

ATTACHMENT 18

CALCULATION OF ENERGY SAVINGS

1. GENERAL

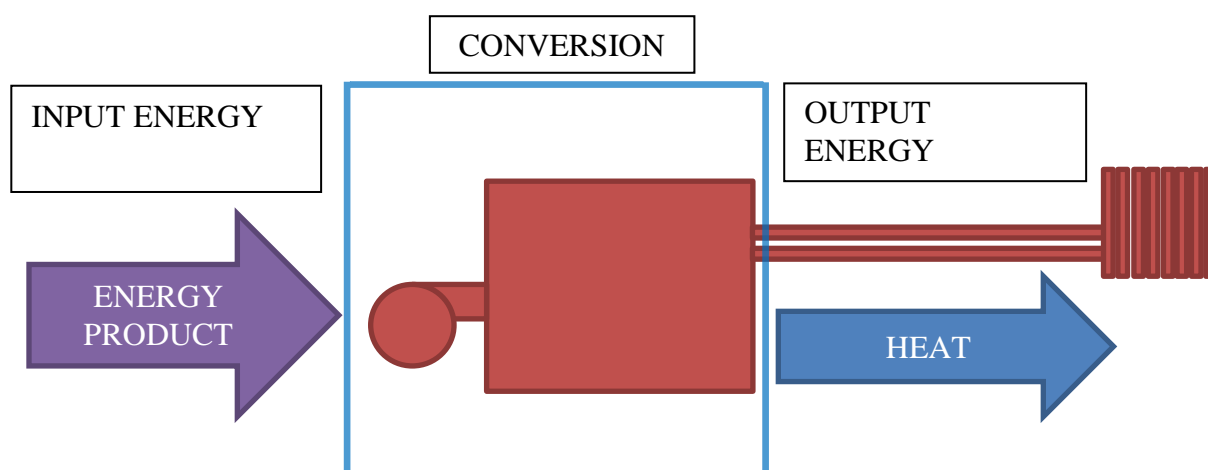
This document provides a methodology for calculating energy savings.

1.1. Definitions

Input energy is the energy of energy products used for generating useful output energy.

Energy products include:

- natural gas,
- biomass,
- extra light fuel oil (ELFO),
- fuel oil – medium,
- liquefied petroleum gas (LPG),
- electricity, and
- district heating network.



2. INPUT DATA

Input data (list of buildings, referential quantities, prices, etc.) are listed in the attachment »List of buildings«.

2.1. Reference energy and water consumption, costs, prices, and periods

The reference consumption of energy and water is the consumption of energy and water consumed in the reference period (2015).

The consumption of water covers the consumption of drinking water from a distribution network in the area.

The consumption of an energy carrier is the sum of monthly energy consumptions of this energy carrier in the reference period on the basis of issued invoices (e.g. electrical energy in kWh, natural gas in Sm³, ELFO in l, district heating in kWh, etc.).

The consumption of energy carriers is converted into kWh by multiplying the usage of the energy carrier in its measurement unit with the calorific value in accordance with the table below:

Table 1: Calorific values of energy products

Type of energy product	Input energy product	Measurement unit	Calorific value
	Extra light fuel oil (ELFO)	l (litre)	10.06 [kWh/l]
	Fuel oil – medium	kg	11.5 [kWh/kg]
	Natural gas	Sm ³	9.5 [kWh/Sm ³]
	Liquefied petroleum gas (LPG)	l (litre)	6.95 [kWh/l]
	Liquefied petroleum gas (LPG)	m ³	25.93 [kWh/m ³]
	Biomass – wood chips, pellets	kg	4.9 [kWh/kg]
	District heating network	kWh	1.0 [kWh/kWh]
	Electricity	kWh	1.0 [kWh/kWh]

Note: During the duration of the contract of guaranteed savings, the calorific values shall be harmonised with values listed in the contracts for the supply of energy carriers or energy.

Output energy is useful energy that enables operation and achieving comfort. Output energy in a building comprises:

- a) heating used for:
 - heating
 - heating sanitary water
 - cooling
 - other (e.g. technology)
- b) electricity used for:
 - lighting
 - equipment
 - heating
 - heating sanitary water
 - cooling
 - reactive energy
 - other (e.g. smaller devices)

Reference quantities of supplied energy for each individual building are listed in the Attachment “List of buildings”, where (among other things) energy products, the consumption of EP, and their cost for each building are listed.

