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MONITORING OF ELECTRICITY CONSUMPTION IN TERTIARY SECTOR

ELEKTROENERĢIJAS PATĒRIŅA MONITORINGS TERCIĀRAJĀ SEKTORĀ

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Introduction

Increased awareness of energy consumption in the European Union (EU) stimulates projects about different energy efficiency measures and the use of renewable resource. In 2006, the European Union's program – the Intelligent Energy-Europe -- agreed to financially support the project EL_TERTIARY, the main objectives of which are to analyse electricity consumption in the tertiary sector and to promote a more efficient use of electricity in this sector. The tertiary sector includes companies and institutions of public and private services showing very heterogeneous economic and energy-related characteristics. The electricity consumption in the tertiary sector is increasing – between 1995 and 2005 by 3% per year in the EU – 27 countries – and a further increase is expected of more than 2% per year during the next 15 years. But for identifying the most appropriate efficient electricity – saving measures it is necessary to have detailed and reliable information about electricity consumption patterns depending on the types of electricity use, consumers behaviour, available technical solutions etc.
Main types of electricity users, which are analysed in the project, are:

- Lighting
- Office equipment
- Ventilation
- Air conditioning

- Pumps and electric motor drives.

The aim of the project is to provide reliable and valid data that are obtained through empirical methods. A further objective is to find out factors determining energy consumption such as sector-specific technical equipment, user behaviour etc., in order to identify options for efficiency improvement regarding investments in equipment as well as behavioural changes. A key outcome of the project is a database with a reliable set of data on electricity consumption in types of buildings and branches in the tertiary sector and a harmonised methodology for electricity metering and analysis, which has been tested in selected typical buildings in countries involved in the project. 12 countries are involved in the EL_TERTIARY project where more than 100 buildings in the tertiary sector are analysed with respect to their electricity consumption: e.g. office buildings, supermarkets, hotels, hospitals, schools, and universities. The first phase of the project has been completed, whereby information about buildings electricity consumption has been collected and analysed to plan the second phase of the project when electricity consumption metering and monitoring in the buildings will take place. In Latvia, 13 buildings from the tertiary sector have been included: 3 hospitals, 3 universities, 2 kindergartens, 3 office buildings, 1 hotel and 1 school, which are further reviewed according to the developed methodology.

Methodology

Lack of unified methodology and understanding of interactions between different electricity user groups, consumers' behaviour and technical possibilities prevent successful efficient electricity – saving measures implementation. Thus, during the project a common methodology was developed to carry out the electricity consumption measurements of different tertiary sector's buildings. In the first phase selected buildings were inspected and main types of electricity users and their electricity consumption were identified. Then information about electricity consumption was analysed and classified according to the developed methodology. The methodology consists of 6 parts:

1. General building information – Basic information about building; main electricity consumption building's parts; total energy consumption; areas of the building sections
2. System information – Electricity consumption in building sections; lighting, ventilation/AC – system, cooling, pumps and electric motor drives and office equipment description in typical building parts
3. Metering total – Metering data for whole building
4. Metering sections – Metering data for building sections systems (according to System information part's data)
5. Metering lighting – Metering data for most important lighting systems (according to System information part's data)
6. Metering ventilation – Metering data for most important ventilation systems (according to System information part's data)

The first phase of the project covered the first two parts of the methodology. The collected information about electricity consumption was classified in two ways:

- by the type of use of buildings section,
- by main types of electricity users.

Building sections were determined according to the type of use of building section, see Table 1.

Table 1.

