

MunEM:
Sustainable energy management on municipal level

WP 1: Management and fundamentals

**Organisational structure of municipal energy
management**

(Draft report)

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by
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on behalf of
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1 Introduction

The following report was elaborated in the framework of work package 1 “Management and fundamentals”. It provides the result of the work task “organisational structure of municipal energy management” which was carried out within the milestone 2 of the project.

The future purpose of a meaningful energy supply which is equally secured long term both economically and ecologically concerns the cities and municipalities in the Kaliningrad Oblast in a particular dimension. Rising energy costs which orientate themselves on the world market energy price have the effect that energy prices for the municipal budget increase in significance. The increase in energy requirements in the Kaliningrad Oblast also demands that expansion planning be carried out at local and regional level. Available energy conservation potentials should be implemented to avoid shortages in the energy supply.

Administrative structures must therefore be created whereby planning of the energy infrastructure and energy conservation can be co-ordinated and effective measures introduced whereby energy conservation on municipal premises are exploited, thereby reducing the load on the municipal budget. This can be achieved within the framework of a long term municipal energy management plan.

This report is intended to illustrate the use of energy management and to serve as an introductory procedure guide. It should be seen as a proposal for the introduction of an energy management at local and regional level.

2 Organisational Structure

2.1 Energy Management at Municipal Level

Energy relevant factors of influence and information within municipal administrations are often spread over many offices and individual persons. For this reason it is impossible to realise the full energy conservation potential without having inter-departmental co-ordination and planning. The municipal energy management starts to function at this point, as it integrates and co-ordinates old and new tasks and techniques of energy conservation within a uniform strategy and thus reduces the load on the municipal budget.

2.1.1 Tasks of Municipal Energy Management

The tasks of the municipal energy management are as follows:

Energy Consumption Monitoring on Municipal Properties.

Regular monthly consumption monitoring and benchmarking is one of the fundamental building blocks of municipal energy management.

Under energy consumption monitoring the continual recording, evaluation and analysis of electricity, heating and water consumption is understood.

The consumption values are also used in compiling identification numbers whereby buildings of similar type and use can be compared in a form of benchmarking. Energy characteristic values within a building area are illustrated as the annual energy consumption in relation to the energy reference area (sum of all heated gross floor areas in the building)

Timely consumption data is required for effective consumption monitoring. For this purpose the data from the main meters for heat (district heating, natural gas and heating oil), electricity and water is recorded on a monthly basis. The meters can be read locally by personnel e.g. caretaker or it can be called up by remote control. Consumption invoices of the energy suppliers can also be used as long as they are available on a monthly basis.

The consumption data should be able to be assigned to individual buildings to enable a meaningful evaluation to be made. When a building contains important areas where is a greatly different use (e.g. living and administration areas in one and the same building) the consumption of these areas by assignment should also be possible. Recording of the different energy supplies (oil, coal, gas, district heating, electricity etc.) must be recorded separately. The different units of measurement (gas in cubic meter, oil in litres etc.) are thereby converted into the so-called calorific value in kilowatt hour. This ensures that when using different sources of energy benchmarking the energy consumption is possible.

Evaluation of the consumption data is made by computer processing. The advantage of computer processing is that concluding preparation of the data such as addition of monthly values, weather cleansing, characteristic values and graphical illustrations can be speedily made.

Energy consumption monitoring enables quick reaction by above normal consumption which occur for example when a machine becomes defective or when an operating error occurs. Further to this energy consumption monitoring provides the basis for all following actions of the energy management, e.g. decisions on modernisation or renovation of technical or constructions systems.

Building Analysis and Planning of Conservation Measures

Fundamentally when compiling conservation measures the individual building must be first analysed. To obtain an overview of the most important energy factors of a building the following data must be determined:

- Building use (e.g. school, administration, kinder gardens, sport gymnasium, factory building, fire station, museum, tenement house etc.)
- Energy consumption area (sum of all heated gross floor areas of the building).
- Heating system (energy source, type of boiler and age thereof, installed performance and type of water heating).
- Energy consumption and consumption expenses of the last three years, these can be obtained from the energy supplier bills.

