

EU GPP Criteria for Water-based Heaters

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EU GPP Criteria for Water-based Heaters

Green Public Procurement (GPP) is a voluntary instrument. This document provides the EU GPP criteria developed for product group 'water-based heaters'. The accompanying Technical Background Report provides full details on the reasons for selecting these criteria and references for further information.

For each product/service group two sets of criteria are presented:

- The core criteria are those suitable for use by any contracting authority across the Member States and address the key environmental impacts. They are designed to be used with minimum additional verification effort or cost increases.
- The comprehensive criteria are for those who wish to purchase the best products available on the market. These may require additional verification effort or a slight increase in cost compared to other products with the same functionality.

The criteria applying to cogenerations up to 50 kWe (micro-cogenerations) that provide useful heat to a water-based space heating system will prevail over the EU GPP criteria for CHP.

INFORMATIVE NOTE

The following text will be added in EU GPP Criteria for CHP:

Those cogenerations up to 50 kWe (micro-cogenerations) that provide useful heat to a water-based space heating system are excluded from the scope of EU GPP Criteria for CHP. EU GPP Criteria for Water-based heaters shall be applied to the procurement of those heaters.

1. Definition and Scope

1.1 Product Scope

This document covers procurement actions for water-based heaters. For the purposes of these criteria, the product group 'water-based heaters' shall comprise products that are used to generate heat as part of a water-based central heating system, where the heated water is distributed by means of circulators and heat emitters in order to reach and maintain the indoor temperature of an enclosed space such as a building, a dwelling, or a room, at a desired level. The operation of the heat generator can be based on a number of processes and technologies, such as:

- Combustion of gaseous, liquid or solid fossil fuels;
- Combustion of gaseous, liquid or solid biomass;
- Use of the Joule effect in electric resistance heating elements;
- Capture of ambient heat from air, water or ground source, and/or waste heat;
- Cogeneration (the simultaneous generation in one process of heat and electricity);
- Solar (auxiliary);

The maximum output power of the water-based heaters shall be 400 kW.

Combination heaters are included in the scope of this product group, provided that their primary function is to provide ambient heat.

The following products are excluded from the scope of this product group:

- Heaters whose primary function is to provide hot drinking or sanitary water;
- Heaters for heating and distributing gaseous heat transfer media such as vapour or air;
- Cogeneration heaters with a maximum electrical capacity of 50 kW or above;
- Space heaters that combine both indirect heating, using water-based central heating system, and direct heating, by direct emission of heat into the room or space the appliance is installed.

Although it is not explicitly stated in the definitions above, it may be that the circulator is an integral part of the heater. For larger heaters the circulator is usually supplied separately, and therefore the circulator itself is out of the scope. The maximum output power of the water-based heaters shall be 400 kW.

1.2 Product Definitions

The following definitions apply:

- ‘space heater’ means a water-based space heater, i.e. a device that provides heat to a water-based central heating system in order to reach and maintain at a desired level the indoor temperature of an enclosed space such as a building, a dwelling or a room; a heater is equipped with one or more heat generators;
- ‘combination heater’ means a water-based space heater that is designed to also provide heat to deliver hot drinking or sanitary water at given temperature levels, quantities and flow rates during given intervals, and is connected to an external supply of drinking or sanitary water;
- ‘package of space heater, temperature control and solar device’ means a package offered to the end-user containing one or more space heaters combined with one or more temperature controls and/or one or more solar devices;
- ‘package of combination heater, temperature control and solar device’ means a package offered to the end-user containing one or more combination heaters combined with one or more temperature controls, and/or one or more solar devices;
- ‘solar device’ means a solar-only system, a solar collector, a solar hot water storage tank or a pump in the collector loop, which are placed on the market separately;
- ‘water-based central heating system’ means a system using water as a heat transfer medium to distribute centrally generated heat to heat emitters for the space heating of buildings, or parts thereof;
- ‘heat generator’ means the part of a heater that generates the heat.

- ‘gas heater’ means a space heater or combination heater equipped with one or more heat generators fuelled with gaseous fuels of fossil origin or from biomass;
- ‘liquid fuel heater’ means a space heater or combination heater equipped with one or more heat generators fuelled with liquid fuels of fossil origin or from biomass;
- ‘solid fuel heater’ means a a space heater or combination heater equipped with one or more heat generators fuelled with solid fuels of fossil origin or from biomass;
- ‘electric heater’ means a space heater or combination heater equipped with one or more heat generators using electricity as a fuel;
- ‘boiler heater’ means a space heater or combination heater equipped with one or more heat generators using the combustion of gaseous, liquid or solid fuels of fossil origin or from biomass;
- ‘gas boiler heater’ means a boiler heater equipped with one or more heat generators using the combustion of gaseous fuels of fossil origin or from biomass;
- ‘liquid fuel boiler heater’ means a boiler heater equipped with one or more heat generators using the combustion of liquid fuels of fossil origin or from biomass;
- ‘solid fuel boiler heater’ means a boiler heater equipped with one or more heat generators using the combustion of solid fuels of fossil origin or from biomass;
- ‘solid biomass boiler heater’ means a boiler heater equipped with one or more heat generators using the combustion of solid fuels from biomass;
- ‘electric boiler heater’ means a boiler heater equipped with one or more heat generators using the Joule effect in electric resistance heating elements only;
- ‘heat pump heater’ means a space heater or combination heater equipped with one or more heat generators using ambient heat from an air, water or ground source, and/or waste heat for heat generation;
- ‘fuel-driven heat pump heater’ means a heat pump heater equipped with one or more heat generators fueled with gas or liquid fuel of fossil origin or from biomass;
- ‘electrically-driven heat pump heater’ means a heat pump heater equipped with one or more heat generators using electricity as a fuel;
- ‘cogeneration heater’ means a space heater simultaneously generating heat and electricity in a single process;
- ‘temperature control’ means equipment that interfaces with the end-user regarding the values and timing of the desired indoor temperature, and communicates relevant data, such as actual indoor and/or outdoor temperature(s), to an interface of the heater such as a central processing unit, thus helping to regulate the indoor temperature(s);
- ‘seasonal space heating energy efficiency’ (η_s) means the ratio between the space heating demand for a designated heating season, supplied by a space heater, a combination heater or a hybrid heater, including temperature control, and the annual energy consumption required to meet this demand, expressed in %;

- ‘rated heat output’ means the declared heat output of a heater when providing space heating and, if applicable, water heating at standard rating conditions, expressed in kW; for heat pump space heaters and heat pump combination heaters the standard rating conditions for establishing the rated heat output are the reference design conditions, as set out in Regulation (EU) No 813/2013 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for space heaters and combination heaters¹;
- ‘standard rating conditions’ means the operating conditions of heaters under average climate conditions for establishing the rated heat output, seasonal space heating energy efficiency, water heating energy efficiency, sound power level, nitrogen oxide (NO_x) emissions, carbon monoxide (CO) emissions, organic gaseous carbon (OGC) emissions and particulate matter.
- ‘average climate conditions’ mean the temperature conditions characteristic for the city of Strasbourg;
- ‘seasonal space heating emissions’ means:
 - for automatically stoked solid fuel boilers, a weighted average of the emissions at rated heat output and the emissions at 30 % of the rated heat output, expressed in mg/m³;
 - for manually stoked solid fuel boilers that can be operated at 50% of the rated heat output in continuous mode, a weighted average of the emissions at rated heat output and the emissions at 50 % of the rated heat output, expressed in mg/m³;
 - for manually stoked solid fuel boilers that cannot be operated at 50% or less of the rated heat output in continuous mode, the emissions at rated heat output, expressed in mg/m³;
 - for solid fuel cogeneration boilers, the emissions at rated heat output, expressed in mg/m³.
- ‘global warming potential’ means global warming potential as defined in Article 2(4) of Regulation (EC) No 842/2006⁽²⁾;
- ‘Nm³’ means normal cubic metre (at 101.325 kPa, 273.15 K).

