# Ene 03 Energy monitoring

(All buildings)

## Aim

To encourage and promote the installation of energy sub-metering to monitor energy use. To enable predicted and actual energy performance to be compared, troubleshooting and optimization of energy use during operation.

## Overview

| Assessment type | Credits available | Applicable assessment criteria |
|---|---|---|
| Fully fitted | 2 | All (see ref 3.0) |
| Shell and core | 2 | All (see ref 3.0) |
| Shell only | 0 | Not applicable |
| Residential: Fully fitted | 1 | 1-5, 10-11 (see ref 2.0) |
| Residential: Partially fitted | 1 | 1-5, 10-11 (see ref 2.0) |
| EU taxonomy | - | None |

## Minimum standards

| Rating level | Credits |
|---|---|
| Very Good | The credit for Energy monitoring strategy and energy monitoring by end use is achieved (criteria 1-4) |

## Assessment type specific notes

| Reference | Assessment type specific note |
|---|---|
| - | None |

## Building type specific notes

| Reference | Building type specific note |
|---|---|
| 2.0 | **Residential**<br>For Residential buildings, the energy monitoring for different occupiers and functional areas credit is filtered out. |
| 2.1 | **Education – Preschool**<br>For Education – Preschool buildings, the energy monitoring for different occupiers and functional areas credit is filtered out. |
| 2.2 | **Residential institution (long term stay)**<br>For Residential institution (long term stay) buildings, the energy monitoring for different occupiers and functional areas credit is filtered out. |

### Issue specific notes

| Ref | Issue specific note |
|---|---|
| 3.0 | **Energy monitoring for separately occupied areas and different functional areas** For buildings with an area ($A_{temp}$) of < 500 m², where there are no separately occupied areas or different functional areas (criterion 6) the energy monitoring for different occupiers and functional areas credit will be filtered out. |

# Assessment criteria

This issue is split into two parts:

- Energy monitoring strategy and energy monitoring by end use - one credit
- Energy monitoring for different occupiers and functional areas - one credit

## Energy monitoring strategy and energy monitoring by end use – One credit

1 An energy monitoring strategy (see M1) is developed by a suitably qualifier energy coordinator (see Ene 01) at the design stage, taking into account the following:
- 1.a Identification of major energy consuming items (>3 kWh/m² Atemp per year).
- 1.b Risk analysis of deviations that may affect the building's energy use
- 1.c Identification of essential meters to facilitate energy performance assessment, system balancing and operational optimization in the completed building.
- 1.d Required information about meters (See M1.2)
- 1.e Information about the energy monitoring system used for data collection
- 1.f Requirements for calibration and verification during commissioning

2 Energy monitoring is installed that allows ≥ 90% of the estimated annual energy consumption for each energy source to be assigned to an end-use category (see M2).

3 There is an energy metering system appropriate for the size of the building:
- 3.a Buildings with an area ($A_{temp}$) ≥ 1000 m² must have automatic meter reading and should visualize measured energy in the buildings monitoring and management system or in other suitable energy monitoring system.
- 3.b Buildings with an area ($A_{temp}$) < 1000 m², automatic meter reading must be installed, or prepared for, to be able to display measured energy in the building's control and monitoring system or other suitable energy monitoring system.

4 Those responsible for monitoring the building's energy consumption can clearly identify the end-use category covered by each meter.

### Energy monitoring for different occupiers and functional areas – One credit

5 The credit for Energy monitoring strategy and energy monitoring by end use has been achieved (criteria 1 to 4).
6 Energy monitoring is installed that allows energy use to be assigned to separately tenanted or occupied areas and to relevant functional areas within the building (see M3).
7 Those responsible for monitoring the building's energy consumption can clearly identify the functional or occupier area covered by each meter.
8 Measured energy consumption related to each tenant can be communicated to the respective tenant, see M3.4

# Methodology

## M1: Energy monitoring strategy

Detailed guidance for metering can be found in Sveby's Metering Instructions (Version 2.0). This can serve as an aid in choosing which energy items need to be metered to achieve the purpose of this criterion.

### M1.1: Identifying risks and essential meters

Identify potential deviation sources e.g settings, operation or performance of installed technical systems.

