Integrating Energy Management in comprehensive Facility Management Service tenders

Final Manual, Version_071231

Compiled by the Austrian Energy Agency in cooperation with the Energy Agency Graz and the Energy Agency Berlin

The sole responsibility for the content of this manual lies with the authors. It does not represent the opinion of the Community. The European Commission is not responsible for any use that may be made of the information contained therein.
Table of Contents

1 SUMMARY .............................................................4
2 ABBREVIATIONS ...................................................6
3 INTRODUCTION ..........................................................7
4 ENERGY SERVICE OR GUARANTEED SAVINGS CONTRACTS ..........9
  4.1 Overview ........................................................................................................ 9
  4.2 Options for combining Guarantee Models and Facility Management .................9
  4.3 Feasibility check for the integration of guarantee elements .................................10
  4.4 Contracting models ............................................................................................10
    4.4.1 Energy Supply Contracting (Plant Contracting) ..............................................11
    4.4.2 Performance or Savings Contracting ..............................................................12
    4.4.3 Operations Management Contracting .............................................................13
    4.4.4 Comprehensive renovations with guarantee elements ..................................13
  4.5 Financing .............................................................................................................14
5 TYPES OF TENDER ..................................................15
  5.1 Functional Tendering ............................................................................................15
  5.2 Specification-based tenders ..................................................................................16
6 PROCEDURE FOR INTEGRATING ENERGY MANAGEMENT IN FACILITY MANAGEMENT TENDERS ..............................................17
  6.1 Target setting ......................................................................................................18
  6.2 Potential analysis .................................................................................................18
    6.2.1 Determining savings potential .......................................................................18
    6.2.2 System inventory ............................................................................................19
  6.3 Selecting suitable buildings and properties ........................................................20
6.4 Calculating the energy cost baseline

6.4.1 Standards for calculating the energy cost baseline

6.4.2 Determining the heating degree days (in compliance with EN 832)

6.4.3 Accrual for one calendar year

6.5 Determination of contract period

6.6 Defining rights and duties of contractor and customer

6.6.1 Validity period of contractor

6.6.2 Detailed planning and veto right

6.6.3 Consumption and cost controlling

6.6.4 Penalties

6.7 Methods of payment

7 STANDARD PROCEDURE FOLLOWING DECISION ON A BID

7.1 Preparation phase

7.1.1 Detailed analysis

7.1.2 Adjusting measures to customer needs

7.1.3 Implementation of measures by the contractor

7.1.4 Measures assumed and audited by customer

7.2 Main performance stage

8 APPENDIX

8.1 Contract Annex: Measures form

8.2 Contract Annex: User information

8.3 Contract Annex: Energy monitoring and controlling

8.4 Contract Annex: Comfort standards

8.5 Contract Annex: Calculation of energy cost baseline

8.6 Contract Annex: Calculation of adjusted savings

8.7 Adjusting current consumption data

8.8 Key Norms and Regulations
9 BIBLIOGRAPHY.................................................................51
1 Summary

Managing and maintaining a building involves numerous activities and services, which often go beyond a company’s core competencies. These services may range from procurement and property management, to in-house postal services, cleaning services, security services, product and logistics services. Facility management can help to organize and optimize these activities to enhance the operating efficiency of facilities.

Facility management also involves energy management, which is not offered in a standardized form, as of now. Due to rising energy costs, however, it has become crucial to be aware of a building’s energy consumption. This knowledge will ultimately help to identify and evaluate the building’s energy savings potential. Energy service companies provide the expertise needed to implement such tasks as part of savings contracting. This type of contracting involves developing measures to reduce costs and/or to supply and use energy efficiently. Structural, technical, economic and organizational aspects of facility management are combined. The energy service company guarantees the savings agreed upon. The benefits for the business are as follows:

- professional development of energy-saving measures
- outsourcing installation and operation risks
- wide range of services for maintenance, plant management and servicing of equipment and buildings
- company’s image - perceived as environmentally friendly and sustainable

Energy management must be included in the facility management tender.

There are two types of tenders:
- functional tender
- specification-based tender

Functional tenders merely involve stating the function to be carried out. The potential contractors provide their expertise by develop measures that will help meet the objectives. If the general framework given by the client is inaccurate and vague, errors and misunderstandings are likely to occur. For this reason, both the framework and the contractor’s freedom to implement new ideas need to be well-balanced.

In the specification-based tender the customer presents an accurate and detailed list of the services to be undertaken. Offers can thus be compared more easily and effectively but it bars the contractor from the creativity in finding better solutions.
The procedure of integrating energy management in the facility management tender - whether functional or specification-based – is as follows:

1. Target setting
2. Defining the general framework
3. Potential analysis
4. Selecting suitable facilities
5. Calculation of energy cost baseline
6. Calculation of energy savings amount
7. Defining the rights and obligations of contractor and client
8. Specifying penalties
9. Methods of payment

These nine points serve as a basis for inviting, assessing and selecting bids. This manual provides a detailed description of the points. Once a bid has been awarded, the contractor conducts a detailed analysis, which helps determine cost and savings on the basis of the general analysis. Next, both contract partners agree on the objective measures. After implementing these measures, the customer begins the audit. During the main performance stage, the contractor undertakes the contractually guaranteed services. Failure to meet the terms agreed upon will affect the contractor’s fee.
2 Abbreviations

The following abbreviations are used in the text:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAIFM</td>
<td>Computer Aided Integrated Facility Management</td>
</tr>
<tr>
<td>FM</td>
<td>Facility Management</td>
</tr>
<tr>
<td>FMS</td>
<td>Facility Management Software</td>
</tr>
</tbody>
</table>
3 Introduction

Businesses are increasingly facing new challenges, due to rising production costs and strong competition. That means, that they are forced to apply their resources on their core business. Their buildings, plants and equipment are thereby strategic resources and have to be economic, cost efficient and representative.

The core business of Facility Management (FM) is to help businesses to manage all services related to their buildings, and to coordinate them to make it possible for the customers to focus on their core business. The goal of FM is to optimize productivity, flexibility of use, as well as the return on capital.

Currently FM provides services particularly centered around building inventory. The expertise in building management can be applied as early as in the planning phase of constructing a new building. This can help make important decisions as to future follow-up costs (energy, cleaning services, logistics, etc.) during the early stages of designing.

A FM service provider has extensive knowledge on all aspects of operating facilities, particularly on those factors causing problems and/or creating high operating costs. Thus, they can advise customers on how to optimize properties and assist in the implementation. FM can lead to a considerable reduction of annual costs considerably by combining services, re-tendering services and by using synergies.

The three different aspects of Facility Management are:

<table>
<thead>
<tr>
<th>Technical Facility Management</th>
<th>Infrastructural Facility Management</th>
<th>Commercial Facility Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating, keeping records,</td>
<td>Catering, data processing services,</td>
<td>Supply management, space</td>
</tr>
<tr>
<td>energy management, disposal,</td>
<td>garden and janitorial services, in-</td>
<td>management, cost planning</td>
</tr>
<tr>
<td>communications management,</td>
<td>house postal service, copy and print</td>
<td>and controlling, property</td>
</tr>
<tr>
<td>modernizing, optimizing,</td>
<td>services, parking garage service,</td>
<td>accounting, project</td>
</tr>
<tr>
<td>renovating, remodeling,</td>
<td>cleaning service, security service,</td>
<td>management, real estate</td>
</tr>
<tr>
<td>tracking technical warranty,</td>
<td>moving service, commodity and logistics</td>
<td>contract and lease</td>
</tr>
<tr>
<td>supply, etc.</td>
<td>service, winter service, central</td>
<td>management usw.</td>
</tr>
<tr>
<td></td>
<td>communications service, etc.</td>
<td></td>
</tr>
</tbody>
</table>

Table 1: The three aspects of Facility Management

Energy management is part of FM and involves the optimization of
- operational systems and their use,
- structural impacts on energy consumption and
- energy supply contracts.

With energy prices rising and the growing awareness of potential savings opportunities, energy management has become more significant than ever.
In addition to labor and material costs, energy costs make up a large part of a company’s overall expenses. In the first stage, a facility manager helps to make energy costs more transparent. Next, potential energy savings are identified, and implementation measures are developed. The energy management provider is liable for the guaranteed energy savings. This type of agreement is referred to as performance or savings contracting, in which the energy service company is responsible for planning, financing, developing and implementing the constructive and technical measures required as well as for managing technical equipment over the contract period. The goal is to maximize the life and performance of a facility. The energy saving measures are refinanced through the energy cost savings achieved. If, however, the guaranteed goals are not met by the energy service company, it is responsible for settling the balance. For more details on the savings contracting procedures and other types of contracting, see chapter 4.