Building sections classification

Nr.	Type of use of building section	Building section
1.	Floor, stairs, entrance area	Logistic area
2.	Technical and central HVAC rooms, IT room, retail	Function area
3.	Hotel room, residential room, apartment	Effective area 1
4.	Office (single rooms; group rooms; open plan), conference rooms, teller rooms	Effective area 2
5.	Production, laboratories, kitchens	Effective area 3
6.	Storage, retail, logistics	Effective area 4
7.	Educational, sports, culture – classrooms, social rooms etc.	Effective area 5
8.	Health care rooms	Effective area 6
9.	Toilet, sanitary rooms	Effective area 7
10.	Parking garages	Effective area 8
11.	Other, mixed use	all

Main types of electricity users were estimated to gain complete and reliable information for the second phase of the project planning and to estimate most appropriate and efficient electricity-saving measures for certain types of buildings. Depending on building specification – office, educational or hospital building, and collected information were stated main types of electricity users for certain buildings:

- Elevators,
- Health care equipment,
- Kitchen equipment,
- Lighting,
- Office equipment,
- Pumps,
- Refrigerators,
- Servers,
- Ventilation,
- Other

For each building the above mentioned classification was performed to identify main electricity users and state where electricity and monitoring needs to be carried out. Electricity consumption information analysis made it feasible to understand where most attention should be spent in implementing and performing efficient electricity-saving measures.

Results

Based on the collected and calculated data about buildings, the following results were reached (see Figure 1-4).

Figure 1 illustrates typical electricity consumption distribution in different kindergartens buildings sections. Mainly electricity is consumed by kitchen and storage, technical room equipment.

Figure 2 shows main types of electricity users in hospital buildings where about 39% of total electricity consumption is used by lighting systems, 25% – refrigerators, 14% – kitchen equipment and only 6% of total electricity consumption is used by health care equipment.

Figure 3 illustrates typical electricity users for office buildings where lighting, office equipment and servers occupy most of electricity consumption. Ventilation's electricity consumption is quite small because surveyed office buildings have separate ventilation systems instead of unified ventilation system.

In the school mainly electricity is used in classrooms for lighting system and in the kitchen for equipment, sees Figure 4.

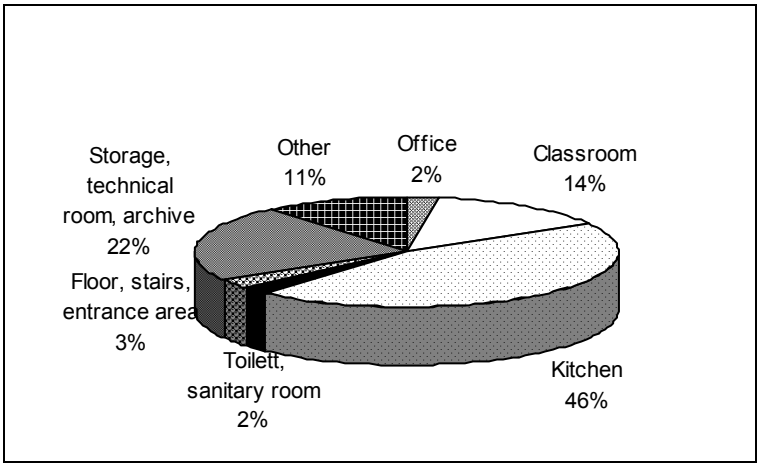

Figure 1. Distribution of electricity consumption in kindergartens building sections