2. Key Environmental Impacts

The key environmental impacts from water-based heaters are associated with their use phase and linked mainly to the **energy efficiency** of the product and related **greenhouse gas (GHG) emissions** during operation. Greenhouse gas emissions are mainly due to the emission of CO₂ from combustion and potentially – to a lesser extent – refrigerant leakage (for certain types of heating technologies such as heat pumps).

Installation instructions and user information criteria were identified as one of the most important criteria to guarantee optimum environmental performance of the water-based heaters.

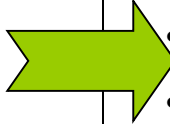
Additional environmental impacts as acidification, tropospheric ozone and air, water and soil pollution are related to air emissions during operation including nitrogen oxides (NO_x), carbon monoxide (CO), organic gaseous carbon (OGC) and particulate matter (PM).

Other environmental issues of relevance include: noise and product design.

¹ OJ L 239, 6.9.2013, p. 136–161.

⁽²⁾ OJ L 161, 14.6.2006, p. 1.

Key environmental impacts	GPP approach
<ul style="list-style-type: none"> • Energy consumption in use-phase • GHG emissions in use-phase, due to fossil fuel combustion or heat pump refrigerant leakage • Air emissions of NO_x, OGC, CO and PM in use-phase • Noise in use phase 	<ul style="list-style-type: none"> • Purchase water-based heaters with high energy efficiency, low air emissions including GHG and low noise emissions • Promote the use of renewable energy sources for water-based heaters • Maximise water-based heater efficiency by correct sizing and installation • Maintain water-based heater efficiency through effective maintenance by trained personnel



3. EU GPP Criteria for Water-based Heaters

Core criteria	Comprehensive criteria
SUBJECT MATTER	SUBJECT MATTER
Purchase/Purchase and installation of water-based heaters with low environmental impact	Purchase/Purchase and installation of water-based heaters with low environmental impact
SELECTION CRITERIA	SELECTION CRITERIA
<p>1. Ability of the tenderer – only in case of installation works</p> <p>Where water-based heaters are being installed, the contractor shall demonstrate that suitably qualified and experienced personnel will undertake the installation or replacement of the products.</p> <p>Fitters, dealers and service personnel shall be fully trained. Training should comprise the following elements:</p> <ul style="list-style-type: none"> - Assembly, installation and commissioning of heating systems. - Safety tests applicable under the national legislation - Adjustment of the equipment and environment-friendly settings - Maintenance and repair of heating systems - Air emissions measurement techniques. - Technical and legal documentation of the heating systems (test reports, certificates, permits) <p>Verification:</p> <p>The tenderer shall supply a list of comparable projects recently carried out (number and time frame of projects to be specified by the contracting authority), certificates of satisfactory execution and information on the qualifications and experience of staff.</p>	<p>1. Ability of the tenderer – only in case of installation works</p> <p>Where water-based heaters are being installed, the contractor shall demonstrate that suitably qualified and experienced personnel will undertake the installation or replacement of the products.</p> <p>Fitters, dealers and service personnel shall be fully trained. Training should comprise the following elements:</p> <ul style="list-style-type: none"> - Assembly, installation and commissioning of heating systems. - Safety tests applicable under the national legislation - Adjustment of the equipment and environment-friendly settings - Maintenance and repair of heating systems - Air emissions measurement techniques. - Technical and legal documentation of the heating systems (test reports, certificates, permits) <p>Verification:</p> <p>The tenderer shall supply a list of comparable projects recently carried out (number and time frame of projects to be specified by the contracting authority), certificates of satisfactory execution and information on the qualifications and experience of staff.</p>

TECHNICAL SPECIFICATIONS	TECHNICAL SPECIFICATIONS												
<p>1. Minimum energy efficiency</p> <p>The seasonal space heating energy efficiency η_s of the water-based heater shall not fall below the limit values set out as follows:</p> <table border="1"> <thead> <tr> <th>Heat generator technology</th> <th>Minimum seasonal space heating energy efficiency</th> </tr> </thead> <tbody> <tr> <td>All heaters except solid biomass boiler heaters</td> <td>$\eta_s \geq 90 \%$</td> </tr> <tr> <td>Solid biomass boiler heaters</td> <td>$\eta_s \geq 75 \%^3$</td> </tr> </tbody> </table> <p>The seasonal space heating energy efficiency shall be calculated in accordance with</p> <ol style="list-style-type: none"> 1) the procedures set out in Annex III of Ecodesign Regulation for space heaters and combination heaters⁴ 2) the harmonised standards and the transitional methods of measurement and calculation for the implementation of the Ecodesign and Energy Labelling Regulations <p>In addition to the procedures 1) and 2), the procedures set out in Annex VII to Energy Labelling Regulation of space heaters, combination heaters and packages of space heater⁵ shall apply to the packages of space heaters.</p> <p>For solid fuel boiler heaters, η_s shall be calculated according to the aforementioned procedures, taking into account the following provisions:</p> <ol style="list-style-type: none"> (a) the calculation of η_s shall be based on the gross calorific value of the wet fuel (as received) GCVar, which corrects for the moisture content in the fuel and includes the latent heat energy stored in hydrogen that is oxidised to water in the combustion process. The 	Heat generator technology	Minimum seasonal space heating energy efficiency	All heaters except solid biomass boiler heaters	$\eta_s \geq 90 \%$	Solid biomass boiler heaters	$\eta_s \geq 75 \%^3$	<p>1. Minimum energy efficiency</p> <p>The seasonal space heating energy efficiency η_s of the water-based heater shall not fall below the limit values set out as follows:</p> <table border="1"> <thead> <tr> <th>Heat generator technology</th> <th>Minimum seasonal space heating energy efficiency</th> </tr> </thead> <tbody> <tr> <td>All heaters except solid biomass boiler heaters</td> <td>$\eta_s \geq 96 \%$</td> </tr> <tr> <td>Solid biomass boiler heaters</td> <td>$\eta_s \geq 77 \%$</td> </tr> </tbody> </table> <p>The seasonal space heating energy efficiency shall be calculated in accordance with</p> <ol style="list-style-type: none"> 1) the procedures set out in Annex III of Ecodesign Regulation for space heaters and combination heaters 2) the harmonised standards and the transitional methods of measurement and calculation for the implementation of the Ecodesign and Energy Labelling Regulations <p>In addition to the procedures 1) and 2), the procedures set out in Annex VII to Energy Labelling Regulation of space heaters, combination heaters and packages of space heater shall apply to the packages of space heaters.</p> <p>For solid fuel boiler heaters, η_s shall be calculated according to the aforementioned procedures, taking into account the following provisions:</p> <ol style="list-style-type: none"> (a) the calculation of η_s shall be based on the gross calorific value of the wet fuel (as received) GCVar, which corrects for the moisture content in the fuel and includes the latent heat energy stored in hydrogen that is oxidised to water in the combustion process. The 	Heat generator technology	Minimum seasonal space heating energy efficiency	All heaters except solid biomass boiler heaters	$\eta_s \geq 96 \%$	Solid biomass boiler heaters	$\eta_s \geq 77 \%$
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³ Ecodesign Lot 15 for solid fuel boilers is currently ongoing, and it will set seasonal space heating energy efficiency thresholds that might be above 75%, in line to the efficiency performed by BAT solid fuel boilers (77%). Therefore, following the entry into force of the mandatory requirements set by Ecodesign lot 15 the ambition level on energy efficiency could be raised. Ecodesign lot 15 is expected to provide a transitional period of 4 years after the publication in the Official Journal.