The benefits of a savings contracting program are as follows:

- Transparency of energy costs
- Developing professional energy saving measures
- Savings and quality guarantee and hence
- Outsourcing installation and operation risks
- No initial capital investment due to third-party financing
- Reduction of CO2 emissions and other forms of emissions
- Wide range of system and building services: maintenance, plant management and repairs
- Focus on core competencies, as a result of outsourcing energy management
- Efficient communication: only one contact person in charge of entire energy management
- Energy efficiency, eco-friendliness and sustainability are key factors for winning new customers.

Taking these benefits into consideration, it is strongly recommended to integrate energy management in the FM service agreement.

If the above guarantees are required by the building operator, they need to be specified in the contract and in the tender offers. It is crucial that the tender documents include a clear specification of the general conditions and the contact points between the customer and the contractor.

It is advisable to involve an experienced and independent consultant to help define the nature of the contact points between customer and contractor.

To create a more competitive environment, rich with creative ideas, the best bidder is selected by collecting several offers.

This guide provides advice on how to search for and select the contracting model and energy management company most suitable for a particular business. Contract models have been included to further assist businesses.

The first section is an introduction to the various contracting models.
4 Energy Service or Guaranteed Savings Contracts

4.1 Overview

Guaranteed savings contracts (energy service models/contracting models) are packages of services providing a variety of cost-effective energy saving measures, while combining structural, technical, economical and organizational components of facility management. The energy services company guarantees the stipulated energy savings and is accountable for the operation details and tasks.

Businesses can select from a wide range of measures to achieve savings, and decide which package best meets their needs and requirements. Generally the services provided include:

- planning and consulting
- construction
- guaranteed savings
- maintenance, operation management, servicing
- fault clearing service
- (possibly) financing

In order to ensure successful project execution, it is essential that the facility manager provides a detailed functional description of the services required, as well as the organizational, legal and technical guidelines thereof. The energy services company accounts for the detailed planning of measures. It is recommended to involve an experienced and qualified consultant.

4.2 Options for combining Guarantee Models and Facility Management

There are different ways for combining Energy Management with Facility Management. Here are three options:

The facility manager has the expertise and ressources to evaluate potential energy savings, to develop savings measures and to guarantee the savings suggested. In that case the Facility Manager will assume the contracting himself.

If the facility manager lacks the expertise, he can outsource the energy management to a contractor.

The third option for a client is to outsource Energy Management separated from Facility Management.
4.3 Feasibility check for the integration of guarantee elements

In principle, contracts with guaranteed energy savings make sense for all facilities with an adequate potential to reduce energy costs. A decision criterion for incorporating guarantee elements in the FM tender is the availability of personnel and financial resources for an action on one's own responsibility. As designing a contract, selecting the right partners and continuous controlling are rather time-consuming, this option is only suitable for facilities which produce annual energy costs of € 40,000 to 50,000.

This type of contract is particularly suitable for new buildings with high economic potential and low investment costs. Their energy consumption is often substantial because, even though HVACR may have already been installed, the services have not yet been adjusted to the user's daily energy demand.

4.4 Contracting models

Depending on the compensation system and the scope of modernization, there are four basic types of contracts:

- Energy Supply Contracting (Plant Contracting)
- Savings contracting (Performance contracting)
- Operation Management Contracting
4.4.1 Energy Supply Contracting (Plant Contracting)

With this type of contracting the energy service company or contractor assumes full responsibility of financing, installing and operating your energy supply systems. It is primarily applied when upgrading existing boiler systems in serviceable buildings or in buildings which require renovation.

The energy service company or contractor installs and operates the systems, while assuming all technical and financial risks. Other services provided include fuel procurement and the handling of regulatory permits.

**Energy supply or asset contracting**

![Diagram showing energy supply or asset contracting]

**Figure 1: Statement of costs of energy supply contracting**

The energy service company is responsible for financing and investment. The facility owner may choose to contribute to the building cost grants or final payments (at expiration of the contract). As a result, the annual basic rate (contracting rate) is reduced, or more extensive renovations may be commissioned.

Refinancing is done solely through the supplied heat. To cover the fixed costs and investment costs, the fee is typically divided into a kilowatt-hour rate for usage-bound heat (Euro/MWh) as specified in the contract, and a fixed annual basic rate (demand rate).
4.4.2 **Performance or Savings Contracting**

As mentioned above, the energy service company accounts for the planning, financing and installation/execution of the required structural and technical measures over the contract period. The goal is to optimize the overall facility conditions and to achieve efficient equipment performance. Thus this type of contracting is a viable option to ensure energy efficiency in a facility. The energy service company provides the expertise needed to guarantee maximum energy savings, which, in turn, are used to refinance the energy saving measures.

The benefits for the facility owner are illustrated in the chart below.

---

**Energy performance contracting**

- **Building owner's annual costs**
  - Baseline - actual costs
  - Costs after renovation

**Total heating costs (old)**
- Fuel
- Electricity
- Maintenance
- Reinvestment
- Personnel costs
- Miscellaneous

**If necessary, building cost subsidy**
- or final payments to contractor

**Contracting rate for energy service providers**
- Refinancing of investment
- Comfort and value enhancement
- Servicing and maintenance
- Risk assumption

**Financial benefit for the facility owner**

**Consumption costs (new)**
- Accounting monitoring through
  - Price adjustment (reference prices baseline)
  - Outside temperature adjustment (number of heating degree days)
  - Usage adjustment

**Figure 2: Statement of costs for Energy Savings Contracting**

If the stipulated savings are not achieved, the energy service company is required to compensate the facility owner. Changes in climate, usage or price are included and adjusted accordingly in the annual account. If savings are greater than projected, the excess savings are shared with the energy service company.

The facility owner benefits from the wide range of services provided, including servicing, maintenance and upgrading of the systems and buildings. In addition, the energy service company assumes installation risks, and, if desired, financing (TPF = Third Party Financing). The package of services is tailored to meet individual customer needs.
4.4.3 Operations Management Contracting

All operations related to an existing supply plant are outsourced to a energy service company. This is a viable option if a facility runs without major problems and there are no major upgrading investments planned, but if, at the same time, there is energy saving potential. Both plant contracting, as well as savings contracting, can be applied here. The energy service company is responsible for energy supply, including fuel procurement, and is paid according to the energy quantity supplied. It thus differs from conventional asset contracting only in the way that it does not involve the financing and installation of the supply plant.

Another option is that compensation is made according to operating expenses. This involves a wider range of services compared to a common maintenance contract. Services provided by the energy services company include, for example, servicing, maintenance and the handling of liability matters. If the guaranteed smooth operation and handling of fault clearance are not fulfilled, the customer pays less for the contractor’s compensation.

If a plant management contract is applied as savings contracting, the energy service company is furthermore responsible for the efficient operation of the existing facility. In addition, it provides optimization measures (the investment costs usually being low). The energy services company assumes the risk that the project will save the amount of energy guaranteed. If these goals are not met, the energy services company gets paid less.

However, caution is advised when the contracting period lasts for a short time: Services provided for new facilities may, in some cases, be insufficient as they usually require less maintenance and disruptions are less likely to occur during the first few years. To avoid negligence, then, it is advised to choose a long-term plant management contract. To ensure high quality of services at short-time contracts, the contractor’s activities have to be closely monitored.

4.4.4 Comprehensive renovations with guarantee elements

In addition to saving energy, construction measures can also be included as part of a guarantee contract, thus including renovation of a facility. The energy service company assumes the role of the general contractor, which adds further responsibilities to the range of services provided: planning and implementing of construction measures. In addition, it guarantees the amount of energy consumed.

The energy service company also undertakes maintenance and operation of the power systems, so as to ensure that the guaranteed savings are achieved. If these goals are not met, the fee – which is paid on an annual basis – is cut.

An example of comprehensive renovation with savings guarantees is the refurbishment of a building envelope so as to make it more energy efficient. The benefit of full heat protection (energy savings, indoor climate, mould avoidance, etc.) requires a high-quality construction. The level of full heat protection efficiency is stipulated in the contract and is guaranteed over the full contract period.

The difference between a guaranteed savings contract and an in-house solution, is that the former provides a long-term guaranteed level of quality of the executed measures, which go far beyond the implied warranty. If problems occur after renovation is completed (unexpected and high energy consumption, mould, etc.), the contractor is responsible for handling them. If the facility owner the in-house solution, he assumes all risks and responsibilities.

This model provides the facility owner with innovative and state-of-the-art products, which help to operate the facility more effectively and efficiently. For examples of successful
projects, please go to http://www.ecoundco.at/, click on “Success Stories” and read about the Joanneum Research office and laboratory facilities in Graz.

The scope of savings guarantees is tailored to the project’s needs.

4.5 Financing

For details on how to finance contracting projects, please refer to the guide, „Comparing and evaluating financing options for energy savings contracting projects“, compiled by the Energy Agency Graz. This manual was created as part of the EUROCONTRACT project.