All calculations of quantities, associated costs, and prices are made for **each building separately** and for a group of buildings as a whole entity. The calculation employs the prices of energy products and energy (VAT excluded) and various contributions required by law that may change from one year to another. The invoice for the service of energy management, which the concessionaire issues to the concession grantor, may relate to several buildings within a group of buildings. The concessionaire shall show the VAT on the invoice.

The reference price of the energy is calculated by dividing the full amount of costs (with VAT) from the invoices for the reference period for each energy carrier with the energy consumption in kWh for the reference period.

The reference period for all supplied energy products is the 2015 calendar year, except for ELFO, where the past three years (2013, 2014, and 2015) for the reference period are taken in account. For this period, the yearly average consumption of ELFO is calculated, in order to balance the deviations due to the delay of the delivery of ELFO.

During the first heating season after the concession contract has been concluded and before the implementation of the main service of the concession contract, the concessionaire shall, via installed metering devices (points) of energy consumption (heating and electricity), compare these readings to the reference consumptions quantities listed in “List of buildings”.

In the event of any major deviations (>10%), the concessionaire and the concession grantor shall come to an agreement about potential corrections to the reference energy consumption quantities.

3. THE ACCOUNTING PERIOD

All calculations performed for the purpose of achieving guaranteed savings shall be performed for accounting period of one year, whereby the first accounting year equals the period of one year from the date of commencement of the main service of the concession contract. The main service of the concession contract shall commence on 1 July or 1 January of the current year.

If the duration of the contract or the duration of the measurements of the energy savings is not equal to the start or the end of the accounting period, the account for such partial durations shall be made proportionally based on the number of contractual months that fall within the accounting period.

The account of prices, costs, energy consumption, savings, etc. shall be made separately for each building in the group of buildings, for each type of energy product, and jointly for each individual group of buildings.

4. CALCULATION OF ENERGY SAVINGS

4.1. Guaranteed consumption of energy and guaranteed savings

Guaranteed energy consumption is the consumption that the concessionaire guarantees in the contract of guaranteed savings (in kWh). The guaranteed energy savings is the difference between the reference energy consumption and the guaranteed energy consumption:

Guaranteed energy savings [kWh] = Reference energy consumption [kWh] – Guaranteed energy consumption [kWh]

The guaranteed energy cost savings is equal to the difference between the referential energy cost and the guaranteed energy cost:

$$\text{Guaranteed energy cost savings [€]} = \text{Reference energy cost [€]} - \text{Guaranteed energy cost [€]}$$

Guaranteed energy savings as a percentage is equal to the quotient between the guaranteed energy savings and referential energy consumption:

$$\text{Guaranteed energy savings [\%]} = \text{Guaranteed energy savings [kWh]} / \text{Reference energy consumption [kWh]}$$

4.2. Calculation of energy savings

Having achieved guaranteed savings, it is to be determined whether the concessionaire is entitled to the payment of the amount of energy savings. This is established on grounds of accounting documents, separately for each energy product (or type of energy), water and maintenance for each individual building, and cumulatively for each group.

Savings are defined as the difference vis-à-vis the amount of energy consumed if the measure had not been implemented. Savings for a specific measure is to be determined on grounds of the reference quantities of supplied energy consumption before the implementation of the measure and the metered consumption after the measure was implemented, adjusting the parameters that vary according to the reference period.

For measures that depend on the factors that the public partner has influence over and that are not measurable in the reference and/or accounting period, the savings are determined by adjusting the savings of an individual measure to standard (“normal”) conditions. They are fixedly determined. Normalised savings compare directly to the anticipated savings under fixed conditions.

The method of calculating savings of thermal and electrical energy with “normalised savings” is to be used only when savings cannot be calculated by the method prescribed in point 4.2.1 (thermal energy - heat) or 4.2.2.1 (electrical energy).

If the concessionaire anticipates to calculate energy savings for heating and electricity by this method (with normalised savings), this must be indicated in the programme for the implementation of the concession, under the respective measure.