Analyse which meters that are essential for detecting deviations and to support energy performance assessment (comparison vs. design), enable system balancing (e.g., flow meters for HVAC circuits) and facilitate operational optimization (granularity for trend analysis). This could be meters enabling verification of COP or EER, temperature meters in zones, separation between produced hot water and heat from a heat pump, etc.

### M1.2: Required information about meters

Energy use shall be classified as either the building's energy use or acti/household energy in accordance with Boverket's delineation, se definition in Ene 02.

The metering strategy shall specify, for each energy source, the following:

- Metered item
- Metering method or calculation method (including any measurement equation)
- Meter number or ID
- Physical location of the meter
- Estimated energy use

- Classification according to Boverket's delineation

### M1.3: Calibration and verification of meters

The strategy shall clarify how meters are calibrated and verified during commissioning to avoid inaccurate energy data.

## M2: Energy monitoring by end-use

Identify the energy uses that together are expected to account for 90% of the total annual energy consumption.

Renewable electricity generated on-site and exported from the building must be separately monitored.

Where annual operational energy consumption has been calculated in accordance with Ene 02 Energy forecast methodology, these results should be used. Otherwise, energy consumption estimates may be derived from simple energy modelling results, benchmarks, data for similar projects, or simple engineering calculations.

## M3: Monitoring energy consumption for different occupants and functional areas

Identify units or areas in the building with different tenants or occupiers, OR, where the building is designed for a single occupancy, different functional areas.

Devise an energy metering strategy that ensures that different occupants or functional areas are separately monitored where it is technically feasible and cost effective to do so.

For this issue metering is considered cost effective where the cost of installing a sub-meter is lower than the energy cost savings arising from improved energy management over the expected lifetime of the building.

### M3.1: Different tenants or occupants

For buildings with different tenants or occupants, meters must be installed on the energy supply to each separate tenanted unit or area.

For buildings with an area ($A_{temp}$) of ≥ 500 m², with a single tenant or occupant, and with only one function, the area must be split up into smaller, discrete, logical areas that provides useful information to building management about energy use.

### M3.2: Different functional areas

For this issue, a different functional area is defined as an area where there is expected to be significantly different energy loads, controls, occupation, or usage patterns.

Some existing functional areas that may be relevant for separate measurement are exemplified below. The list is not complete, and there may be other functional areas that are relevant. Examples of relevant functional areas:

- Offices
- Laboratories
- Garages
- Warehouses and storage
- Commercial kitchens
- Larger server rooms/computer halls
- Swimming pools or health/leisure facilities
- Refrigerator and freezer storage
- Areas for the manufacturing industry
- Transport systems (e.g., lifts and escalators)
- EV charging stations

Measurement by functional area does not need to take place if the tenant's area is less than 250 m² ($A_{temp}$).

## M3.4: Communication of measured energy consumption

Energy consumption that falls within the tenant’s scope of use and influence, can be communicated to the tenant in order to raise awareness and promote energy-efficient usage patterns. This includes energy consumption that the tenant can directly or indirectly affect through their operation, behaviour, or control of systems.

The communication may take the form of a display visible to the tenants or of digital information available to all tenants, e.g., via app or website. The tenant shall have access to information on their own total energy use within their scope, as well as a breakdown by relevant functional areas where applicable.

The information shall include both historical energy consumption data and current energy use presented in near real time, enabling the tenant to understand how changes in usage patterns and operational decisions affect overall energy consumption.

# Compliance notes

| Reference | Terms | Description |
|---|---|---|
| CN1 | Assessing part of a building | When the certification is for part of a building, the project team can decide for itself whether some of the meters are more useful at the building level or certification level when it comes to the follow-up. However, the level of detail shall not be reduced, and the choice shall be clearly justified. |
| CN2 | Buildings situated on campus developments | Buildings situated on campus developments must be monitored using either an appropriate energy monitoring and management system or another automated control system, e.g. outstations linked to a central computer.<br><br>The criteria only apply to the assessed building. Where energy services are supplied from an existing building on the campus, they must be metered at the entry points to the assessed building, e.g. hot water, chilled water, gas and electricity.<br><br>Pulsed or other open protocol communication output meters are not sufficient to award the credit for these building types. |
| CN3 | Excluding large untreated areas | For industrial buildings, where there are offices and the internal spaces are not serviced by heating ventilation or HVAC systems and will have no energy-intensive systems or processes, the warehouse space can be excluded from the calculation of 'gross internal floor area' to determine whether option a) or b) is applicable for criteria 4 or 7. |
| CN4 | Sub-metering by calculation / monitoring by difference | Two direct meters may be used to estimate a third by difference, e.g., where total external lighting consumption and car park lighting consumption are both measured, the difference between the two will be other external lighting consumption.<br>Where an energy monitoring and energy management system is used, the software should be capable of calculating and displaying all required end-uses in line with the criteria. |
| CN5 | Point of use water heaters | 'Point of use' water heaters are excluded from the sub-metering requirements. |
| CN6 | Centralised air handling units (AHU) | Where it is not technically feasible to separately meter energy use by floor plate or functional area of a centralised AHU, the requirements of the second credit do not need to be applied to the AHU. The credit will be assessed based on the rest of the energy uses applicable. |
| CN7 | Shell and core buildings with capped services | Where a tenanted area within the building will have its own individual energy supply and utility meter, this supply is excluded from assessment.<br>All shared energy supplies and common areas under the responsibility of building management must still be included. |