The specified value of the energy consumption of a building does not initially permit an evaluation of whether the energy has been economically or wastefully used or not. First when the consumption is brought into a relationship with the energy reference area and with this obtained energy parameter are comparisons with other similar buildings and use possible.

When the benchmarking of the energy parameters indicate a comparatively high consumption then the reason for this should be determined by a local inspection of the building. The optimising proposals for reduction of the energy consumption should be listed in a measures catalogue and sub-divided and prioritised according to the amortisation time of each energy conservation measure into short, medium and long term economical measures (see report „Measures Catalogue for Public Buildings“).

Costs Monitoring and Checking Energy Supply Contracts

Energy supplier bills and invoices should be checked for plausibility and completeness on the basis of the determined energy consumption data. Furthermore a check of the supply contract should be carried out as especially with long term contracts the frame conditions (building technical equipment, change to the loading profile and market development) may have changed in progress of time.

Actualisation of these contracts can lead to an immediate saving in costs for the municipality without investment having to be made.

Optimising Operation and Implementation

To optimise the operation and implementation of the technical systems of a building energy management and tasks such as control adjustments on the heating system, monitoring of room temperatures, training and advice to the operating personnel and building users are carried out.

The controls of heating systems are often incorrectly adjusted so that the heating operates one or the other hour earlier and switches off later than is possible or a night time temperature reduction doesn't even happen. The task of the energy management is to compile general conditions for the adjustment of the controls, to determine who is responsible for the adjustment and to arrange qualification measures for the operating personnel.

When optimising the operation of the technical system of a building observing the correct permissible room temperature has a special meaning as an increase of this temperature by only 1 degree centigrade over one year can result in an increased energy consumption of 6% on average.

The corresponding temperature for typical room use should primarily be prescribed (e.g. school room or office 20°C). The caretaker responsible for the building should then make regular temperature recordings and compare them with the prescribed values and readjust the control valves when necessary.

The users have a larger or smaller degree in influence on the energy requirement for a building according to the type of building in question. They should therefore be instructed on the correct use of thermostatic valves, energy saving illumination and in correct ventilation.

Examples as follows:

- Project week in schools with the theme „Energy Saving in our school“
- Basic course on energy related behaviour patterns for teachers
- Information sheets with energy saving tips for administrations

Reporting and Publicity

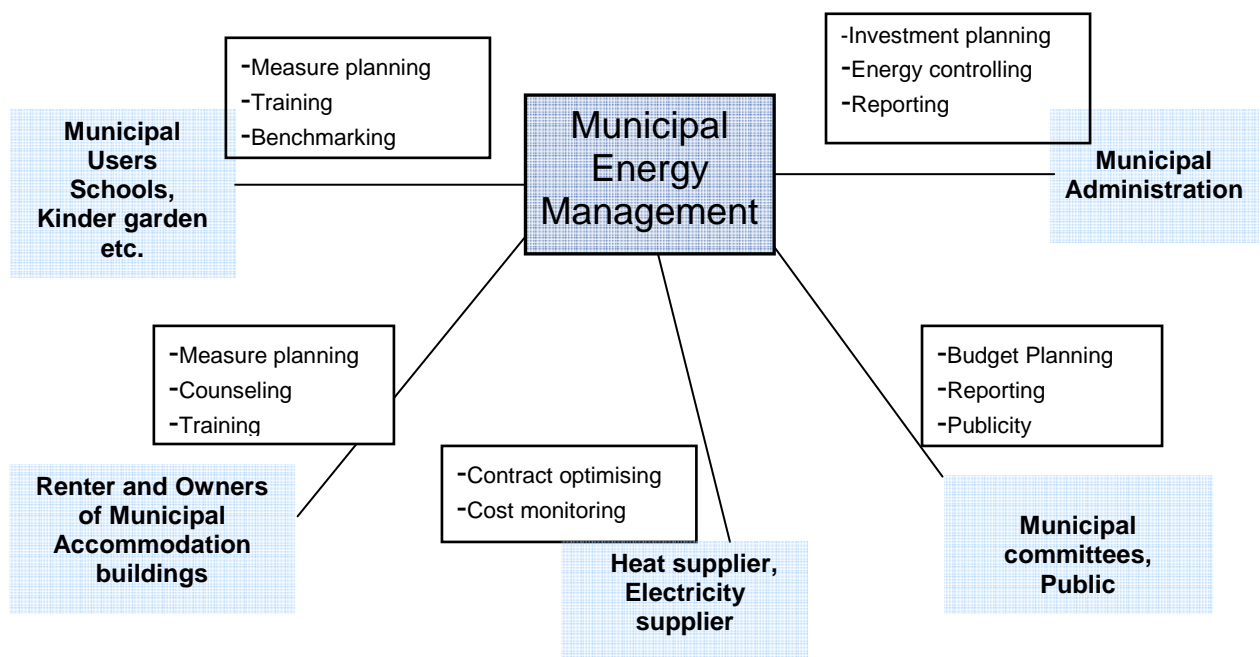
A good illustration of the work of the energy management, the results thereof and the energy saving measures which are planned are of great meaning in both directions, inwards (administration, politic) and outwards (building users and the public).

