II

(Non-legislative acts)

REGULATIONS

COMMISSION DELEGATED REGULATION (EU) 2022/759

of 14 December 2021

amending Annex VII to Directive (EU) 2018/2001 of the European Parliament and of the Council as regards a methodology for calculating the amount of renewable energy used for cooling and district cooling

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources ([1]), and in particular Article 7(3),, fifth subparagraph thereof,

Whereas:

(1) Annex VII to Directive (EU) 2018/2001 provides a methodology to calculate renewable energy from heat pumps used for heating, but does not regulate how to calculate renewable energy from heat pumps used for cooling. The lack of methodology in that Annex to calculate renewable energy from heat pumps used for cooling prevents the cooling sector from contributing to the Union's overall renewable energy target laid down in Article 3 of Directive (EU) 2018/2001 and makes it more difficult for Member States, especially those with a high cooling share in their energy consumption, to deliver the heating and cooling target and district heating and cooling targets under Articles 23 and 24 of that Directive, respectively.

(2) Therefore a methodology on renewable cooling, including district cooling, should be introduced in Annex VII to Directive (EU) 2018/2001. Such a methodology is necessary to ensure that the renewable energy share from cooling is calculated in a harmonised way in all Member States and to make a reliable comparison of all cooling systems in terms of their capacity to use renewable energy for cooling possible.

(3) The methodology should include minimum seasonal performance factors (SPF) for heat pumps operating in reverse mode in accordance with Article 7(3), sixth subparagraph of Directive (EU) 2018/2001. Since all active cooling systems can be considered as heat pumps working in reverse mode, so-called 'cooling mode', minimum seasonal performance factors should apply to all cooling systems. This is necessary because heat pumps extract and transfer heat from one location to another. In the case of cooling, heat pumps extract heat from a space or process and reject it to the environment (air, water or ground). Extraction of heat is the essence of cooling and the core function of a heat pump. Since this extraction goes against the natural flow of energy, which goes from hot to cold, such extraction requires energy input to the heat pump, which works as a cooling generator.

(4) The mandatory inclusion of minimum seasonal performance factors in the methodology is due to the importance of energy efficiency to establish the presence and use of renewable energy by heat pumps. The renewable energy in the case of cooling is the renewable cold source, which can increase the efficiency of the cooling process, and makes the seasonal performance factor of cooling higher. High seasonal performance factors, while being an energy efficiency indicator, function at the same time as proxy for the presence and use of renewable cold source in cooling.

([1]) OJ L 328, 21.12.2018, p. 82.

(5) In cooling, the cold source functions as a heat sink, as it absorbs the heat extracted and rejected by the heat pump outside the space or process that needs to be cooled. The quantity of renewable cooling depends on the efficiency of the cooling process, and is equivalent to the quantity of heat absorbed by the heat sink. This in practice is equivalent to the quantity of cooling capacity provided by the cold source.

(6) The cold source can be ambient energy or geothermal energy. Ambient energy is present in ambient air (formerly known as aerothermal) and ambient water (formerly known as hydrothermal), while geothermal energy comes from the ground under the surface of solid earth. Ambient and geothermal energy used for cooling by means of heat pumps and district cooling systems should be taken into account for the purposes of calculating the share of renewable energy in the gross final consumption of energy, provided that the final energy output significantly exceeds the primary energy input required to drive the heat pumps. This requirement, established in Article 7(3), third subparagraph of Directive (EU) 2018/2001, could be fulfilled with appropriately high seasonal performance factors as defined by the methodology.

(7) Given the variety of cooling solutions, it is necessary to define which cooling solutions should fall into the scope of the methodology and which should be excluded. Cooling by the natural flow of thermal energy without the intervention of a cooling device is passive cooling and should therefore be excluded from the scope of the calculation in accordance with Article 7(3), fourth subparagraph of Directive (EU) 2018/2001.

(8) Decreasing the need for cooling by building design, such as building insulation, green roof, vegetal wall, and shading or increased building mass, while valuable, can be considered as a passive cooling and should therefore not be included in the scope of the renewable cooling calculation.

(9) Ventilation (either natural or forced), which is the introduction of ambient air inside a space with the aim to ensure appropriate indoor air quality is considered passive cooling and should therefore not be included in the scope of the renewable calculation. This exclusion should be maintained even when ventilation leads to the introduction of cold ambient air and thus reduces the cooling supply in some periods of the year; indeed, this cooling is not the primary function and ventilation may also contribute to heating the air in the summer and thus to increase the cooling load. Notwithstanding, where ventilation air is used as a heat transport medium for cooling, the corresponding cooling supply, which can be supplied either by a cooling generator or by free cooling, should be considered active cooling. In situations where the ventilation airflow is increased above ventilation requirements for cooling purposes, the cooling supply due to this extra airflow should be part of the renewable cooling calculation.