4.2.1. Heating

Thermal energy savings are to be determined as the sum of all savings for each type of use of thermal energy, in the following manner:

Actual cost savings in thermal energy [€] =

$$\sum_{i=1}^n (\text{Reference cost of supplied energy for heating (€)} - \text{Adjusted cost of supplied energy (€)})$$

i

Whereby for each individual type of useful energy:

Reference cost of supplied energy for heating [€] =

$$\sum_{i=1}^n (\text{Reference consumption of supplied energy for heating (kWh)} \\ \times \text{Reference price of supplied energy (€/kWh)})_i$$

Reference consumption of supplied energy for heating:

Consumption of supplied energy in the reference period for the building listed in the Attachment “List of buildings”, in kWh, taking into account the calorific values in Table 1.

Reference price of supplied energy:

Price of supplied energy for the building, listed in the attachment »List of buildings«, in €/kWh.

Adjusted cost of supplied energy (€):

$$\sum_{i=1}^n \left(\text{Adjusted consumption of supplied energy of input energy products [kWh]} \right. \\ \left. \times \text{Reference price of supplied energy of the input energy product} \left[\frac{\text{€}}{\text{kWh}} \right] \right)_i$$

Adjusted consumption of supplied energy of the input energy product:

Actual metered consumption of supplied energy of input energy product in the accounting period, adjusted for temperature deficit, any changes in the building’s purpose, and any other agreed-upon effects (all effects agreed-upon are listed in Attachment “The list of services for the implementation of measures to ensure savings”), in kWh, taking into account calorific values.

Reference price of supplied energy of input energy product:

The reference price of supplied energy of this input energy product in the event of the same input energy product. In the event of switching to another input energy product, this is the reference price of supplied energy of the new input energy product, listed in the Attachment “List of buildings”, for each type of input energy product per building.

4.2.1.1. Thermal energy savings with “normalised savings”

Actual thermal energy savings [kWh] =

Normalised reference consumption of supplied energy [kWh] – Normalised consumption of supplied energy [kWh]

Normalised reference consumption of supplied energy:

Consumption of supplied energy in the reference period for an individual measure, adjusted to normalised conditions in the following manner:

Normalised reference consumption of supplied energy [kWh] =

Calculated total installed capacity of users before implementing measures (kW)
× Standard operating hours (h)

Normalised consumption of supplied energy:

Consumption of supplied energy in an accounting period, adjusted to normalised conditions.

Normalised consumption of supplied energy [kWh] =

Measured total installed capacity of users after implementing measures (kW)
× Standard operating hours (h)

The sum of reference use for all kinds of consumption is set out in “List of buildings”.

4.2.2. Electrical energy

Savings are to be determined as the sum of all savings for each type of use of electricity, in the following manner:

Actual electricity cost savings [€] =

$$\sum_{i=1}^n (\text{Actual electricity savings (kWh)} \times \text{Reference price of electricity (€/kWh)})$$

Whereby for each individual type of useful energy:

Reference price of electricity:

Price of electrical energy for building, listed in the attachment »List of buildings«.

Savings are to be determined as the sum of all savings for each type of use of electricity. The method of calculating savings of thermal and electrical energy with “normalised savings” is to be used only when savings cannot be calculated by the method prescribed in point 4.2.2.1 (thermal energy) or 4.2.2.1 (electrical energy).

4.2.2.1. Electrical energy savings

Actual electrical energy savings [kWh] =

$$\begin{aligned} &\text{Reference consumption electrical energy [kWh]} \\ &- \text{Adjusted consumption electrical energy [kWh]} \end{aligned}$$

Reference consumption of electrical energy

Price of energy in the reference period for building, listed in the attachment »List of buildings«.

Adjusted consumption of electrical energy

Actual metered consumption of supplied energy product in an accounting period, adjusted for temperature deficit, any changes in the building’s purpose, and any other agreed-upon effects.

