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Standard EPC documents

IV. Baseline and verification of energy savings

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BASELINE AND VERIFICATION OF ENERGY SAVINGS

1 Introduction and remarks

This document includes basic principles and remarks on energy costs baselines and the accounting of savings within EPC. It is based on the methods and experiences of the EESI partners. However other procedures may also be applicable. An international standard for the measurement and verification is set by the International Performance Measurement & Verification Protocol IPMVP (read more on www.evo-world.org).

2 Determination of the Energy Costs Baseline

The basis of the energy costs baseline is the energy consumption in a reference year (e.g. past year before implementation of EPC) in connection with the energy supply prices applicable to the client at a certain key date (e.g. 31.12. reference year). It is pointed out that it may make sense in individual EPC projects to demand the inclusion of additional media. In particular, the cost of water supply and sewage disposal is relevant. For reasons of convenience, the term energy costs baseline will be used hereafter.

The baseline is to be provided to all bidders in the invitation to tender. They will prepare their saving forecast on this basis. In the context of the implementation planning, the baseline might be finally checked and confirmed by the contractually bound ESCO.

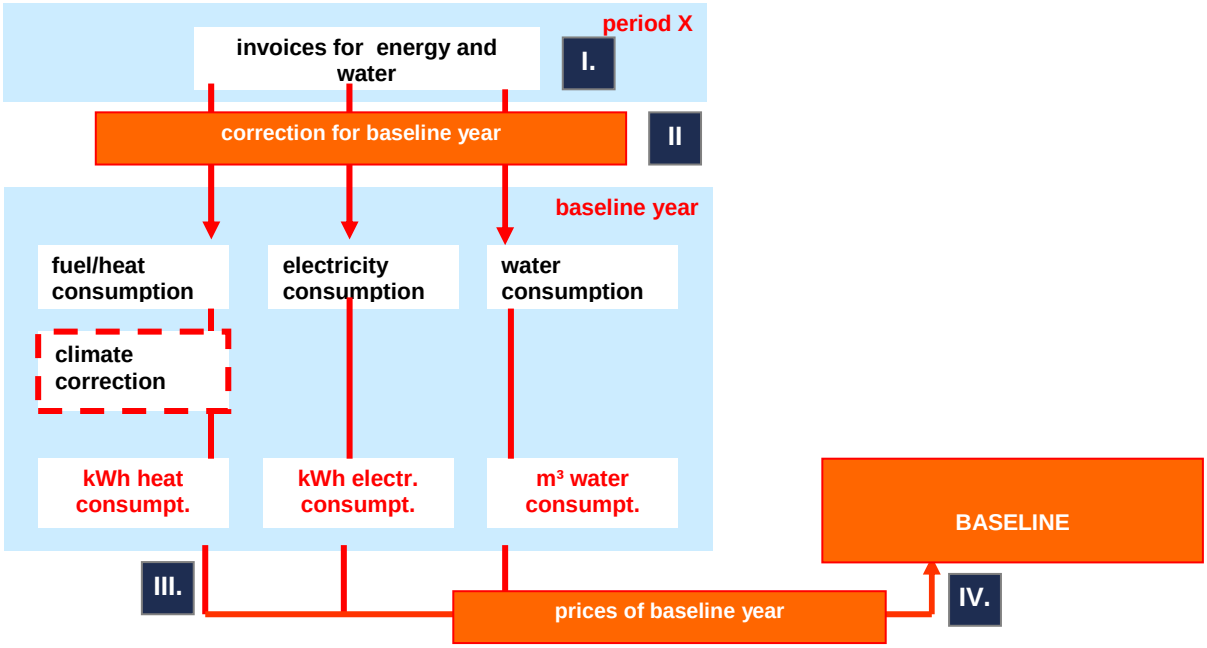
Here are some general remarks regarding the determination of the energy costs baseline:

- ☑ There is a certain minimum amount of the baseline to be achieved (about €200,000 in most countries). Only at these values will the relation between basic expenditure and achievable saving be interesting for the competitors in economic terms. In isolated cases such as self-financing by the client, smaller project sizes can also be realised.
- ☑ Higher energy prices are a better refinancing basis for efficiency measures. Therefore, higher reference prices should rather be estimated for the baseline in the case of price fluctuation or foreseeable price increases.
- ☑ Maintenance costs are usually not included in the baseline and, accordingly, any maintenance cost saving (which may well be achieved) will not be rated as a cost saving within the meaning of the saving guarantee. Exceptions are possible at the client's express request if it can forecast the amount of the achievable cost saving in the run-up to the invitation to tender.
- ☑ To be able to take account of possible changes of the energy sources, all consumption units should be stated in kWh (if applicable with the appropriate factors/calorific values). To derive a CO2 emission saving, the current CO2 emissions and factors have to be shown also.

3 Baseline design

The consumption of the respective energy demand types of the last completed calendar year preceding the EPC project will be used as the basis for the ESCO's saving guarantee and the annual proof of saving to be provided later on. That year is called reference year (baseline year). To ensure that the selected year is representative, the underlying energy consumption figures should be compared to those of the two preceding years. As an alternative, an average consumption value of the three last completed years may be defined as baseline. The calculation methodology has to be defined in the EPC contract. As specific energy prices for each metering point, if applicable broken down by price components such as kilowatt hour rate and basic price, these prices should be shown explicitly as reference energy prices in the EPC contract prior to the start of EPC.

Baseline – step-by-step:



STEP I collection and list of invoices

Energy bills are a feasible base for baseline calculation due to their official, independent and testable character. They are collected and summarised in the baseline as follows:

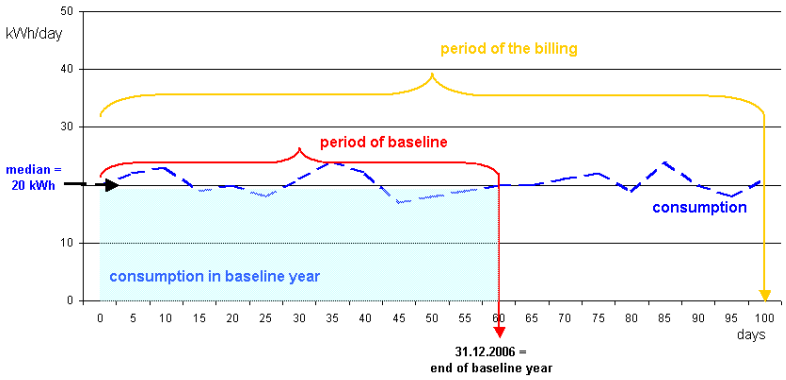
- ☑ collect all energy bills for each building with consumption in the baseline year, copy them for the tender documents (ESCOs will need them before final approval of the baseline)
- ☑ list meter by meter, building by building into one data sheet
- ☑ note extra information (provider, meter number, factors, date of fitting, extra meters..) in the data sheet
- ☑ compare to own meter readings of building management for verification

STEP II time correction for baseline year

Since energy bills may have a different charging periods in comparison to the baseline year, consumption has to be corrected. For Electricity and water the correction is done by relation to number of days, in case of heat consumption climate influence must be taken into consideration.

☑ done by calculations/formula in the baseline data sheet

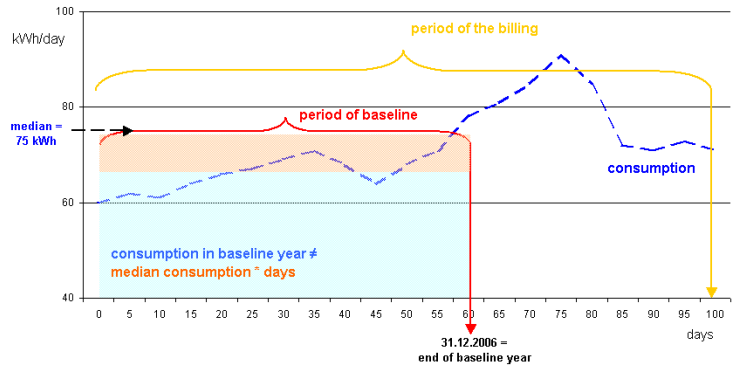
Example Electricity /Water:



Consumption is corrected by number of days, in example:

kWh Baseline = kWh bill x 60/100

Example Heat:



Consumption is corrected by median temperature of days, in example:

kWh Baseline = kWh bill x ∑ (median temperatures) 60 days / ∑ (median temperatures) 100 days

STEP III prices correction

The energy prices of the baseline year are reference prices for the whole EPC period to secure a constant calculation basis for the investments. This approach follows the principle of risk sharing, that each partner takes the risk he can influence. Therefore energy price changes should stay outside of the EPC contract.

- ☑ list prices in data sheet following the structure of buildings and meters from Step I
- ☑ each building / meter may have different prices
- ☑ take into account prices for consumption and fix prices (connection power), fix parts of the pricing like metering price, basic prices or tax parts (no influence from the ESCO) my be left out of the calculation
- ☑ if necessary give a description of the price system in a comment

Due to the methodology the energy costs per baseline may differ from the charged amount on the energy bill. Higher prices extend the financing base for energy saving investments of the EPC project, therefore in some cases it might make sense to use higher reference prices than the actual prices from the baseline year also taking into consideration the overall trend to rising energy prices.

The principle of fixed reference prices might be changed in projects where clients require a optimisation of the supply also done by the ESCO.

STEP IV baseline calculation

Formula*:

$$\begin{aligned}\text{Baseline (€)} = {} & kWh_{heat} * \text{Reference price}_{heat} + kW_{heat} * \text{Reference price}_{kW} + \text{Fixprice}_{heat} \\ & + kWh_{electr} * \text{Reference price}_{electr} + kW_{electr} * \text{Reference price}_{kW} + \text{Fixprice}_{electr} \\ & + m^3_{water} * \text{Reference price}_{water} + \text{Fixprice}_{water}\end{aligned}$$

*for typical energy price structure

- ☑ baseline is calculated net – exclusive of VAT, VAT is just rated per each yearly accounting
- ☑ verification /check for representativeness is done by comparison with other years, comparison to benchmarks, comparison to own meter readings of building management

STEP IV baseline documentation

Part of the baseline documentation, beside its calculation, are informations about work time (opening hours for public buildings, work schedule, class schedule in schools), scheme of yearly events, information about facilities and technical equipment (large-scale consumers of power, IT-equipment, lightning), number of employees, pupil, students in each building, further special utilisations. In summary all equipment and activities in baseline year should be documented as a official part of the tender documents and EPC contract