(10) Comfort fan products include a fan and electric motor assembly. Comfort fans move air and provide summer comfort by increasing the air speed around the human body, which gives a thermal feeling of coolness. As opposed to ventilation, there is no introduction of ambient air in the case of comfort fans; comfort fans only move indoor air. Consequently, they are not cooling indoor air but heating it (all electricity consumed is ultimately released as heat in the room where the comfort fan is used). Comfort fans are not cooling solutions and should therefore fall outside the scope of the renewable cooling calculation.

(11) Cooling system energy input in means of transportation (such as cars, trucks, ships) is in general supplied by the transportation engine. The use of renewable energy in non-stationary cooling is part of the renewable transport target calculation pursuant to Article 7(1), point (c) of Directive (EU) 2018/2001 and should therefore not fall into the scope of the renewable cooling calculation.

(12) The temperature range of the cooling supply for which renewable cold sources can grow, and reduce or displace the energy use of a cooling generator lays between 0 °C and 30 °C. This temperature range is one of the parameters that should be used to screen potential cooling process sectors and applications to be included in the scope of the renewable cooling calculation.

(13) Process cooling with low and very low cooling supply temperature has little room to use renewable cold sources to any significant degree and is mostly operated with electrically driven refrigeration. The main way of making refrigeration equipment renewable is through their energy input. When electricity driven refrigeration equipment is renewable, it is already accounted for in the renewable electricity shares under Directive (EU) 2018/2001. The efficiency improvement potential is already covered by the EU ecodesign and labelling framework. Consequently, there would be no benefit of including refrigeration equipment in the scope of the renewable cooling calculation.

(14) As regards high temperature process cooling, any thermal power plant, combustion and other high temperature processes offer the possibility to recover waste heat. Incentivising the release of high temperature waste heat into the environment without heat recovery through renewable cooling would be against the ‘energy efficiency first’ principle and environmental protection. In that perspective, the 30 °C temperature limit is not enough to distinguish those processes; indeed, in a steam power plant, condensation may occur at 30 °C or lower. The cooling system of the power plant may supply cooling at a temperature lower than 30 °C.

(15) To ensure that the scope is clearly set, the methodology should include a list of processes where the recovery or avoidance of waste heat should be prioritised instead of incentivising the use of cooling. Sectors where waste heat avoidance and recovery is promoted through Directive 2012/27/EU of the European Parliament and of the Council [2] include power generation plants, including cogeneration, and processes producing hot fluids from combustion or from an exothermic chemical reaction. Additional processes where waste heat avoidance and recovery is important include cement, iron and steel manufacturing, wastewater treatment plants, information technology facilities such as data centres, power transmission and distribution facilities, as well as cremation and transportation infrastructures, where cooling should not be promoted for mitigating waste heat resulting from these processes.

(16) A central parameter for the calculations of renewable energy from heat pump used for cooling is the seasonal performance factor calculated in primary energy, denoted as the SPF_p. SPF_p is a ratio expressing the efficiency of cooling systems during the cooling season. It is calculated by dividing the produced quantity of cooling with the energy input. Higher SPF_p is better, because more cooling is produced for the same energy input.

(17) To calculate the quantity of renewable energy from cooling, it is necessary to define the share of the cooling supply that can be considered renewable. This share is denoted as s_{SPFp}. The s_{SPFp} is a function of a low and high SPF_p threshold value. The methodology should set a low SPF_p threshold value below which renewable energy from a cooling system is zero. The methodology should also set a high SPF_p threshold value above which the entire cooling supply produced by a cooling system counts as renewable. A progressive calculation method should allow calculating the linearly growing portion of the cooling supply that can be counted as renewable from cooling systems with SPF_p values falling between the low and high SPF_p thresholds.

(18) The methodology should ensure that, in accordance with Article 7(1), second subparagraph of Directive (EU) 2018/2001, gas, electricity, and hydrogen from renewable sources are considered only once for the purposes of calculating the share of gross final consumption of energy from renewable sources.

(19) To ensure stability and predictability from the application of the methodology for the cooling sector, the low and high threshold SPF values calculated in primary energy terms should be set using the default coefficient, also called primary energy factor, as set in Directive 2012/27/EU.