4.2.2.2. Electrical energy savings with “normalised savings”

Actual electrical energy savings [kWh] =

$$\begin{aligned} &\text{Normalised reference consumption of electrical energy [kWh]} - \\ &\text{Normalised consumption of electrical energy [kWh]} \end{aligned}$$

Normalised reference consumption of electrical energy	Consumption of electrical energy in the reference period for individual measure, adjusted to normalised conditions in the following manner:
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Normalised reference consumption of electrical energy [kWh] =

Calculated total installed capacity of users before implementing measures (kW)
 × Standard operating hours (h)

Normalised consumption of electrical energy:	Consumption of electrical energy in an accounting period, adjusted to normalised conditions.
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Normalised consumption of electrical energy [kWh] =

Measured total installed capacity of users after implementing measures (kW)
 × Standard operating hours (h)

The sum of reference use for all kinds of consumption is set out in “List of buildings”.

4.2.3. Drinking water

Savings are to be determined as the sum of all savings for each type of use of drinking water, in the following manner:

Actual cost savings of water [€] =

$$\sum_{i=1}^n (\text{Actual water savings (m3)} \times \text{Reference price of water (€/m3)})$$

Whereby for each individual type of useful energy:

Reference price of water:	Price of water for building, listed in the attachment »List of buildings«.
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Actual water savings [m3] =

Reference consumption of water [m3] – Adjusted consumption of water [m3]

Reference consumption of water	Price of water in the reference period for building, listed in the attachment »List of buildings«.
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Adjusted consumption of water:	Actual metered consumption of water in an accounting period, adjusted for temperature deficit, any changes in the building’s purpose, and any other agreed-upon effects.
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4.3. Maintenance

The savings during the contractual period are determined with normalised savings, as follows:

Actual cost savings for routine maintenance works during the contractual period [€] =
Actual cost savings for routine maintenance works × Factor of cost savings for routine maintenance works during the contractual period [%]

Actual cost savings for major maintenance works during the contractual period [€] =
Reference cost of major maintenance works [€] × Factor of cost savings for major maintenance works during the contractual period [%]

Whereby:

Reference cost of routine maintenance works:	Cost of routine maintenance works necessary to achieve the consumption of energy listed in Attachment “List of buildings”.
Reference cost of major maintenance works:	Cost of major maintenance works necessary to achieve the consumption of energy listed in Attachment “List of buildings”.
Factor of cost savings for routine maintenance works during the contractual period:	The savings factor of costs for routine maintenance works for the public partner (0–100%) that the applicant proposed in its tender, and represents the reduction of costs for routine maintenance works during the contractual period.
Factor of cost savings for major maintenance works during the contractual period:	The savings factor of costs for major maintenance works for the public partner (0–100%) that the applicant proposed in its tender, and represents the reduction of costs for major maintenance works during the contractual period.

Maintenance costs after the contractual period runs out:

Actual cost savings for routine maintenance works after the contractual period runs out [€] =
Actual cost savings for routine maintenance works × Factor of cost savings for routine maintenance works after the contractual period runs out [%]

Actual cost savings for major maintenance works after the contractual period runs out [€] =
Reference cost of major maintenance works [€] × Factor of cost savings for major maintenance works after the contractual period runs out [%]

Whereby:

Reference cost of routine maintenance works:	Cost of routine maintenance works necessary to achieve the consumption of energy listed in Attachment “List of buildings”.
Reference cost of major maintenance works:	Cost of major maintenance works necessary to achieve the consumption of energy listed in Attachment “List of buildings”.
Factor of cost savings for routine maintenance works after the contractual period runs out:	The savings factor of costs for routine maintenance works for the public partner (0–100%) that represents the reduction of routine maintenance works costs due to implemented measures after the expiry of the contract.
Factor of cost savings for major maintenance works after the contractual period runs out:	The savings factor of costs for major maintenance works for the public partner (0–100%) that represents the

reduction of major maintenance works costs due to implemented measures after the expiry of the contract.

Costs for major maintenance works is to be managed in records and tables as a separate cost item, and shall not be added to costs of regular maintenance works.

Costs for regular and major maintenance works shall not be included in the price of supplied energy; rather, they shall be managed as a separate cost item within energy management costs.