Regular reporting “inwards” and “outwards” is due to the following reason important: The energy management demands co-operation, information and financial means from other persons. Therefore a report should be made as to why this work is to be done and if it is progressing successfully. The energy management can thereby justify the occasional critical query on expenses etc. added to which identification of further energy saving potentials will help to stress the importance of a sustained and permanent energy management. Reporting by the energy management is an important source of information for municipal authorities in preparation of decisions.

Reporting can be in the form of an annual energy report and should contain the following points:

- A retrospective view of actions, consumption, costs and emission development of the last year and from the start of energy management.
- A comparison of the expenses with the savings since start of energy management
- Description of successful savings measures on selected buildings
- A prognosis on further feasible savings measures

2.1.2 Structures at Municipal Level



2.1.3 Resources for Municipal Energy Management

Human Resources

A half office work place for an energy manager is to be regarded as the realistic minimum and should not be under this in communities with a population of 10,000 and less. In the case of small communities a co-operation of several neighbouring communities which share an energy manager is feasible.

In larger communities in excess of 10,000 residents the energy saving possibilities presented by energy management justifies a full working place for an energy manager. Persons with the corresponding technical knowledge are suitable for this work.

A technical education (engineer or technician) is advantageous but not mandatory for this work. Administration and monitoring tasks can be mainly carried out by administration clerks. For tasks which are mainly more technical in orientation such as building analysis, planning saving measures, operating and usage optimising a technical education is necessary.

Technical resources

- EDP Hardware:
 - PC
 - Printer

- Software:
 - Software tool to illustrate the generation and distribution situation (WP 4)
 - Software tool for energy monitoring for self used premises (WP 3)

2.1.4 Financing and Financial Effects

Experiences gained in Germany show that with energy prices at world market level energy savings achieved by municipal energy management mostly exceed the associated expenses by a multiple. Creation of energy management positions therefore pay for them selves. Before financial savings can be made by energy saving measures it must first be invested in the energy management system. In the long term this type of investment is meaningful when considered the aspects of economics and the sustainable reduction of energy required for the municipal building.

An investment in the municipal energy management is, under the aspect of rising energy prices, to be considered as being absolute necessary in order that the rising costs for the building management be counteracted and that a sustainable relief be given to the municipal budget.