The following section focuses on tender preparation.
5 Types of tender

The two types of tender are:

- Functional tenders
- Specification-based tenders

5.1 Functional Tendering

Often the customer has decided only on the function required, not, which specific solutions should fulfil the function. These are developed by the contractor during the tender process.

A functional specification of services allows the customer to combine flexibility in business dealings, goal setting and control with the contractor’s creative skills and expertise. The process requires a clear and precise definition of the existing framework and requirements. These help the contractor to arrange and prepare a tailor-made service package to best meet the customer’s needs.

If the specifications of the framework are presented inaccurately and vaguely, uncertainty and conflict of interest are much more likely to occur, resulting in inflated costs and disadvantages, which may effect all parties:

- With regard to the constructor: additional costs for amendments, which cannot be ruled out in the contract. Disputes often result in litigation costs and settlements.
- With regard to the building company: losses, because services were not calculated and cannot be implemented through amendments.

Key factors for ensuring cost effective outcomes are accurately-defined general conditions and the contractor’s freedom to implement measures and suggestions according to his ideas and judgement.

Assessing and designing the contract through functional tenders can be demanding and time-consuming for the customer, as the individual offers cannot be compared.

While the customer can focus on his core business, the contractor is faced with the high level of complexity and costs during the tender process, compared to specification-based tenders. The additional costs and efforts incurred often result in inflated prices.

As with conventional service tender, it is crucial to solicit several bids or to engage in a tender process. This will spur the contractor’s creativity, due to competition.

The best bid is determined first via a cash value analysis for quantifiable criteria, followed by a value benefit analysis. The best bid therefore is not necessarily the one that is most cost-efficient, but the one which provides best value for money.
5.2 Specification-based tenders

In this type of tender the customer closely specifies the services required, thus defining the scope of the contract as well as the quality standards requested.

This procedure allows the customer to compare bids more effectively. On the other hand, it puts constraints on the contractor's creativity, which might help to track further energy savings measures or to develop more effective plans.
6 Procedure for Integrating Energy Management in Facility Management Tenders

The procedure of setting up a tender is as follows:

1. Target setting
2. Defining the general framework
3. Potential analysis
4. Selecting suitable facilities
5. Calculating the energy cost baseline
6. Calculating the amount saved
7. Defining the rights and obligations of the contractor and the client
8. Specifying penalties
9. Methods of payment

The following chapters provide a detailed description of the nine steps and components, which serve as a basis for inviting, assessing and selecting bids. Once the decision for a bid has been made, the contractor conducts a detailed analysis, which helps determine costs and savings on the basis of the general analysis. Next, the objective measures are discussed and tailored to the customer’s needs. After implementing these measures done by the contractor, the customer carries out the inspection. During the main performance stage the contractor delivers the stipulated the contractually guaranteed services. For more details please refer to chapter 7.

The appendix includes annexes, which should be included in the contract.
6.1 Target setting

During this stage suitable evaluation criteria are developed to assess the tender bids. The selection criteria should be geared to the project's goals and should be measurable. They need to be defined by the customer and declared during the search for a suitable bidder. Below are examples of goal settings and their scope:

**Budget relief**
Savings measures result in energy cost reductions
Measurable, e.g. through electricity costs in Euro/year

**Increase in availability of facilities**
Tolerance limit or immediate fault service
Measurable, e.g. through number of standstills

**Improvement of user comfort**
Problem areas are eliminated and comfort standards defined
Measurable, e.g. through number of error reports of comfort problems

**Maintenance or increase of facility value**
New investments within the facility are made as a result of maintenance and restoration, thus raising the facility value.
Measurable, e.g. through property value in Euro

**Positive impact on environment**
Reducing energy consumption results in a reduction of CO2 emissions, thus mitigating environmental damage.
Measurable, e.g. through tonnes CO2/year

6.2 Potential analysis

6.2.1 Determining savings potential

First, the customer collects data on energy savings potential. By comparing the energy consumption and costs to similar facilities in terms of building type, use and equipment, the energy service company or energy consultant can then assess the level of savings potential quickly and easily. To compare different buildings with each other, a suitable measure system is required. For this purpose, all relevant facility and use characteristics can be applied, such as number of overnight stays or meals for hotels and restaurants, of beds in hospitals or hotels, the area (gross floor area, effective area or sales area). This information is then seen in relation to the energy consumption or energy costs. Only facilities that are equal in terms of comparison indicators can be compared with each other. In addition, time intervals of all indicators to be compared have to be equal.

A rough analysis during property inspection can also shed light on the state of the building.

*Sample text:*

In the first stage an energetic comparison of the facilities tendered needs to be done. These are compared with facilities of similar structure and use. It is advisable to create a comprehensive catalogue of measures during a property inspection. The catalogue should include qualified conclusions regarding energy saving potentials. Photographs may be included to substantiate these conclusions and observations.
### 6.2.2 System inventory

For the contractor to get a general idea of the building’s energetic situation and draw up a contract specification, data on technical equipment needs to be collected as well.

The following areas are involved:

- House services engineering, such as:
  - Ventilation and air-conditioning technology
  - Indoor heating/process heat and hot water
  - Refrigeration engineering
  - Lighting
- Energy supply
- Logistics
- Other

The system inventory is also an integral part of the future FM contract and the maintenance plan.

In the course of the tendering process, the contractor identifies measures to increase the energy efficiency and offers solutions. Figure 3 presents the expense gap with the optimal cost ratio point in maintenance management. The more high-quality and thus mostly cost intense the measures are, in terms of maintenance and monitoring, the lower are the follow-up costs in the upkeep. For this reason, it is advised to determine and aim for an optimum in the cost relation between maintenance/monitoring and the restorations. This can be reached most effectively through a value benefit analysis.

![Figure 3: Expense gap with cost-optimal ratio point](image-url)
6.3 Selecting suitable buildings and properties

The process of finding a suitable building(s) involves taking the following aspects into consideration: longtime circumstances of use, renovation needs, high savings potential, combination of individual buildings to create so-called pools, and the option of involving available technical staff.

6.4 Calculating the energy cost baseline

The energy cost baseline is the basis for calculating annual savings, which are achieved through the measures taken by the contractor. It is the status quo before measures are undertaken.

During project preparation the customer uses the facility data available to calculate the energy cost baseline for the period of reference, on the basis of reference energy- and, occasionally, water prices for the chosen building(s). Other factors, which are determined through the energy cost baseline include reference use, reference prices and reference climate. The baseline is a key component in the tender documents for preparing the tender. It is the basis bidders use to determine savings guarantee, which they are prepared to commit to. To compensate the contractor, the actual factors – usage, prices and climate – which the contractor has no influence on, are adjusted to the reference factors.

In special cases there might be substantial discrepancies in terms of energy costs, e.g. due to permanent changes in use or partial facility shutdowns. In this case, the contracting parties have to renegotiate a change/re-specification of the energy cost baseline, which both agree on. It is negotiated on the basis of stipulated policies, and including a general specification rule for the energy cost baseline, which is part of the annex of the energys savings contract. The final energy cost baseline is thus the reference figure for the constructor's successful execution of the savings guarantee, and is signed by both parties.

6.4.1 Standards for calculating the energy cost baseline

The reference period used for creating the energy cost baseline is the last calendar year for which there is full documentation of all energy bills.

*Sample text guidelines:*

The reference period used for creating the energy cost baseline is the last calendar year for which there is full documentation of all energy bills, including the modifications stated below (facility adjustments executed by the customer within the period of reference, which affect energy consumption). The consumption value for the facility in terms of heat and electricity (possibly including water), the respective energy prices and rates, as well as the resulting energy costs serve as the basis for creating the energy cost baseline.

If measures were undertaken during or after the period of reference until the call for tender bids, which caused significant and permanent changes in consumption and/or demand (e.g. change of fuel, installation of ventilation, insulation, etc.), the consumption value of the reference year is adjusted to the resulting change in consumption and/or demand. For determining the energy cost baseline the energy costs before VAT are used as the basis.

---

6.4.2 Determining the heating degree days (in compliance with EN 832)

Heating Degree days (HDD) is the term used for the total sum of the daily difference between room temperature (RT) and mean outdoor temperature (OT), measured during the heating period.

Calculating heating degree days: $\text{HDD}_{20/12} = \text{HD} \times (\theta_i - \theta_e)$

- $\text{HDD}_{20/12}$ ... Heating degree days [d/M, d/a]
- NHDD ... Number of Heating degree days [d/M, d/a]
- $\theta_i$ ... Mean room temperature [°C]
- $\theta_e$ ... Mean outdoor temperature [°C]

Heating degree days typically refer to a heat limit of +12°C (decisive for the length of the heating period) and on indoor temperature of +20°C (hence HDD_{20/12}). The reference for heating degree days is always a mean value stretching over a ten-year period. To draw accurate conclusions, the energy consumption of the respective year has to be calculated on the basis of HDD (=degree-day adjusted).