(20) It is appropriate to distinguish between different approaches to calculating renewable cooling depending on the availability of standard values for the parameters needed in the calculation, such as standard seasonal performance factors or equivalent full load hours of operation.

(21) It is appropriate that the methodology allows the use of a simplified statistical approach based on standard values for installations smaller than 1.5 MW nominal capacity. Where standard values are not available, the methodology should make it possible to use measured data to allow cooling systems to benefit from the calculation methodology of renewable energy from cooling. The measurement approach should apply to cooling systems with a nominal capacity above 1.5 MW, for district cooling and for small systems using technologies where standard values are not available. Notwithstanding the availability of standard values, Member States may use measured data for all cooling systems.

[2] Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC (OJ L 315, 14.11.2012, p. 1).

(22) Member States should be allowed to undertake their own calculations and surveys in order to improve the accuracy of national statistics beyond what is feasible with the methodology set out in this Regulation.

(23) Annex VII to Directive (EU) 2018/2001 should therefore be amended accordingly,

HAS ADOPTED THIS REGULATION:

Article 1

Amendment

Annex VII to Directive (EU) 2018/2001 is replaced by the Annex to this Regulation.

Article 2

Review

The Commission shall review this Regulation in the light of technological progress and innovation, the stock deployment, and its impacts on the renewable energy targets.

Article 3

Entry into force

This Regulation shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Union*.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels, 14 December 2021.

For the Commission

The President

Ursula VON DER LEYEN

ANNEX

'ANNEX VII

ACCOUNTING OF RENEWABLE ENERGY USED FOR HEATING AND COOLING

PART A: ACCOUNTING OF RENEWABLE ENERGY FROM HEAT PUMPS USED FOR HEATING

The amount of aerothermal, geothermal or hydrothermal energy captured by heat pumps to be considered to be energy from renewable sources for the purposes of this Directive, E_{RES}, shall be calculated in accordance with the following formula:

$E_{RES} = Q_{usable} * (1 - 1/SPF)$

where

—	Q_{usable}	=	the estimated total usable heat delivered by heat pumps fulfilling the criteria referred to in Article 7(4), implemented as follows: Only heat pumps for which SPF > 1,15 * 1/η shall be taken into account,
—	SPF	=	the estimated average seasonal performance factor for those heat pumps,
—	Η	=	the ratio between total gross production of electricity and the primary energy consumption for the production of electricity and shall be calculated as an EU average based on Eurostat data.

PART B: ACCOUNTING OF RENEWABLE ENERGY USED FOR COOLING

1. **DEFINITIONS**

When calculating renewable energy used for cooling the following definitions shall apply:

(1) 'cooling' means the extraction of heat from an enclosed or indoor space (comfort application) or from a process in order to reduce the space or process temperature to, or maintain it at, a specified temperature (set point); for cooling systems, the extracted heat is rejected into and absorbed by the ambient air, ambient water or the ground, where the environment (air, ground, and water) provides a sink for the heat extracted and thus functions as a cold source;

(2) 'cooling system' means an assembly of components consisting of a heat extraction system, one or several cooling devices and a heat rejection system, complemented in the case of active cooling with a cooling medium in the form of fluid that work together to generate a specified heat transfer and, thus, ensures a required temperature;

(a) for space cooling, the cooling system can be either a free cooling system or a cooling system embedding a cooling generator, and for which cooling is one of the primary functions;

(b) for process cooling, the cooling system is embedding a cooling generator, and for which cooling is one of the primary functions;

(3) 'free cooling' means a cooling system using a natural cold source to extract heat from the space or process to be cooled via fluid(s) transportation with pump(s) and/or fan(s) and which does not require the use of a cooling generator;

(4) 'cooling generator' means the part of a cooling system that generates a temperature difference allowing heat extraction from the space or process to be cooled, using a vapour compression cycle, a sorption cycle or driven by another thermodynamic cycle, used when the cold source is unavailable or insufficient;

(5) 'active cooling' means the removal of heat from a space or process, for which an energy input is needed to meet the cooling demand, used when the natural flow of energy is unavailable or insufficient and can occur with or without a cooling generator;

(6) 'passive cooling' means the removal of heat by the natural flow of energy through conduction, convection, radiation or mass transfer without the need for moving a cooling fluid to extract and reject heat or to generate a lower temperature with a cooling generator, including decreasing the need for cooling by building design features such as building insulation, green roof, vegetal wall, shading or increased building mass, by ventilation or by using comfort fans;

(7) 'ventilation' means the natural or forced movement of air to introduce ambient air inside a space with the aim to ensure appropriate indoor air quality, including temperature;

