

# Power and energy data analysis, processing and visualization, including data from building/energy management systems (BMS/EMS)

*Remote services and consulting on energy management.*

*We provide these services **via Internet from Poland.***

*Therefore price of these services is reasonable low.*

## Introduction

Data collected from various measurement systems, ie. SCADA/BMS/EMS systems, power meters and analyzers, should be analyzed to utilize the data, draw conclusions and reach solutions, and therefore to generate profits from expensive measurement systems.

A dynamically developing market of metering systems gives a wide range of opportunities to create integrated systems allowing to analyze energy consumption in an enterprise. However, data recorded by tens, hundreds or even thousands of meters, energy analyzers and other measuring points are difficult to analyze due to their large amount.

We offer a service for the analysis and development of measurement data in the field of energy consumption, including data collected for the cause of energy management. The service is aimed at supporting energy management in conditions of large amounts of data from meters and energy analyzers.

## Purpose

The aims of energy measurement analysis service are:

- Relieving the employees of the engineering staff of the company by outsourcing the work needed for the fruitful use of measurement data, and in relation to the data analysis:
- Identification of the share of individual receivers (groups of receivers) in the total energy consumption (energy balancing), i.e. determining which receivers consume the largest amount of energy,
- Determination of the load profile of receivers (groups of receivers), e.g. continuous operation with constant power, intermittent operation, performance requiring the use of power regulation,
- Classification of energy consumption for permanent consumption (independent of production quantity) and variable consumption (depending on the production quantity),
- Searching for unnecessary energy losses, ie. idling devices or unnecessary operation of devices in given time periods,
- Determination of energy consumption during production shutdowns and analysis of these values separately for different production areas,
- Searching for unnecessary load peaks that may cause excessive power consumption, as well as searching for energy losses of machine starts, which can be avoided using soft start devices,

- Searching for ways to reduce the inductive reactive power factor defined as  $\tan(\phi)$ , which is the ratio of inductive reactive energy to the amount of active energy, so that  $\tan(\phi)$  would be below the allowed value,
- Searching for time periods and sources of capacitive reactive power, if this is significant,
- Determination of energy efficiency of devices, if the determination of such a size is possible (ie. determination of energy consumption of compressed air systems expressed in [kWh/m<sup>3</sup> of air] with comparison to typical values),
- Correlation of energy consumption values with any measured parameters affecting this consumption,
- Diagnostics of machines (detection of abnormal state) according to power consumption.

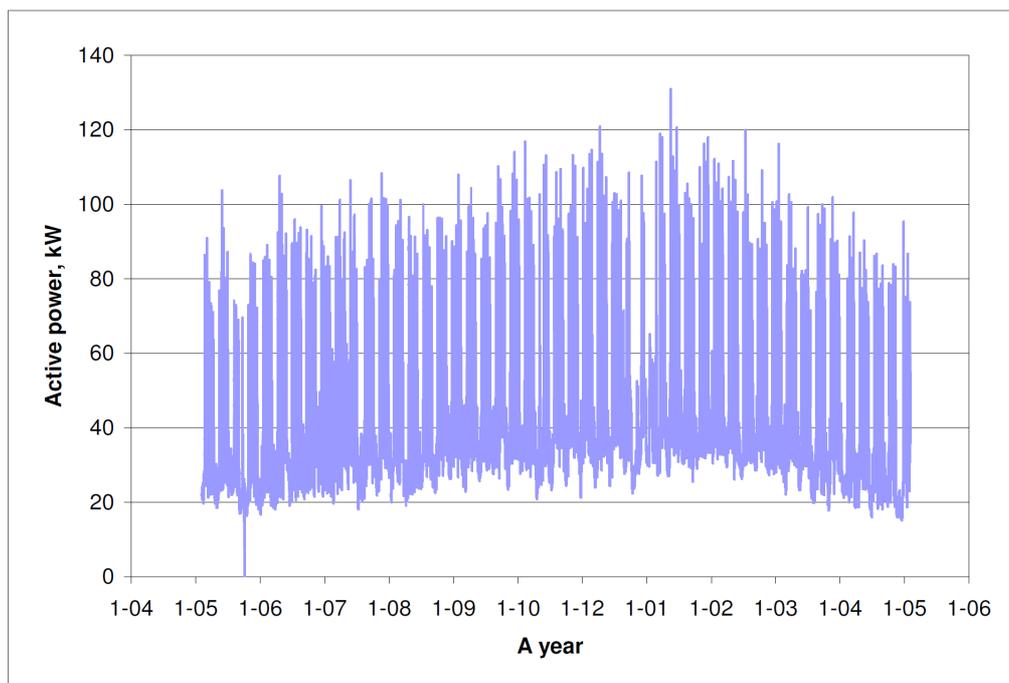
## Example

In company "X" dozens of energy analyzers (according to the power structure of individual receivers), as well as natural gas flow meters with volume correctors giving the measurement signal in real time, were installed. All indications are registered by the BMS / EMS (Building / Energy Management System) servers. Historical data is available from the beginning of the system operation.

To make full use of the measurement data, analytical work (analysis of measurement data) is needed. It is necessary to spend a large number of man hours due to the data volume.

Following case is an example of fruitful analysis of measurement data. A profile of active power consumed by the administrative building of an industrial enterprise was taken under consideration.