4 Energy Savings verification

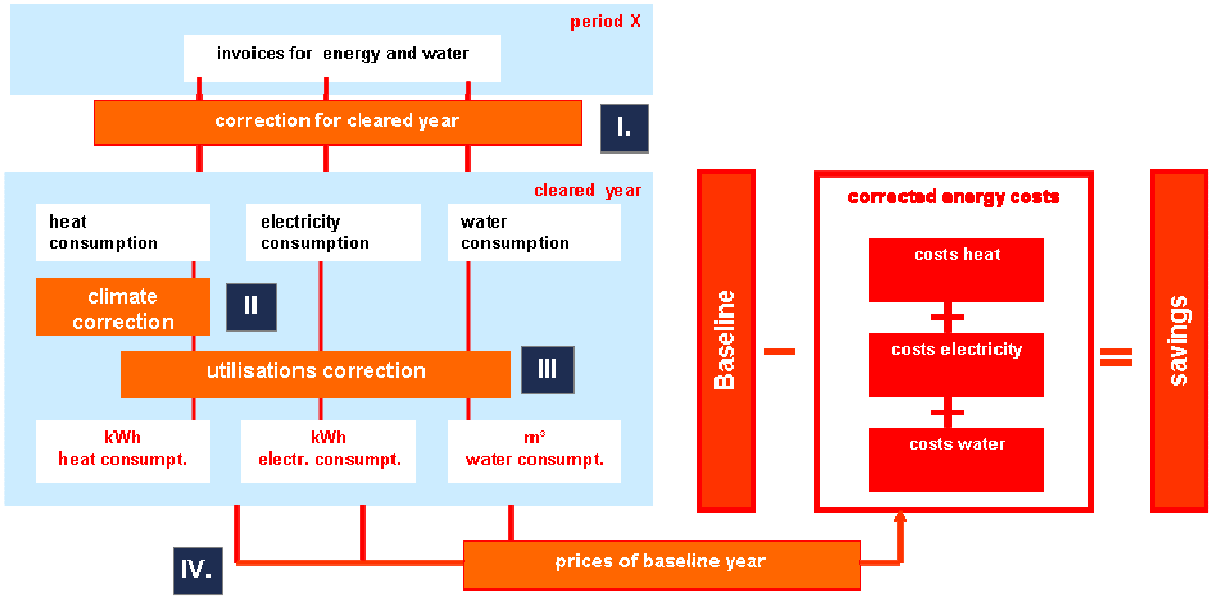
In each contract year of the EPC, the ESCO has to provide a proof of saving. The basis for this are the energy bills for the contract buildings which the client is obliged to provide for the relevant settlement periods. If defined so in the contract also meter reading or reports of the energy management tools may be sufficient.

The ESCO then has to determine the adjusted net amount of saving actually achieved using the calculation rules in accordance with the EPC contract, in a manner which is comprehensible to the client, enter the amount and its remuneration claim into the settlement sheet and present the sheet to the client.

For the determination, either the calculation file for the energy costs baseline handed over upon signing of the contract is updated or the contractor develops its own file or uses modules it already has.

The settlement method is analogous to that for baseline determination. In addition, "adjusting" steps are necessary (day, price, climate and usage adjustment) that establish comparability between reference year and settlement year.

Overview of calculation of saving



STEP I Day adjustment

First, the energy consumption/costs from different bills are allocated to the settlement period (usually a calendar year) to adjust for different numbers of days.

STEP II Climate adjustment

In accordance with existing technical standards (e.g. German VDI 2067) the annual climate is characterised for example as the sum of the degree days. This has to be defined in the contract as the reference value for the adjustment for the reference year. The current annual sum of the degree days is then used to adjust the heat consumption (space heating share, e.9. 90% in schools) for the respective settlement period. Alternatively, the reference year and all settlement years may be adjusted to the same basis (multi-annual mean of degree days). Climate adjustment of consumption is also necessary for central refrigeration plants.

STEP III Utilisation adjustment

If the usage conditions change in a contract building, the changes of the energy demand are to be determined and assessed under cost aspects. The client has to give notice in due time of any change of use. Methods of calculation for the most common changes in usage can be provided with the contract or the assessment is done based on existing technical rules and standards. If applicable the EPC contract should also contain appropriate calculation rules to account for changes of energy sources or the use of CHP units in the saving settlement.

STEP IV Price adjustment

Finally, the energy costs of the respective settlement year are calculated from adjusted consumption values of the supply bills and fixed reference prices.

The energy costs of the settlement year determined in this way are deducted from the baseline. The difference between the two is the objective energy cost saving achieved in the settlement year. The values have to be determined for each individual building. After summing up the values for all buildings, the total remuneration is determined as the sum of basic remuneration for the guaranteed saving achieved and (if achieved) the proportional bonus remuneration for saving beyond the obligation.

The client has to check and acknowledge the contractually agreed settlements provided by the ESCO and, in particular, the energy cost saving taking account of all adjustment factors. It is practical to do this in discussions in the regular steering meetings.