⁴ 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

⁵ Commission Delegated Regulation (EU) No 811/2013 of 18 February 2013 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to the energy labelling of space heaters, combination heaters, packages of space heater, temperature control and solar device and packages of combination heater, temperature control and solar device

<p>principles laid down in Standard EN 303-5 or equivalent shall apply to estimate η_s, while GCV_{ar} shall be used for the calculation of η_s, instead of the net calorific value of the wet fuel (as received), NCV_{ar},</p> <p>(b) for determining the gross calorific value of the wet fuel (as received) GCV_{ar}, the principles laid down in Standard EN 14918 or equivalent shall apply.</p> <p>Verification:</p> <p>Products holding the EU Ecolabel for water-based heaters (Commission Decision 2014/.../EC⁶) or another relevant Type 1 Eco-label fulfilling the listed requirements will be deemed to comply. Other appropriate means of proof will also be accepted, e.g. a declaration of compliance with this criterion, together with test results conducted in accordance with testing procedure indicated in respective EN standards or equivalent standards for the given kind of product (see Table 1 in explanatory notes).</p>	<p>principles laid down in Standard EN 303-5 or equivalent shall apply to estimate η_s, while GCV_{ar} shall be used for the calculation of η_s, instead of the net calorific value of the wet fuel (as received), NCV_{ar},</p> <p>(b) for determining the gross calorific value of the wet fuel (as received) GCV_{ar}, the principles laid down in Standard EN 14918 or equivalent shall apply.</p> <p>Verification:</p> <p>Products holding the EU Ecolabel for water-based heaters (Commission Decision 2014/.../EC) or another relevant Type 1 Eco-label fulfilling the listed requirements will be deemed to comply. Other appropriate means of proof will also be accepted, e.g. a declaration of compliance with this criterion, together with test results conducted in accordance with testing procedure indicated in respective EN standards or equivalent standards for the given kind of product (see Table 1 in explanatory notes).</p>												
<p>2. Greenhouse gas emission limits</p> <p>The greenhouse gas (GHG) emissions of the water-based heater, expressed in grams of CO₂-equivalent per kWh of heating output calculated using the Total Equivalent Warming Impact (TEWI) formulae defined in the explanatory notes, shall not exceed the values set out as follows:</p> <table border="1" data-bbox="186 1015 1020 1170"> <thead> <tr> <th>Heat generator technology</th> <th>GHG emission limits</th> </tr> </thead> <tbody> <tr> <td>All heaters, except heat pump heaters</td> <td>220 g CO₂-equivalent/kWh heating output</td> </tr> <tr> <td>Heat pump heaters</td> <td>170 g CO₂-equivalent/kWh heating output</td> </tr> </tbody> </table> <p>Verification:</p> <p>Products holding the EU Ecolabel for water-based heaters or another relevant Type 1 Eco-label fulfilling the listed requirements will be deemed to comply. Other appropriate means of proof will also be accepted, e.g. a declaration of compliance with this criterion, together</p>	Heat generator technology	GHG emission limits	All heaters, except heat pump heaters	220 g CO ₂ -equivalent/kWh heating output	Heat pump heaters	170 g CO ₂ -equivalent/kWh heating output	<p>2. Greenhouse gas emission limits</p> <p>The greenhouse gas (GHG) emissions of the water-based heater, expressed in grams of CO₂-equivalent per kWh of heating output calculated using the Total Equivalent Warming Impact (TEWI) formulae defined in the explanatory notes, shall not exceed the values set out as follows:</p> <table border="1" data-bbox="1041 1015 1875 1170"> <thead> <tr> <th>Heat generator technology</th> <th>GHG emission limits</th> </tr> </thead> <tbody> <tr> <td>All heaters, except heat pump heaters</td> <td>210 g CO₂-equivalent/kWh heating output</td> </tr> <tr> <td>Heat pump heaters</td> <td>150 g CO₂-equivalent/kWh heating output</td> </tr> </tbody> </table> <p>Verification:</p> <p>Products holding a relevant Type 1 Eco-label fulfilling the listed requirements will be deemed to comply. Other appropriate means of proof will also be accepted, e.g. a declaration of compliance with this criterion, together with the calculated GHG emissions following the</p>	Heat generator technology	GHG emission limits	All heaters, except heat pump heaters	210 g CO ₂ -equivalent/kWh heating output	Heat pump heaters	150 g CO ₂ -equivalent/kWh heating output
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⁶ It refers to the Commission Decision establishing the EU Ecolabel criteria for water-based heaters, which will be published in 2014

<p>with the calculated GHG emissions following the proposed TEWI formulae and information on all the parameters used to calculate the GHG emissions.</p>	<p>proposed TEWI formulae and information on all the parameters used to calculate the GHG emissions.</p>
<p>3. Product longevity and warranty</p> <p>Repair or replacement of the product shall be covered by the warranty terms for minimum four years. The tenderer shall further ensure that genuine or equivalent spare parts are available (direct or via other nominated agents) for at least ten years from the date of purchase. This clause will not apply to unavoidable temporary situations beyond the manufacturer's control such as natural disasters.</p> <p>Verification: Products holding the EU Ecolabel for water-based heaters (Commission Decision 2014/.../EC) or another relevant Type 1 Ecolabel fulfilling the listed requirements will be deemed to comply. Other appropriate means of proof will also be accepted, such as a self-declaration from the manufacturer stating that the above requirement will be met.</p>	<p>3. Product longevity and warranty</p> <p>Repair or replacement of the product shall be covered by the warranty terms for minimum five years. The tenderer shall further ensure that genuine or equivalent spare parts are available (direct or via other nominated agents) for at least ten years from the date of purchase. This clause will not apply to unavoidable temporary situations beyond the manufacturer's control such as natural disasters.</p> <p>Verification: Products holding the EU Ecolabel for water-based heaters (Commission Decision 2014/.../EC) or another relevant Type 1 Ecolabel fulfilling the listed requirements will be deemed to comply. Other appropriate means of proof will also be accepted, such as a self-declaration from the manufacturer stating that the above requirement will be met.</p>
<p>4. Installation instructions and user information</p> <p>The product shall be supplied with the following installation instructions and user information in printed (on the packaging and/or on documentation accompanying the product) and/or in electronic format:</p> <p>(a) general information on appropriate dimensions of heaters for different building characteristics/size;</p> <p>(b) information on the energy consumption of the heater.</p> <p>(c) proper installation instructions, including:</p> <p>(i) instructions specifying that the heater shall be installed by fully trained fitters;</p> <p>(ii) any specific precautions that shall be taken when the heater is assembled or installed;</p> <p>(iii) instructions specifying that the control settings of the heater ('heating curve') shall be adjusted properly after installation;</p>	<p>4. Installation instructions and user information</p> <p>The product shall be supplied with the following installation instructions and user information in printed (on the packaging and/or on documentation accompanying the product) and/or in electronic format:</p> <p>(a) general information on appropriate dimensions of heaters for different building characteristics/size;</p> <p>(b) information on the energy consumption of the heater.</p> <p>(c) proper installation instructions, including:</p> <p>(i) instructions specifying that the heater shall be installed by fully trained fitters;</p> <p>(ii) any specific precautions that shall be taken when the heater is assembled or installed;</p> <p>(iii) instructions specifying that the control settings of the heater ('heating curve') shall be adjusted properly after installation;</p>

