Hydronic Central Heating Generators – Green Public Procurement Product Sheet

Green Public Procurement (GPP) is a voluntary instrument. This Product Sheet provides a summary of the European Commission GPP criteria developed for the hydronic central heating generators product group. The accompanying Technical Background Report provides full details on the reasons for selecting these criteria and references for further information.

The format for the purchasing recommendations comes in the form of two sets of criteria:

- 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 most environmentally-friendly 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.

Within the core and comprehensive criteria, environmental criteria or specifications are proposed for the various stages of the procurement process as appropriate: selection criteria, technical specifications, award criteria and contract performance clauses, as outlined below:

- Selection Criteria - Assist in the identification of appropriate suppliers, for example to ensure adequately trained personnel or relevant environmental policies and procedures are in place

- Technical Specifications - Set specific environmental criteria, including hurdles and levels that need to be met for specific products

- Award Criteria - Additional criteria on which the contracting authority will base its award decision. Award criteria are not pass/fall criteria, meaning that offers of products that don't comply with the criteria may still be withheld for the final decision, depending on their score on the other award criteria.

- Contract Performance Clauses - Reinforce legal requirements that the supplier should be meeting and the supply of product information where applicable

It should be noted that the contractor is bound by the existing legal framework.

1. Definition and Scope

This document covers procurement actions for hydronic central heating generators (called "heating generators" for the remainder of this document). For the purposes of these criteria, the heating generators product group shall comprise a group of products that are used to generate heat as part of a hydronic 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 heating 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 biofuels
- 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)
- § Hybrid generators: certain combinations of the above

The maximum output power of the hydronic central heating generators shall be 400 kW.

Included in the scope are combination boilers (combi-boilers), provided that their primary function is to provide ambient heat.

Excluded from the scope of this product group are heating generators whose primary function is to provide sanitary hot water.

Although it is not explicitly stated in the definitions above, it may be that the circulator is an integral part of the heating generator. For larger heating generators the circulator is usually supplied separately, and therefore the circulator itself will be out of the scope of this criteria development.

2. Key Environmental Impacts

The key environmental impacts from heating generators are associated with their use phase and linked mainly to the **energy efficiency** of the heating generator and related **greenhouse gas (GHG) emissions** during operation. Greenhouse gas emissions are mainly due to the emission of CO_2 from combustion and potentially – to a lesser extent – refrigerant leakage (for certain types of heating technologies such as heat pumps).

The ongoing development of EU Ecolabel criteria for heating generators proposes as common benchmark criteria (common to all heating technologies) both **energy efficiency** and **greenhouse (GHG) emissions**. In addition, **installation and user information** criteria were identified as one of the most important criteria to guarantee optimum environmental performance of the heating generators. These three criteria will constitute both core and comprehensive GPP criteria.

Additional environmental impacts, which are however smaller, are: refrigerant and secondary refrigerant (for heat pumps), air emissions during operation: nitrogen oxides (NOx), organic carbon (OGC), carbon monoxide (CO), and particulate matter (PM); noise, hazardous substances and mixtures, plastic parts, and product design for sustainability.

- · Therefore the core and comprehensive criteria focus on energy efficiency, greenhouse gas emissions and provision of information
- · The comprehensive criteria include, in addition to the abovementioned three criteria, other aspects such as other air emissions, the use of hazardous substances and mixtures and noise.

Core and comprehensive criteria are inter-related, as e.g. establishing minimum energy efficiency and maximum greenhouse gas emissions limits for heating generators will contribute not only to a reduction in the consumption of energy and related greenhouse emissions, but also to a reduction in other environmental impacts such as other air emissions.

Key Environmental Impacts	GPP Approach
· Energy consumption, in particular during use-phase · Greenhouse gas emissions, in particular during use-phase, due to CO_2 from combustion (mainly for fossil fuels), or refrigerant leakage (for the case of heat pumps) · Air emissions, in particular during use-phase, of NOx, organic carbon (OGC), carbon monoxide (CO) and particulate matter (PM) · Risk of pollution from the use of hazardous substances and mixtures	· Install heating generators with high energy efficiency and low greenhouse gas emissions · Promote the use of renewable energy sources in boilers to reduce environmental impacts · Maximise efficiency by correctly sizing and installing the heating generators · Maintain boiler efficiency through effective maintenance by trained personnel · Limitations on the use of certain hazardous materials/substances

3. GPP Criteria for Hydronic Central Heating Generators

Table 1 shall be used to identify the criteria that are applicable to each of the heating generator technologies within the scope of this product group. In the case of a hybrid heating generator product, it shall comply with all the criteria areas applicable to each of the heating technologies of which it is comprised.

Table 1. Applicability of the different criteria to each of the heating generator technologies

Heating generator technology / Criteria	Gas or liquid fuel boiler	Biomass boiler	Gas-driven hydronic heat pump	Electrically-driven hydronic heat pump	Co-generation
Minimum energy efficiency	X	X	X	X	X
Greenhouse gas emissions	X	X	X	X	X
Refrigerant and secondary refrigerant			X	X	
Nitrogen oxides (NOx) emissions limit	X	X	X		X
Organic carbon (OGC) emissions limit		X			
Carbon monoxide (CO) emissions limit	X	X	X		X
Particulate matter (PM) emissions limit		X			X
Noise	X	X	X	X	X
Hazardous substances and materials	X	X	X	X	X
Substances listed in accordance with Article 59(1) of Regulation (EC) 1907/2006	X	X	X	X	X
Plastic parts	X	X	X	X	X
Product design for sustainability	X	X	X	X	X
Installation and user information	X	X	X	X	X

3.1. Core GPP Criteria for Hydronic Central Heating Generators

SELECTION CRITERIA

1. Fitters, dealers and service personnel shall be fully trained and be familiar with the heating generator purchased. Training should comprise the following elements:

   - General information and familiarity with the product
   - Installation
   - Measurement methods with practical exercises
   - Adjustment of the equipment and environmentally friendly settings
   - Trouble-shooting
   - Service

Verification: The contractor shall provide appropriate evidence that their installers are suitably trained in the aspects above. Existing training schemes and their certification that can demonstrate these requirements will be deemed to prove compliance.

TECHNICAL SPECIFICATIONS

1. Minimum energy efficiency

The energy efficiency of the hydronic central heating generator shall at a minimum be 90%.

Type of heating generator	Minimum energy efficiency
All types of hydronic central heating generators, regardless of technology.	90%

For all types of heating generators – except for biomass boilers – the unit for measuring energy efficiency shall follow the definition of **"seasonal space heating efficiency" (η_s, or "etas")**, as developed in the Ecodesign Implementing Measures for boilers and described in Annex II of the accompanying technical background report[1]. The energy efficiency for biomass boilers shall be measured following the international standard EN 303-5.

The "seasonal space heating efficiency" is generally defined as the ratio between the space heating demand pertaining to a designated heating season provided by a boiler, and the annual energy consumption required for its generation, expressed as percentage. According to the methodology developed in Ecodesign Lot 1, the seasonal space heating efficiency, "etas", shall be calculated as the seasonal steady-state space heating efficiency, corrected by contributions accounting for turndown ratio, temperature control, auxiliary electricity consumption, standby heat loss, ignition flame energy consumption, and in addition for cogeneration boilers the seasonal electric efficiency.