2.2 Energy co-ordination centre at Regional Level

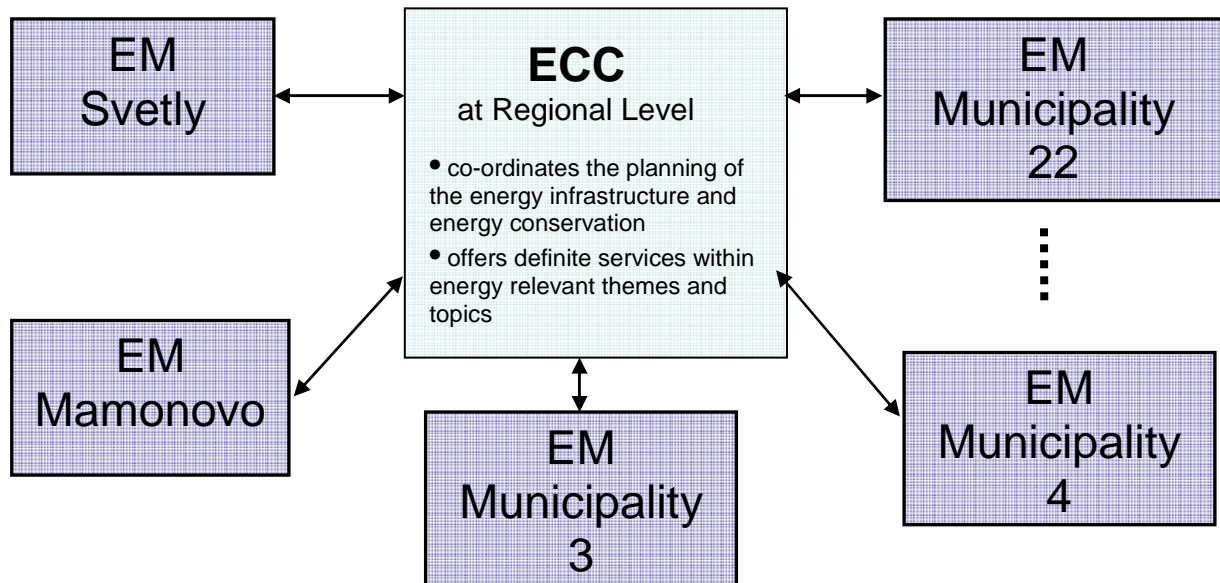
An energy co-ordination centre (ECC) should be established at regional level. This centre co-ordinates the planning of the energy infrastructure and energy conservation and supports the work of the municipal energy managers whereby it should be emphasised that this ECC is not to be seen as a regulatory office whose purpose is calling up information and distribution of instructions. The ECC is more importantly a central contact point which offers definite services within energy relevant themes and topics.

2.2.1 Tasks at Regional Level

The tasks of the ECC are as follows:

- Planning co-ordination of the energy infrastructure and energy conservation at regional level
- Experience exchange (e. g. through regular events, working groups of the municipal energy managers, Workshops)
- Determination of common standards
- Regional Benchmarking
- Assistance in connection with energy conservation measures/ measures catalogue
- Project co-ordination in the energy sector
- Training and further education of the municipal energy managers
- Information events and publicity
- Creating the conditions for a safe and rational energy supply and distribution by
 - Assessment of the requirements (performance related, annual energy requirement)
 - Recording the network situation
 - Determination of necessary energy structures
- Co-ordination of regional energy sources

2.2.2 Structures at Regional Level



2.2.3 Resources on Regional Level

- Personnel:
 - Engineer / Technician
 - Administration Clerk
- EDV Hardware:
 - PC
 - Printer
 - Internet
- Software:
 - Software tool for training of the generation and distribution situation (WP 4)
 - Software tool for energy monitoring for self-used premises (WP 3)
 - Geographical information system and simulation program for planning of heating networks.

3 Ten Steps to Establish an Effective EM System for Municipal Buildings and Properties

Start-up phase

1. Organisational preparation

Energy management measures must be created and provided with the appropriate resources. With smaller neighbouring communities it is feasible that they co-operate and share an energy manager. As the energy management represents a cross-sectional issue which affects many administration areas the responsibilities and competencies of the energy manager should be clearly defined. All departments within the administration effected by this should be involved in this process to ensure that the best possible consensus on the organisational measures be obtained and thereby ensure that the acceptance of the energy management be strengthened.