<p>(iv) if applicable, details on what air pollution emission values the flue gas shall have during the operating phase and how the heater should be adjusted to achieve it. In particular, the recommendations should mention that:</p> <ul style="list-style-type: none"> – the heater shall be adjusted with the aid of measuring gauges for measuring CO, O₂ or CO₂, NO_x, temperature and soot to ensure that none of the threshold values provided for in criteria 2, 4, 5, 6 and 7 are exceeded; – holes shall be made for measuring gauges in the same location as used in laboratory testing; – measurement results shall be recorded in a special form or diagram, one copy of which is retained by the end user; <p>(v) for low flue gas temperature technology, instructions specifying that the system shall be equipped with corrosion retarding technology;</p> <p>(vi) for condensing boiler technology, instructions specifying that the chimney shall be protected against condensate with low pH;</p> <p>(vii) for heat pumps, clear indication that substances classified as environmentally hazardous or constituting a health hazard as defined by Council Directive 67/548/EEC⁽⁷⁾ and its subsequent amendments shall not be used</p> <p>(viii) information on who the fitter can approach for guidance on installation;</p> <p>(d) operating instructions for service personnel;</p> <p>(e) user information, including:</p> <ul style="list-style-type: none"> (i) references to competent installers and service personnel; (ii) recommendations on the proper use and maintenance of the heater, including the correct fuels to be used and their appropriate storage for optimum combustion and the regular maintenance schedule to keep; (iii) advice on how rational use can minimise the environmental 	<p>(iv) if applicable, details on what air pollution emission values the flue gas shall have during the operating phase and how the heater should be adjusted to achieve it. In particular, the recommendations should mention that:</p> <ul style="list-style-type: none"> – the heater shall be adjusted with the aid of measuring gauges for measuring CO, O₂ or CO₂, NO_x, temperature and soot to ensure that none of the threshold values provided for in criteria 2, 4, 5, 6 and 7 are exceeded; – holes shall be made for measuring gauges in the same location as used in laboratory testing; – measurement results shall be recorded in a special form or diagram, one copy of which is retained by the end user; <p>(v) for low flue gas temperature technology, instructions specifying that the system shall be equipped with corrosion retarding technology;</p> <p>(vi) for condensing boiler technology, instructions specifying that the chimney shall be protected against condensate with low pH;</p> <p>(vii) for heat pumps, clear indication that substances classified as environmentally hazardous or constituting a health hazard as defined by Council Directive 67/548/EEC and its subsequent amendments shall not be used,</p> <p>(viii) information on who the fitter can approach for guidance on installation;</p> <p>(d) operating instructions for service personnel;</p> <p>(e) user information, including:</p> <ul style="list-style-type: none"> (i) references to competent installers and service personnel; (ii) recommendations on the proper use and maintenance of the heater, including the correct fuels to be used and their appropriate storage for optimum combustion and the regular maintenance schedule to keep; (iii) advice on how rational use can minimise the environmental
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⁽⁷⁾ OJ 196, 16.8.1967, p. 1.

<p>impact of the heater, in particular information on proper product's use to minimise energy consumption;</p> <p>(iv) if applicable, information on how the measurement results should be interpreted and how they can be improved.</p> <p>(v) information about which spare parts can be replaced;</p> <p>(f) recommendations on appropriate disposal at product's end-of-life.</p> <p>Verification:</p> <p>Products holding a relevant Type 1 Eco-label fulfilling the listed requirements will be deemed to comply. Other appropriate means of proof will also be accepted, such as written evidence from the manufacturer that the above clause will be met.</p>	<p>impact of the heater, in particular information on proper product's use to minimise energy consumption;</p> <p>(iv) if applicable, information on how the measurement results should be interpreted and how they can be improved.</p> <p>(v) information about which spare parts can be replaced;</p> <p>(f) recommendations on appropriate disposal at product's end-of-life.</p> <p>Verification:</p> <p>Products holding a relevant Type 1 Eco-label fulfilling the listed requirements will be deemed to comply. Other appropriate means of proof will also be accepted, such as written evidence from the manufacturer that the above clause will be met.</p>
	<p>5. Primary and secondary refrigerants</p> <p><u>Primary refrigerant</u></p> <p>The global warming potential over a 100 year period (GWP_{100}) of the primary refrigerant shall not exceed a value of 2000. GWP_{100} values shall be those set out in Annex I to Regulation (EC) No 842/2006 ⁽⁸⁾. The GWP_{100} values of refrigerants shall be calculated in terms of the 100-year warming potential of one kilogram of a gas relative to one kilogram of CO_2. For those refrigerants that are not covered by the Regulation (EC) No 842/2006, sources of references for the GWP_{100} values should be those defined in Annex 1.1(7) to Regulation (EU) No 206/2012 ⁽⁹⁾.</p> <p><u>Secondary refrigerant</u></p> <p>If applicable, the secondary refrigerant, brine or additives, shall not contain substances classified as environmentally hazardous or constituting a health hazard as defined by Council Directive 67/548/EEC ⁽¹⁰⁾ and its subsequent amendments. The design of the water-based heater shall not be based on secondary refrigerant, brine or additives classified as environmentally hazardous or constituting a</p>

⁽⁸⁾ OJ L 161, 14.6.2006, p. 1.