For heat pumps, the seasonal space heating efficiency (etas) is obtained through the seasonal coefficient of performace (SCOP) (and corrected by the primary energy factor 2.5 in

[1] See Annex II: Working documents Ecodesign/Energy Labelling. In: "Development of European Ecolabel and Green Public Procurement Criteria for Hydronic Central Heating Generators. Draft Report. **Policy Analysis**", Nov. 2011, http://susproc.jrc.ec.europa.eu/heating/stakeholders.html

order to convert to "etas"), and following the methodology developed in Ecodesign Lot 1 and described in the Draft Commission Regulation implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to Ecodesign requirements for boilers, available online[2].

Verification: Products holding a relevant Type 1 Ecolabel or that demonstrate compliance with relevant Type 1 Ecolabel criteria will be deemed to comply. Other appropriate means of proof will also be accepted.

If following the EU Ecolabel for heating generators, the verification is as follows:

The applicant shall declare the product's compliance with the energy efficiency requirement and specify the minimum energy efficiency of at least 90% of the product submitted for labelling procedure together with the testing procedure indicated in respective EN standards for the given kind of product (see Table below). For all types of heating generators – except for biomass boilers - the testing shall be conducted following the methodology of seasonal space heating efficiency of Ecodesign Lot 1 and the corresponding testing standard. For example, gas/oil boilers are tested at two loads, 100% and 30%; air-source heat pumps are tested at 6-8 points, and water- or brine-source heat pumps at 4-5 points (see technical background document).

A mean value of three energy efficiency measurements shall not exceed the respective minimum efficiency established by this criterion, irrespective of heating generator technology. The testing shall be performed by laboratories that meet the general requirements of EN ISO 17025 or equivalent.

A certificate signed by the manufacturer declaring compliance with these requirements shall be submitted to the awarding competent body, together with the relevant documentation.

EN standards for energy efficiency relevant for the product group "hydronic central heating generators".

Number	Title
Gas boilers	
FprEN 15502-1: July 2010	Gas-fired heating boilers – Part 1: General requirements and tests (CEN)
Biomass boilers	
EN 303-5	Heating boilers - Part 5: Heating boilers for solid fuels, hand and automatically stocked, nominal heat output of up to 300 kW - Terminology, requirements, testing and marking
Gas-driven heat pumps	
prEN 12309 – 2: 2000	Gas-fired absorption and adsorption air-conditioning and/or heat pump appliances with a net heat input not exceeding 70 kW
Electrically-driven heat pumps	
prEN 14825: June 2010	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.
EN 14511: 2007	Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling.
Cogeneration	
prEN 50465: 2010	Gas appliances – Combined Heat and Power appliance of nominal

[2] Draft Commission Regulation implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for boilers, http://www.eceee.org/Eco_design/products/boilers/WD_ecodesign_March_2011

Draft ed. 2.	heat input inferior or equal to 70 kW (CEN)

Note: The efficiency of heat pumps was traditionally tested using EN 14511. For testing at different loads and to obtain the SCOP and seasonal space heating efficiency, prEN 14825 is used. The testing method proposed, prEN 14825: June 2010 has been already revised; the most updated standard will be used in the final GPP criteria document.

2. Greenhouse gas emissions limit

The applicant shall demonstrate that the greenhouse gas emissions, expressed in grams of CO_2-equivalents per kWh of heating output calculated using the Total Equivalent Warming Impact (TEWI) formulas defined below, shall not exceed the value(s) established in this criterion. Two options are proposed for discussion.

OPTION 1:

Type of heating generator	**Max. greenhouse gas emissions (g CO_2-equivalents per kWh of heating output)**
All types of hydronic central heating generators, regardless of technology, except biomass boilers	220 g CO_2-equivalents per kWh of heating output
Notes: Results from the technical analysis indicate that all biomass boilers emit much lower GHG emissions and therefore a limit is not needed.	

OPTION 2:

Type of heating generator	**Max. greenhouse gas emissions (g CO_2-equivalents per kWh of heating output)**
Gas/liquid fuel boiler and gas-driven hydronic heat pumps	220 g CO_2-equivalents per kWh of heating output
Electrically-driven hydronic heat pump	180 g CO_2-equivalents per kWh of heating output
Cogeneration	220 g CO_2-equivalents per kWh of heating output
Notes: Results from the technical analysis indicate that all biomass boilers emit much lower GHG emissions and therefore a limit is not needed	

The greenhouse gas emissions will be calculated following the TEWI formulas below (different formulations, for gas/oil boilers, electrically-driven heating generators, gas-driven heating generators, cogeneration, and hybrid generators).

Each TEWI formula consists of two parts, one dependent only on the efficiency of the heating generator (expressed in terms of the seasonal space heating efficiency, η_s) and the carbon intensity of the fuel (represented by $\beta_{elec.}$ and β_{gas}, for electricity and natural gas, respectively), and the second part (which has a value different than zero only for heat pumps)

dependent on the greenhouse gas emissions due to refrigerant leakage. The GHG emissions from the refrigerant leakage depend on the global warming potential (GWP_{100}) of the refrigerant, and the refrigerant leakage during use-phase (expressed as an annual leakage rate, ER, in % 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).

The following TEWI formulas, which provide the GHG emissions in CO_2-equiv per kWh of heat output shall be used:

$$\frac{\text{TEWI}}{\text{kWh heat output}}\left(\frac{\text{g}CO_2\text{ - equiv.}}{\text{kWh heat output}}\right)=\frac{\beta_{gas}}{\eta_s}\text{, for gas boilers}$$

$$\frac{\text{TEWI}}{\text{kWh heat output}}\left(\frac{\text{g}CO_2\text{ - equiv.}}{\text{kWh heat output}}\right)=\frac{\beta_{oil}}{\eta_s}\text{, for oil boilers}$$

$$\frac{\text{TEWI}}{\text{kWh heat output}}\left(\frac{\text{g}CO_2\text{ - equiv.}}{\text{kWh heat output}}\right)=\frac{\beta_{elec}}{2.5\,\eta_s}+\frac{GWP_{100}\times m\ (ER\times n+\alpha)}{P\times h\times n}\text{, for electrically-driven heat pumps}$$

$$\frac{\text{TEWI}}{\text{kWh heat output}}\left(\frac{\text{g}CO_2\text{ - equiv.}}{\text{kWh heat output}}\right)=\frac{\beta_{gas}}{\eta_s}+\frac{GWP_{100}\times m\ (ER\times n+\alpha)}{P\times h\times n}\text{, for gas-driven heat pumps}$$

The parameters in the formulas above are described in the following table:

Parameter	**Description of parameter**	**Units**	**Constant value or test to be performed in order to obtain the parameter**
$\beta_{elec.}$	Carbon emissions of electricity	[g CO_2-equiv./$kWh_{elec.}$]	384
β_{gas}	Carbon emissions of gas	[g CO_2-equiv./kWh_{gas}]	202
η_s	Seasonal space heating efficiency	[-]	To be tested and declared by the applicant (Criterion 1)
GWP_{100}	Global warming potential (effect over 100 years)	[-]	According to Annex I of the F-gas regulation
m	Refrigerant mass	[g]	To be declared by the applicant
ER	Refrigerant loss per year	[%/yr]	A value of ER = 2.5%/yr shall be used.
n	Lifetime	[yr]	A value of n = 15 shall be used.
α	Refrigerant loss at end of life	[%]	A value of α = 5% shall

	(disposal loss)		be used.
P	Design load	[kW]	To be tested and declared by the applicant.
h	Full load operating hours	[h/yr]	2000
Notes: § The value of $\beta_{elec.}$ = 384 g CO_2-equiv./ $kWh_{elec.}$ corresponds to the average EU-27 carbon intensity of electricity (corresponding to the period 2010-2020, as used in the MEErP methodology of 2011). The corresponding value used in Ecodesign Lot 1 (MEEuP methodology of 2005) was equal to 458 g CO_2-equiv./ kWh_{elec}			

$$\frac{TEWI}{kWh\ heat\ output}\left(\frac{g CO_2\text{ - equiv.}}{kWh\ heat\ output}\right)=\frac{\beta_{gas}}{\eta_{thermal}}+\frac{\eta_{cogen}*\beta_{elec}}{2.5\ \eta_{thermal}}\text{, for cogeneration units}$$

In the formula for cogeneration units, the η_{cogen} and $\eta_{thermal}$ are obtained as:

$\eta_{thermal}$ = etason - F(1-5)

η_{cogen} = F(6), where F(6) is a negative value

The factors F(1-5) and F(6) are used in the derivation of the seasonal space heating efficiency η_s, as developed in Annex II of the accompanying technical background report[3]. F(1-5) applies to the thermal part of the heating generator, F(6) is only relevant for cogeneration and it serves to correct for electricity production. In the cogeneration TEWI formula, β_{elec} is divided by 2.5 to convert to electric savings instead of primary savings.

For a hybrid heating generator, the following formula is proposed:

$$\frac{TEWI}{kWh\ heat\ output}\left(\frac{g CO_2\text{ - equiv.}}{kWh\ heat\ output}\right)=\frac{\%gb*\beta_{gas}}{\eta_{gb}}+\frac{(1-\%gb)*\beta_{elec}}{2.5\ \eta_{hp}}+GHG_{direct}$$

with the corresponding parameters:

Parameter	**Description of parameter**	**Units**	**Constant value or test to be performed in order to obtain the parameter**
%gb	The share of gas boiler of the total heat output (fraction with no units)	[-]	Declared by the applicant
$\beta_{elec.}$	Carbon emissions of electricity, corresponding to the electrically-driven heat pump part	[g CO_2-equiv./$kWh_{elec.}$]	384
β_{gas}	Carbon emissions of gas, corresponding to the gas boiler part	[g CO_2-equiv./kWh_{gas}]	202
η_{gb}	Seasonal space heating efficiency of the gas boiler part for the typical operating conditions (outside temperature below +3°C)	[-]	To be tested and declared by the applicant (Criterion 1)

[3] Annex II: Working documents Ecodesign/Energy Labelling. In: "Development of European Ecolabel and Green Public Procurement Criteria for Hydronic Central Heating Generators. Draft Report. **Policy Analysis**", November 2011, http://susproc.jrc.ec.europa.eu/heating/stakeholders.html

η_{hp}	Seasonal space heating efficiency (in primary energy, hence the correction by 2.5 to secondary) of the heat pump part for the typical operating conditions (outside temperature temperature above +3ºC)	[-]	To be tested and declared by the applicant (Criterion 1)
GHG_{direct}	Contribution of direct emissions (annual plus end-of-life refrigerant leakage) from the heat pump part	[kg.CO_2eq./kWh heat output]	According to Annex I of the F-gas regulation
Notes: § The value of $\beta_{elec.}$ = 384 g CO_2-equiv./ $kWh_{elec.}$ corresponds to the average EU-27 carbon intensity of electricity (corresponding to the period 2010-2020, as used in the MEErP methodology of 2011). The corresponding value used in Ecodesign Lot 1 (MEEuP methodology of 2005) was equal to 458 g CO_2-equiv./ kWh_{elec}			

Explanation for the formula for hybrid heating generators:
The heat output of the hybrid generator is first split up into a gas boiler and a heat pump part. This can be based on an approach involving a bivalent point, i.e. the outside temperature below which the gas boiler takes over from the heat pump. The calculation for the gas boiler part is then fairly straightforward. The calculation for the heat pump part includes a correction of 2.5 to convert the efficiency on primary energy basis to secondary energy (electricity) since the specific carbon emissions apply to kWh_{elec}. Finally, the contribution corresponding to the direct emissions (annual plus end-of-life refrigerant leakage) from the heat pump part is added.

Verification: The applicant shall provide the calculated GHG emissions following the proposed TEWI formulas above. A certificate signed by the manufacturer declaring compliance with these requirements shall be submitted to the awarding competent body, together with the relevant documentation.

The applicant's statement shall include the following information:

§ Type of refrigerant and its global warming potential value, GWP_{100}.

§ Nominal filling quantity of the refrigerant, grams.

§ Calculation of grams of CO_2-equivalent in grams/kWh of heat output, following the TEWI formulas provided.

§ Calculation and verification data with respect to the seasonal seasonal space heating efficiency, as provided in Criterion 1.

3. Refrigerant and secondary refrigerant

Refrigerant

The global warming potential (GWP_{100}) of the refrigerant shall not exceed a GWP_{100} value > 2000 over a 100 year period.

Notes:

§ Global warming potential (GWP_{100}) means the measure of how much 1 kg of the refrigerant applied in the vapour compression cycle is estimated to contribute to global warming, expressed in kg CO_2 equivalents over a 100 year time horizon.

§ GWP_{100} values considered will be those set out in Annex I of Regulation (EC) No 842/2006 of the European Parliament and the Council[4].

Secondary refrigerant

(Note: Not applicable to all types of heat pumps within this product group)

The secondary refrigerant, brine or additives must not be substances classified as environmentally hazardous or constituting a health hazard as defined by Council Directive 67/548/EEC[5] concerning environmental hazard and its subsequent amendments.

Verification: The names of refrigerant(s) used in the product shall be submitted with the application, along with their GWP_{100} values according to the Regulation above. 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.

The GWP_{100} values for the refrigerants shall be taken from the following sources:

§ GWP values considered will be those set out in Annex 1 of Regulation (EC) No 842/2006 of the European Parliament and of the Council[6].

§ For fluorinated refrigerants, the GWP values shall be those published in the third assessment report (TAR) adopted by the Intergovernmental Panel on Climate Change (2001 IPCC GWP values for a 100 year period)[7].

§ For non-fluorinated gases, the GWP values are those published in the First IPCC assessment over a 100 year period[8].

§ For refrigerants not included in the above references, the IPCC UNEP 2010 report on Refrigeration, Air Conditioning and Heat Pumps, dated February 2011, or newer, shall be used as a reference[9].

