

EU GPP Criteria for Water-based Heaters

EU GPP criteria aim at facilitating public authorities the purchase of products, services and works with reduced environmental impacts. The use of the criteria is voluntary. The criteria are formulated in such a way that they can be, if deemed appropriate by the individual authority, integrated into its tender documents. 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 Combined Heat and Power (CHP) from 2010¹.

NOTE (1):

The following text will be added to the 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.

NOTE (2):

Article 6 and Annex III of the Energy Efficiency Directive (2012/27/EU), which had to be transposed into national law by June 2014, set out specific obligations for public authorities to procure certain energy efficient equipment. This includes the obligation to purchase only those products that belong to the highest energy efficiency class in case of products falling under an implementing measure of the Energy Labelling Directive (2010/30/EU). For the water-based heaters covered by the scope of Commission Delegated Regulation (EU) No 811/2013², Energy Labelling Implementing Measures will enter into force on 26 September 2015

This obligation is limited to central government and for purchases above the thresholds set out in the procurement directives. Moreover, the requirements have to be consistent with cost-effectiveness, economic feasibility, wider sustainability, technical suitability and sufficient competition. These factors can differ between public authorities and markets. For more guidance on the interpretation of this aspect of Article 6 and Annex III of the EED regarding procurement of energy-efficient products, services and buildings by central government authorities, please see points 33-42 of the Commission guidance document³.

¹ Published here: http://ec.europa.eu/environment/gpp/eu_gpp_criteria_en.htm

² OJ L 239, 6.9.2013, p. 1.

³ http://eur-lex.europa.eu/legal-content/EN/ALL/;ELX_SESSIONID=36J6T82ZkBpM9Qgp1kJDCcvL1Qyw4GrVGdpls5pJQ9BtPQT9nPb2!-533323992?uri=CELEX:52013SC0446

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:

- ‘heater’ means a space heater or combination heater
- ‘space heater’ means a device that
 - a. 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; and
 - b. 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;
- ‘heat generator’ means the part of a heater that generates the heat using one or more of the following processes:
 - a. combustion of fossil fuels and/or biomass fuels;
 - b. use of the Joule effect in electric resistance heating elements;
 - c. capture of ambient heat from an air source, water source or ground source, and/or waste heat;.
- ‘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;
- ‘biomass’ means the biodegradable fraction of products, waste and residues from biological origin from agriculture (including vegetal and animal substances), forestry and related industries including fisheries and aquaculture, as well as the biodegradable fraction of industrial and municipal waste;
- ‘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;
- ‘heater equipped with external combustion’ means a category of heaters comprising boilers, a-sorption heat pumps and heaters equipped with external combustion engine;
- ‘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 heaters⁴;

- ‘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 842/2006⁵;
- ‘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.

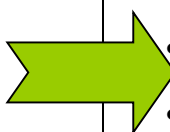
Additional environmental impacts as acidification, tropospheric ozone and air, water and soil pollution are related to air emissions during operation including nitrogen oxides (NO_x), carbon monoxide (CO), organic gaseous carbon (OGC) and particulate matter (PM).

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

⁴ OJ L 239, 6.9.2013, p. 136–161.

⁵ 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" data-bbox="184 370 1020 532"> <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>$\eta_s \geq 75 \%^6$</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 heaters⁷ and 2) the harmonised standards and the transitional methods of measurement and calculation for the implementation of the Ecodesign and Energy Labelling Regulations within Commission Communication 2014/C 207/02⁸ <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 heater⁹ 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> <p>(a) the calculation of η_s shall be based on the gross calorific value of</p>	Heat generator technology	Minimum seasonal space heating energy efficiency	All heaters except solid biomass boiler heaters	$\eta_s \geq 90 \%$	Solid biomass boiler heaters	$\eta_s \geq 75 \%^6$	<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" data-bbox="1045 370 1881 532"> <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 and 2) the harmonised standards and the transitional methods of measurement and calculation for the implementation of the Ecodesign and Energy Labelling Regulations within Commission Communication 2014/C 207/02 <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> <p>(a) the calculation of η_s shall be based on the gross calorific value of</p>	Heat generator technology	Minimum seasonal space heating energy efficiency	All heaters except solid biomass boiler heaters	$\eta_s \geq 96 \%$	Solid biomass boiler heaters	$\eta_s \geq 77 \%$
Heat generator technology	Minimum seasonal space heating energy efficiency												
All heaters except solid biomass boiler heaters	$\eta_s \geq 90 \%$												
Solid biomass boiler heaters	$\eta_s \geq 75 \%^6$												
Heat generator technology	Minimum seasonal space heating energy efficiency												
All heaters except solid biomass boiler heaters	$\eta_s \geq 96 \%$												
Solid biomass boiler heaters	$\eta_s \geq 77 \%$												

⁶ Draft Ecodesign regulation for solid fuel boilers is currently under consideration. The draft notified to the World Trade Organization included seasonal space heating energy efficiency thresholds of 75% and 77% depending on the size of the boiler that would apply four years after its publication in the Official Journal (although this could be postponed following consideration by the ecodesign regulatory committee). Therefore, following the entry into force of the mandatory requirements set by Ecodesign for solid fuel boilers the ambition level on energy efficiency could be raised.

