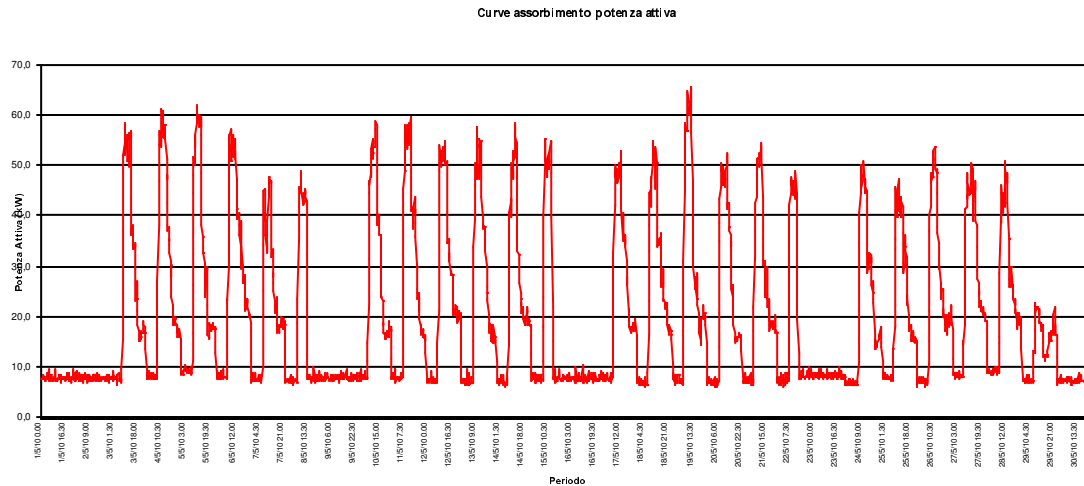


Figure 3: Electric power in kW in the Art Institute “Venturi”, managed by Modena Province, in the month of May 2010.

The curve shows that a baseline consumption of about 10 kW is absorbed at all times. The school operates 6 days a week, but only for the morning on Saturdays. In the late evening on weekdays there is a “shoulder” peak due to the use of the gym by sporting clubs, representing about 10 kW extra load.

The top load during weekdays is in the morning, when all classes are active, and gradually decreases in the afternoon, by steps. The last Saturday had a lower load, but a dual peak shape, probably due to meetings or events in the afternoon.

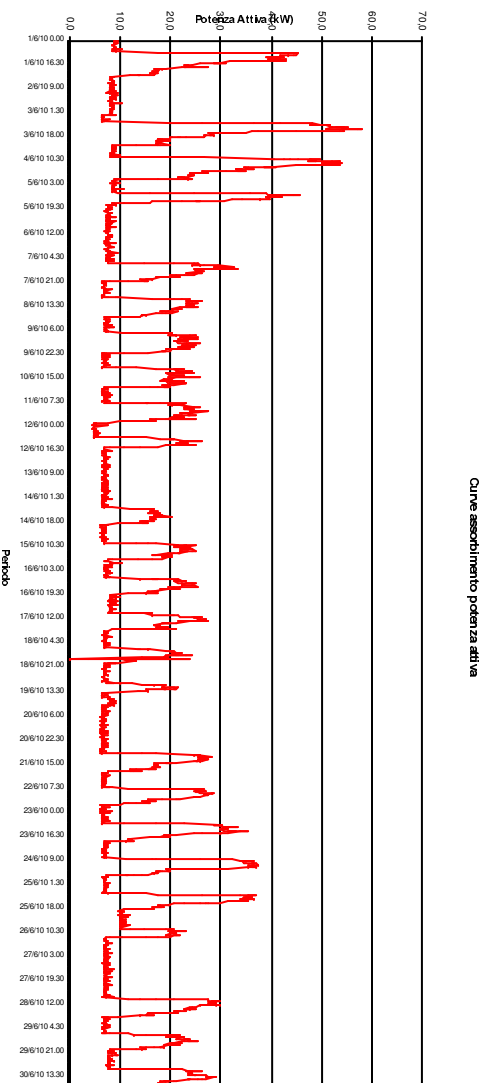


Figure 4: Electric power in kW in the Art Institute “Venturi”, managed by Modena Province, in the month of June 2010.

Figure 4 shows the decrease of load in the second week of June when holidays started for students and daylight was at a maximum. The late evening use of the gym is still evident, but with a much lower load.