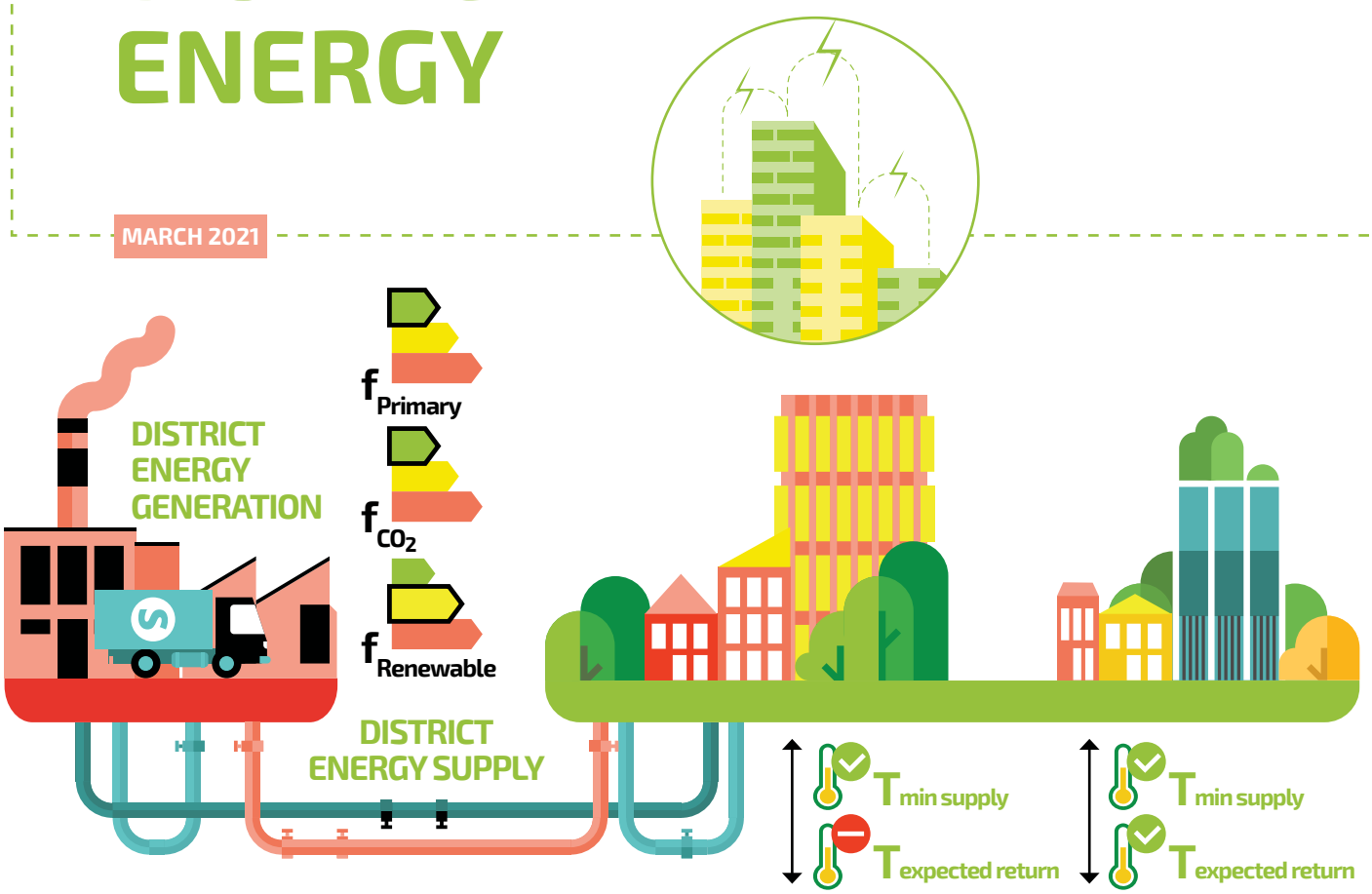
X-tendo

INTRODUCTORY REPORTS

DISTRICT ENERGY

MARCH 2021



THE DISTRICT ENERGY INDICATOR INFORMS RESIDENTS ABOUT THE EFFICIENCY AND CLIMATE EFFECT OF THE NEARBY DISTRICT HEATING (OR COOLING) NETWORK. IT ALSO SHOWS WHETHER THE BUILDING CAN BE CONNECTED TO A LOW-TEMPERATURE DISTRICT HEATING GRID. OVERALL, IT PROVIDES AN INCENTIVE TO DECREASE CARBON EMISSIONS IN EXISTING DISTRICT ENERGY NETWORKS AND INCREASE INVESTMENTS IN NEW AND MORE EFFICIENT NETWORKS.