§ GWP_{100} values for mixtures of refrigerants shall be based on the formula stated in Annex I of the Regulation 842/2006.

For the secondary refrigerant(s) only

The name(s) of the secondary refrigerant(s) used shall be submitted with the application.

4. Nitrogen oxides (NOx) emissions limit

The content of nitrogen oxides (NOx) in the exhaust gas must not exceed the limit values indicated in the table below, for each of the heating technologies. The units shall be given in mg/kWh of energy input or in mg/m_N^3.

[4] OJ L 161, 14.6.2006, p. 1.
[5] OJ 196, 16.8.1967, p. 1.
[6] OJ L 161, 14.6.2006, p. 1.
[7] IPPC Third Assessment Climate Change 2001. A Report of the Intergovernmental Panel on Climate Change: http://www.ipcc.ch/pub/reports.htm
[8] Climate Change, The IPPC Scientific Assessment, J. T. Houghton, G. J. Jenkins, J. J. Ephraums (ed.) Cambridge University Press, Cambridge (UK), 1990.
[9] This reference, applicable for refrigerants not included in the above references, is provided in the Draft Commission Regulation for implementing ecodesign requirements for air conditioners and comfort fans, published on 18 July 2011. The Draft Regulation can be accessed at: http://register.consilium.europa.eu/pdf/en/11/st13/st13029.en11.pdf

Heating generator technology	**NOx emissions**
Gas/liquid fuel boiler	45 mg/kWh of heat input
Biomass boiler	Pellet/wood-log boilers: 150 mg/m_N^3 Wood chip boilers: 190 mg/m_N^3
Gas-driven hydronic heat pump	110 mg/kWh of heat input
Sorption (absorption and adsorption) hydronic heat pump	45 mg/kWh of heat input
Electrically-driven hydronic heat pump	No limit
Cogeneration	120 mg/kWh (gas) 500 mg/kWh (liquid; internal combustion or Stirling)

Verification: Products holding a relevant Type 1 Ecolabel or that demonstrate compliance with relevant Type 1 Ecolabel criteria will be deemed to comply. Other appropriate means of proof will also be accepted.

If following the EU Ecolabel for heating generators, the verification is as follows:

The NOx emission data – related to dry exhaust gas – are to be determined as standard emission factors according to the international standards included in the table below

A certificate signed by the manufacturer declaring compliance with these requirements shall be submitted to the awarding competent body, together with the relevant documentation.

Number	**Title**
Gas boilers	
FprEN 15502-1: July 2010	Gas-fired heating boilers – Part 1: General requirements and tests (CEN) §8.13. NOx (classification, test and calculation methods)
Biomass boilers	
EN 303-5	Heating boilers - Part 5: Heating boilers for solid fuels, hand and automatically stocked, nominal heat output of up to 300 kW - Terminology, requirements, testing and marking
Gas-driven heat pumps	
prEN 12309 – 2: 2000	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 pumps	
prEN 14825: June 2010	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.
EN 14511: 2007	Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling.
Cogeneration	
prEN 50465: 2010 Draft ed. 2.	Gas appliances – Combined Heat and Power appliance of nominal heat input inferior or equal to 70 kW (CEN)

5. Organic carbon (OGC) emissions limit

The organic substance content of the exhaust gas given as total organic carbon (OGC) must not exceed the limit value of 5 mg/m_N^3 (10% O_2), as indicated the table below (this air emissions parameter is only applicable to biomass boilers). The unit of measurement is mg/m^3 of dry gas at 10% O_2 at normal conditions (1 atm, and 0 ^oC).

Heating generator technology	**Organic carbon (OGC) emissions (mg/m^3, or mg/kWh)**
Biomass boilers	5 mg/m_N^3 (10% O_2)

Verification: Products holding a relevant Type 1 Ecolabel or that demonstrate compliance with relevant Type 1 Ecolabel criteria will be deemed to comply. Other appropriate means of proof will also be accepted.

If following the EU Ecolabel for heating generators, the verification is as follows:

A certificate signed by the manufacturer declaring compliance with these requirements shall be submitted to the awarding competent body, together with the relevant documentation.

The verification will be done following the standard specified in the table below

Number	**Title**
Biomass boilers	
EN 303-5	Heating boilers - Part 5: Heating boilers for solid fuels, hand and automatically stocked, nominal heat output of up to 300 kW - Terminology, requirements, testing and marking

Note: EN 303-5 is the only standard with specifications on how to test for OGC.

6. Carbon monoxide (CO) emissions limit

The carbon monoxide (CO) content in the exhaust gas must not exceed the values indicated in the table below. The units shall be given in mg/kWh of energy input or in mg/m_N^3.

Heating generator technology	CO emissions
Gas/liquid fuel boiler	25 mg/kWh
Biomass boiler	200 mg/m_N^3 (13% O_2)
Gas-driven hydronic heat pump	100 mg/m_N^3 (5% O_2)
Sorption (absorption and adsorption) hydronic heat pump	25 mg/kWh (gas)
Electrically-driven hydronic heat pump	No limit
Cogeneration	100 mg/m_N^3 (5% O_2) (Internal combustion engine, gas) 200 mg/m_N^3 (5% O_2) (Internal combustion engine, liq) 25 mg/kWh (Stirling, gas)

Verification: Products holding a relevant Type 1 Ecolabel or that demonstrate compliance with relevant Type 1 Ecolabel criteria will be deemed to comply. Other appropriate means of proof will also be accepted.

If following the EU Ecolabel for heating generators, the verification is as follows:

A certificate signed by the manufacturer declaring compliance with these requirements shall be submitted to the awarding competent body, together with the relevant documentation.

The verification will be done following the standards specified in the following table:

Number	Title
Gas boilers	
FprEN 15502-1: July 2010	Gas-fired heating boilers – Part 1: General requirements and tests (CEN)
Biomass boilers	
EN 303-5	Heating boilers - Part 5: Heating boilers for solid fuels, hand and automatically stocked, nominal heat output of up to 300 kW - Terminology, requirements, testing and marking

7. Particulate matter (PM) emissions limit

The particle matter (PM) content in the exhaust gas must not exceed the values indicated in the following table. The units shall be given mg/m_N^3.

Heating generator technology	Particle matter (PM)
Gas/liquid boiler	No limit
Biomass boiler	20 mg/m_N^3 (13% O_2) (pellet and wood log boilers) 30 mg/m_N^3 (13% O_2) (wood chips boilers)
Gas-driven hydronic heat pump	No limit
Electrically-driven hydronic heat pump	No limit
Cogeneration	1 mg/m_N^3 (5% O_2) for internal combustion engines using liquid fuels

Verification: Products holding a relevant Type 1 Ecolabel or that demonstrate compliance with relevant Type 1 Ecolabel criteria will be deemed to comply. Other appropriate means of proof will also be accepted.

If following the EU Ecolabel for heating generators, the verification is as follows:

A certificate signed by the manufacturer declaring compliance with these requirements shall be submitted to the awarding competent body, together with the relevant documentation.