(8) 'comfort fan' means a product that includes a fan and electric motor assembly to move air and provide summer comfort by increasing the air speed around human body giving a thermal feeling of coolness;

(9) 'renewable energy quantity for cooling' means the cooling supply that has been generated with a specified energy efficiency expressed as a Seasonal Performance Factor calculated in primary energy;

(10) 'heat sink' or 'cold source' means an external natural sink into which the heat extracted from the space or process is transferred; it can be ambient air, ambient water in the form of natural or artificial water bodies and geothermal formations beneath the surface of solid earth;

(11) 'heat extraction system' means a device that removes heat from the space or process to be cooled, such as an evaporator in a vapour compression cycle;

(12) 'cooling device' means a device designed to perform active cooling;

(13) 'heat rejection system' means the device where the final heat transfer from the cooling medium to the heat sink occurs, such as the air-to-refrigerant condenser in an air-cooled vapour compression cycle;

(14) 'energy input' means the energy needed to transport the fluid (free cooling), or the energy needed to transport the fluid and to drive the cooling generator (active cooling with a cooling generator);

(15) 'district cooling' means the distribution of thermal energy in the form of chilled liquids, from central or decentralised sources of production through a network to multiple buildings or sites, for the use of space or process cooling;

(16) 'primary seasonal performance factor' means a metric of the primary energy conversion efficiency of the cooling system;

(17) 'equivalent full load hours' means the number of hours a cooling system runs with full load to produce the amount of cooling that it actually produces during a year but at varying loads;

(18) 'Cooling Degree Days' means the climate values computed with a base of 18 °C used as input to determine equivalent full load hours.

2. **SCOPE**

1. When calculating the amount of renewable energy used for cooling, Member States shall count active cooling, including district cooling, regardless of whether it is free cooling or a cooling generator is used.

2. Member States shall not count:

   (a) passive cooling, although where ventilation air is used as a heat transport medium for cooling, the corresponding cooling supply, which can be supplied either by a cooling generator or by free cooling is part of renewable cooling calculation.

   b) the following technologies or processes of cooling:

      (i) cooling in means of transportation [1];

      (ii) cooling systems whose primary function is to produce or store perishable materials at specified temperatures (refrigeration and freezing);

      (iii) cooling systems with space or process cooling temperature set points lower than 2 °C;

      (iv) cooling systems with space or process cooling temperature set points above 30 °C;

[1] The renewable cooling definition concerns only stationary cooling.

(v) cooling of waste heat resulting from energy generation, industrial processes and the tertiary sector (waste heat) [2].

(c) energy used for cooling in power generation plants; cement, iron and steel manufacturing; wastewater treatment plants; information technology facilities (such as data centres); power transmission and distribution facilities; and transportation infrastructures.

Member States may exclude more categories of cooling systems from the calculation of the renewable energy used for cooling in order to preserve natural cold sources in specific geographic areas for environmental protection reasons. Examples are the protection of rivers or lakes from the risk of overheating.

3. METHODOLOGY FOR ACCOUNTING OF RENEWABLE ENERGY FOR INDIVIDUAL AND DISTRICT COOLING

Only cooling systems operating above the minimum efficiency requirement expressed as primary Seasonal Performance Factor (SPF_p) in section 3.2, second paragraph shall be considered to produce renewable energy.

3.1. **Renewable energy quantity for cooling**

The renewable energy quantity for cooling (E_{RES-C}) shall be calculated with the following formula:

$$E_{RES-C} = (Q_{C_{Source}} - E_{INPUT}) \times s_{SPF_p} = Q_{C_{Supply}} \times s_{SPF_p}$$

where:

$Q_{C_{Source}}$ is the amount of heat released to the ambient air, ambient water or to the ground by the cooling system [3];

E_{INPUT} is the energy consumption of the cooling system, including energy consumption of the auxiliary systems for measured systems, such as district cooling;

$Q_{C_{Supply}}$ is the cooling energy supplied by the cooling system [4];

s_{SPF_p} is defined at cooling system level as the share of the cooling supply that can be considered as renewable according to the SPF requirements, expressed as a percentage. The SPF is established without accounting for distribution losses. For district cooling, this means that the SPF is established per cooling generator, or at free cooling system level. For cooling systems where standard SPF can apply, the F(1) and F(2) coefficients according to Commission Regulation (EU) 2016/2281 [5] and the linked Commission Communication [6] are not used as correction factors.

For 100 % renewable heat driven cooling (absorption and adsorption) the cooling delivered should be considered fully renewable.

