

ISEE - Intelligent System of Energy Efficiency

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Abstract

Increasing energy efficiency is one of the priorities of the European 3x20 climate and energy package. The ISEE system - Intelligent Energy Efficiency Control is a response to the growing interest in energy saving. It is also closely related to energy efficiency and reduction of greenhouse gas emissions. The presented system also allows connecting renewable energy sources to the analyzed facilities. It is intended for a wide range of recipients.

Keywords: energy efficiency, control system

1 Introduction

The current year 2020 is an important moment to summarize a number of activities related to the 3x20 climate and energy package. The package sets three key targets [11]:

- 20% cut in greenhouse gas emissions (from 1990 levels);
- 20% of EU energy from renewables;
- 20% improvement in energy efficiency.

These goals were set by EU leaders in 2007, and regulations were adopted in 2009. At the same time, these are the main goals of the Europe 2020 strategy for smart, sustainable and inclusive growth [4, 5, 9].

The presented tool is ISEE - Intelligent System of Energy Efficiency. It is a monitoring system with intelligent data interpretation. By monitoring key energy areas and ongoing cost control, it allows quick responses to possible failures and anomalies in various types of facilities. It allows for complex presentations in the form of understandable indicators (KPIs). Automatically recommends to take optimization actions in reference to energy classification tables.

2 System operation

ISEE was designed based on the philosophy of ISO 50001 [6]. According to the Polish Act of 20 May 2016 on energy efficiency [3], large enterprises are required to carry out energy audits. However, the Act gives companies the possibility to bypass the audit obligation. If the Company has implemented an Energy Management System specified in the ISO standard or Eco-Management and Audit System in accordance with the requirements of the European Parliament and the Council, it may apply for exemption from energy audits. The ISO 50001 standard applies to Energy Management Systems. If you have a certificate confirming compliance with the standard and conducting an energy audit of the company as part of the above system, the Entrepreneur is released from the obligation to carry out the energy audit referred to in the Act. The standard describes the requirements for energy management, which allows improving the energy efficiency of the company, taking into account applicable legal regulations [6]. Many companies simultaneously implement other management systems to ensure efficient and smooth operation of the enterprise on various levels [1, 2, 7, 12].

The ISEE system operates based on the existing measuring infrastructure or newly installed sensors. Energy utilities are monitored, i.e. electricity, gas and other fuels, water and sewage, steam, compressed air, energy production,

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energy recovery and others. In addition, the external conditions of the facility are monitored in the form of lighting intensity and efficiency of its use, temperature, humidity, CO₂ concentration and others [8, 10]. The measuring devices are integrated with the ISEE hardware module (purchased or leased), which is connected on-line with the isee24.pl platform. The ISEE platform is paid in the form of a subscription or possibly as a percentage of the profits obtained from the implemented expert recommendations. The advantages of using the ISEE system are shown in Figure 1.