Sample text:
For the reference period the contract partners define an annual degree-day adjusted cumulative value as a reference value, based on data from the Austrian weather service for the respective area. If this value changes during the billing period, the new annual cumulative value, officially set by the Austrian weather service, is used. This new annual cumulative value is then adjusted to the reference value by considering the respective statistical values, norms and regulations. Energy supplies are regarded as being dependent on climate and billing cycle and are recalculated for the contract period.

6.4.3 Accural for one calendar year

In case the billing period is not equal to the calendar year, the periods covered by the two bills, which fall into that calendar year (reference year), are limited to the respective calendar year (see figure 5 on p. 40). Changes in the billing cycle, e.g. adjustments to heating seasons or business year, are possible. However, they require the customer’s written approval. The heat baseline is subject to a calendar year and weather adjustment.

To determine the actual energy cost savings achieved by the contractor, an annual usage-bound billing is required, effected by the contractor and monitored by the customer. The annual energy consumption, as issued by the energy service company, are adjusted as a result of:

- Changes of energy supply prices
- Changes of climate indicators
- Changes of usage
- Energy-relevant construction maintenance measures
The appendix in this manual „Contract Annex: Calculation of adjusted savings“ on p. 43 provides guidelines for calculating the adjusted amount of savings.

Calculating adjusted savings sample text:

a) The contractor is required to verify the savings achieved on a yearly basis during the validity period, excluding the official VAT and taking into account the calculation formalities as specified in the Annex „Energy cost baseline and calculation of adjusted savings“.

b) On this basis the following calculations can be done:

i. The non-adjusted annual consumption rate of a billing period, with respect to the contract property results from the energy supply bills after subtracting VAT.

ii. If the agreed conditions of facility use, as stated in the Annex „Energy cost baseline and Calculation of adjusted savings“, change at the instigation of or tolerated by the customer, it cannot incriminate nor benefit the contractor. For this reason, the change in use needs to be assessed on a cost basis and adjusted to the basic data, in compliance with the Annex „Energy cost baseline and Calculation of adjusted savings“. If the change in use is permanent, the parties can redefine the energy cost baseline for future calculations by mutual consent, in compliance with the respective Annex and according to prior agreed standards.

iii. In addition, a degree day adjustment of the energy consumption is required, according to the Annex „Energy cost baseline and Calculation of savings“.

iv. To avoid the impact of increasing and decreasing energy prices, the contractor is required to display the adjusted annual consumption rate on the basis of reference prices of the energy cost baseline in compliance with the Annex „Energy cost baseline and Calculation of adjusted savings“. This procedure also applies if energy saving measures allow the customer to stipulate a more cost-effective rate structure, or if there is a similar effect as indirect result of peak demand management.

v. The contractor is required to calculate the amount of savings which results exclusively from the services he provides. Unless stated otherwise, circumstances, which cause the energy costs to change and are not supported or instigated by the contractor, cannot incriminate or benefit the contractor.

vi. Compliance with guaranteed savings is controlled on the basis of the accounting results as follows:

<table>
<thead>
<tr>
<th>Energy cost baseline in €</th>
<th>minus</th>
<th>adjusted annual energy costs in €</th>
<th>= amount of savings in €</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>minus</td>
<td>guaranteed amount of savings in €</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>= Difference in billing cycle in €</td>
<td></td>
</tr>
</tbody>
</table>

The following chart is an example of the savings distribution.
6.5 Determination of contract period

In a comprehensive facility management tender the contract period of the guarantee model equals that of the FM service contract. The latter should run over a minimum of 5 years. However, the contract period depends on the scope to which the contractor is involved in the financing of the energy saving measures, maintenance and restoration. If the customer undertakes large investments, the contract period can be kept short. However, long contract periods may be an incentive for the contractor to implement the most cost-effective measures and achieve an overall optimization of the building, at the same time.

**Tip:**
A commitment to the FM company exceeding 5 years is usually undesirable because of short-term planning. This challenge can be bypassed by including a release clause.

**Sample text:**
If, however, the customer terminates the contract before XX.XX. 20XX, he is required to pay a one-time clearance payment to the contractor, incl. VAT, as well as fees he may still owe, as follows:
6 Procedure for Integrating Energy Management in Facility Management Tenders

6.6 Defining rights and duties of contractor and customer

6.6.1 Validity period of contractor

The validity period is the key element of the FM contract to increase energy efficiency. It allows the customer to outsource the technical and financial risk of energy consumption to a company, which can provide the expertise needed. As a result, the client can focus on his core competencies. Failure to meet the guaranteed savings targets, has an impact on the contractor's fee.

The contractor is required to implement the energy reduction measures, which he describes in a measures form. He thus assumes responsibility of these measures and, if desired, of existing facilities. Further, he is responsible for, service, operation and maintenance.

Indemnity bond sample text:

1. The contractor
   a) implements the energy/water saving measures under his name and bears the expenses. These measures are specified in the Annex "Measures Form", which the contractor is required to complete as part of detailed planning. In addition, he

   b) guarantees a reduction of heating, electricity and water costs for the accounting year that corresponds to the savings rate cash value of _____ % of the energy cost baseline (Annex "Energy cost baseline and calculation of savings"), and using the measure of the calculation methods as illustrated in Appendix 8.6. The savings rate corresponds to savings of € _______ (net without VAT) for each guarantee year. An adjustment spread over the year is not possible.

2. During the contract period the contractor is responsible for operating and maintaining the facilities, complying with the quality standards specified in section 6.5.

3. The contractor is required to establish an incentive and information system to inform users about efficient energy and water use. (Annex "User information").
4. Energy monitoring and controlling system, Appendix 8.3
5. Maintenance (including operation) of existing facilities shall be specified in Annex "Technical Facility Management"
   - The contractor is required to provide high-quality maintenance service, aside from renovation, which aims at achieving highest energy and water savings. In particular, restorations up to € _____ for single measures, which are included in the annual flat rate, can and should be aimed at achieving energy savings. The customer thus expects optimum cost-benefit for all maintenance work, on the one hand, and guaranteed savings, on the other.

6. The offer may also include suggestions for measures which are not entirely financed through energy savings, and which therefore can only be realized through an investment costs grant provided by the client. The bidder is required to point out the customer’s long-term benefits, resulting from implementing measures. The benefits may include reduction of restoration expenses, long-term utility savings, etc. The customer can decide whether or not to agree on these suggestions.

6.6.2 Detailed planning and veto right

**Detailed planning and veto right sample text:**

1. The contractor is required to present a detailed and written analysis within 50 business days of contract commencement. In the detailed analysis the energy and water saving measures for each facility are specified and completed.

2. Unless the customer vetoes the detailed analysis within 50 days, the contractor is required to promptly begin with the implementation of the measures. The right to veto may be applied, if ...
   a) the intended investments are incompatible with the current legislation or the contract regulations,
   b) there is incompatibility with third-party contracts and these parties object to adjustments,
   c) the investment creates additional costs for the client, or
   d) the contractor fails to prove that the energy saving measure meets the quality standards required.

6.6.3 Consumption and cost controlling

Comprehensive cost controlling is a key element of energy management. A systematic analysis of the energy and water consumption can provide information on existing saving potentials. Further, it may help to initiate improvement measures, if this is required.

Recommended tools are: CAIFMs (Computer Aided Integrated Facility Management) or FMs (Facility Management Systems) and Energy Management Software.

Large businesses typically use software tools for technical management, which can range from the administration of required maintenance, to repair and operation activities, and statistical analysis thereof. A further key component is facility documentation, which shows all processes involved on an ongoing basis.

The basic systems data, such as staff, companies, units, building components, and maintenance strategies are the basis for the technical order processing system. The data facilitates the execution of activities and tasks, such as
- structured documentation of technical systems,
- automated processing of maintenance and restauration works,
- projecting costs and budget planning for the total costs of technical maintenance
- Warehouse management and evaluation.

Managing the required facility and maintenance data enables the contractor to plan maintenance activities for a given year. Planning includes a cost prediction, which can be as detailed as required. Reports, such as the facility’s history and forms, daily reports, maintenance and repair calculations and supplements to invoices can facilitate performance support and evaluation.

Statistics and analyses, as well as certificates and testing regulations, sorted and clustered according to location, time, facility or employees can be applied to determine the quality of performance and for quality improvement. The analysis includes
- Material consumption,
- Number and type of restoration contracts,
- Adherence to priorities,
- variance comparisons for cost units,
- cost distribution analyses,
- capacity planning and degree of staff utilization,
- Presence of staff,
- Performance statistics,
- Weak point analysis, etc.