5. ADJUSTMENT OF ANNUAL ENERGY CONSUMPTION AND MAINTENANCE COSTS

Based on energy consumption metering at the end of each accounting period, non-adjustable values of annual energy consumption and costs for the current accounting period is obtained for each concession grantor's building that is the subject of the contract.

With the accounting quantities, it is necessary to ensure that only those effects are taken into the calculation that are direct consequences of measures to achieve energy savings. The concession grantor and the concessionaire must not be placed in a worse or a more favourable position in this case.

The non-adjusted values of annual energy consumption shall therefore be adjusted when necessary (changes in the building's purpose and use, climate values, and other agreed-upon effects). Adjustment of annual consumption values can only be performed by both parties by common accord. Insofar as the agreement is not possible, the matter is entrusted to an independent institution, appointed by both parties at the time of the conclusion of the contract.

5.1. CHANGES IN CLIMATE VALUES

Using the measured values established by the Slovenian Environment Agency for Ljubljana – Bežigrad (or the measured values established by the meteorological station closest to the building), the reference value of temperature deficit is determined as the average value of 2013, 2014, and 2015.

The temperature deficit (TD) is the monthly sum of daily differences between the temperature 20 °C (for buildings where a higher indoor temperature is anticipated, the anticipated temperature is taken into account) and the average daily temperature, if it is equal or lower than 12 °C.

The concessionaire shall obtain the data on the average daily temperatures for the accounting period and for the relevant area from the Slovenian Environment Agency.

TD adjustment is performed only for the part of thermal energy that was used for space heating. The TD adjustment shall exclude the thermal energy that was consumed during the heating season when the outside daily temperature was higher than 12 °C, i.e., when the daily TD equals zero (TD = 0). The annual TD values exclude daily TD values for those days when space heating was not performed. This is taken into account when the number of days when TD equals zero is larger than 5% of the total duration of the heating season.

Additionally, the adjustment is also performed in the event of space cooling.

5.2. CHANGES OF USE

Any potential changes of use of a building shall be assessed based on the data listed in the Attachment "List of buildings". Should these information change due to the concession grantor's will, or if the concession grantor gives its consent, then the selected concessionaire is not burdened by it nor is it in a more favourable position. Thus, the change of use is to be assessed from the viewpoint of a) change in reference quantities or b) newly anticipated consumption, and is to be adjusted as soon as the change takes place. Changes of use in this sense are as follows:

- Increased or decreased time of occupancy of the building, listed in Attachment “List of buildings”;
- Subsequent retrofitting or removing of devices, apparatus, or other equipment that has significant effects in the increase or decrease of energy consumption;
- Changing the purpose and use of the building;
- Reduction or increase of the building’s surface,
- Reduction or increase in hot water or pool water consumption,
- Switching to another energy product.

If the event of changes that affect the execution of the contract, the concessionaire shall, in an agreement with the concession grantor, make an adjustment calculation on the basis of the reference quantities referred to in Attachment “List of buildings”:

1. With respect to potential changes of needs for heating, cooling and/or ventilation, and water heating, the concession grantor and the concessionaire shall agree upon the necessary quantity of energy for heating, cooling and/or ventilation, water heating and pool water heating.
2. With respect to possible changes of needs for electrical energy due to additional (integrated) electrical appliances, the concession grantor and the concessionaire shall, in agreement, assess the expected duration of the use of such an appliance, while taking into consideration the time of occupancy of the building, which is a part of the contract, and based on the nominal power of each appliance, calculate the share of consumption for which the annual reference quantities have to be adjusted.

If this is a permanent change in the usage of the building, the concession grantor and concessionaire can mutually agree to redefine the reference quantities in Attachment 19 in accordance with the above-mentioned principles for future accounting.

If consent or agreement about the adjustment calculation is not possible, a proposal is prepared by an independent court-appointed expert, designated by both parties in a separate contract. In the event of a dispute, the adjustment calculation must be approved by both parties by common accord.

5.3. CHANGES IN MAINTENANCE COSTS

No more than once per year, at the end of the accounting period, the concession grantor and the concessionaire can propose a change for reference costs of regular and major maintenance works by a factor determined on the basis of changes in the rate of inflation (Consumer Price Index) in the previous period, if the rate of inflation changed for at least 5.0% since its last change.