The calculation steps needed for $Q_{C_{Supply}}$ and s_{SPF_p} are explained in Sections 3.2 to 3.4.

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[2] Waste heat is defined in Article 2(9) of this Directive. Waste heat can be accounted for the purposes of Articles 23 and 24 of this Directive.

[3] The quantity of cold source corresponds to the quantity of heat absorbed by ambient air, ambient water and the ground acting as heat sinks. Ambient air and ambient water correspond to ambient energy as defined in Article 2(2) of this Directive. The ground correspond to geothermal energy as defined in Article 2(3) of this Directive.

[4] From a thermodynamical point of view, cooling supply corresponds to a portion of the heat released by a cooling system to ambient air, ambient water or to the ground, which function as a heat sink or cold source. Ambient air and ambient water correspond to ambient energy as defined in Article 2(2) of this Directive. The heat sink or cold source function of the ground corresponds to geothermal energy as defined in Article 2(3) of this Directive.

[5] Commission Regulation (EU) 2016/2281 of 30 November 2016 implementing Directive 2009/125/EC of the European Parliament and of the Council establishing a framework for the setting of ecodesign requirements for energy-related products, with regard to ecodesign requirements for air heating products, cooling products, high temperature process chillers and fan coil units (OJ L 346, 20.12.2016, p. 1).

[6] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.C_.2017.229.01.0001.01.ENG&toc=OJ:C:2017:229:TOC

3.2. Calculation of the share of Seasonal Performance Factor that qualifies as renewable energy – s_{SPF_p}

S_{SPF} is the share of cooling supply that can be counted as renewable. The s_{SPF_p} increases with increasing SPF_p values. The SPF_p [7] is defined as described in Commission Regulation (EU) 2016/2281 and Commission Regulation (EU) No 206/2012 [8], except that the default primary energy factor for electricity has been updated to 2.1 in Directive 2012/27/EU (as amended by Directive (EU) 2018/2002 [9]) of the European Parliament and of the Council. Boundary conditions from the EN14511 standard shall be used.

The minimum efficiency requirement of the cooling system expressed in primary seasonal performance factor shall be at least 1.4 ($SPFp_{LOW}$). For s_{SPF_p} to be 100 % the minimum efficiency requirement of the cooling system shall be at least 6 ($SPFp_{HIGH}$). For all the other cooling systems the following calculation shall be applied:

$$sSPFp = \frac{SPF_p - SPF_{p\_LOW}}{SPF_{p\_HIGH} - SPF_{p\_LOW}} \%$$

SPFp is the efficiency of the cooling system expressed as primary seasonal performance factor;

$SPFp_{LOW}$ is the minimum seasonal performance factor expressed in primary energy and based upon the efficiency of standard cooling systems (minimum eco-design requirements);

$SPFp_{HIGH}$ is the upper threshold for seasonal performance factor expressed in primary energy and based on best practices for free cooling used in district cooling [10].

3.3. Calculation of renewable energy quantity for cooling using standard and measured SPF_p

Standard and measured SPF

Standardised SPF values are available for electric vapour compression cooling generators and combustion engine vapour compression cooling generator due to the Ecodesign requirements in Regulation (EU) No 206/2012 and (EU) No 2016/2281. Values are available for these cooling generators up to 2 MW for comfort cooling and up to 1.5 MW for process cooling. For other technologies and capacity scales standard values are not available. As regards district cooling, standard values are not available but measurements are used and available; these allow to compute SPF values at least on a yearly basis.

To calculate the quantity of renewable cooling, standard SPF values may be used where available. Where standard values are not available or measurement is standard practice, measured SPF values shall be used, separated by cooling capacity thresholds. For cooling generators with a cooling capacity below 1.5 MW, standard SPF can be used, while measured SPF shall be used for district cooling, for cooling generators with cooling capacities higher than or equal to 1.5 MW and cooling generators for which standard values are not available.

In addition, for all cooling systems without standard SPF, which includes all free cooling solutions and heat activated cooling generators, a measured SPF shall be established in order to take advantage of the calculation methodology for renewable cooling.

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(7) In case the real operating conditions of cooling generators lead to SPF values substantially lower than planned in standard conditions because of different installation provisions, Member States may exclude these systems from the scope of the renewable cooling definition (e.g. a water cooled cooling generator using a dry cooler instead of a cooling tower to release heat to ambient air).

(8) Commission Regulation (EU) No 206/2012 of 6 March 2012 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for air conditioners and comfort fans (OJ L 72, 10.3.2012, p. 7).