Feasible is for example that several tasks which were formerly carried out in diverse administration departments such as consumption recording, measure planning, compiling of energy reports and personal training could be transferred to the energy manager, while other tasks such as monitoring the technical systems and energy purchasing etc. remain in the individual technical departments and would be co-ordinated by the energy manager.

2. Develop Obligatory Energy Standards

In the area of energy management are energy standards general and standardised guidelines, requirements or instructions which should influence or generally determine and consider user behaviour.

They are concerned normally with the planning and handling of the buildings technical equipment with the main purpose of energy conservation. Observance of binding energy standards ensure that unsure decisions, in connection with efficient handling of energy by the persons responsible for the buildings function and by the buildings users are avoided.

Important aspects of these energy standards should be as follows:

- Responsibilities and competences of the energy manager
- Start and end of the heating period
- Descent times of the heating system (night operation)
- Planned room temperatures
- Ventilation of rooms (shock ventilation with closed heating valves)
- Recording and monitoring the energy and water consumption

3. Promote the motivation of all sub-units to perform energy efficiency measures

Motivation of all participants is decisive for the success of energy management. It is therefore of great importance initially to explain the meaningfulness of energy management. Regular reporting about the conservation successes already achieved and the still available potential heighten motivation as does a transparent Benchmarking of the participating building.

Mapping Phase

4. Master Data Recording

To obtain an overview of the most important energy factors of a building the following data should be acquired:

- Use of the building (e.g. School, administration building, Kinder garden, sport gymnasium, factory building, fire station, museum, tenement building etc.)
- Energy reference area (sum of all heated gross floor areas of the building).
- Heating system (energy source, type of boiler and age thereof, installed performance and type of water heating)
- Energy consumption and consumption expenses of the last three years, these can be obtained from the energy supplier bills.

5. Consumption Monitoring

Prerequisite for efficient consumption monitoring is that the consumption values are regularly and separately recorded for the individual buildings. For this it is imperative that consumption meters be installed in each building.

Evaluation of the consumption data should be made by computer processing. The advantage of computer processing is that concluding data processing such as consumption calculation, weather cleansing, comparison with previous annual value and graphical illustrations and also that a timely response can be speedily made in the case of excessive consumption.

6. Establishing Energy Characteristic Values

The reference value given from the relationship between consumption and the energy reference area make it possible to compare buildings of the same type and use. This method enables buildings with excessive energy consumption to be detected.

7. Detailed Building Analysis

When the benchmarking of the energy parameters indicate a comparatively high consumption then the reason for this should be determined by a local inspection of the building. Measures designed to eliminate the excessive energy consumption and sustainable energy conservation can be planned on the basis of the findings of such an inspection.

Optimisation Phase

8. Measure Planning, Implementation and Control

The optimisation proposals for reduction of the energy consumption should be summarised in a measures catalogue and sub-divided and prioritised each according to its amortisation period in „short“, „medium“ and „long“ term economical measures (see report „Measures Catalogue for Public Buildings“). After implementation of the measures a comparison between the planned targets and the actual achieved results and continuous monitoring of consumption development should be made.

Documentation, Promotion and Adjustment Phase

9. Report the results to the local policy makers and the public

Regular reporting to the political decision makers on the achieved results serves on one hand to document that the investment made has led to savings and on the other hand the indication of further conservation potential emphasises the importance of a sustained energy management.

The importance of publicity due to its multiplicity and generation of motivation should not be under-estimated. The role model function of the communities leads to public sensitisation for energy economical correlations and to a conscious and efficient energy handling.

10. Promote networking, exchange of experiences with other municipalities and dissemination of good practices

A regular experience exchange, e.g. through working groups of the municipal energy manager offers the possibility to learn from one another and to implement “best practices” in one’s own community.