# Evidence

| Criteria | Interim design stage | Final post-construction stage |
|---|---|---|
| **Energy monitoring strategy** | | |
| 1 | Metering strategy document<br>Evidence that the energy assessor or coordinator meets the definition for this role. | As-built metering strategy document.<br>Assessors site inspection report and photographic evidence.<br>OR<br>Screenshots from the energy monitoring system showing data from the meters where installed. |
| **Energy monitoring by end-use and for different occupiers and functional areas** | | |
| 2, 3, 6 | Floor plans showing functional or tenanted areas, where applicable. | The final construction or equivalent metering schedule or metering strategy document.<br>Assessors site inspection report and photographic evidence showing the labelled meters.<br>OR<br>Screenshots from the energy monitoring system showing data from the meters and what they relate to, where installed. |
| 4, 7 | Specification for the energy monitoring system and/or meters. | Final construction drawings, specification, manufacturer's product data or O&M documentation for the installed energy monitoring system and/or meters.<br><br>Assessors site inspection report and photographic evidence. |
| 5, 8 | The metering schedule or metering strategy document. | Assessor site inspection report and photographic evidence showing the labelled meters.<br>OR<br>Screenshots from the energy monitoring system showing data from the meters and what they relate to, where installed. |
| 9 | Description of the tenant energy communication approach,<br>Specification for the energy monitoring system showing how measured energy data within the tenant's scope will be made available to tenants (e.g. via app, web portal or local display).<br>Specification or outline requirements for the energy monitoring and data presentation system, including access per tenant and level of detail (total use and functional breakdown where applicable). | Assessor's site inspection report and photographic evidence of installed displays, interfaces or other means used to communicate energy use to tenants.<br>**OR**<br>Screenshots from the energy monitoring or tenant interface system showing:<br>• tenant-specific energy consumption data, and<br>• historical and current (near real-time) energy use information. |
| Preparing for in-use measurement of energy consumption | | |
| 11-12 | Energy modelling report showing a breakdown of results of the energy use by sub-meter. | Updated energy modelling report to account for any changes to the building specification, where required. |

# Definitions

**Accessible meters**

Energy meters located for easy access to allow regular monitoring and readings by building occupants or facilities managers. Typically, this will be a plant room, main distribution room or control room where a building energy management system (BEMS) is installed.

**Common areas**

Shared facilities, spaces, and access that are not owned or controlled by any individual tenant or occupier. These are typically managed and maintained by the development's owner or managing organisation. Examples include atria, stairwells, entrance foyers and external areas.

**Energy meters**

Devices that measure the amount of energy used on a circuit while energy is flowing.

- Primary meters measure main incoming energy and are used for billing by the utility supplier.
- Sub-meters are installed to measure consumption by specific items of plant or equipment, or to discrete physical areas, e.g. individual buildings, floors, tenanted areas or function areas.

**Energy monitoring and management systems**

A system that provides users with data about energy consumption patterns in a building to facilitate informed energy management decisions.

In addition to providing real time data on energy consumption they may also flag faults in equipment and in some cases to remotely activate or deactivate equipment. They may have the ability to provide performance indicators that can be used to measure performance against targets and provide real time alerts in instances where energy use is unexpected such as equipment left on after hours.

**Functional areas**

Areas with significantly different energy loads, controls, occupation, or usage patterns.

# Additional information

None