⁷ 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)

⁸ Commission Communication 2014/C 207/02 including the transitional methods of measurement and calculation for the implementation of Ecodesign Lot1 (OJ C 207 03.07.2014)

⁹ 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 (OJ L 239, 6.9.2013)

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 principles laid down in Standard EN 303-5 or equivalent shall apply to estimate η_s , while GCVar shall be used for the calculation of η_s , instead of the net calorific value of the wet fuel (as received), NCVar,

(b) for determining the gross calorific value of the wet fuel (as received) GCVar, the principles laid down in Standard EN 14918 or equivalent shall apply.

Verification:

Products holding the EU Ecolabel for water-based heaters (Commission Decision 2014/314/EU¹⁰) 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).

2. Greenhouse gas emission limits

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:

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

Verification:

Products holding the EU Ecolabel for water-based heaters or another

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 principles laid down in Standard EN 303-5 or equivalent shall apply to estimate η_s , while GCVar shall be used for the calculation of η_s , instead of the net calorific value of the wet fuel (as received), NCVar,

(b) for determining the gross calorific value of the wet fuel (as received) GCVar, the principles laid down in Standard EN 14918 or equivalent shall apply.

Verification:

Products holding the EU Ecolabel for water-based heaters (Commission Decision 2014/314/EU) 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).

2. Greenhouse gas emission limits

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:

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

Verification:

Products holding a relevant Type 1 Eco-label fulfilling the listed

¹⁰ Commission Decision of 28 May 2014 establishing the criteria for the award of the EU Ecolabel for water-based heaters OJ L164 3.6.2014, p. 83

<p>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 proposed TEWI formulae and information on all the parameters used to calculate the GHG emissions.</p>	<p>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 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 2014/314/EU) 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, 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 2014/314/EU) 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, 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> <ul style="list-style-type: none"> (a) general information on appropriate dimensions of heaters for different building characteristics/size; (b) information on the energy consumption of the heater. (c) proper installation instructions, including: <ul style="list-style-type: none"> (i) instructions specifying that the heater shall be installed by fully trained fitters; (ii) any specific precautions that shall be taken when the heater is 	<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> <ul style="list-style-type: none"> (a) general information on appropriate dimensions of heaters for different building characteristics/size; (b) information on the energy consumption of the heater. (c) proper installation instructions, including: <ul style="list-style-type: none"> (i) instructions specifying that the heater shall be installed by fully trained fitters; (ii) any specific precautions that shall be taken when the heater is

<p>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/EEC¹¹ 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 	<p>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 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
---	---

¹¹ OJ 196, 16.8.1967, p. 1.

<p>heater, including the correct fuels to be used and their appropriate storage for optimum combustion and the regular maintenance schedule to keep;</p> <p>(iii) advice on how rational use can minimise the environmental 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 of compliance with the above criteria.</p>	<p>heater, including the correct fuels to be used and their appropriate storage for optimum combustion and the regular maintenance schedule to keep;</p> <p>(iii) advice on how rational use can minimise the environmental 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 of compliance with the above criteria.</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 2000¹². GWP_{100} values shall be those set out in Annex I to Regulation (EC) No 517/2014¹³. 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 517/2014, sources of references for the GWP_{100} values should be those defined in Annex 1.1(7) to Regulation (EU) No 206/2012¹⁴.</p> <p><u>Secondary refrigerant</u></p> <p>In the case of space heaters using a secondary refrigerant, the design</p>

¹² Following the implementation of Regulation (EU) No 517/2014, wider availability of equipment using refrigerants with significantly lower GWP is expected in the coming years, which will be taken into account in a future update of these criteria.

¹³ OJ L 150, 20.05.2014, p. 195–230 .