⁽⁹⁾ OJ L 72, 10.3.2012, p. 7

⁽¹⁰⁾ OJ 196, 16.8.1967, p. 1.

health hazard as defined by Council Directive 67/548/EEC

Verification:

Products holding

Products holding the EU Ecolabel for water-based heaters (Commission Decision 2014/.../EC) or another relevant Type 1 Ecolabel fulfilling the listed requirements will be deemed to comply. Other appropriate means of proof will also be accepted, e.g. a declaration of compliance with this criterion, together with providing the names of refrigerant(s) used in the product along with their GWP₁₀₀ values

6. Nitrogen oxide (NO_x) emission limits

The nitrogen oxide (NO_x) content of the exhaust gas shall not exceed the limit values indicated below (not applicable to electrical heaters). NO_x emissions shall be measured as the sum of nitrogen monoxide and nitrogen dioxide and at the following operating conditions:

- Gas and liquid heaters, at standard rating conditions and rated heat output
- Solid fuel heaters, as seasonal space heating emissions according Table 2 in the explanatory notes

Heat generator technology	NO _x emission limit
Gas fuel heaters	Equipped with internal combustion: 170 mg/kWh GCV energy input
	Equipped with external combustion: 36 mg/kWh GCV energy input
Liquid fuel heaters	Equipped with internal combustion: 380 mg/kWh GCV energy input
	Equipped with external combustion: 100 mg/kWh GCV energy input
Solid fuel	150 mg/Nm ³ at 10 % O ₂

	<table border="1" data-bbox="1045 191 1877 240"> <tr> <td data-bbox="1045 191 1272 240">heaters</td> <td data-bbox="1272 191 1877 240"></td> </tr> </table> <p data-bbox="1045 289 1877 410">The unit of measurement shall be given in mg/kWh GCV energy input or in mg/Nm³, as appropriate. The tests shall be conducted according to the relevant standards or equivalent included in Table 1 (see explanatory notes) or equivalent.</p> <p data-bbox="1045 459 1199 483">Verification:</p> <p data-bbox="1045 508 1245 532">Products holding</p> <p data-bbox="1045 557 1877 735">Products holding the EU Ecolabel for water-based heaters (Commission Decision 2014/.../EC) or another relevant Type 1 Ecolabel fulfilling the listed requirements will be deemed to comply. Other appropriate means of proof will also be accepted, e.g. a declaration of compliance with this criterion, together with test results showing the NO_x emissions in the exhaust gas</p>	heaters			
heaters					
	<p data-bbox="1045 760 1566 784">7. Carbon monoxide (CO) emission limits</p> <p data-bbox="1045 824 1877 938">The carbon monoxide (CO) content of the exhaust gas shall not exceed the limit values indicated below (not applicable to electrical heaters). CO emissions shall be measured at standard rating conditions and rated heat output at the following operating conditions:</p> <ul data-bbox="1094 963 1877 1101" style="list-style-type: none"> • Gas and liquid heaters, at standard rating conditions and rated heat output • Solid fuel heaters, as seasonal space heating emissions according Table 2 in the explanatory notes <table border="1" data-bbox="1045 1166 1877 1393"> <thead> <tr> <th data-bbox="1045 1166 1329 1239">Heat generator technology</th> <th data-bbox="1329 1166 1877 1239">CO emission limit</th> </tr> </thead> <tbody> <tr> <td data-bbox="1045 1239 1329 1393">Gas fuel heaters</td> <td data-bbox="1329 1239 1877 1393"> Equipped with internal combustion: 150 mg/Nm³ at 5 % O₂ Equipped with external combustion: 25 mg/kWh GCV energy input </td> </tr> </tbody> </table>	Heat generator technology	CO emission limit	Gas fuel heaters	Equipped with internal combustion: 150 mg/Nm ³ at 5 % O ₂ Equipped with external combustion: 25 mg/kWh GCV energy input
Heat generator technology	CO emission limit				
Gas fuel heaters	Equipped with internal combustion: 150 mg/Nm ³ at 5 % O ₂ Equipped with external combustion: 25 mg/kWh GCV energy input				

Liquid fuel heaters	Equipped with internal combustion: 200 mg/Nm ³ at 5 % O ₂ Equipped with external combustion: 50 mg/kWh GCV energy input
Solid fuel heaters	Automatically stoked: 175 mg/Nm ³ at 10 % O ₂ Hand stoked: 250 mg/Nm ³ at 10 % O ₂

The unit of measurement shall be given in mg/kWh energy input GCV or in mg/Nm³, as appropriate. The tests shall be conducted according to the relevant standards or equivalent included in Table 1 (see explanatory notes) or equivalent..

Verification:

Products holding

Products holding the EU Ecolabel for water-based heaters (Commission Decision 2014/.../EC) or another relevant Type 1 Ecolabel fulfilling the listed requirements will be deemed to comply. Other appropriate means of proof will also be accepted, e.g. a declaration of compliance with this criterion, together with test results showing the CO emissions in the exhaust gas.

8. Organic gaseous carbon (OGC) emission limits

The organic gaseous carbon (OGC) of the exhaust gas shall not exceed the limit values indicated below (only applicable to solid fuel boiler heaters). OGC emissions shall be measured as seasonal space heating emissions according Table 2 in the explanatory notes.

Heat generator technology	OGC emission limit
Solid fuel boiler heaters	7 mg/Nm ³ at 10 % O ₂

The unit of measurement shall be given in mg/Nm³. The tests shall be conducted according to the relevant standards or equivalent included in Table 1 (see explanatory notes) or equivalent.

Verification:

Products holding

Products holding the EU Ecolabel for water-based heaters (Commission Decision 2014/.../EC) or another relevant Type 1 Ecolabel fulfilling the listed requirements will be deemed to comply. Other appropriate means of proof will also be accepted, e.g. a declaration of compliance with this criterion, together with test results showing the OGC emissions in the exhaust gas.

9. Particulate matter (PM) emission limits

The particle matter (PM) content of the exhaust gas shall not exceed the limit values indicated below. PM emissions shall be measured at standard rating conditions and rated heat output at the following operating conditions:

- Liquid heaters, at standard rating conditions and rated heat output
- Solid fuel heaters, as seasonal space heating emissions according Table 2 in the explanatory notes

Heat generator technology	PM emission limit
Liquid fuel heaters	Equipped with internal combustion: 1 mg/Nm ³ at 5 % O ₂ Equipped with external combustion: no limit
Solid fuel heaters	20 mg/Nm ³ at 10 % O ₂

The unit of measurement shall be given in mg/Nm³. The tests shall be conducted according to the relevant standards or equivalent included in Table 1 (see explanatory notes) or equivalent.

	<p>Verification:</p> <p>Products holding</p> <p>Products holding the EU Ecolabel for water-based heaters (Commission Decision 2014/.../EC) or another relevant Type 1 Ecolabel fulfilling the listed requirements will be deemed to comply. Other appropriate means of proof will also be accepted, e.g. a declaration of compliance with this criterion, together with test results showing the PM emissions in the exhaust gas</p>
AWARD CRITERIA	AWARD CRITERIA
Points will be awarded for:	Points will be awarded for:
<p>1. Additional energy efficiency</p> <p>Additional points will be awarded for every 1 % additional increase in the seasonal space heating energy efficiency η_s of the water-based heater as specified under criterion 1.</p> <p>Verification:</p> <p>A declaration of compliance with this criterion shall be provided, together with test results conducted in accordance with testing procedure indicated in respective EN standards or equivalent standards for the given kind of product (see Table 1 in explanatory notes).</p>	<p>1. Additional energy efficiency</p> <p>Additional points will be awarded for every 1 % additional increase in the seasonal space heating energy efficiency η_s of the water-based heater as specified under criterion 1.</p> <p>Verification:</p> <p>A declaration of compliance with this criterion shall be provided, together with test results conducted in accordance with testing procedure indicated in respective EN standards or equivalent standards for the given kind of product (see Table 1 in explanatory notes).</p>
<p>2. Additional greenhouse gas emission reduction</p> <p>Additional points will be awarded for every 5 g of additional reduction in the greenhouse gas emissions of the water-based heater as specified under criterion 2.</p> <p>Verification:</p> <p>A declaration of compliance with this criterion shall be provided, together with the calculated GHG emissions following the proposed TEWI formulae and information on all the parameters used to calculate the GHG emissions.</p>	<p>2. Additional greenhouse gas emission reduction</p> <p>Additional points will be awarded for every 5 g of additional reduction in the greenhouse gas emissions of the water-based heater as specified under criterion 2.</p> <p>Verification:</p> <p>A declaration of compliance with this criterion shall be provided, together with the calculated GHG emissions following the proposed TEWI formulae and information on all the parameters used to calculate the GHG emissions.</p>

3. Noise emission limits

Points will be awarded if the noise emissions of the hydronic heater do not exceed the limit values set out as follows.