The verification will be done following the standards specified in the following table:

Number	Title
Gas boilers	
FprEN 15502-1: July 2010	Gas-fired heating boilers – Part 1: General requirements and tests (CEN)
Biomass boilers	
EN 303-5	Heating boilers - Part 5: Heating boilers for solid fuels, hand and automatically stocked, nominal heat output of up to 300 kW - Terminology, requirements, testing and marking
Gas-driven heat pumps	
prEN 12309 – 2: 2000	Gas-fired absorption and adsorption air-conditioning and/or heat pump appliances with a net heat input not exceeding 70 kW
Cogeneration	
prEN 50465: 2010 Draft ed. 2.	Gas appliances – Combined Heat and Power appliance of nominal heat input inferior or equal to 70 kW (CEN)

8. Installation and user information

The following issues shall appear on the packaging, a leaflet attached to the product, or on a companion website:

- correct installation instruction,
- correct operation instruction,
- information concerning appropriate disposal at end-of-life,
- information on appropriate dimensions of heating generators for different building characteristics/size.

Verification: A certificate signed by the manufacturer declaring compliance with these requirements shall be submitted to the awarding competent body, together with the relevant documentation.

AWARD CRITERIA
Additional points will be awarded for:

9. Sound power level

Additional points will be awarded for:

Declaration of sound power level. The tenderer should declare the sound power level of the heating generator unit. The sound power level shall be tested and stated in dB(A).

Additional points will be awarded if the sound power level is below limits established by the following formulas, as stated in the following table:

Heating generator technology	Sound power level, in dB(A)
Air-to-water heat pumps	Sound power level: **$L_{WAd} \leq 17 + 36 * lg\ (P_N+10)$ dB(A)** P_N is the design load Note: This formula allows also larger heat pumps to comply with these limits.
Cogeneration	Sound power level: **$L_{pAd,lim} \leq [25+20 * lg\ (P_{el}+15)]$ dB(A)** **$L_{pCd} \leq L_{pAd,lim} + 20$ dB(C)**

Implementation note:

Award criteria: Contracting authorities will have to indicate in the contract notice and tender documents how many additional points will be awarded for each award criterion. Environmental award criteria should, altogether, account for at least 10 to 15 % of the total points available. Where the award criterion is formulated in terms of "better performance as compared to the minimum requirements included in the technical specifications", points will be awarded in proportion to the improved performance.

Verification: A certificate signed by the manufacturer declaring compliance with these requirements shall be submitted to the awarding competent body, together with the relevant documentation. Testing shall be performance in accordance with EN 12102. The test report shall be submitted with the application.

10. Plastic parts

Additional points will be awarded if plastic parts meet the following criteria:

a. If any plasticiser substance in the manufacturing process is applied, it must comply with the requirements on hazardous substances set out in the corresponding comprehensive criteria on hazardous substances.

b. Plastic parts of articles or homogeneous parts of complex articles with weight 50 g or more shall not contain a chlorine content greater than 50 % by weight.

c. Plastic parts with weight 50 g or more shall be labelled according to ISO 11469, in order to facilitate recycling.

Implementation note:

Award criteria: Contracting authorities will have to indicate in the contract notice and tender documents how many additional points will be awarded for each award criterion. Environmental award criteria should, altogether, account for at least 10 to 15 % of the total points available. Where the award criterion is formulated in terms of "better performance as compared to the minimum requirements included in the technical specifications", points will be awarded in proportion to the improved performance.

Verification: The applicant shall provide a declaration of compliance with this criterion, together with related documentation, such as declarations of compliance signed by the suppliers of substances and copies of relevant Safety Data Sheets. The applicant shall provide information on the plasticisers used in the product. The applicant shall provide information on the maximum chlorine content of the plastic parts. A declaration of compliance signed by the plastic and biocides suppliers and copies of relevant safety data sheets about materials and substances shall also be provided to the awarding competent body. All biocides used shall be clearly indicated. The applicant shall provide information on the intentionally added substances used as flame retardants.

11. Product design for sustainability

Additional points will be awarded if the product meets criteria on:

- Promotion of reuse, recycling and generally sound end-of-life management
- Product quality/usability and lifetime extension

Implementation note:

Award criteria: Contracting authorities will have to indicate in the contract notice and tender documents how many additional points will be awarded for each award criterion. Environmental award criteria should, altogether, account for at least 10 to 15 % of the total points available.

Where the award criterion is formulated in terms of "better performance as compared to the minimum requirements included in the technical specifications", points will be awarded in proportion to the improved performance.

Verification: Products holding a relevant Type 1 Ecolabel or that demonstrate compliance with relevant Type 1 Ecolabel criteria will be deemed to comply. Other appropriate means of proof will also be accepted.

If following the EU Ecolabel for heating generators, the verification is as follows:

A certificate signed by the manufacturer declaring compliance with these requirements shall be submitted to the awarding competent body, together with the relevant documentation.

CONTRACT PERFORMANCE CLAUSES

1. The following instructions should be provided by the manufacturer or supplier for **central hydronic heating generators:**

   Sales information:
   The buyer must be provided with guidance and information on the energy consumption of the system and how this can be limited. Information must also be provided on the availability of manageable circulation pumps, which will reduce the system's own electricity consumption considerably.

   Installation Instructions:
   In a separate, clearly-marked section the installation instructions must provide details on what air pollution values the flue gas must have during the operating phase (see

the section on emissions to the atmosphere) and how the burner can be adjusted in order to achieve this.

The installation instructions must as a minimum contain the following:

1. The burner must be adjusted with the aid of measuring gauges for measuring CO, O_2 or CO_2, NO_x, temperature and soot to ensure that none of the threshold values provided for in the section on air pollution are exceeded.

2. Holes must be made for measuring gauges in the same location as used in laboratory testing, i.e. between the boiler and the chimney.

3. Measurement results must be recorded in a special form or diagram, one copy of which is retained by the end user.

4. Burners must be installed by fitters who have been fully trained in accordance with the requirements in the selection criteria outlined above.

5. In the case of technology involving low flue gas temperatures (< 120°C), the system must be equipped with corrosion retarding technology (applies only to oil burner/boiler combinations). Recommendation that the chimney ought to be protected against condensate with low pH, e.g. by neutralization of the condensate

6. After the installation of the boiler, its control settings (“heating curve”) are to be adjusted properly.

Information must also be provided on who the fitter can approach for guidance on installation.

The information specified in the installation instructions must also be clearly shown in the operating instructions.

Instructions for use for the buyer / end user

The information for the end user must be clear and comprehensible. It must provide information on:

1. The importance of regular service and maintenance and the use of the correct type of fuel oil, natural gas or oil or, if applicable, gas made from renewable energy, stating the type recommended to achieve economical operations and lower energy consumption, low emissions and a long useful life for the appliance.

2. Guidance on service and maintenance and what work can be performed by the end user and what work must not be attempted by the end user.

3. What demands the end user should make of service personnel in order to ensure that the service provided is of good quality. This includes ensuring that the service personnel have the correct measuring equipment and have received training in the installation and operation of burners.

4. That energy consumption and emissions can be reduced by means of automatic feed temperature adjustment.

5. How the measured values should be interpreted and how they can be improved, if applicable. Ranges of values must be provided for what are acceptable and unacceptable emission levels. In the case of burners, a range of up to 20 % of the threshold value is regarded as acceptable. This does not apply at the time of installation, only at subsequent services.