(9) Directive (EU) 2018/2002 of the European Parliament and of the Council of 11 December 2018 amending Directive 2012/27/EU on energy efficiency (OJ L 328, 21.12.2018, p. 210).

(10) ENER/C1/2018-493, Renewable cooling under the revised Renewable Energy Directive, TU-Wien, 2021.

Definition of standard SPF values

SPF values are expressed in terms of primary energy efficiency calculated using primary energy factors following Regulation (EU) 2016/2281 to determine the space cooling efficiency for the different types of cooling generators ([11]). The primary energy factor in Regulation (EU) 2016/2281 shall be calculated as 1/η, where η is the average ratio of total gross production of electricity to the primary energy consumption for electricity production in the whole EU. With the amendment of the default primary energy factor for electricity, called coefficient in point (1) of the Annex to Directive (EU) 2018/2002 amending footnote (3) in Annex IV of Directive 2012/27/EU, the primary energy factor of 2.5 in Regulation (EU) 2016/2281 shall be replaced by 2.1 when calculating the SPF values.

When primary energy carriers, such as heat or gas are used as energy input to drive the cooling generator, the default primary energy factor (1/η) is 1, reflecting the lack of energy transformation η = 1.

The standard operating conditions and the other parameters necessary for the determination of the SPF are defined in Regulation (EU) 2016/2281 and Regulation (EU) No 206/2012, depending on the cooling generator category. Boundary conditions are the ones defined in the EN14511 standard.

For reversible cooling generators (reversible heat pumps), which are excluded from the scope of Regulation (EU) 2016/2281 because their heating function is covered by Commission Regulation (EU) No 813/2013 ([12]) with regard to Ecodesign requirements for space heaters and combination heaters, the same SPF calculation that is defined for similar non reversible cooling generators in Regulation (EU) 2016/2281 shall be used.

For instance, for electric vapour compression cooling generators, the SPF_p shall be defined as follows (the index *p* is used to clarify that the SPF is defined in terms of primary energy):

— For space cooling: $$SPF_p = \frac{SEER}{\frac{1}{\eta}} - F(1) - F(2)$$

— For process cooling: $$SPF_p = \frac{SEPR}{\frac{1}{\eta}} - F(1) - F(2)$$

Where:

— SEER and SEPR are seasonal performance factors ([13]) (SEER stands for ‘Seasonal Energy Efficiency Ratio’, SEPR stands for ‘Seasonal Energy Performance Ratio’) in final energy defined according to Regulation (EU) 2016/2281 and Regulation (EU) No 206/2012;

— η is the average ratio of total gross production of electricity to the primary energy consumption for electricity production in the EU (η = 0.475 and 1/η = 2.1).

F(1) and F(2) are correction factors according to Regulation (EU) 2016/2281 and the linked Commission Communication. These coefficients do not apply to process cooling in Regulation (EU) 2016/2281 as the SEPR final energy metrics is directly used. In absence of adapted values, the same values used for SEER conversion shall be used for the SEPR conversion.

SPF boundary conditions

For defining the SPF of the cooling generator, the SPF boundary conditions defined in Regulation (EU) No 2281/2016 and in Regulation (EU) No 206/2012 shall be used. In the case of water-to-air and water-to-water cooling generators, the energy input required to make the cold source available is included via the F(2) correction factor. The SPF boundary conditions are shown in Figure 1. These boundary conditions shall apply for all cooling systems, either free cooling systems or systems containing cooling generators.

([11]) SPF_p is identical to $\eta_{s,c}$ defined in Regulation (EU) No 2016/2281.
([12]) Commission Regulation (EU) No 813/2013 of 2 August 2013 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for space heaters and combination heaters (OJ L 239, 6.9.2013, p. 136).
([13]) Part 1 of the study ENER/C1/2018-493 on ‘Cooling Technologies Overview and Market Share’ provides more detailed definitions and equations for these metrics in chapter 1.5 ‘Energy efficiency metrics of state-of-the-art cooling systems’.

These boundary conditions are similar to the ones for heat pumps (used in heating mode) in Commission Decision 2013/114/EU ([14]). The difference is that for heat pumps, the electricity consumption corresponding to auxiliary power consumption (thermostat-off mode, standby mode, off mode, crankcase heater) is not taken into account to evaluate the SPF. However, as in the case of cooling both standard SPF values and measured SPF will be used, and given the fact that in the measured SPF auxiliary consumption is taken into account, it is necessary to include auxiliary power consumption in both situations.

For district cooling, distribution cold losses and distribution pump electric consumption between the cooling plant and the customer substation shall not be included in the estimation of the SPF.