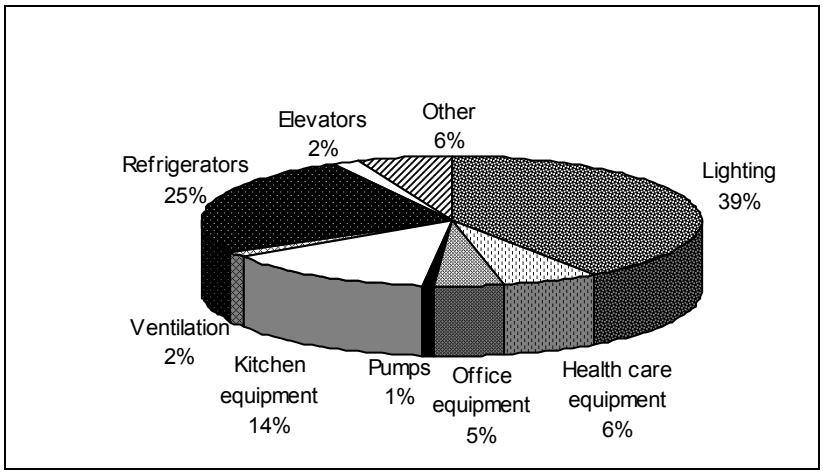

Figure 2. Main types of electricity users in hospital buildings

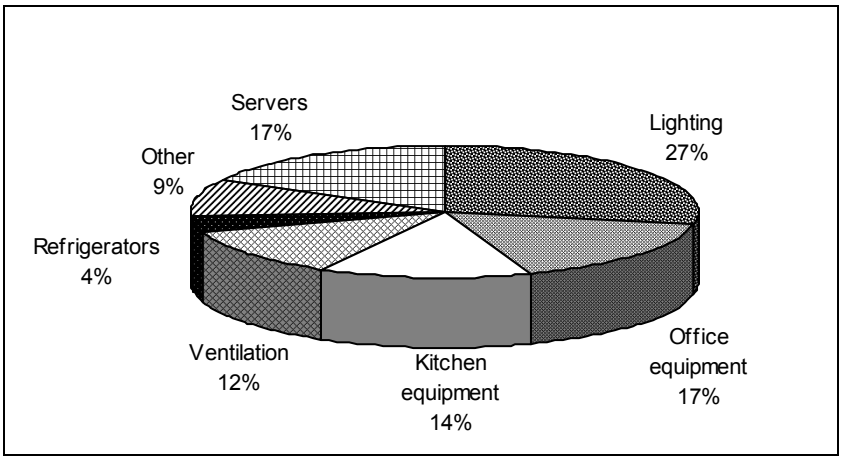

Figure 3. Main types of electricity users in office buildings

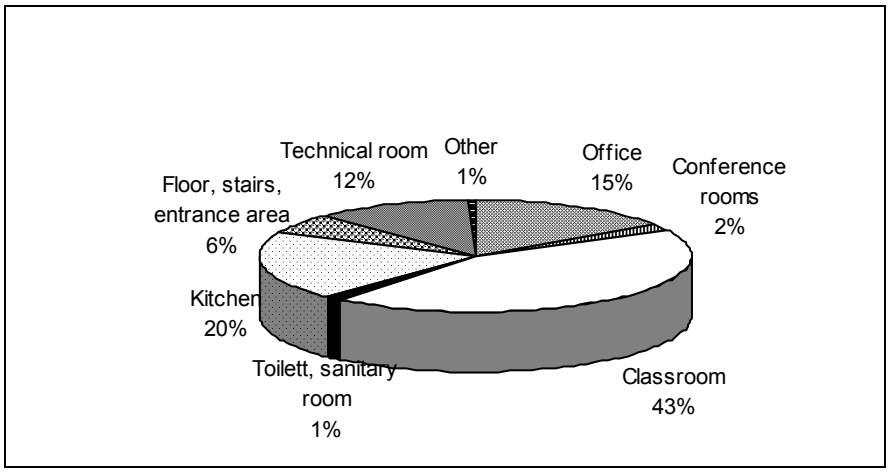

Figure 4. Distribution of electricity consumption in school building sections

The analysis of electricity consumption conducted allowed identification of the main areas where attention should be paid in the second phase of the project for making suggestions and proposing efficient electricity-saving measures.

Conclusions

Performed classification according to developed methodology allowed identification of the main types of electricity users for certain buildings. Electricity analysis showed that efficient electricity-saving measures should be implemented in lighting systems, kitchen equipment, servers and refrigerators. More precise information about whether these efficient electricity-saving measures should be technically based or on consumers behaviour will be inferred from these users electricity metering and monitoring in the second phase of the project.