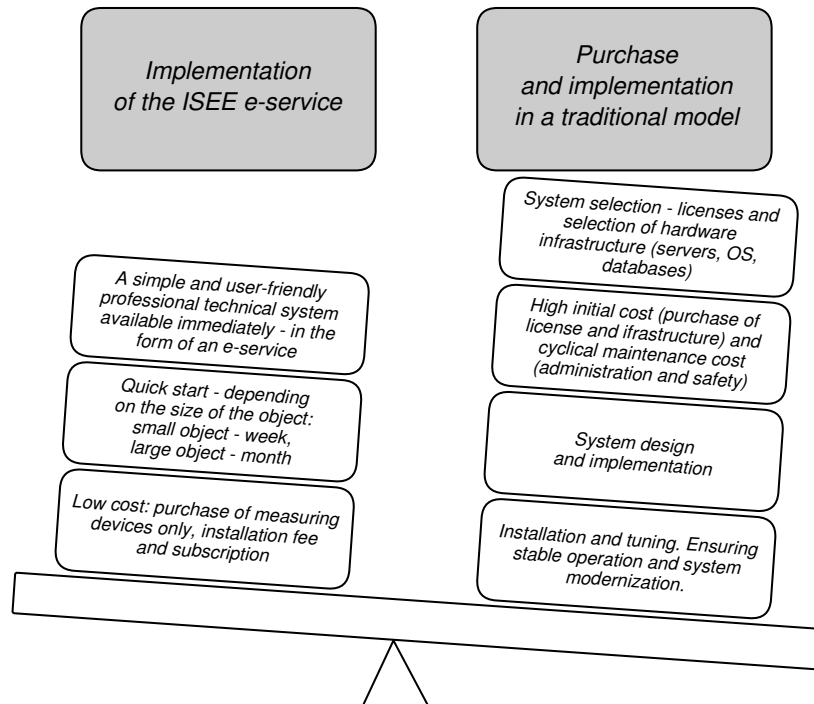


Figure 1. Difference between ISEE and other systems

The ISEE system is effective and gives quick results in energy efficiency increasing. The first benefits appear after a week of work (e.g. power guard, alarms, alerts about anomalies, e.t.c.). In the long-term, the first recommendations appear after a month (e.g. tariff change, tuning of the compressor set, e.t.c.). The ISEE system is intended for a wide range of recipients:

- ISEE 100 - dedicated to facilities with annual energy and fuel consumption higher than 100 MWh, e.g. store, office, hotel, warehouse;
- ISEE 500 - profiled for small and medium industrial plants with annual energy consumption higher than 500 MWh;
- ISEE 5000 - large and very large industrial plants with annual energy consumption higher than 5 GWh.

Figure 2 and 3 present the ISEE service as a comprehensive, multi-dimensional monitoring of the company's energy condition during the implementation process.

Data obtained from ISEE is delivered to various types of users with assigned permissions:

- managers (access to on-line performance indicators and their history);
- technical managers (access to indicators, recommendations, alerts, trends and reports, visualizations);
- users (access to dashboards, trends and reports as well as alerts in a specific area (energy, facility, installation, device e.t.c.);
- administrators (technical manager rights + settings and users management);
- facility users (facility automation control: manual/automatic operation).

In the case of a dispersed group of facilities (chain of stores, hotels) the whole process can be simplified into diagram shown in the Figure 5:

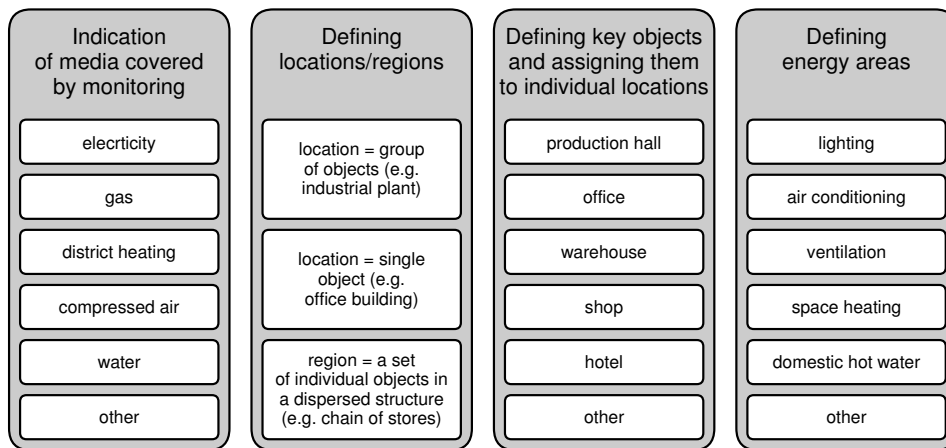


Figure 2. ISEE implementation process (step 1)

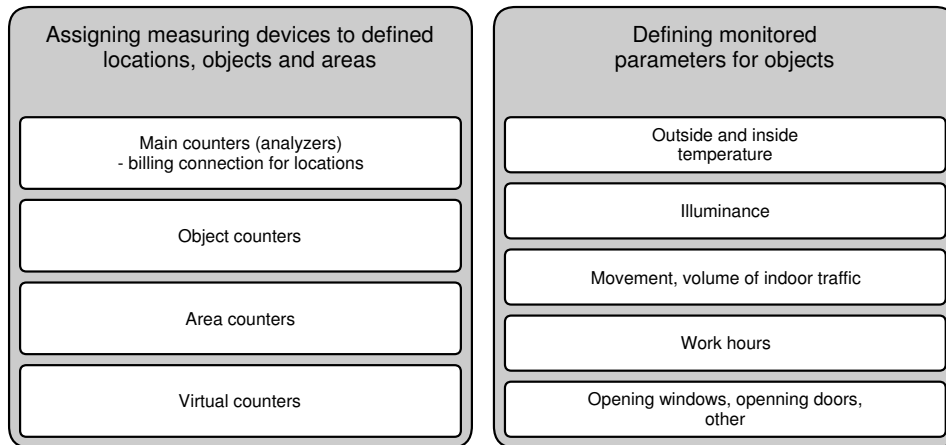


Figure 3. ISEE implementation process (step 2)