**Interfaces between FM and energy management**

As mentioned earlier, FM includes technical, infrastructural, and commercial facility management. Energy management is part of technical FM, and is the controlling of all technical equipment. Thus it involves energy consumption, energy costs, operational safety, and user comfort.

Interfaces between technical FM and Energy Management may be:
- Central building control system
- Central building control system & energy management software
- Energy management software
- MS Office
- Documentation management
- CA(I)FM (Computer Aided Integrated Facility management)

New versions of building control systems can log energy data with meters. The data can be charted or exported, eg. XLS, TXT files. In addition, load shedding circuits can be carried out using building control systems or energy management software.
Energy management software, which logs energy data collected from various meters, is typically installed in properties which do not have building control engineering.

If energy data is not logged with building control systems or energy management software, the data can be read off manually and entered into an MS Excel sheet, for example.

Documentation management is a key element for successful energy management. It should include all meter lists, maintenance plans, energy supply contract, etc. to efficiently undertake measures.

A Facility Management System (FMS) or a Computer Aided Integrated Facilitymanagement System (CAIFM) is an essential contact point to technical facility management, as it illustrates technical facility management.

The purpose of an FMS/CAIFM System is to show interfaces for the various areas, such as accounting or invoicing. Users have access to a wide range of specialized software packages, e.g. SAP R/3 System. Interfaces have been created to assure effective communication between the various software solutions. (SAP R2, SAP R3 and higher, MS-Office, time recording and access control systems, telephone systems, email, etc.)

The software should contain an energy monitoring and control system with an integrated accounting system. The computer aided system must be able to include and process the required data and information, especially data which documents the energy reduction as a result of measures taken by the facility manager. Factors which also need to be considered are the implications of changes in use and rate, and other changes on energy demand and costs.

The energy service manager is required to ensure access to existing data at all hours, and should be able to transfer reports from the energy management and controlling system. The customer decides on the report design.

The contractor’s duty to install an energy management and controlling system should be specified in the Annex “Quality management”. One of the main purposes of this system is to reproduce energy and water cost reductions, which are a result of the contractor’s measures.

**Sample text FMS**

All the information and data is collected structurally and is inserted in the FMS. This ensures that facility management has been carried out efficiently and professionally. For the quality performance and continuous upgrades the contractor provides a Facility Management System for the course of the contract period. It displays all FM processes undertaken.

The contractor is required to integrate all QM improvements on processes into the software tool, and to use all FM System data for alarm signals and reports. The KPI’s (Key-Performance-Indicators) are derived from the FM System and stored data, and are integrated in an report. The customer does not pay for the FM System, nor for possible upgrading, updates, etc. required or the continous use at the location. The customer assumes that the requested target quality level can only be met by means of an appropriate FM System.
6.6.4 Penalties

The sample text presents the circumstances of contract-compliant performance delivery and the means of customer compensation, in case the stipulated targets are not met.

**Penalties sample text**

1. Services provided by the contractor are only subject to contract-compliant performance delivery if

   a) they are free of defects, and - provided they are construction or maintenance services – comply with current official regulations, legal and stipulated terms, and the rules of technology,

   b) they do not cause any interference or shortfall in the requirements specified in the Annex “Minimum comfort standards”,

   c) they do not cause restrictions in current facility use, unless the customer has agreed to it in writing,

   d) they do not result in unreasonably high upkeep for the customer

   e) they do not increase emissions

2. If the contractor didn’t fully or partly fulfil the above mentioned requirements, he is required to adequately deliver the stipulated services and targets within reasonable time. Failure to do so, will result in the customer sourcing replacements at the contractor’s expense.

### 6.7 Methods of payment

**Methods of payment sample text:**

The contractor is required to state the annual account and energy savings value for the respective guarantee year according to Appendix 8.6, and to charge the resulting fee according to chapter VI.V. Once the contractor has provided evidence that the guarantee was met according to chapter VI.V the client has to pay a twelfth of the savings guarantee on an monthly basis. The adjustment of actual energy savings achieved is done in the following annual account.
7 Standard procedure following decision on a bid

7.1 Preparation phase

7.1.1 Detailed analysis
In this stage the contractor accounts for planning, financing and installing energy savings measures and adjusts these to the building owner’s needs and requirements. The contractor is required to conduct a detailed analysis (detailed cost and savings calculation based on the general analysis and on measurements). The building owner ensures access to the property and appoints a contact person for the plant inspection.

To avoid future disputes, the accurate definition of the interfaces between the existing facility and the systems to be installed by the contractor is crucial. The interfaces need to be specified separately in the Annex Services Form, in the documentation section.

7.1.2 Adjusting measures to customer needs
Once the contractor has presented the projected measures (e.g. optimizing hot water generation, heating engineering, lighting, ventilation), which may deviate from those of the general analysis, adjustments are made together with the client. The latter examines the proposed measures and agrees by signing each service form. If there is no agreement, the customer can claim the measures from the general analysis. He also bears full responsibility of structural maintenance and facility modernization, and can, under certain, in the contract defined conditions, veto energy savings measures. The contractor is, within his preparing services, responsible for obtaining official permits.

7.1.3 Implementation of measures by the contractor
Once the customer has agreed to the proposed measures, the contractor begins implementing them.

7.1.4 Measures assumed and audited by customer
In this last step the client accepts all energy saving measures (construction, plant or other services), which comply with the contract.
7.2 **Main performance stage**

During the main performance stage, the contractor undertakes the stipulated services, above all, the reduction of energy costs, monitoring and maintenance of facilities, user motivation, energy management and controlling, and other services. The customer, or a commissioned engineering company (or a qualified in-house staff member) monitors the contractor’s invoicing procedure as stipulated in the contract, in particular the energy cost savings considering all adjustment factors.

The data has to be collected for each unit. Next, the adjustment is carried out, followed by the pooling of all units and, finally, the calculation of the total payment. The total payment, in turn, is calculated by comparing energy costs in the accounting year with the baseline costs.

Energy and water supply bills are used as the basis, and are provided by the customer for the respective billing period. The contractor then calculates the adjusted amount of savings achieved - in a way that is easily traceable for the customer. Finally, the contractor enters the amount of savings and his fee into the accounting sheet, and presents it to the customer.

To do the calculation, either the calculation data file for the energy cost baseline is updated, or the contractor creates a special data file, or relies on existing modules. The energy management system, which the contractor is required to install, helps to monitor target achievement of the energy saving measures.

The main performance duties start with the completion, take-over and initiation of the prepared measures, corresponding to chapter 7.1., and ends when the contract period expires. The client then bears full responsibility of the energy saving measures and benefits from the savings. The contractor passes all energy saving measures over to the client, in an overall condition based on the guaranteed construction services, facility automation, and maintenance duties. Both parties then determine the overall condition by signing an auditing protocol.

---

8 Appendix

8.1 Contract Annex: Measures form ................................................................. 32
8.2 Contract Annex: User information ............................................................ 34
8.3 Contract Annex: Energy monitoring and controlling ............................... 35
8.4 Contract Annex: Comfort standards .......................................................... 36
8.5 Contract Annex: Calculation of energy cost baseline ............................... 37
  8.5.1 Energy cost baseline electricity ............................................................... 37
  8.5.2 Heat ........................................................................................................ 39
8.6 Contract Annex: Calculation of adjusted savings ..................................... 40
  8.6.1 Ascertaining current data for billing periods ......................................... 40
8.7 Adjusting current consumption data .......................................................... 42
  8.7.1 Calculating adjusted consumption data on energy sources, which used for
         heating: ...................................................................................................... 43
  8.7.2 Calculating adjusted consumption value (electricity) ............................ 44
  8.7.3 Adjustment to measures undertaken by the customer............................ 45
  8.7.4 Calculating adjusted consumption after measures undertaken by the
         customer .................................................................................................... 45
  8.7.5 Calculating adjusted energy costs ............................................................ 46
  8.7.6 Calculating adjusted energy savings ....................................................... 47
  8.7.7 Calculating the contracting fee ............................................................... 47
8.8 Key Norms and Regulations ..................................................................... 50
8.1 **Contract Annex: Measures form**

During the bidding process, the measures form shall be completed for each contract facility. The collected measures forms are included as annex to contract.