6. Information on electricity demand for burner/boiler combination.

7. A request that burner and boiler be delivered to a recycling centre after the end of their working life and not dumped outside of an approved waste management facility.

8. Oil-fired installations: End users should be urged to have their oil tank checked to avoid leakages into the ground.

9. Addresses and telephone numbers at which the buyer can seek further information and details of trade organisations or other sources of information.

Verification: Declarations shall be provided as written proof by the supplier to the contracting authority.

2. The following instructions should be provided for **solid biomass boilers**:

Installation manual:

The installation manual shall contain technical data about the boiler.

The manufacturer shall notify that a hot-water tank must be installed with a manual feed boiler.

Information on the required size of water tank shall be included.

The manufacturer/reseller must recommend qualified fitters in the installation manual, marketing material or in some other way. The installation manual must clearly state the importance of installation being performed by a qualified technician as instructed. The installation instructions shall cover:

- Necessary volume of air for combustion.
- Distance from combustible materials.
- Space required for operation, maintenance and chimney sweeping.
- Type of gas flue to which the boiler can be connected with regard to flue gas temperature, height and area.
- Instructions for the design of fuel storage.

Other necessary installation information according to EN 303-5 must be included.

Information on the heat contribution that the heating system can provide.

Operating and maintenance instructions:

The manufacturer must ensure that the customer is supplied with operating and maintenance instructions. These shall include:

- The type of fuel used during testing.
- A description of how various fuels affect output and emissions.

- Recommendations as to the grade, size and moisture content of wood fuel.
- Handling and storage recommendations for the biofuel.
- Lighting instructions.
- Stocking instructions.
- Cleaning instructions and checks.

Verification: Products holding a relevant Type 1 Ecolabel or that demonstrate compliance with relevant Type 1 Ecolabel criteria will be deemed to comply. Other appropriate means of proof will also be accepted.

Finally, for all types of heating generators:

The manufacturer shall ensure availability of spare parts for 10 years for the boiler, starting from the date of purchase.

Verification: The manufacturer shall provide credible proof that this clause will be met.

3.2. Comprehensive GPP Criteria for Hydronic Central Heating Generators

SELECTION CRITERIA

1. Fitters, dealers and service personnel shall be fully trained and be familiar with the heating generator purchased. Training should comprise the following elements:

- General information and familiarity with the product
- Installation
- Measurement methods with practical exercises
- Adjustment of the equipment and environmentally friendly settings
- Trouble-shooting
- Service

Verification: The contractor shall provide appropriate evidence that their installers are suitably trained in the aspects above. Existing training schemes and their certification that can demonstrate these requirements will be deemed to prove compliance.

TECHNICAL SPECIFICATIONS

1. Minimum energy efficiency

The energy efficiency of the hydronic central heating generator shall at a minimum be 90%.

Type of heating generator	Minimum energy efficiency
All types of hydronic central heating generators, regardless of technology.	90%

For all types of heating generators – except for biomass boilers – the unit for measuring energy efficiency shall follow the definition of **"seasonal space heating efficiency" (η_s, or "etas")**, as developed in the Ecodesign Implementing Measures for boilers and described in Annex II of the accompanying technical background report[10]. The energy efficiency for biomass boilers shall be measured following the international standard EN 303-5.

The "seasonal space heating efficiency" is generally defined as the ratio between the space heating demand pertaining to a designated heating season provided by a boiler, and the annual energy consumption required for its generation, expressed as percentage. According to the methodology developed in Ecodesign Lot 1, the seasonal space heating efficiency, "etas", shall be calculated as the seasonal steady-state space heating efficiency, corrected by contributions accounting for turndown ratio, temperature control, auxiliary electricity consumption, standby heat loss, ignition flame energy consumption, and in addition for cogeneration boilers the seasonal electric efficiency.

[10] See Annex II: Working documents Ecodesign/Energy Labelling. In: "Development of European Ecolabel and Green Public Procurement Criteria for Hydronic Central Heating Generators. Draft Report. **Policy Analysis**", Nov. 2011, http://susproc.jrc.ec.europa.eu/heating/stakeholders.html

For heat pumps, the seasonal space heating efficiency (etas) is obtained through the seasonal coefficient of performace (SCOP) (and corrected by the primary energy factor 2.5 in order to convert to "etas"), and following the methodology developed in Ecodesign Lot 1 and described in the Draft Commission Regulation implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to Ecodesign requirements for boilers, available online[11].

Verification: Products holding a relevant Type 1 Ecolabel or that demonstrate compliance with relevant Type 1 Ecolabel criteria will be deemed to comply. Other appropriate means of proof will also be accepted.

If following the EU Ecolabel for heating generators, the verification is as follows:

The applicant shall declare the product's compliance with the energy efficiency requirement and specify the minimum energy efficiency of at least 90% of the product submitted for labelling procedure together with the testing procedure indicated in respective EN standards for the given kind of product (see Table below). For all types of heating generators – except for biomass boilers - the testing shall be conducted following the methodology of seasonal space heating efficiency of Ecodesign Lot 1 and the corresponding testing standard. For example, gas/oil boilers are tested at two loads, 100% and 30%; air-source heat pumps are tested at 6-8 points, and water- or brine-source heat pumps at 4-5 points (see technical background document).

A mean value of three energy efficiency measurements shall not exceed the respective minimum efficiency established by this criterion, irrespective of heating generator technology. The testing shall be performed by laboratories that meet the general requirements of EN ISO 17025 or equivalent.

A certificate signed by the manufacturer declaring compliance with these requirements shall be submitted to the awarding competent body, together with the relevant documentation.

EN standards for energy efficiency relevant for the product group "hydronic central heating generators".

Number	Title
Gas boilers	
FprEN 15502-1: July 2010	Gas-fired heating boilers – Part 1: General requirements and tests (CEN)
Biomass boilers	
EN 303-5	Heating boilers - Part 5: Heating boilers for solid fuels, hand and automatically stocked, nominal heat output of up to 300 kW - Terminology, requirements, testing and marking
Gas-driven heat pumps	
prEN 12309 – 2: 2000	Gas-fired absorption and adsorption air-conditioning and/or heat pump appliances with a net heat input not exceeding 70 kW
Electrically-driven heat pumps	
prEN 14825: June 2010	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.
EN 14511: 2007	Air conditioners, liquid chilling packages and heat pumps with

[11] Draft Commission Regulation implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for boilers, http://www.eceee.org/Eco_design/products/boilers/WD_ecodesign_March_2011

	electrically driven compressors for space heating and cooling.
Cogeneration	
prEN 50465: 2010 Draft ed. 2.	Gas appliances – Combined Heat and Power appliance of nominal heat input inferior or equal to 70 kW (CEN)

Note: The efficiency of heat pumps was traditionally tested using EN 14511. For testing at different loads and to obtain the SCOP and seasonal space heating efficiency, prEN 14825 is used. The testing method proposed, prEN 14825: June 2010 has been already revised; the most updated standard will be used in the final GPP criteria document.