Heat generator technology	Measurement	Noise emission limit
Heat pump heaters	A-weighted sound power level limit value ($L_{WA,d,lim}$)	$17 + 36 \times \log(P_N + 10)$ dB(A)
Cogeneration heaters equipped with internal combustion	A-weighted sound pressure level limit value ($L_{PA,d,lim}$)	$30 + 20 \times \log(PE + 15)$ dB(A)
	C-weighted sound pressure level limit value ($L_{PC,d,lim}$)	$L_{PA,d,lim} + 20$ dB(C)

Note: PN means the nominal (full load) heat output; PE means the electricity output.

The unit of measurement shall be given in dB(A) or dB(C), as appropriate. The tests shall be conducted according to the relevant standards or equivalent included in Table 1 (see explanatory notes) or equivalent.

Points to be awarded shall be calculated as follows:

$$PL = \frac{L_{A,min}}{L_A} \times PL_{A,max} + \frac{L_{C,min}}{L_C} \times PL_{C,max}$$

Where

- PL is the noise level points
- $L_{A,min}$ is the lowest A-weighted sound pressure level for a fully compliant offer
- $L_{C,min}$ is the lowest C-weighted sound pressure level for a fully

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Note: PN means the nominal (full load) heat output; PE means the electricity output.

The unit of measurement shall be given in dB(A) or dB(C), as appropriate. The tests shall be conducted according to the relevant standards or equivalent included in Table 1 (see explanatory notes) or equivalent.

Points to be awarded shall be calculated as follows:

$$PL = \frac{L_{A,min}}{L_A} \times PL_{A,max} + \frac{L_{C,min}}{L_C} \times PL_{C,max}$$

Where

- PL is the noise level points
- $L_{A,min}$ is the lowest A-weighted sound pressure level for a fully compliant offer
- $L_{C,min}$ is the lowest C-weighted sound pressure level for a fully

<p>compliant offer</p> <ul style="list-style-type: none"> • L_A is the A-weighted sound pressure level being evaluated • L_C is the C-weighted sound pressure level being evaluated • $PL_{A,max}$ is the maximum number of A-weighted sound pressure level points available • $PL_{C,max}$ is the maximum number of C-weighted sound pressure level points available <p>Verification:</p> <p>A declaration of compliance with this criterion shall be provided together with test results showing the noise emissions.</p>	<p>compliant offer</p> <ul style="list-style-type: none"> • L_A is the A-weighted sound pressure level being evaluated • L_C is the C-weighted sound pressure level being evaluated • $PL_{A,max}$ is the maximum number of A-weighted sound pressure level points available • $PL_{C,max}$ is the maximum number of C-weighted sound pressure level points available <p>Verification:</p> <p>A declaration of compliance with this criterion shall be provided together with test results showing the noise emissions.</p>
<p>4. Product design</p> <p>Points will be awarded if the water-based heater is easy to dismantle by professionally trained personnel using commonly available tools, for the purpose of repairs and replacements of worn-out parts, upgrading older or obsolete parts, and separating parts and materials, ultimately for reuse or recycling.</p> <p>Verification:</p> <p>Products holding a relevant Type 1 Eco-label fulfilling the listed requirements will be deemed to comply. Other appropriate means of proof will also be accepted, e.g. a declaration of compliance with this criterion, together with a technical report from the manufacturer showing the dismantling of the product with an exploded diagram labelling the main components as well as identifying any hazardous substances in these components as specified in Annex 2 to Directive 2002/96/EC (WEEE Directive). This diagram shall be available in the manufacturer website. Information regarding hazardous substances shall be provided to the procurer in the form of a list of materials identifying material type, quantity used and position on the water-based heater equipment.</p>	<p>4. Product design</p> <p>Points will be awarded if the water-based heater is easy to dismantle by professionally trained personnel using commonly available tools, for the purpose of repairs and replacements of worn-out parts, upgrading older or obsolete parts, and separating parts and materials, ultimately for reuse or recycling.</p> <p>Verification:</p> <p>Products holding a relevant Type 1 Eco-label fulfilling the listed requirements will be deemed to comply. Other appropriate means of proof will also be accepted, e.g. a declaration of compliance with this criterion, together with a technical report from the manufacturer showing the dismantling of the product with an exploded diagram labelling the main components as well as identifying any hazardous substances in these components as specified in Annex 2 to Directive 2002/96/EC (WEEE Directive). This diagram shall be available in the manufacturer website. Information regarding hazardous substances shall be provided to the procurer in the form of a list of materials identifying material type, quantity used and position on the water-based heater equipment.</p>

Explanatory notes

1. Test methods for each criterion, unless specified otherwise, shall be those described in the relevant Standards as indicated in Table 1. Where appropriate, test methods other than those indicated for each criterion may be used if they can be considered as equivalent.

Table 1. Relevant standards for test methods

Number	Title
Gas boiler heaters	
EN 676	Automatic Forced draught burners for gaseous fuels
EN 15502-1	Gas-fired heating boilers – Part 1: General requirements and tests
Liquid fuel boiler heaters	
EN 267	Automatic forced draught burners for liquid fuels
EN 303-1	Heating boilers - Part 1: Heating boilers with forced draught burners - Terminology, general requirements, testing and marking
EN 303-2	Heating boilers – Part 2: Heating boilers with forced draught burners – Special requirements for boilers with atomizing oil burners
EN 303-4	Heating boilers - Part 4: Heating boilers with forced draught burners - Special requirements for boilers with forced draught oil burners with outputs up to 70 kW and a maximum operating pressure of 3 bar - Terminology, special requirements, testing and marking
EN 304	Heating boilers – Test code for heating boilers for atomizing oil burners
Solid fuel boiler heaters	
EN 303-5	Heating boilers – Part 5: Heating boilers for solid fuels, manually and automatically stoked, nominal heat output of up to 500 kW – Terminology, requirements, testing and marking
EN 14918	Solid biofuels - Determination of calorific value
Electric boiler heaters	
EN 60335-2-35	Household and similar electrical appliances – Safety – Part 2-35: Particular requirements for instantaneous water heaters
Fuel-driven heat pump heaters	
EN 12309 series	Gas-fired absorption and adsorption air-conditioning and/or heat pump appliances with a net heat input not exceeding 70 kW
DIN 4702, Part 8	Central heating boiler; determination of the standard efficiency and the standard emissivity
Electrically-driven heat pump heaters	
EN 14511 series	Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling
EN 14825	Air conditioners, liquid chilling packages and heat pumps, with electrically driven compressors, for space