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WHY WE DEVELOPED THIS FEATURE

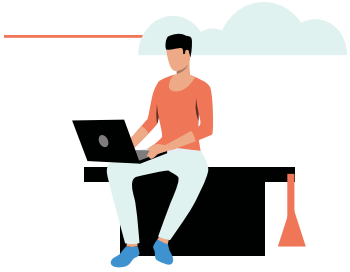
District energy networks are an important pillar for low-carbon future heating (and cooling). Industrial waste heat or the heat from combined heat and power (CHP) plants can often only be used in district heating networks. The district energy indicator has two sets of parameters. The first indicates the efficiency, the carbon content and the share of renewables of the nearest district heating grid to end-users. These parameters will also be presented for a future point in time, thus showing the ambition of the district heating grid operator to the end-users. The second set of parameters consists of two temperatures related to the building's heat distribution system: supply and return flow temperatures. These indicate the feasibility of the building being connected to a (low-temperature) network, so provide important information for potential future construction of efficient heat networks.

SCOPE OF APPLICATION

Both sets of parameters would be included in the EPC for each type of building. In cases where the nearest district heating network is far away from the building, the first set of parameters contains the average values of all national district heating systems, and a note is included that no network is available in the immediate vicinity. The second set of parameters consists of the minimal supply temperature and the minimum expected return temperature of the heat distribution system in the building. Both temperatures are rough estimations based on expert judgement.

Building typology	New and existing buildings • Residential (single-family and multi-family) • Non-residential (office, wholesale and retail, etc.) • Public (schools, public offices)
Tenure	Owner-occupied, co-operative, private rental, public rental
Property status	Renovating, renting, selling, buying

LEVEL OF EXPERTISE, SKILLS AND TRAINING



The first set of parameters, for the nearest district heating network, should be calculated by accredited engineers who have practical knowledge. To receive the accreditation, the engineer must prove they have the skills or experience to calculate these parameters according to the given standard. The accredited engineer then calculates the parameters using activity data provided by the district heating operator. A relevant authority, e.g. the national district heating association or the national authority responsible for district heating regulation, receives these parameters from the accredited engineers and collects them in a database The parameters will then be available for the EPC assessor when preparing the EPC. The second set of parameters, the temperatures related to the heat distribution system of the building, is calculated by the EPC assessor. To be able to follow and perform the method of estimating the temperatures, an intermediate level of expertise is necessary. Necessary know-how is mainly related to identification of different types of radiators and their thermal power, as well as the amount of heat to be supplied to the building.

	Fundamental awareness (basic knowledge)	**Novice** (limited experience)	**Intermediate** (practical application)	**Advanced** (applied theory)	**Expert** (recognised authority)
District energy indicator			✓		

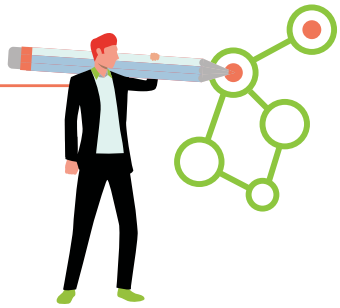
GOOD PRACTICES

For the parameters related to the efficiency, carbon content and share of renewables of the nearest district heating system, good practice exists in several European countries. A similar system to the one proposed is currently implemented in Germany. The AGFW, the German district heating association, is the authority accredited to educate and certify engineers for calculating primary energy factors for district heating systems in Germany. The calculation is performed according to regulation FW 309 published by the AGFW.[1] At present, however, these factors are not included in the German EPCs.

For the parameters related to the temperatures in the building's heat distribution system, no good practices are available.

[1] AGFW. 2014. Arbeitsblatt AGFW FW 309 Teil 1 - Energetische Bewtung von Fernwärme - Bestimmung der spezifischen Primärenergiefaktoren für Fernwärmeversorgungssysteme.

METHODS AND ASPECTS INCLUDED



As explained above, the district heating indicator consist of two sets of parameters. The first describes the efficiency and the carbon content of the nearest district heating network. By including this information in the EPC, building owners who are connected are better informed about their heat supply, while those who are not can compare these values with those of the heat supply system that they currently have installed. The same parameters for a future point in time will also be indicated to express the ambition of the district heating provider to increase efficiency and reduce carbon emissions. The recommended timeframe is 10 years. The following three parameters should be integrated in this first parameter set:

1. **Primary energy factor** – indicates how much primary energy is used to generate a unit of usable thermal energy delivered to the consumer.

2. **Carbon emission coefficient** – converts activity data (process/processes) into CO_2 emissions, calculated based on primary energy.

3. **Renewable energy factor** – gives the share of renewable energy in the heat supplied by the district heating system, calculated based on primary energy.

The second set of parameters looks at the heat distribution system in the building to give an indication of how far the building is suited for a connection to a low-temperature district heating system. This information is particularly suitable for use by public authorities. The corresponding flow rate is based on the European radiator standard rate. It includes two temperatures:

1. **Minimum supply temperature:** This temperature represents the lower limit supply temperature, which allows the heating of indoor spaces under the most difficult conditions throughout the year.