In the case of air based cooling systems ensuring also the ventilation function, the cooling supply due to ventilation air flow shall not be accounted. The fan power needed for the ventilation shall also be discounted in proportion of the ratio of the ventilation air flow to the cooling air flow.

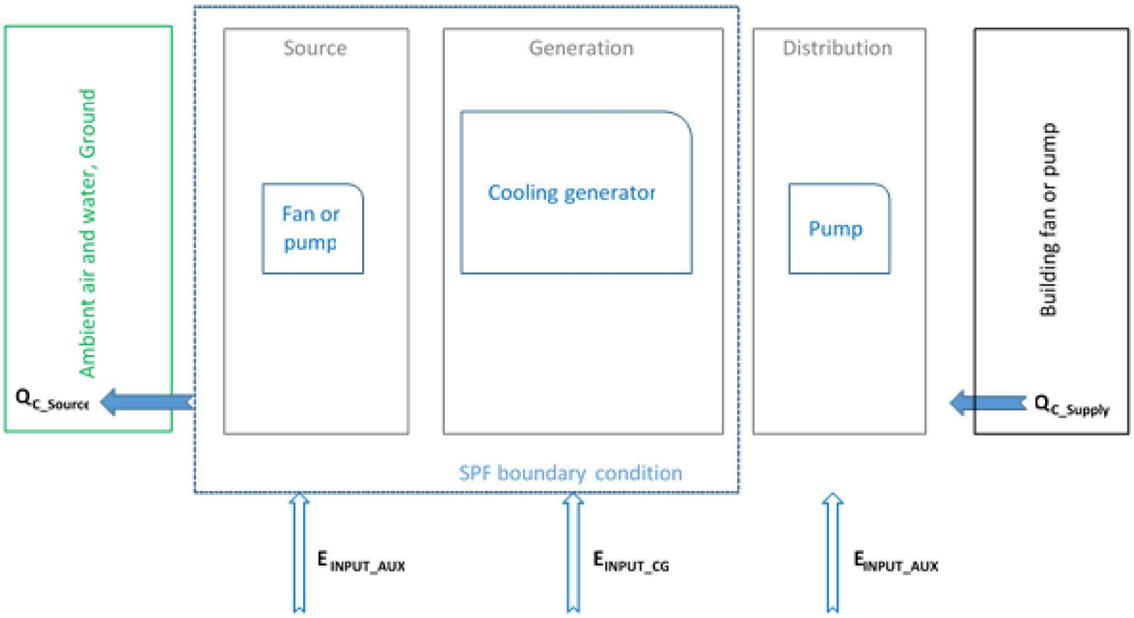

Figure 1 Illustration of SPF boundary conditions for cooling generator using standard SPF and district cooling (and other large cooling systems using measured SPF), where E_{INPUT_AUX} is the energy input to fan and/or pump and E_{INPUT_CG} the energy input to the cooling generator

In the case of air based cooling systems with internal cold recovery, the cooling supply due to the cold recovery shall not be accounted. The fan power needed for the cold recovery performed by the heat exchanger shall be discounted in proportion of the ratio of the pressure losses due to the cold recovery heat exchanger to the total pressure losses of the air based cooling system.

3.4. **Calculation using standard values**

A simplified method may be used for individual cooling systems of less than 1.5 MW capacity, for which a standard SPF value is available, to estimate the total cooling energy supplied.

Under the simplified method, the cooling energy supplied by the cooling system ($Q_{Csupply}$) is the nominal cooling capacity *(Pc)* multiplied by the number of equivalent full load hours *(EFLH)*. A single Cooling Degree Days (CDD) value may be used for a whole country, or distinct values for different climate zones provided that nominal capacities and SPFs are available for these climate zones.

The following default methods may be used to compute *EFLH*:

— for space cooling in the residential sector: EFLH = 96 + 0.85 * CDD

— for space cooling in the tertiary sector: EFLH = 475 + 0.49 * CDD

— for process cooling: EFLH = τ_s * (7300 + 0.32 * CDD)

([14]) Commission Decision of 1 March 2013 establishing the guidelines for Member States on calculating renewable energy from heat pumps from different heat pump technologies pursuant to Article 5 of Directive 2009/28/EC of the European Parliament and of the Council (OJ L 62, 6.3.2013, p. 27).

Where:

τ_s is an activity factor to account for the operation time of the specific processes (e.g. all year long $\tau_s = 1$, not on weekends $\tau_s = 5/7$). There is no default value.