**Bidder:**  
**Contract facility name:**

<table>
<thead>
<tr>
<th>A. Description of energy saving measures, which the bidder - provided the contract is awarded - undertakes at his own expense (a detailed description of the services can be included in an appendix)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated costs of the above-mentioned measures (including planning and engineering)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. Description of energy saving measures, which the bidder - provided the contract is awarded - pays through the annual flat rate for each restoration measure up to € 3,500 (a detailed description of the services can be included in an appendix)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated costs of the above-mentioned measures (including planning and engineering)</td>
</tr>
</tbody>
</table>
C. Description of energy saving measures, which the bidder - provided the contract is awarded - undertakes, if the customer provides an investment costs grant (a detailed description of the services can be included in an appendix)

Description of benefits for the customer, resulting from implementing these measures

| Estimated total costs of the above-mentioned measures (including planning and engineering) | € ............ |
| Required investment costs grant, provided by the customer | € ............ |

<table>
<thead>
<tr>
<th>Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated savings rate, not including measures undertaken with investment cost grant provided by the customer (Part C)</td>
</tr>
<tr>
<td>Estimated savings rate, including measures undertaken with investment cost grant provided by the customer (Part C)</td>
</tr>
</tbody>
</table>

OPTIONAL

A. Description of water saving measures (a detailed description of the services can be included in an appendix)

| Estimated total costs of the above-mentioned measures (including planning and engineering) | € ............ |
| Estimated savings rate | ............% |
8.2 Contract Annex: User information

Bidder: 

We declare with legally binding effect - provided the contract is awarded - to undertake measures with the aim to create user motivation within the scope and content focus stated below.

### Summary of user motivation-related measures (a detailed description of the services can be included in an appendix)

### Notes on the chronology of user motivation-related measures (a detailed description of the services can be included in an appendix)

### Costs projection for user motivation-related measures

<table>
<thead>
<tr>
<th>Costs</th>
<th>€........</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor costs (contractor)</td>
<td></td>
</tr>
<tr>
<td>Sub (contractor)</td>
<td></td>
</tr>
<tr>
<td>Material costs</td>
<td></td>
</tr>
<tr>
<td><strong>Total costs user motivation</strong></td>
<td>€........</td>
</tr>
</tbody>
</table>
8.3 Contract Annex: Energy monitoring and controlling

Bidder: 

| Summary of key functions with regard to the energy monitoring and controlling system (a detailed description of the services can be included in an appendix) |
| Description of refitting with measuring points required to meet the contractual standards of energy monitoring and controlling (a detailed description of the services can be included in an appendix) |

Costs projection

| Costs for energy monitoring and controlling system installation | €......... |
| Annual costs for energy monitoring and controlling | €......... |
| **Total costs for energy monitoring and controlling over the contract period** | €......... |
8.4 Contract Annex: Comfort standards

- With regard to indoor climate, artificial lighting and other energy management-related comfort standards, the current workplaces ordinance shall be followed.
- With regard to air temperature, a level of between 21 and 25°C shall be maintained throughout the year.
- A change in air change of air conditioning plants is only permitted if the customer gives his approval, and if standards comply with workplaces ordinance.
8.5 Contract Annex: Calculation of energy cost baseline

8.5.1 Energy cost baseline electricity

The annex on baseline and energy cost savings contains an itemization of the property-specific and total cost baseline for electricity. The electricity consumption data can be found in the invoice records of the respective electricity company. The invoices refer to the reference year xyz.

Accrual for calendar year

In case the billing cycle does not correspond with the calendar year, the periods covered by the two bills, which fall into that calendar year (reference year), are limited to the respective calendar year (see figure below). Changes in the billing period, e.g. adjustments to heating seasons or business year, are possible. However, they require the customer’s written consent.

![Diagram](image)

(*= calendar year for which the accrual is done)

Figure 5: Recording of invoice accrual

Invoices from the energy supply company are accrued by distributing them proportionally over the reference year (i.e. the respective calendar year for which the savings results are calculated).

For power the accrual is determined by multiplying the total amount of services with the ratio between „Number of days of billing cycle, which also fall into the reference year“ and „Number of days of billing cycle“.

For work the accrual is determined by multiplying the total annual demand with the ratio between „Number of days of billing period, which also fall into the reference year“ and „Number of days of billing period“ (calendar year to be settled).
Examples:
For the accrual of two electricity invoices 2000/2001 and 2001/2002 spread over the calendar year 2001, the following formulas are applied:

Accrual of electricity quantity:

\[
S_{Q,2001} = S_{Q,2000/2001} \times \frac{RT_{00/01,RT=2001}}{RT_{00/01}} + S_{Q,2001/2002} \times \frac{RT_{01/02,RT=2001}}{RT_{01/02}}
\]

\[
S_{Q,2000/2001}
\]
Accrued electricity procurement 2000/2001

\[
S_{Q,2001/2002}
\]
Electricity service procurement as per 2001/2002 invoice

\[
RT_{00/01,RT=2001}
\]
Invoice days of the 2000/2001 electricity bill, which fall into the calendar year 2001

\[
RT_{00/01}
\]
Invoice days of the 2000/2001 electricity bill

\[
S_{Q,2001/2002}
\]
Electricity service procurement as per 2001/2002 invoice

\[
RT_{01/02,RT=2001}
\]
Invoice days of the 2001/2002 electricity bill, which fall into the calendar year 2001

\[
RT_{01/02}
\]
Invoice dates of the 2001/2002 electricity bill

Accrual of electricity demand:

\[
L_{2001} = L_{2000/2001} \times \frac{RT_{00/01,RT=2001}}{T_{2001}} + L_{2001/2002} \times \frac{RT_{01/02,RT=2001}}{T_{2001}}
\]

\[
L_{2000/2001}
\]
Accrued billing demand 2000/2001

\[
L_{2001/2002}
\]
Billing demand as per 2001/2002 electricity bill

\[
RT_{00/01,RT=2001}
\]
Invoice days of the 2000/2001 electricity bill, which fall into the calendar year 2001

\[
T_{2001}
\]
Days in 2001 (= 365)

\[
RT_{01/02,RT=2001}
\]
Invoice dates of the electricity invoice 2001/2002, which fall into the calendar year 2001

For some facilities the drawn active energy supplied is recorded separately for four different tariff periods (summer peak tariff period, summer low tariff period, winter peak tariff period, winter low tariff period). For those facilities whose procured active energy is recorded in less than four tariff periods, the respective consumption data is found in the categories active energy winter peak tariff period and active energy winter low tariff period, or solely in the category active energy winter peak tariff period.
8.5.2 Heat

The Annex to baseline and energy cost savings contains an itemization of the property-specific and total cost baseline for heat. For calculating the cost baseline heat, bills were – with some exceptions – used, which were issued by the respective energy company for the reference period XYZ.

The heat supply accounting data (billing period, service demand, service expenses, delivery rate, annual base price) is accrued over the course reference year, taking into account the heating degree days for the location.

Accrual over the course of the calendar year
If the billing period (e.g. heating period or time between tankfuls) does not correspond with the reference year, a proportional accrual of heat service costs weighted by heating degree days, is done.

To calculate the accrual, the following formulas are applied:

\[
Q_{2001} = Q_{2000/2001} \times \frac{HGT_{00/01,RT\leq2001}}{HGT_{00/01}} + Q_{2001/2002} \times \frac{HGT_{01/02,RT\leq2001}}{HGT_{01/02}}
\]

- \(Q_{2001}\) Accrued service procurements in 2001
- \(Q_{2000/2001}\) Service procurement according to heating bill in 2000/2001
- \(HGT_{00/01,RT\leq2001}\) Heating degree days (HGT\(_{20/12} = \) HDD\(_{20/12}\)) of billing dates in the 2000/2001 heating bill, which fall into the year 2001
- \(HGT_{00/01}\) Heating degree days of billing cycle of 2000/2001 heating bill
- \(Q_{2001/2002}\) Service procurements according to 2001/2002 heating bill
- \(HGT_{01/02,RT\leq2001}\) Heating degree days of billing dates of the 2001/2002 heating bill, which fall into the year 2001
- \(HGT_{01/02}\) Heating degree days of the billing period of the 2001/2002 heating bill
8.6 Contract Annex: Calculation of adjusted savings

8.6.1 Ascertaining current data for billing periods

The contractor ascertains and gathers the data stated below for each billing period, processes it by means of monitoring software provided, and finally, publishes and grants access to it via the internet at all times (see Annex Monitoring software).

Current energy supply data

The following data is collected on all energy sources used. If the required data cannot be taken directly from the energy supply invoices, the contractor calculates the figures needed. The data for the period of reference is calculated the same way as the energy cost baseline (see Annex energy cost baseline).