¹⁴ OJ L 72, 10.3.2012, p. 7

	<p>of these heaters shall not be based on secondary refrigerant, brine or additives classified as environmentally hazardous or constituting a health hazard within the meaning of Regulation (EC) No 1272/2008⁽¹⁵⁾ and Council Directive 67/548/EEC ⁽¹⁶⁾, and installation instructions shall clearly indicate that substances classified as environmentally hazardous or constituting a health hazard shall not be used as a secondary refrigerant.</p> <p>Verification:</p> <p>Products holding the EU Ecolabel for water-based heaters (Commission Decision 2014/314/EU) 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</p>				
	<p>6. Nitrogen oxide (NO_x) emission limits</p> <p>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:</p> <ul 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 1112 1875 1188"> <thead> <tr> <th data-bbox="1045 1112 1272 1188">Heat generator technology</th> <th data-bbox="1272 1112 1875 1188">NO_x emission limit</th> </tr> </thead> <tbody> <tr> <td data-bbox="1045 1188 1272 1193"></td> <td data-bbox="1272 1188 1875 1193"></td> </tr> </tbody> </table>	Heat generator technology	NO _x emission limit		
Heat generator technology	NO _x emission limit				

⁽¹⁵⁾ OJ L 353, 31.12.2008, p. 1.

⁽¹⁶⁾ OJ 196, 16.8.1967, p. 1.

	<table border="1"> <tr> <td data-bbox="1043 191 1272 347">Gas fuel heaters</td> <td data-bbox="1272 191 1877 347"> Equipped with internal combustion engine: 170 mg/kWh GCV energy input Equipped with external combustion: 36 mg/kWh GCV energy input </td> </tr> <tr> <td data-bbox="1043 347 1272 503">Liquid fuel heaters</td> <td data-bbox="1272 347 1877 503"> Equipped with internal combustion engine: 380 mg/kWh GCV energy input Equipped with external combustion: 100 mg/kWh GCV energy input </td> </tr> <tr> <td data-bbox="1043 503 1272 581">Solid fuel heaters</td> <td data-bbox="1272 503 1877 581">150 mg/Nm³ at 10 % O₂</td> </tr> </table> <p data-bbox="1043 630 1887 751">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="1043 800 1203 824">Verification:</p> <p data-bbox="1043 846 1247 870">Products holding</p> <p data-bbox="1043 891 1887 1073">Products holding the EU Ecolabel for water-based heaters (Commission Decision 2014/314/EU) 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>	Gas fuel heaters	Equipped with internal combustion engine: 170 mg/kWh GCV energy input Equipped with external combustion: 36 mg/kWh GCV energy input	Liquid fuel heaters	Equipped with internal combustion engine: 380 mg/kWh GCV energy input Equipped with external combustion: 100 mg/kWh GCV energy input	Solid fuel heaters	150 mg/Nm ³ at 10 % O ₂
Gas fuel heaters	Equipped with internal combustion engine: 170 mg/kWh GCV energy input Equipped with external combustion: 36 mg/kWh GCV energy input						
Liquid fuel heaters	Equipped with internal combustion engine: 380 mg/kWh GCV energy input Equipped with external combustion: 100 mg/kWh GCV energy input						
Solid fuel heaters	150 mg/Nm ³ at 10 % O ₂						
	<p data-bbox="1043 1101 1566 1125">7. Carbon monoxide (CO) emission limits</p> <p data-bbox="1043 1162 1887 1279">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 1300 1887 1409" style="list-style-type: none"> <li data-bbox="1094 1300 1887 1360">• Gas and liquid heaters, at standard rating conditions and rated heat output <li data-bbox="1094 1382 1887 1409">• Solid fuel heaters, as seasonal space heating emissions 						

according Table 2 in the explanatory notes

Heat generator technology	CO emission limit
Gas fuel heaters	Equipped with internal combustion engine: 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 engine: 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 2014/314/EU) 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 the EU Ecolabel for water-based heaters (Commission Decision 2014/314/EU) 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 engine: 1 mg/Nm ³ at 5 % O ₂