	heating and cooling – Testing and rating at part load conditions and calculation of seasonal performance
Cogeneration heaters	
EN 50465	Gas appliances – Fuel cell gas heating appliances – Fuel cell gas heating appliance of nominal heat input inferior or equal to 70 kW ⁽¹¹⁾
ISO 3046-1	Reciprocating internal combustion engines – Performance – Part 1: Declarations of power, fuel and lubricating oil consumptions, and test methods – Additional requirements for engines for general use
Nitrogen oxide emissions	
EN 14792	Stationary source emissions – Determination of mass concentration of nitrogen oxides (NOx) – Reference method: Chemiluminescence
Carbon monoxide emissions	
EN 15058	Stationary source emissions – Determination of the mass concentration of carbon monoxide (CO) – Reference method: Non-dispersive infrared spectrometry
Organic gaseous carbon emissions	
EN 12619	Stationary source emissions – Determination of the mass concentration of total gaseous organic carbon at low concentrations in flue gases – Continuous flame ionisation detector method
Particulate matter emissions	
EN 13284-1	Stationary source emissions – Determination of low range mass concentration of dust – Part 1: Manual gravimetric method
Noise emissions	
EN ISO 3744	Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Engineering methods for an essentially free field over a reflecting plane (ISO 3744:2010)
EN ISO 3746	Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Survey method using an enveloping measurement surface over a reflecting plane (ISO 3746:2010)
EN 12102	Air conditioners, liquid chilling packages, heat pumps and dehumidifiers with electrically driven compressors for space heating and cooling - Measurement of airborne noise - Determination of the sound power level

Table 2. Methodology to calculate the seasonal space heating emissions

Type of solid fuel boiler	Formula
Manually stoked solid fuel boilers that can be operated at 50% of the rated heat output in continuous mode, and automatically stoked solid fuel boilers	$E_s = 0.85 \times E_{s,p} + 0.15 \times E_{s,r}$
Manually stoked solid fuel boilers that cannot be operated at 50% or less of the rated heat output in continuous mode, and solid fuel cogeneration boilers	$E_s = E_{s,r}$
Where	

¹¹ An updated version of the standard is expected to cover cogeneration as well (see Draft prEN 50465:2011 Gas appliances – Combined Heat and Power appliance of nominal heat input inferior or equal to 70 kW)

E_s are the seasonal space heating emissions.

$E_{s,p}$ are the emissions of respectively particulate matter, organic gaseous compounds, carbon monoxide and nitrogen oxides measured at 30% or 50% of rated heat output, as applicable.

$E_{s,r}$ are the emissions of respectively particulate matter, organic gaseous compounds, carbon monoxide and nitrogen oxides measured at rated heat output.

- The GHG emissions in Criterion 2 of the technical specifications shall be calculated following the TEWI formulae as set out in **Table 3** (the formula depends on the heat generator technology). Each TEWI formula may consist of two parts, one depending solely on the heater efficiency (expressed in terms of the seasonal space heating energy efficiency, η_s) and the fuel carbon intensity (represented by the β parameter), and the second part (only applicable to heat pump heaters) depending on the greenhouse gas emissions due to refrigerant leakage. The GHG emissions from the refrigerant leakage depend on the global warming potential (GWP100) of the refrigerant and the refrigerant leakage during the use phase (expressed as an annual leakage rate, ER, in percentage of the total mass of the refrigerant per year) and at end-of-life (expressed as a percentage of the total mass of the refrigerant, α).

Table 3. TEWI formulae by heat generator technology

Heat generator technology	TEWI formula (g CO ₂ -equivalent/kWh heating output)
Boiler heaters	$\frac{\beta_{\text{fuel}}}{\eta_{sl}}$
Heat pump heaters	$\delta \times \frac{\beta_{\text{fuel}}}{\eta_s} + (1 - \delta) \times \frac{\beta_{\text{elec}}}{2.5 \times \eta_s} + \frac{GWP_{100} \times m \times (ER \times n + \alpha)}{P \times h \times n}$
Cogeneration heaters	$\frac{\beta_{\text{fuel}}}{\eta_{\text{thermal}}} - \frac{\eta_{el} \times \beta_{\text{elec}}}{\eta_{\text{thermal}}}$
Package of heaters	$(1 - s_{HP}) \times \frac{\beta_{\text{fuel}}}{\eta_{s,B}} + s_{HP} \times (\delta \times \frac{\beta_{\text{fuel}}}{\eta_{s,HP}} + (1 - \delta) \times \frac{\beta_{\text{elec}}}{2.5 \times \eta_{s,HP}}) + \frac{GWP_{100} \times m \times (ER \times n + \alpha)}{P \times h \times n}$

The main parameters in the TEWI formulae above are described in Table 4.

Table 4. Main parameters for computing the TEWI formulae

Parameter	Description of parameter	Units	Constant value or test to be performed in order to obtain the parameter
β_{elec}	GHG emission intensity of electricity	[g CO ₂ -equivalent/kWhelec]	384
β_{fuel}	GHG emission intensity of the fuel used by the heater	[g CO ₂ -equivalent/kWhgas]	See Table 5
η_s	Seasonal space heating energy efficiency	[-]	To be tested and declared by the applicant (Criterion 1)
$\eta_{s,b}$	Seasonal space heating energy efficiency of the boiler heater part for average climate conditions	[-]	To be tested and declared by the applicant (Criterion 1)
$\eta_{s,hp}$	Seasonal space heating energy efficiency of the heat pump heater part for average climate conditions	[-]	To be tested and declared by the applicant (Criterion 1)
$\eta_{thermal}$	Thermal efficiency	[-]	See Table 6
η_{el}	Electrical efficiency	[-]	See Table 6
δ	Proxy	[-]	= 0 if electrically-driven heat pump heater = 1 if fuel-driven heat pump heater
GWP ₁₀₀	Global warming potential (effect over 100 years)	[g CO ₂ -equivalent/g refrigerant, over 100 year period]	According to Annex I to Regulation (EC) No 842/2006
m	Refrigerant mass	[g]	To be declared by the applicant
ER	Refrigerant loss per year	[%/yr]	A value of ER = 3.5 %/yr shall be used.
n	Lifetime	[yr]	A value of n = 15 shall be used.
α	Refrigerant loss at end of life (disposal loss)	[%]	A value of α = 35 % shall be used.
P	Design load	[kW]	To be declared by the applicant.
h	Full load operating hours	[h/yr]	2000
S_{hp}	Share of heat output from the heat pump heater part over the total heat output	[-]	To be declared by the applicant

Table 5 describes how to evaluate parameter β_{fuel} in the TEWI formulae above depending on the fuel used by the heater. In case the boiler is designed for a fuel not listed in the table, the closest match of fuel shall be selected, based on the origin (fossil or biomass) and form (gaseous, liquid or solid) of the fuel used.