2. Greenhouse gas emissions limit

The applicant shall demonstrate that the greenhouse gas emissions, expressed in grams of CO_2-equivalents per kWh of heating output calculated using the Total Equivalent Warming Impact (TEWI) formulas defined below, shall not exceed the value(s) established in this criterion. Two options are proposed for discussion.

OPTION 1:

Type of heating generator	**Max. greenhouse gas emissions (g CO_2-equivalents per kWh of heating output)**
All types of hydronic central heating generators, regardless of technology, except biomass boilers	220 g CO_2-equivalents per kWh of heating output
Notes: Results from the technical analysis indicate that all biomass boilers emit much lower GHG emissions and therefore a limit is not needed.	

OPTION 2:

Type of heating generator	**Max. greenhouse gas emissions (g CO_2-equivalents per kWh of heating output)**
Gas/liquid fuel boiler and gas-driven hydronic heat pumps	220 g CO_2-equivalents per kWh of heating output
Electrically-driven hydronic heat pump	180 g CO_2-equivalents per kWh of heating output
Cogeneration	220 g CO_2-equivalents per kWh of heating output
Notes: Results from the technical analysis indicate that all biomass boilers emit much lower GHG emissions and therefore a limit is not needed	

The greenhouse gas emissions will be calculated following the TEWI formulas below (different formulations, for gas/oil boilers, electrically-driven heating generators, gas-driven heating generators, cogeneration, and hybrid generators).

Each TEWI formula consists of two parts, one dependent only on the efficiency of the heating generator (expressed in terms of the seasonal space heating efficiency, η_s) and the carbon intensity of the fuel (represented by $\beta_{elec.}$ and β_{gas}, for electricity and natural gas, respectively), and the second part (which has a value different than zero only for heat pumps) dependent on the greenhouse gas emissions due to refrigerant leakage. The GHG emissions from the refrigerant leakage depend on the global warming potential (GWP_{100}) of the refrigerant, and the refrigerant leakage during use-phase (expressed as an annual leakage rate, ER, in % 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).

The following TEWI formulas, which provide the GHG emissions in CO_2-equiv per kWh of heat output shall be used:

$$\frac{\text{TEWI}}{\text{kWh heat output}}\left(\frac{\text{g}CO_2\text{ - equiv.}}{\text{kWh heat output}}\right)=\frac{\beta_{gas}}{\eta_s}\text{, for gas boilers}$$

$$\frac{\text{TEWI}}{\text{kWh heat output}}\left(\frac{\text{g}CO_2\text{ - equiv.}}{\text{kWh heat output}}\right)=\frac{\beta_{oil}}{\eta_s}\text{, for oil boilers}$$

$$\frac{\text{TEWI}}{\text{kWh heat output}}\left(\frac{\text{g}CO_2\text{ - equiv.}}{\text{kWh heat output}}\right)=\frac{\beta_{elec}}{2.5\,\eta_s}+\frac{GWP_{100}\times m\ (ER\times n+\alpha)}{P\times h\times n}\text{, for electrically-driven heat pumps}$$

$$\frac{\text{TEWI}}{\text{kWh heat output}}\left(\frac{\text{g}CO_2\text{ - equiv.}}{\text{kWh heat output}}\right)=\frac{\beta_{gas}}{\eta_s}+\frac{GWP_{100}\times m\ (ER\times n+\alpha)}{P\times h\times n}\text{, for gas-driven heat pumps}$$

The parameters in the formulas above are described in the following table:

Parameter	**Description of parameter**	**Units**	**Constant value or test to be performed in order to obtain the parameter**
$\beta_{elec.}$	Carbon emissions of electricity	[g CO_2-equiv./$kWh_{elec.}$]	384
β_{gas}	Carbon emissions of gas	[g CO_2-equiv./kWh_{gas}]	202
η_s	Seasonal space heating efficiency	[-]	To be tested and declared by the applicant (Criterion 1)
GWP_{100}	Global warming potential (effect over 100 years)	[-]	According to Annex I of the F-gas regulation
m	Refrigerant mass	[g]	To be declared by the applicant
ER	Refrigerant loss per year	[%/yr]	A value of ER = 2.5%/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 = 5% shall be used.
P	Design load	[kW]	To be tested and declared by the applicant.
h	Full load operating hours	[h/yr]	2000
Notes: § The value of $\beta_{elec.}$ = 384 g CO_2-equiv./ $kWh_{elec.}$ corresponds to the average EU-27 carbon intensity of electricity (corresponding to the period 2010-2020, as used in the MEErP methodology of 2011). The corresponding value used in Ecodesign Lot 1 (MEEuP methodology of 2005) was equal to 458 g CO_2-equiv./ kWh_{elec}			

$$\frac{TEWI}{kWh\ heat\ output}\left(\frac{g CO_2\ -\ equiv.}{kWh\ heat\ output}\right)=\frac{\beta_{gas}}{\eta_{thermal}}+\frac{\eta_{cogen}*\beta_{elec}}{2.5\ \eta_{thermal}}\text{, for cogeneration units}$$

In the formula for cogeneration units, the η_{cogen} and $\eta_{thermal}$ are obtained as:

$\eta_{thermal}$ = etason - F(1-5)

η_{cogen} = F(6), where F(6) is a negative value

The factors F(1-5) and F(6) are used in the derivation of the seasonal space heating efficiency η_s, as developed in Annex II of the accompanying technical background report[12]. F(1-5) applies to the thermal part of the heating generator, F(6) is only relevant for cogeneration and it serves to correct for electricity production. In the cogeneration TEWI formula, β_{elec} is divided by 2.5 to convert to electric savings instead of primary savings.

For a hybrid heating generator, the following formula is proposed:

$$\frac{TEWI}{kWh\ heat\ output}\left(\frac{g CO_2\ -\ equiv.}{kWh\ heat\ output}\right)=\frac{\%gb*\beta_{gas}}{\eta_{gb}}+\frac{(1-\%gb)*\beta_{elec}}{2.5\ \eta_{hp}}+GHG_{direct}$$

with the corresponding parameters:

Parameter	**Description of parameter**	**Units**	**Constant value or test to be performed in order to obtain the parameter**
%gb	The share of gas boiler of the total heat output (fraction with no units)	[-]	Declared by the applicant
$\beta_{elec.}$	Carbon emissions of electricity, corresponding to the electrically-driven heat pump part	[g CO_2-equiv./$kWh_{elec.}$]	384
β_{gas}	Carbon emissions of gas, corresponding to the gas boiler part	[g CO_2-equiv./kWh_{gas}]	202

[12] Annex II: Working documents Ecodesign/Energy Labelling. In: "Development of European Ecolabel and Green Public Procurement Criteria for Hydronic Central Heating Generators. Draft Report. **Policy Analysis**", November 2011, http://susproc.jrc.ec.europa.eu/heating/stakeholders.html