	<table border="1" data-bbox="1045 190 1875 289"> <tr> <td data-bbox="1045 190 1329 240"></td> <td data-bbox="1329 190 1875 240">Equipped with external combustion: no limit</td> </tr> <tr> <td data-bbox="1045 240 1329 289">Solid fuel heaters</td> <td data-bbox="1329 240 1875 289">20 mg/Nm³ at 10 % O₂</td> </tr> </table> <p data-bbox="1045 293 1875 381">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> <p data-bbox="1045 492 1875 719">Verification: Products holding the EU Ecolabel for water-based heaters (Commission Decision 2014/314/EU) 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>		Equipped with external combustion: no limit	Solid fuel heaters	20 mg/Nm ³ at 10 % O ₂
	Equipped with external combustion: no limit				
Solid fuel heaters	20 mg/Nm ³ at 10 % O ₂				
AWARD CRITERIA	AWARD CRITERIA				
Points will be awarded for:	Points will be awarded for:				
<p data-bbox="172 823 1033 857">1. Additional energy efficiency</p> <p data-bbox="172 889 1033 977">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 data-bbox="172 1026 1033 1193">Verification: A declaration 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) shall be provided.</p>	<p data-bbox="1033 823 1896 857">1. Additional energy efficiency</p> <p data-bbox="1033 889 1896 977">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 data-bbox="1033 1026 1896 1193">Verification: A declaration 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) shall be provided.</p>				
<p data-bbox="172 1214 1033 1248">2. Additional greenhouse gas emission reduction</p> <p data-bbox="172 1281 1033 1369">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 data-bbox="1033 1214 1896 1248">2. Additional greenhouse gas emission reduction</p> <p data-bbox="1033 1281 1896 1369">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 together with the calculated GHG emissions following the proposed TEWI formulae and information on all the parameters used to calculate the GHG emissions shall be provided.</p>	<p>Verification:</p> <p>A declaration together with the calculated GHG emissions following the proposed TEWI formulae and information on all the parameters used to calculate the GHG emissions shall be provided.</p>
<p>3. Noise emission limits</p> <p>This award criterion is recommended to be applied in the public procurement of water-based heaters that are to be installed in noise-sensitive buildings, as e.g. hospitals and schools, according to the scope of Directive 2002/49/EC relating to the assessment and management of environmental noise.</p> <p>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), at standard rating conditions and rated heat output.</p> <p>Points to be awarded shall be calculated as follows</p> $PL = \frac{L_{A,min}}{L_A} \times PL_{A,max} + \frac{L_{C,min}}{L_C} \times PL_{C,max}$ <p>Where</p> <ul style="list-style-type: none"> • <i>PL</i> is the noise level points • <i>L_{A,min}</i> is the lowest A-weighted sound power level for a fully compliant offer. • <i>L_{C,min}</i> is the lowest C-weighted sound power level for a fully compliant offer, where applicable. • <i>L_A</i> is the A-weighted sound power level being evaluated • <i>L_C</i> is the C-weighted sound power level being evaluated, where applicable, 	<p>3. Noise emission limits</p> <p>This award criterion is recommended to be applied in the public procurement of water-based heaters that are to be installed in noise-sensitive buildings, as e.g. hospitals and schools, according to the scope of Directive 2002/49/EC relating to the assessment and management of environmental noise.</p> <p>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), at standard rating conditions and rated heat output.</p> <p>Points to be awarded shall be calculated as follows</p> $PL = \frac{L_{A,min}}{L_A} \times PL_{A,max} + \frac{L_{C,min}}{L_C} \times PL_{C,max}$ <p>Where</p> <ul style="list-style-type: none"> • <i>PL</i> is the noise level points • <i>L_{A,min}</i> is the lowest A-weighted sound power level for a fully compliant offer. • <i>L_{C,min}</i> is the lowest C-weighted sound power level for a fully compliant offer, where applicable. • <i>L_A</i> is the A-weighted sound power level being evaluated • <i>L_C</i> is the C-weighted sound power level being evaluated, where applicable,

- $PL_{A,max}$ is the maximum number of A-weighted sound power level points available
- $PL_{C,max}$ is the maximum number of C-weighted sound power level points available, where applicable

No points will be awarded if the noise emissions of the hydronic heater exceed the limit values set out as follows.

Heat generator technology	Measurement	Noise emission limit
All heaters except cogeneration heaters and heat pumps equipped with internal combustion engine	A-weighted sound power level limit value ($L_{WAd, lim}$)	$17 + 36 \times \log(P_N + 10)$ dB(A)
Cogeneration heaters and heat pumps equipped with internal combustion engine	A-weighted sound power level limit value ($L_{PAAd, lim}$)	$30 + 20 \times \log(PE + 15)$ dB(A)
	C-weighted sound power level limit value ($L_{PCd, lim}$)	$L_{PAAd, lim} + 20$ dB(C)

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

Verification:

A declaration together with test results showing the noise emissions (A-weighted sound power level limit value and where applicable C-weighted sound power level limit value) shall be provided

- $PL_{A,max}$ is the maximum number of A-weighted sound power level points available
- $PL_{C,max}$ is the maximum number of C-weighted sound power level points available, where applicable

No points will be awarded if the noise emissions of the hydronic heater exceed the limit values set out as follows.