Table 5. Parameter β_{fuel} (GHG emission intensity) to compute the TEWI formulae

Fuel used by the heater	GHG emission intensity	Value (g CO ₂ -equivalent/kWh _{gas})
Gaseous fossil fuels	$\beta_{fuel} = \beta_{gas}$	202
Liquid fossil fuels	$\beta_{fuel} = \beta_{oil}$	292
Solid fossil fuels	$\beta_{fuel} = \beta_{coal}$	392
Gaseous biomass	$\beta_{fuel} = \beta_{bio-gas}$	98
Liquid biomass	$\beta_{fuel} = \beta_{bio-oil}$	149
Wood logs	$\beta_{fuel} = \beta_{bio-log}$	19
Wood chips	$\beta_{fuel} = \beta_{bio-chip}$	16
Wood pellets	$\beta_{fuel} = \beta_{bio-pellet}$	39
Blends of fossil fuels and biomass	$\beta_{fuel} =$ weighted average derived from the sum of the weight fractions of the individual fuels multiplied by their GHG emission parameter	Σ (Fuel X % \times $\beta_{fuel X}$) + (Fuel Y % \times $\beta_{fuel Y}$) + ... (Fuel N % \times $\beta_{fuel N}$)

Table 6 describes how to evaluate parameters $\eta_{thermal}$ and η_{el} in the TEWI formula for cogeneration heaters.

Table 6. Parameters $\eta_{thermal}$ and η_{el} to compute the TEWI formula for cogeneration heaters

Parameter	Expression
$\eta_{thermal}$	$\eta_{thermal} = \eta_s - 2.5 \times \eta_{el}$
η_{el}	For cogeneration space heaters not equipped with supplementary heaters $\eta_{el} = \eta_{el,CHP100+Sup0}$
	For cogeneration space heaters equipped with supplementary heaters $\eta_{el} = 0.85 \times \eta_{el,CHP100+Sup0} + 0.15 \times \eta_{el,CHP100+Sup100}$
Where: η_s means the seasonal space heating energy efficiency as defined in Regulation (EU) No 813/2013 η_{el} means the electrical efficiency as defined in Regulation (EU) No 813/2013 $\eta_{el,CHP100+Sup0}$ means the electrical efficiency at rated heat output of cogeneration space heater with supplementary heater disabled, as defined in Regulation (EU) No 813/2013	

$\eta_{el,CHP100+Sup100}$ means the electrical efficiency at rated heat output of cogeneration space heater with supplementary heater enabled, as defined in Regulation (EU) No 813/2013

3. The contracting authority must ensure that the water-based heater they are purchasing meets any laws applicable in the country where it will be used. This may include, but not be limited to laws relating to environment and safety.
4. The contracting authority shall have regard to local circumstances (building types, sizes and energy demand, potential fuel source etc) and undertake a market survey to determine the best available technology for the need identified. The system should be designed with adequate control systems to ensure that temperature and heating demand can be controlled sufficiently to meet local requirements
5. For installation works, contracting authorities should ensure that staff is suitably trained. There might be different legal requirements between different Member States for the training curriculum of staff.
6. **Award Criteria:** Contracting authorities will have to indicate in the contract notice and tender documents how many points will be awarded for each award criterion. Environmental award criteria should, altogether, account for at least 15% of the total points available.

4. Life Cycle Costs (LCC)

In the development of GPP criteria, one of the most important aspects to take into account is a life-cycle cost analysis of the best environmentally-performing products with respect to average products in the market. Cost considerations are especially important in public procurement because of the need to justify public spending. Member States should be encouraged to make choices that are a good value in the long-term and compatible with wider policies.

Water-based heaters are one of the products where life-cycle impacts depend the most on the use-phase (mostly use-phase energy consumption). Therefore, purchase costs are only a comparatively small part of the total life-cycle cost of the products. A number of available studies on cost considerations in GPP⁽¹²⁾ have concluded that higher purchasing prices are usually compensated for by lower operating costs, especially for products with high energy efficiency. A typical example is found e.g. in high-efficient heating installations. During the whole life cycle of the heating installation, the mentioned study found that approximately 95% of the total costs were determined by operating costs. It is therefore concluded that public procurement decisions based only on the purchase price will likely lead to misinvestment.

The technical background report associated with this study presents a detailed life-cycle cost analysis of water-based heaters, and a summary of key conclusions is presented here.

The total life-cycle costs of the different water-based heater options (including purchase, maintenance and running costs) are found to be very susceptible to current energy costs. In particular, some studies¹³ have shown that governmental decisions on energy tariffs may render a heater option from positive economic effects to negative economic effects. Especially electrically-driven heat pump and cogeneration heaters appear sensitive to such effects.

⁽¹²⁾Rüdenauer, I. *et al.* (2007): Costs and Benefits of Green Public Procurement in Europe, Öko-Institut e.V. and ICLEI, Final report prepared for the European Commission under contract DG ENV.G.2/SER/2006/0097r, available at: http://ec.europa.eu/environment/gpp/studies_en.htm

¹³ magazine VV+, March 2010, p.178

Heat pumps were found to be still a relatively expensive heater option, especially if the necessary works for the complete installation (realisation of heat source system and heat sink / emitter/system) are incorporated.

Modelling for the work on Ecodesign measures (more in the Technical Background Report) provided the life cycle costs at LLCC (least life cycle cost) and BAT (best available technology) levels. It shows savings at LLCC level of up to 16 % for the smaller size classes (up to 29 kW) and 30-46 % for the largest sizes (> 60 kW). The savings at BAT level indicate that, apart from the smallest XXS level, the BAT solutions do not save as much as LLCC solutions but are still more economical than the base case.

The BAT (Best Available Technology) levels are mostly based on heat pump technology sometimes with an add-on benefit from solar installations. Some explanations were added in the study:

- Heat pumps cannot be universally applied. Especially ‘geothermal’ or ‘vertical’ ground-source heat pumps require special permissions from the waterworks and/or the commune, etc.;
- Specialist installers and special equipment are necessary and (as yet) not abundant;
- The efficiency of the heat pump is highly dependent on the lay-out and installation;
- Often a heat pump is a base-load device, which means that a hybrid device (e.g. with a conventional boiler) may often be an economical solution to capture both base and peak loads;
- The energetic benefits are highly dependent on the climate, especially with air-based heat pumps and solar energy;
- As a result of the above, the pay-back time will vary widely per country and circumstance.

The energy savings (and their associated cost savings, dependent on the energy prices) that could be achieved by applying the EU GPP criteria for water-based heaters depend on the technology. For boilers, the application of the core criterion might bring about energy savings of around 40% (savings referred to the base case scenario of the Preparatory study of Ecodesign Lot 1¹⁴) for the smaller size classes, and of 50% for the largest sizes. For heat pumps, these energy savings would be 45% and 55% respectively. In the case of the comprehensive criterion, the energy savings for boilers could reach 44% for the smaller ones and 55% for the largest ones, while for heat pumps, those figures could rise to 55% and 64% respectively. The increase of 1% in the energy efficiency (award criterion) would mean an additional energy saving of around 0.5% for boilers and 0.3% for heat pumps.

¹⁴ The base case scenario is defined in the Preparatory study on Ecodesign Lot 1 |(Task 5) to evaluate the improvement potential at the Least Life Cycle Costs (LLCC) and Best Available Technology (BAT). More information is available in <http://www.eup-network.de/product-groups/preparatory-studies/completed/#c1450>