1. NORMALIZATION FACTORS AND HEAT ENERGY CONSUMPTION

The following describes the calculation of normalization factors and normalized heating consumption calculations. A thing to note is that domestic hot water won't be normalized and will be deducted before calculating the normalized proportion of heating energy consumption. See Chapter 2 for more details. The next chapters discuss how the calculation differs country-by-country.

1.1 FINLAND

Normalization of heating energy consumption in Finland is done using the following formula:

$$Q_{norm} = \mathrm{k1} \times \left(\frac{SN_{comparator}}{S_{realized\_comparator}} \right) \times Q_{realized}$$

where:

- Q_{norm} normalized heating energy consumption (kWh)
- k1 correction factor for a specific location/area
- $SN_{comparator}$ the averaged normal year's (or month's) heating degree days between 1981-2000. Starting from 2023 the heating degree days are 1991-2020.
- $S_{realized\_comparator}$ the realized heating degree days yearly (or monthly) in the specific location/area
- $Q_{realized}$ the realized heating energy consumption of a building (kWh)

Finland is divided into 16 different comparison locations. The comparison location for a building is decided based on which location is the closest to the building.

See: http://ilmatieteenlaitos.fi/lammitystarveluvut

1.2 SWEDEN

The normalized heating energy consumption is calculated using the formula:

$$E(korrigerad) = E(uppmätt) \times \frac{1}{1 + 0{,}5 \times \frac{DDÅ - DDNÅ}{DDNÅ}}$$

where:

- *E* = energianvändning (energy use)
- *DDÅ* = antal graddagar för aktuellt år (degree days for the actual year)
- *DDNÅ* = antal graddagar för normalåret (degree days for the normal year)

1.3 OTHER COUNTRIES

The same factor as for Finland will be used without a correction factor. The closest city is used as a reference, which means no correction factor is needed and calculations are more precise.

$$Q_{norm} = \left(\frac{SN_{comparator}}{S_{realized\_comparator}}\right) \times Q_{realized}$$

- $SN_{comparator}$ = the averaged normal year's (or month's) heating degree days between 2000-2020 in the specific location. *Some locations may have shorter weather history and all the years available after the year 2000 will be used to calculate the $SN_{comparator}$.
- $S_{realized\_comparator}$ = realized degree days per month in the specific location.
- $Q_{realized}$ =the realized heating energy consumption of a building (kWh)
- The base temperature for calculating degree days is 17 degrees of Celcius.

2. DOMESTIC HOT WATER CALCULATIONS AND APPLICATION TO NORMALIZATION CALCULATIONS

The domestic hot water energy consumption is not correlated with the outdoor temperature. For this reason, it won't be normalized but must be deducted in the calculation formulas.

Consider the following example:

- Q_{total} = Total heating energy consumption: 10000 kWh
- $Q_{hotWater}$ = Hot water consumption: 3000 kWh
- N = Normalization factor: 1.2

The normalized heating consumption is calculated with formula:

$$Q_{norm} = (\,Q_{total} - Q_{hotWater}) * N + \,Q_{hotWater}$$

Placing values in the example:

- (10 000 kWh – 3 000 kWh) *1.2 + 3 000 kWh = 11 400 kWh

2.1 BASICS OF DETERMINING THE DOMESTIC HOT WATER ENERGY PROPORTION

As seen in the example above, the domestic hot water proportion affects results quite much. The normalized heating consumption would have been 12 000 kWh without considering the domestic hot water.

The system tries to determine an optimized calculation or estimate for domestic hot water energy. Primarily it will use the domestic hot water meters, and, if not found, total water consumption. Also, if all of these are missing, an estimate will be calculated based on the gross floor area and building type. The logic and priority of which formula is used for domestic hot water energy calculations is shown in the table below.

Order	Calculation type
1	Search for domestic hot water heating energy consumption meters (kWh) for building. The sum of the meters will be used as the domestic hot water energy consumption.
2	Search for domestic hot water volume consumption (M3) meters for building. The conversion factor from M3 to kWh is 58 kWh/M3. The sum of the meters applied with the conversion factor will be used as the domestic hot water energy consumption.
3	Estimated domestic hot water consumption setting. If a building has an estimated domestic hot water consumption per month, this setting will be used as the domestic hot water energy consumption. Calculated for days and hours by diving number of days and by number of hours.
4	Search for total water consumption meters (M3) for building. The conversion factor from M3 to kWh is 58 kWh/M3. If the building type is a dwelling building, the domestic hot water proportion is 40% of the total water consumption, otherwise 30% of the total water consumption. The sum of the meters applied with the conversion factor and proportion factor will be used as the domestic hot water energy consumption.
5	Use conversion factors by building type and by floor area. The conversion factors by building type can be found at: https://www.motiva.fi/julkinen_sektori/kiinteiston_energiankaytto/kulutuksen_normitus/laskukaavat_lammin_kayttovesi For this calculation, a building must have a building type and a gross floor area. This calculation type is a fallback default if no other kind of calculation type is found for domestic hot water energy calculations.