Heat generator technology	Measurement	Noise emission limit
All heaters except cogeneration heaters and heat pumps equipped with internal combustion engine	A-weighted sound power level limit value ($L_{WAd, lim}$)	$17 + 36 \times \log(P_N + 10)$ dB(A)
Cogeneration heaters and heat pumps equipped with internal combustion engine	A-weighted sound power level limit value ($L_{PAAd, lim}$)	$30 + 20 \times \log(PE + 15)$ dB(A)
	C-weighted sound power level limit value ($L_{PCd, lim}$)	$L_{PAAd, lim} + 20$ dB(C)

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

Verification:

A declaration together with test results showing the noise emissions (A-weighted sound power level limit value and where applicable C-weighted sound power level limit value) shall be provided

.	
<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 receive the points. 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 receive the points. 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>5. Organic gaseous carbon (OGC) emissions</p> <p>Points will be awarded if the organic gaseous carbon (OGC) emissions do not exceed the value of 7 mg/Nm³ at 10 % O₂</p> <p>OGC emissions shall be measured as seasonal space heating emissions according to Table 2 in the explanatory notes</p> <p>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> <p>For technologies other than solid fuel boiler heaters, the maximum number of points to be awarded for OGC emissions should be given since only solid fuel boilers are known to be potentially problematic as</p>	

regards the OGC emissions.

For solid fuel boiler heaters, points to be awarded shall be calculated as follows:

$$POGC = \frac{OGC_{min}}{OGC} \times POGC_{max}$$

Where

- $POGC$ is the OGC emissions points
- OGC_{min} is the lowest OGC emissions test result for a fully compliant offer among the ones of solid fuel boiler heaters
- OGC is the OGC emissions test result level being evaluated
- $POGC_{max}$ is the maximum number of OGC emissions points available

Verification

A declaration together with test results showing the OGC emissions shall be provided, only for solid fuels boiler heaters.

6. Particulate matter (PM) emissions

Points will be awarded if the particulate matter (PM) emissions do not exceed the value of 20 mg/Nm³ at 10 % O₂.

Particulate matter (PM) emissions shall be measured as seasonal space heating emissions according to **Table 2** in the explanatory notes

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.

For technologies other than solid fuel boiler heaters, the maximum number of points to be awarded for PM emissions should be given since only solid fuel boilers are known to be potentially problematic as regards the PM emissions.

For solid fuel boiler heaters, points to be awarded shall be calculated as follows:

$$PPM = \frac{PM_{min}}{PM} \times PPM_{max}$$

Where

- PPM is the PM emissions points
- PM_{min} is the lowest PM emissions test result for a fully compliant offer among the ones of solid fuel boiler heaters
- PM is the PM emissions test result level being evaluated
- PPM_{max} is the maximum number of PM emissions points available

Verification

A declaration together with test results showing the PM emissions shall be provided, only for solid fuels boiler heaters.

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 ¹⁷
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 15036	Heating boilers - Test regulations for airborne noise emissions from heat generators
ISO EN 3743	Acoustics - Determination of sound power levels of noise sources - Engineering methods for small, movable sources in reverberant fields
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
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
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

¹⁷ 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)

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	$E_s = E_{s,r}$
<p>Where</p> <p>E_s are the seasonal space heating emissions.</p> <p>$E_{s,p}$ 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.</p> <p>$E_{s,r}$ are the emissions of respectively particulate matter, organic gaseous compounds, carbon monoxide and nitrogen oxides measured at rated heat output.</p>	

- 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	$\frac{\beta_{\text{fuel}}}{\eta_s}$
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	$\frac{\beta_{fuel}}{\eta_{thermal}} - \frac{\eta_{el} \times \beta_{elec}}{\eta_{thermal}}$
Package of heaters	$(1 - s_{HP}) \times \frac{\beta_{fuel}}{\eta_{s,B}} + s_{HP} \times (\delta \times \frac{\beta_{fuel}}{\eta_{s,HP}} + (1 - \delta) \times \frac{\beta_{elec}}{2.5 \times \eta_{s,HP}}) + \frac{GWP_{100} \times m \times (ER \times n + \alpha)}{P \times h \times n}$

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 CO2-equivalent/kWhelec]	384
β_{fuel}	GHG emission intensity of the fuel used by the heater	[g CO2-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 CO2-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	β_{fuel} = weighted average derived from the sum of the weight fractions of the individual fuels multiplied by their GHG emission parameter	$\Sigma (\text{Fuel X \%} \times \beta_{fuel\ X}) + (\text{Fuel Y \%} \times \beta_{fuel\ Y}) + \dots (\text{Fuel N \%} \times \beta_{fuel\ N})$

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 GPP¹⁸ 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.

¹⁸Rüdenauer, 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

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 studies¹⁹ 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.

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 1²⁰) 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

¹⁹ magazine VV+, March 2010, p.178

²⁰ 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>

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.