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Rošā K., Rošā M., Baško A. Elektroenerģijas patēriņa monitorings terciārajā sektorā.
Elektroenerģijas patēriņš terciārajā sektorā par spīti dažādiem energoefektivitātes pasākumiem un programmām pastāvīgi pieaug. Laika periodā no 1995.gada līdz 2005.gadam elektroenerģijas patēriņa pieaugums Eiropas Savienības 27 dalībvalstu terciārajā sektorā bija 3% gadā, un tā pieaugums turpmākajos 15 gados tiek prognozēts 2% apmērā gadā. Galvenokārt tas saistīts ar detalizētas un ticamas informācijas trūkumu par galvenajiem elektroenerģijas patērētājiem terciārā sektora ēkās. Eiropas Savienības programmas "Intelligent Energy - Europe" projekta "EL_TERTIARY" mērķis ir palielināt izpratni par elektroenerģijas patēriņa tendencēm dažādās iekārtās Eiropas Savienības 27 dalībvalstu sabiedriskajās un komerciālajās ēkās un veicināt elektroenerģijas patēriņa samazinājumu tajās. Projekta pirmajā fāzē tika noteikts elektroenerģijas patēriņš aptuveni 100 dažādās ēkās un identificēti galvenie elektroenerģijas patērētāji. Latvijā tika apskatītas 13 ēkas: 3 slimnīcas, 2 bērnudārzi, 3 biroja ēkas, 1 viesnīca, 3 universitātes un 1 skola. Rakstā ir analizēts apskatīto ēku elektroenerģijas patēriņš un lielākie elektroenerģijas patērētāji.

Rochas C., Rošā M., Baško A.,. Monitoring of electricity consumption in tertiary sector.
Electricity consumption in the tertiary sector is constantly increasing despite different efficient electricity saving measures and initiatives. The electricity consumption in the tertiary sector between 1995 and 2005 has increased by 3% per year in the European Union 27 member states and a further rise is expected of more than 2% per year during the next 15 years. Main problem is the lack of detailed, reliable and valid information about main types of electricity users in the tertiary sector's buildings. European Union program's "Intelligent Energy - Europe" project EL_TERTIARY objective is to enhance understanding of electricity consumption dynamics in the EU-27 public and commercial buildings for different types of equipment and promote energy efficient use of electricity in this sector. In the first phase of project was identified about 100 buildings electricity consumption in different building sections and main types of electricity users according to developed methodology. In Latvia were surveyed 13 buildings – 3 universities, 2 kindergartens, 3 office buildings, 1 hotel, 3 hospitals and 1 school. Article includes analysis of the surveyed buildings electricity consumption and main types of electricity users.

Рошас К., Роша М., Башко А., Мониторинг потребления электроэнергии в терциарном секторе.
Потребление электричества в терциальном секторе постоянно увеличивается, несмотря на различные мероприятия и инициативы по повышению энергоэффективности. Потребление электричества в терциальном секторе в период с 1995 по 2005 год увеличивалось на 3% в год в 27 странах-членах Европейского Союза и дальнейшее ожидаемое увеличение будет составлять более, чем 2% в год в течении ближайших 15 лет. Главная проблема это недостаток детализированной, надёжной и верной информации о главных потребителей в зданиях терциарного сектора. Цель программы Европейского Союза „Intelligent Energy – Europe" проекта „EL_TERTIARY" исследовать тенденции потребления электроэнергии на различных оборудования в общественных и коммерческих зданиях 27 стран-участников Европейского Союза и способствовать уменьшению потребления электричества в этих зданиях. В первую фазу проекта были определено потребление электроэнергии приблизительно в 100 различных зданиях и установлены главные потребители электроэнергии. В Латвии были рассмотрены 13 зданий: 3 больницы, 2 детских дошкольных учреждений, 3 офисных здания, 1 гостиница, 3 университетских и 1 школа. В статье проанализировано потребление электроэнергии и самые большие потребители электроэнергии.