3.4.1. *Calculation using measured values*

Systems for which no standard values exist, as well as cooling systems larger than 1.5 MW capacity and district cooling systems, shall calculate their renewable cooling based on the following measurements:

Measured energy input: The measured energy input includes all energy sources for the cooling system, including any cooling generator, i.e. electricity, gas, heat etc.. It includes also auxiliary pumps and fans used in the cooling system but not for the distribution of cooling to a building or a process. In case of air-based cooling with ventilation function, only the additional energy input due to cooling shall be included in the energy input of the cooling system.

Measured cooling energy supply: The cooling energy supply shall be measured as the output from the cooling system and subtracted any cold losses in order to estimate the net cooling energy supply to the building or process that is the end-user of the cooling. The cold losses include losses in a district cooling system and in the cooling distribution system in a building or an industrial site. In case of air-based cooling with ventilation function, the cooling energy supply shall be net of the effect of fresh air introduction for ventilation purposes.

The measurements need to be carried out for the specific year to be reported i.e. all energy input and all cooling energy supply for the whole year.

3.4.2. *District cooling: additional requirements*

For district cooling systems the net cooling supply at customer level shall be accounted when defining the net cooling supply, denoted as $Q_{C\_Supply\_net}$ Thermal losses occurring in the distribution network (Q_{c_LOSS}) shall be deducted from the gross cooling supply ($Q_{c\_Supply\_gross}$) as follows:

$Q_{C\_Supply\_net} = Q_{c\_Supply\_gross-} - Q_{c\_LOSS}$

3.4.2.1. *Division in subsystems*

District cooling systems can be divided in subsystems, which comprise at least one cooling generator or free cooling system. This requires the measurement of the cooling energy supply and of the energy input for each sub-system as well as the allocation of cold losses per sub-system as follows:

$$Q_{C\_Supply\_net\_i} = Q_{C\_Supply\_gross\_i} x \left(1 - \frac{Q_{C_{LOSS}}}{\left(\sum_{i=1}^{n} Q_{C_{Supply_{gross_i}}}\right)}\right)$$

3.4.2.2. *Auxiliaries*

When dividing a cooling system into subsystems, the auxiliaries (e.g. controls, pumps and fans) of the cooling generator(s) and/or free cooling system(s) shall be included in the same subsystem(s). Auxiliary energy corresponding to cooling distribution inside the building, e.g. secondary pumps and terminal units (e.g. fan coils, fans of air handling units) are not accounted for.

For auxiliaries which cannot be allocated to a specific subsystem, for instance district cooling network pumps which deliver the cooling energy supplied by all cooling generators, their primary energy consumption shall be allocated to each cooling subsystem in the proportion of the cooling energy supplied by the cooling generators and/or the free cooling systems of each subsystem, in the same way as with cold losses in the network, as follows

$$E_{INPUT\_AUX\_i} = E_{INPUT\_AUX1\_i} + E_{INPUT\_AUX2} * \frac{Q_{C\_Supply\_net\_i}}{\sum_{i=1}^{n} Q_{C\_Supply\_net\_i}}$$

where:

$E_{INPUT\_AUX1\_i}$ is the auxiliary energy consumption of subsystem 'I';

E_{INPUT_AUX12} is the auxiliary energy consumption of the entire cooling system, which cannot be allocated to a specific cooling subsystem.

3.5. Calculation of renewable energy quantity for cooling for the overall renewable shares and for the heating and cooling renewable energy shares

For the calculation of the overall renewable energy shares, the renewable energy quantity for cooling shall be added both to the numerator 'gross final consumption of energy from renewable sources' and to the denominator 'gross final consumption of energy'.

For the calculation of the heating and cooling renewable energy shares the renewable energy quantity for cooling shall be added both to the numerator 'gross final consumption of energy from renewable sources for heating and cooling' and to the denominator 'gross final consumption of energy for heating and cooling'.

3.6. Guidance on the development of more accurate methodologies and calculations

It is envisaged and encouraged that Member States do their own estimations for both SPF and EFLH. Any such national/regional approaches should be based on accurate assumptions, representative samples of sufficient size, resulting in a significantly improved estimate of renewable energy compared to that obtained using the methodology set out in this Delegated Act. Such improved methodologies may be based on detailed calculation based on technical data taking into account, among other factors, year of installation, quality of installation, compressor type and machine size, operation mode, distribution system, cascading of generators and the regional climate. Member States that use alternative methodologies and/or values shall submit them to the Commission together with a report describing the method and data used. The Commission will, if necessary, translate the documents and publish them on its transparency platform.'