The following factors are recorded:

- Power- and consumption-independent costs / unit: €
  - Measure fee / unit: €
  - Provision fee / unit: €
  - Fee for the transformer / unit: €
- (agreed) power / unit: kW
- power costs / unit: cent/kW
- Energy consumption / unit: kWh bzw. kg
- procured active energy at various tariff periods (SHT, SLT, WHT, WLT) / unit: kWh
- (Working) Energy price, possibly at various tariff periods (SHT, SLT, WHT, WLT) / unit: cent/kWh, cent/m³ bzw. €/kg
- payed reactive energy / unit: kvarh
- Reactive energy price / unit: cent/kvarh
- Energy transfer / unit: cent/kWh
- Other data:
  - Natural gas:
    - Tariff category
    - Fuel value / unit: kWh/m³
    - Allowances / unit: cent/m³
  - Heating oil:
    - Fuel value / unit: kWh/kg
Electricity:
- Grid operator
- Grid plane
- Measuring plane
- Grid use price during the various tariff periods / unit: cent/kWh
- Grid loss costs during the various tariff periods / unit: cent/kWh
- Surcharges for stranded costs, renewable energy, combined heat and power cycle (CHP), special surcharge / unit: cent/kWh

**Facility changes undertaken by the customers**

If changes in the building were made by the customer or facility owner, during the reference year, and if those changes have long-term effects on energy consumption, the results in terms of reference conditions are to be calculated according to technical literature. If buildings are extended or additional energy-consuming systems are installed, consumption should be measured if possible. If measuring the consumption is not possible, data have to be calculated or estimated.

- Long-term changes:
  - Heat energy demand is reduced as a result of improvement measures on the building envelope, undertaken by the customer.
  - If, initiated by the customer, the heating system in a contract facility is replaced with a different energy source.
  - If, initiated by the customer, new ventilation or partial or full airconditioning systems are installed.
  - The contractor can verify that the deteriorating state of the building envelope has caused an increase in heat energy demand.
  - If, initiated by the customer, building extensions were made, the calculated results and intensity of use thereof, as well as the weather data in the course of the first operation year, are to be determined. The intensity of use during the first year of operation of the measure serves as a reference, and the weather data is adjusted to the reference conditions in the reference year.

- Weather data
  The customer provides the annual sum of heating degree days 20/12, as identified by the Central institute for meterology and geodynamics, for the individual billing years. The sum of heating degree days, needed for possible trend calculations, shall be provided by the contractor.

- Usage data
  The gross floor space is used as indicator for facility usage in each accounting years. The respective data for the reference period is provided by the client, whereas data for the individual accounting years is gathered by the contractor himself.

- Switch to different source of energy – by order of the contractor
  If, by order of the contractor, and upon approval by the client, an energy source is used for the energy supply of a contract facility during the billing period, which has not been used during the reference period, the energy supply conditions of the billing period for both the old and the new source of energy need to be collected. The respective energy supply conditions for each billing period are determined along the lines of the reference price calculation.
8.7 **Adjusting current consumption data**<sup>3</sup>

The energy source consumption figures, used for the supply of space heat, need to undergo weather and usage adjustments for each billing period.

For usage adjustment (see equation 1), the degree and duration of change in the intensity of use is included as well:

- If the value for the intensity of use during a billing cycle is \( \leq 5\% \) above or below the value of the reference period, there is no usage adjustment.
- If the value for the intensity of use during a billing cycle is \( \geq 25\% \) above or below the value of the reference period, both contract partners will look for a desired solution to adjust the current consumption data.
- In the 5 % and 25 % range the value for usage dependency is set at 0.4.

Usage adjustment is only undertaken if the change in intensity of use is permanent, i.e. stretches over a one-year period minimum.

---

<sup>3</sup> Efficiency data is neither adjusted to climate nor usage factors
### 8.7.1 Calculating adjusted consumption data on energy sources, which used for heating:

\[
Q_{AP,ber.} = Q_{AP} \cdot \left(1 - f_n\right) + f_n \cdot \frac{NI_{RP}}{NI_{AP}} \cdot \left(1 - f_w\right) + f_w \cdot \frac{HGT_{RP}}{HGT_{AP}}
\]

- \(Q_{AP,ber.}\): Procured heat (billing period, adjusted) / unit: kWh
- \(Q_{AP}\): Procured heat (billing period) / unit: kWh
- \(f_n\): Use conditions / unit: none

\[
f_n = 0 \quad \text{für} \quad \left|\frac{NI_{AP} - NI_{RP}}{NI_{RP}}\right| \leq 0.05
\]

\[
f_n = 0.4 \quad \text{für} \quad 0.05 < \left|\frac{NI_{AP} - NI_{RP}}{NI_{RP}}\right| \leq 0.25
\]

- \(f_w\): Weather conditions / unit: none
- \(f_w = 0.7\)
- \(NI_{RP}\): Intensity of use (reference period) / unit: m²
- \(NI_{AP}\): Intensity of use (billing period) / unit: m²
- \(HGT_{RP}\): Heating degree days 20/12 (reference period) / unit: Kd
- \(HGT_{AP}\): Heating degree days 20/12 (billing period) / unit: Kd

Further changes in usage have to be considered, for example temperature rise, extension of usage time, shutdown of parts of buildings or systems, etc. The respective changes are to be documented or calculated according to guidelines in technical literature.

The electricity consumption value has to be also adjusted to usage as well. The degree and duration of change in use intensity are factors, which are also considered.

The same procedure is to be applied, if the energy source natural gas is used solely for cooking purposes, or if a source of energy is used for hot water generation only.
8.7.2 Calculating adjusted consumption value (electricity)

The adjusted consumption value is calculated as follows:

\[
\begin{align*}
W_{\text{AP,ber.}} & \quad \text{Procured word (billing period, adjusted) / unit: kWh} \\
W_{\text{AP}} & \quad \text{Procured work (billing period) / unit: kWh} \\
f_n & \quad \text{Use conditions / unit: none}
\end{align*}
\]

\[
f_n = 0 \quad \text{für } \left| \frac{NI_{\text{AP}} - NI_{\text{RP}}}{NI_{\text{RP}}} \right| \leq 0.05
\]

\[
f_n = 0.4 \quad \text{für } 0.05 < \left| \frac{NI_{\text{AP}} - NI_{\text{RP}}}{NI_{\text{RP}}} \right| \leq 0.25
\]

\[
\begin{align*}
NI_{\text{RP}} & \quad \text{Intensity of use (reference period) / unit: m}^2 \\
NI_{\text{AP}} & \quad \text{Intensity of use (billing period) / unit: m}^2
\end{align*}
\]

Exceptions:

- Other sources of energy are used for supplying electricity from combined heat and power generation.
- Major changes in the service time of the respective facilities occur, e.g. if a school switches from being a half-day to being a full-time institution.

For these exceptions, both contract partners look for a desirable solution to adjust current consumption data.

Further changes in usage include, for example, temperature rise, extension of usage time, shutdown of parts of buildings or systems, etc. The respective changes are to be documented or calculated according to guidelines in technical literature.
8.7.3 **Adjustment to measures undertaken by the customer**

If, by order of the customer, measures were set during the reference period, which are not to be subject to the contractor's compensation, the calculated effects are to undergo a usage and weather adjustment. This applies particularly for the following scenarios:

- **In case of a client-initiated reduction of energy demand** (improvement of building envelope, replacement of heating system, etc.), the usage and weather-adjusted effects for the billing period are to be added to the effective usage and weather-adjusted billing data.

- **In case of a customer-initiated increase in energy demand** (neglected maintenance duties, installation of energy-intense equipment – ventilation systems, etc.) – the usage and weather-adjusted effects are to be subtracted from the effective usage and weather-adjusted billing data.

- **If extensions were made**, by order of the client, the effects of the measures are to undergo a usage and weather adjustment for the billing cycle, and are to be subtracted from the usage and weather-adjusted billing data.

8.7.4 **Calculating adjusted consumption after measures undertaken by the customer**

\[
W_{AP,ber,MAG} = W_{AP,ber} \pm W_{AP,MAG,ber}
\]

- **\( W_{AP,ber,MAG} \)**: Procured work after adding or subtracting measures undertaken by client (billing period, adjusted) / unit: kWh
- **\( W_{AP,ber} \)**: Procured work (billing period, adjusted) / unit: kWh
- **\( W_{AP,MAG,ber} \)**: Measured/calculated effects of measures undertaken by client (billing period, adjusted) / unit: kWh
8.7.5 Calculating adjusted energy costs

The adjusted consumption data (calculated by using the formula described above) is assessed using the reference energy supply conditions, which were applied when calculating the energy cost baseline.