2. **Expected return flow temperature:** This temperature represents the expected return temperature of the heat distribution system in the building at the supply temperature described above.

HOW WE WILL IMPLEMENT IT

To calculate the first three parameters, each district heating network works together with a certified engineering office and reports the data to a relevant authority. The engineering office calculates the parameters based on the values provided by the district heating network operator. Activity data as well future estimates are incorporated into the calculation of future values. These parameters are then passed on to an authority, which checks them and approves them. The authority could be for example a district heating association, as in Germany.

After approval, these values should be stored in a central database. This enables the EPC assessors to easily find data for the nearest network for the calculations in the EPC. If there is no district heating network in the vicinity of the building, national average values are listed in the EPC with an explanatory note.

To calculate the temperatures related to the heat distribution system, the expertise of the assessor plays an important role. Support is given to the assessor through guidance to carry our this assessment.

The minimum system temperature is calculated for a single representative room of the building. The maximum heat load can be estimated by breaking down the total heat load of the building to the heat load of the representative room via the relation of heated floor area. The next step is to check model and dimensions of the heat transfer system (e.g. radiators) in the room. The temperature at which the heating power of the transfer system is still sufficient to cover the heating load in the room can then be found using tables in guidelines provided in the X-tendo toolbox.

The expected return temperature is estimated based on the minimum supply temperature found in the previous step. A calculation sheet gives the default return temperature for the minimum supply temperature. The expected return temperature could change in future if measures were taken to improve the building's energy performance (e.g. thermal renovation, control of the distribution system, etc.).

OVERALL EVALUATION

LESSONS LEARNT

- Easy approach considered best solution.
- End-users and district heating planners can benefit from open database of parameters.
- Statement of future values sets ambition to increase efficiency and share of renewables.

PREREQUISITES

- District heating operators must provide the data and future plans to the engineering office for the calculation of the parameters.
- A database for the first set of parameters must be created and available to the EPC assessors.
- Data tables on the design of radiators given in national regulations must be provided to the EPC assessors.

REPLICATION

- First set of parameters available in database.
- Second set of parameters must be calculated for each building individually.
- Step-by-step calculation through pre-prepared calculation sheets.

PROS

- Comparison of own system to district heating grid.
- Easier to plan connection to a new network with district heating parameters and flow rate.
- Little additional training for auditors and others involved.

CONS

- Less use of parameters if no district heating in vicinity.
- Specification of representative room not currently in the EPC (additional effort).
- Representative space in large buildings difficult to find.

RISKS

- Temperature values could be too imprecise to be useful.
- Additional data on the heating system in the representative room could only be checked with local presence of certificate issuer.
- Lack of information on district heating prices may make it hard for end-users to compare the benefits of switching from existing supply system to a potential district heating connection.

RECOMMENDATIONS

- Develop database for district heating parameters.
- Database should be open access.
- Define national average values for buildings that are too far from nearest district heating grid for a possible connection.

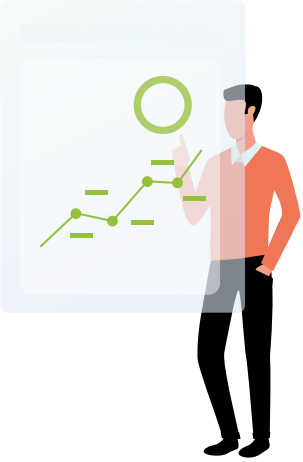
NEXT STEPS

- Further detail the Develop guidelines and calculation help sheets.
- Test feature on real cases.
- Incorporate test findings into the development.

COMPLEXITY

- Simple approach for representing complex relationship.
- Accredited engineering office with advanced personnel required.
- Step-by-step calculation of temperature parameters for certificate issuers.

COMPLIANCE WITH CROSS-CUTTING CRITERIA



QUALITY AND RELIABILITY OF EPCS

The calculation will be done by accredited engineering offices. Good quality is ensured by the engineer and the guidelines provided. Providing spreadsheets ensures greater care and accuracy of inputs for a reliable output.

USER-FRIENDLINESS

By providing user-friendly guidelines in simple language, the calculation can be done with little training. The user interface and outputs are designed for better comprehension. The application of the feature will be described in the guidelines for all building types and different heating systems.

CONSISTENCY WITH STANDARDS

A literature review of existing standards was performed in the beginning of the feature development. Standards such as AGFW (FW 309) and EN442 were used.

ECONOMIC AND POLITICAL FEASIBILITY

Many EU Member States already calculate a form of district heating grid parameters and the necessary inputs for the temperature parameters are part of the current EPCs in most countries. With most of the inputs already available the influence on the price of an EPC would be minimal. The existing framework of EPCs in MS would support the acceptance and implementation of the feature by considering the national legislation in its development.

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