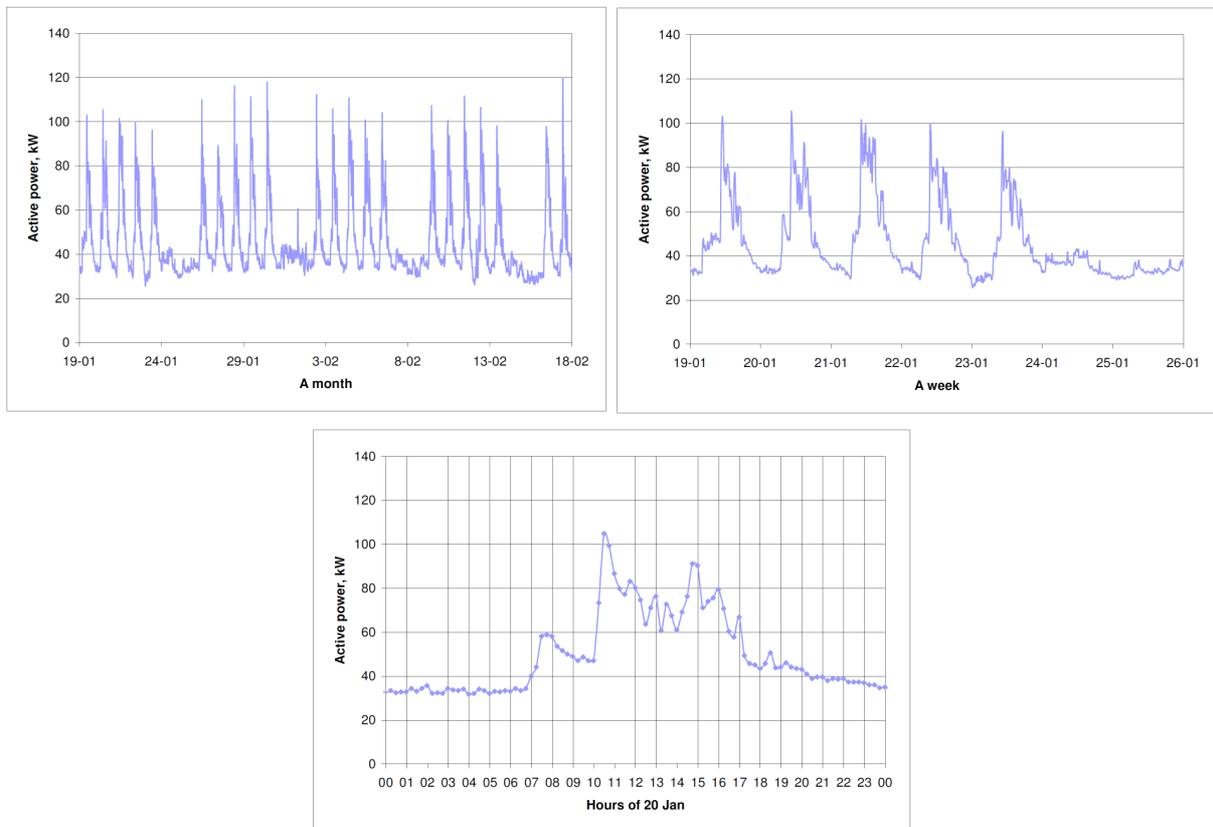
The data is exported from the servers of the data collection system in the form of text or ".csv" files, which in the raw state can be illustrated by the graph below.



**Fig. 1.** Example of raw data from a power analyzer for administrative building

Depending on the needs and expectations of our Client, a different scope of data development is possible. Below is an example of statistical analysis of data from the above chart.

The nature of the power load was analyzed in more detail. Monthly, weekly and daily charts were made.



**Fig. 2.** The data from a power analyzer for: a month; a week; a day

The load characteristic of 1-shift operation was observed. A constant load of approx. 35 kW is seen even when the building is not in use. This information may lead to searching for energy savings by eg. reducing the lighting use periods or reducing the usage of the ventilation system fans at night and on weekends. In this case it is necessary to gather further information from the object's user.

The analysis based on random data is incomplete, hence statistical analysis for whole data set was performed.



## Comments

1. The service ends with a report. The report includes recommendations, conclusions and observations (eg concerning anomalies in energy consumption). As an attachment to the report, we provide a detailed description of the analyzes carried out, including the compilation and diagrams of measurement data.
  2. The service may be an ad-hoc (one time) analysis of historical data (eg. analysis of measurement data from the last accounting year). We also offer continuous analysis of current data, where our report will be supplemented by month-by-month.
  3. As shown in the analysis example, as part of the course of the analysis, it may be necessary to collect additional information from the object's user in order to properly interpret the results and determine if future energy savings are possible. Depending on the Client's expectations, the interpretation of the measurement data may remain on his side.
  4. The service, depending on the Client's expectations, can be extended by:
    - determining the share in total energy consumption for individual energy areas / receivers. This action allows to determine the areas responsible for the significant value of consumption (eg. lighting consumes 40% of electricity supplied to the enterprise),
    - energy bill validation and analysis,
    - determination of energy production efficiency indicators (eg. energy consumption indicators per unit, MWh / unit, or per ton of product, MWh / t), as a result of which it may be possible to determine the factors determining energy efficiency.
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