If the customer decides to apply a source of energy during the billing period, which was not used during the reference period and, which causes higher energy supply conditions (e.g. distance heat), the energy supply conditions of the energy source in the reference period are applied during the entire billing cycle.

\[
E_{K,\text{AP,ber.}} = \sum_{i=1}^{n} \left( P_{\text{WK,RP}_{i}} + W_{j,\text{AP,ber.,i}} \right) \left( W_{j,\text{RP},i} + T_{\text{RP},i} + N_{\text{N},\text{RP},i} + N_{\text{V},\text{RP},i} - R_{\text{j,RP},i} - B_{\text{j,RP},i} + Z_{\text{RP},i} \right) + W_{\text{B,AP},i} \cdot W_{\text{B,RP},i}
\]

\( E_{K,\text{AP,ber.}} \)  
Annual costs energy procurement (billing period, if necessary, adjusted) / unit: €

\( \sum_{i=1}^{n} \)  
Calculation of total value for all energy sources applied \( i = 1 \) to \( n \)

\( P_{\text{WK,RP}_{i}} \)  
Power- and consumption-independent costs (reference period) / unit: €

\( W_{j,\text{AP,ber.,i}} \)  
(agreed) power (billing period) / unit: kW

\( L_{\text{RP},i} \)  
Demand rate (reference period) / unit: cent/kW

\( \sum_{j=1}^{n} \)  
Calculation of total value (for the energy source \( i \)) for all tariff periods \( j = 1 \) to \( n \)

\( W_{j,\text{RP},i} \)  
Procured work (e.g. electricity, billing period, if necessary, adjusted) / unit: kWh

\( T_{\text{RP},i} \)  
Energy transfer / unit: cent/kWh

\( N_{\text{N},\text{RP},i} \)  
Grid use price (e.g. electricity, reference period) / unit: cent/kWh

\( N_{\text{V},\text{RP},i} \)  
Price of grid loss (e.g. electricity, reference period) / unit: cent/kWh

\( R_{\text{j,RP},i} \)  
Allowance (for natural gas, reference period) / unit: cent/kWh

\( B_{\text{j,RP},i} \)  
Compensation (for natural gas, reference period) / unit: cent/kWh

\( Z_{\text{RP},i} \)  
Total surcharges for stranded costs, renewable energy, CHP and special surcharges (reference period) / unit: cent/kWh

\( W_{\text{B,AP},i} \)  
Idle current paid (billing period) / unit: kvarh

\( W_{\text{B,RP},i} \)  
Price of idle current (reference period) / unit: €/kvarh
8.7.6 Calculating adjusted energy savings

The value of the adjusted cost savings is determined using monitoring software, which is provided by the client:

\[ \Delta EK_{AP,ber} = EK_{RP} - EK_{AP,ber} \]

- \( \Delta EK_{AP,ber} \): Cost saving (billing period, adjusted) / unit: €
- \( EK_{RP} \): Energy costs (reference period) / unit: €
- \( EK_{AP,ber} \): Energy costs (billing period, if necessary, adjusted) / unit: €

8.7.7 Calculating the contracting fee

The contracting fee is always determined by the customer.

\[ CH = \frac{\Delta EK_{AP,ber} \times AEK_{C,\%}}{100} \]

- \( CH \): Contractor’s fee
- \( \Delta EK_{AP,ber} \): Cost saving (billing period, adjusted) / unit: €
- \( AEK_{C,\%} \): Contractor’s share in actual energy cost saving in percentage

Switching to alternative source of energy through the contractor

If, during the billing period, a source of energy is applied for energy supply in a contract facility – by order of the contractor, upon approval by the customer - which was not used during the reference period, the contractor either assumes the price risk (difference between energy price of the old and new energy source during the billing period), or he is compensated for the difference in price.

The price risk assumed by the contractor, or his profit results from the actual energy consumption during the billing period, multiplied by the difference in price between old and new energy source during the billing period.
Calculation of additional costs or cost saving achieved by switching to a different source of energy

\[
\Delta EK_{ETalt-neu,AP} = P_{AP,i} \cdot \Delta LP_{ETalt-neu,AP} + \sum_{j=1}^{n} (W_{j,AP,ber,i} \cdot \Delta EP_{ETalt-neu,AP})
\]

Calculation of difference in energy price between old and new energy source

\[
\Delta EP_{ETalt-neu,AP} = \Delta WP_{ETalt-neu,AP} + \Delta T_{ETalt-neu,AP} + \Delta NN_{ETalt-neu,AP} + \Delta NV_{ETalt-neu,AP} - \Delta R_{ETalt,RP-ETneu,AP} - \Delta B_{ETalt,RP-ETneu,AP} + \Delta Z_{ETalt-neu,AP}
\]

<table>
<thead>
<tr>
<th>(\Delta EK_{ETalt-neu,AP})</th>
<th>Additional costs or energy cost savings achieved by switching to different sources of energy during the billing cycle / unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>(P_{AP,i})</td>
<td>(agreed) power (billing period) / unit: kW</td>
</tr>
<tr>
<td>(\Delta LP_{ETalt-neu,AP})</td>
<td>Difference demand rate of energy source old (billing period) minus energy source new (billing cycle) / unit: cent/kW</td>
</tr>
<tr>
<td>(\sum_{j=1}^{n} (\ldots))</td>
<td>Calculating total value (for energy source i) for all tariff periods j = 1 to n</td>
</tr>
<tr>
<td>(W_{j,AP,ber,i})</td>
<td>Procured work (z. B. gas, billing period, if necessary, adjusted) / unit: kWh</td>
</tr>
<tr>
<td>(\Delta EP_{ETalt-neu,AP})</td>
<td>Difference in energy price between old and new source of energy</td>
</tr>
<tr>
<td>(\Delta WP_{ETalt-neu,AP})</td>
<td>Difference energy rate of energy source old (billing period) minus energy rate of energy source new (billing period) / unit: cent/kWh</td>
</tr>
<tr>
<td>(\Delta T_{ETalt-neu,AP})</td>
<td>Difference energy transfer of energy source old (billing period) minus energy source new (billing period) / unit: cent/kWh</td>
</tr>
</tbody>
</table>
Calculating the adjusted cost savings achieved by the client through switching to alternative energy sources

If the contractor switches to an alternative source of energy, the energy cost saving is calculated using an equation

\[
\Delta EK_{AP,ber.} = EK_{RP,mod.} - EK_{AP,ber.} - \Delta EK_{ETab-neu,AP}
\]

<table>
<thead>
<tr>
<th>( \Delta EK_{AP,ber.} )</th>
<th>Cost savings (billing period, adjusted) / unit: €</th>
</tr>
</thead>
<tbody>
<tr>
<td>( EK_{RP,mod.} )</td>
<td>Energy costs (reference period, if necessary, modified) / unit: €</td>
</tr>
<tr>
<td>( EK_{AP,ber.} )</td>
<td>Energy costs (billing period, if necessary, adjusted) / unit: €</td>
</tr>
</tbody>
</table>

Information on prices and costs, which are used to calculate the adjusted cost saving, does not include VAT.
## 8.8 Key Norms and Regulations

<table>
<thead>
<tr>
<th>Norms and Regulations</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VDI Regulations 2890-2895</td>
<td>&quot;Orderly maintenance; maintenance standards on investment goods procurement&quot;</td>
</tr>
<tr>
<td>DIN 31051</td>
<td>&quot;Maintenance “</td>
</tr>
<tr>
<td>EN 13306</td>
<td>&quot;Maintenance terms“</td>
</tr>
<tr>
<td>VDMA 24186</td>
<td>&quot;Service program for the maintenance of technical systems and equipment in buildings“</td>
</tr>
<tr>
<td>EN 378-2</td>
<td>&quot;Refrigeration installations and heat pumps; safety and environmental requirements“</td>
</tr>
<tr>
<td>§22</td>
<td>Refrigeration installation regulations</td>
</tr>
<tr>
<td>ÖVE-ENZ</td>
<td>All parts</td>
</tr>
<tr>
<td>ÖVE-EN 8001</td>
<td>All parts</td>
</tr>
<tr>
<td>ÖVE Z 1000</td>
<td>&quot;Safety identification colors and codes, safety and health protection codes“</td>
</tr>
<tr>
<td>VDI 6022</td>
<td>&quot;Sanitary requirements for air conditioning systems“</td>
</tr>
<tr>
<td>VDI 6023</td>
<td>&quot;Sanitation in drinking water net“</td>
</tr>
<tr>
<td>ÖN H 6021</td>
<td>&quot;Air sanitation“</td>
</tr>
</tbody>
</table>
9 Bibliography

"Manual for Energy savings contracting in public facilities"
Hessian Ministry of Environment, rural areas and Consumer Protection 2002

"Erneuerbare Energien Contracting"
J. Geiss; Oekom Gesell. F. Oekolog; 2006

„Energie Contracting Recht und Praxis“
Martin Hack; Beck Juristischer Verlag; 1. Auflage 2003

„Performance Contracting: Expanding horizons“
Shirly J. Hansen; Fairmont Press; 2. Auflage, 2006

"Leitfaden für die Ausschreibung von Energielieferungen (Contracting),
Ausschreibung von Energielieferung (Wärme, Strom, Kälte)"
Verband für Wärmelieferungen, 2001

"EPC Manual: Preparation of an EPC project: From the first idea to realisation"