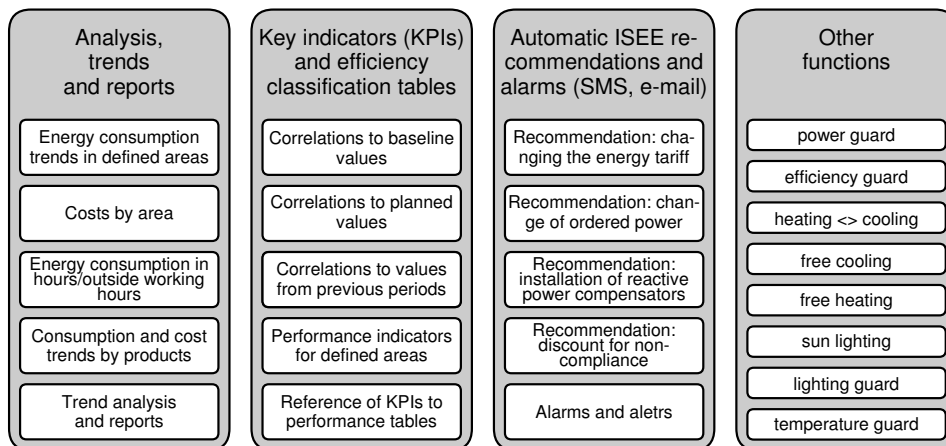


Figure 4. ISEE automatic functions - available from the beginning of system implementation

3 Conclusions

Intelligent System of Energy Efficiency - ISEE is a modern facility management service in terms of increasing energy efficiency. Advantages include the following: The possibility of obtaining funding from the so-called white certificates.

- Lowering the costs of purchasing energy distribution and energy carriers (tariff optimization, optimization of

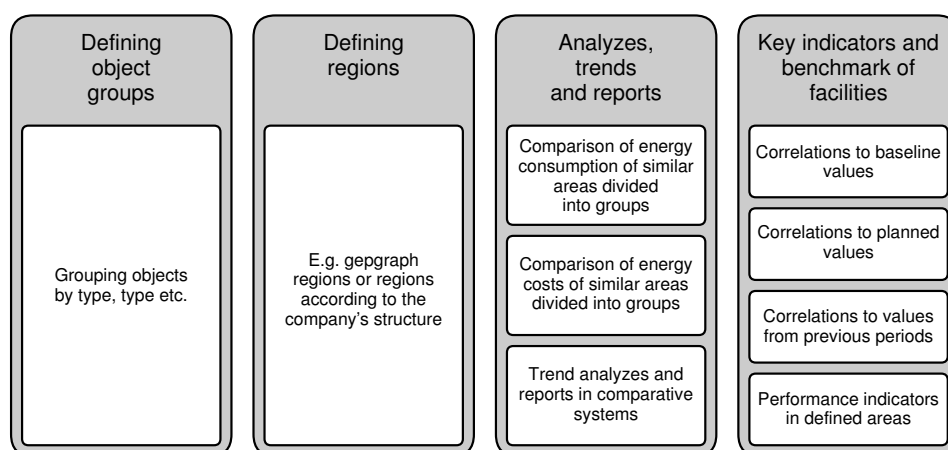


Figure 5. Simplified implementation for chain of stores, hotels, e.t.c.

ordered power and power guard function, recommendations and control of reactive power, compensation for failure to meet power parameters, excise duty refund);

- Reducing the consumption of energy and energy carriers through the use of automatic control (e.g. shutdown control outside of business hours, lighting control, inverter control systems, central heating controllers);
- Quick response to possible failures (e.g. reactive power compensators, water leaks, leaks in compressed air installations e.t.c.);
- Optimization of production processes through the use of information on energy costs of products;
- Predefined energy efficiency indicators (KPIs) for individual areas of the company and the ability to evaluate them based on available energy classification tables;
- Automatic recommendations of the ISEE system and expert consultants of ABZ Energia;
- Through ongoing control, continuous improvement of energy management (ISO 50001 requirement).

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