η_{gb}	Seasonal space heating efficiency of the gas boiler part for the typical operating conditions (outside temperature below +3°C)	[-]	To be tested and declared by the applicant (Criterion 1)
η_{hp}	Seasonal space heating efficiency (in primary energy, hence the correction by 2.5 to secondary) of the heat pump part for the typical operating conditions (outside temperature temperature above +3ºC)	[-]	To be tested and declared by the applicant (Criterion 1)
GHG_{direct}	Contribution of direct emissions (annual plus end-of-life refrigerant leakage) from the heat pump part	[kg.CO_2eq./kWh heat output]	According to Annex I of the F-gas regulation

Notes:

§ The value of $\beta_{elec.}$ = 384 g CO_2-equiv./ $kWh_{elec.}$ corresponds to the average EU-27 carbon intensity of electricity (corresponding to the period 2010-2020, as used in the MEErP methodology of 2011). The corresponding value used in Ecodesign Lot 1 (MEEuP methodology of 2005) was equal to 458 g CO_2-equiv./ kWh_{elec}

Explanation for the formula for hybrid heating generators:
The heat output of the hybrid generator is first split up into a gas boiler and a heat pump part. This can be based on an approach involving a bivalent point, i.e. the outside temperature below which the gas boiler takes over from the heat pump. The calculation for the gas boiler part is then fairly straightforward. The calculation for the heat pump part includes a correction of 2.5 to convert the efficiency on primary energy basis to secondary energy (electricity) since the specific carbon emissions apply to kWh_{elec}. Finally, the contribution corresponding to the direct emissions (annual plus end-of-life refrigerant leakage) from the heat pump part is added.

Verification: The applicant shall provide the calculated GHG emissions following the proposed TEWI formulas above. A certificate signed by the manufacturer declaring compliance with these requirements shall be submitted to the awarding competent body, together with the relevant documentation.

The applicant's statement shall include the following information:

§ Type of refrigerant and its global warming potential value, GWP_{100}.

§ Nominal filling quantity of the refrigerant, grams.

§ Calculation of grams of CO_2-equivalent in grams/kWh of heat output, following the TEWI formulas provided.

§ Calculation and verification data with respect to the seasonal seasonal space heating efficiency, as provided in Criterion 1.

3. Refrigerant and secondary refrigerant

Refrigerant

The global warming potential (GWP_{100}) of the refrigerant shall not exceed a GWP_{100} value > 2000 over a 100 year period.

Notes:

- Global warming potential (GWP_{100}) means the measure of how much 1 kg of the refrigerant applied in the vapour compression cycle is estimated to contribute to global warming, expressed in kg CO_2 equivalents over a 100 year time horizon.
- GWP_{100} values considered will be those set out in Annex I of Regulation (EC) No 842/2006 of the European Parliament and the Council[13].

Secondary refrigerant

(Note: Not applicable to all types of heat pumps within this product group)

The secondary refrigerant, brine or additives must not be substances classified as environmentally hazardous or constituting a health hazard as defined by Council Directive 67/548/EEC[14] concerning environmental hazard and its subsequent amendments.

Verification: The names of refrigerant(s) used in the product shall be submitted with the application, along with their GWP_{100} values according to the Regulation above. 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.

The GWP_{100} values for the refrigerants shall be taken from the following sources:

- GWP values considered will be those set out in Annex 1 of Regulation (EC) No 842/2006 of the European Parliament and of the Council[15].
- For fluorinated refrigerants, the GWP values shall be those published in the third assessment report (TAR) adopted by the Intergovernmental Panel on Climate Change (2001 IPCC GWP values for a 100 year period)[16].
- For non-fluorinated gases, the GWP values are those published in the First IPCC assessment over a 100 year period[17].
- For refrigerants not included in the above references, the IPCC UNEP 2010 report on Refrigeration, Air Conditioning and Heat Pumps, dated February 2011, or newer, shall be used as a reference[18].
- GWP_{100} values for mixtures of refrigerants shall be based on the formula stated in Annex I of the Regulation 842/2006.

For the secondary refrigerant(s) only

The name(s) of the secondary refrigerant(s) used shall be submitted with the application.

[13] OJ L 161, 14.6.2006, p. 1.
[14] OJ 196, 16.8.1967, p. 1.
[15] OJ L 161, 14.6.2006, p. 1.
[16] IPPC Third Assessment Climate Change 2001. A Report of the Intergovernmental Panel on Climate Change: http://www.ipcc.ch/pub/reports.htm
[17] Climate Change, The IPPC Scientific Assessment, J. T. Houghton, G. J. Jenkins, J. J. Ephraums (ed.) Cambridge University Press, Cambridge (UK), 1990.
[18] This reference, applicable for refrigerants not included in the above references, is provided in the Draft Commission Regulation for implementing ecodesign requirements for air conditioners and comfort fans, published on 18 July 2011. The Draft Regulation can be accessed at: http://register.consilium.europa.eu/pdf/en/11/st13/st13029.en11.pdf

4. Nitrogen oxides (NOx) emissions limit

The content of nitrogen oxides (NOx) in the exhaust gas must not exceed the limit values indicated in the table below, for each of the heating technologies. The units shall be given in mg/kWh of energy input or in mg/m_N^3.

Heating generator technology	**NOx emissions**
Gas/liquid fuel boiler	45 mg/kWh of heat input
Biomass boiler	Pellet/wood-log boilers: 150 mg/m_N^3 Wood chip boilers: 190 mg/m_N^3
Gas-driven hydronic heat pump	110 mg/kWh of heat input
Sorption (absorption and adsorption) hydronic heat pump	45 mg/kWh of heat input
Electrically-driven hydronic heat pump	No limit
Cogeneration	120 mg/kWh (gas) 500 mg/kWh (liquid; internal combustion or Stirling)

Verification: Products holding a relevant Type 1 Ecolabel or that demonstrate compliance with relevant Type 1 Ecolabel criteria will be deemed to comply. Other appropriate means of proof will also be accepted.

If following the EU Ecolabel for heating generators, the verification is as follows:

The NOx emission data – related to dry exhaust gas – are to be determined as standard emission factors according to the international standards included in the table below

A certificate signed by the manufacturer declaring compliance with these requirements shall be submitted to the awarding competent body, together with the relevant documentation.

Number	**Title**
Gas boilers	
FprEN 15502-1: July 2010	Gas-fired heating boilers – Part 1: General requirements and tests (CEN) §8.13. NOx (classification, test and calculation methods)
Biomass boilers	
EN 303-5	Heating boilers - Part 5: Heating boilers for solid fuels, hand and automatically stocked, nominal heat output of up to 300 kW - Terminology, requirements, testing and marking
Gas-driven heat pumps	
prEN 12309 – 2: 2000	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 pumps	
prEN 14825: June 2010	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.

EN 14511: 2007	Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling.
Cogeneration	
prEN 50465: 2010 Draft ed. 2.	Gas appliances – Combined Heat and Power appliance of nominal heat input inferior or equal to 70 kW (CEN)

5. Organic carbon (OGC) emissions limit

The organic substance content of the exhaust gas given as total organic carbon (OGC) must not exceed the limit value of 5 mg/m_N^3 (10% O_2), as indicated the table below (this air emissions parameter is only applicable to biomass boilers). The unit of measurement is mg/m^3 of dry gas at 10% O_2 at normal conditions (1 atm, and 0 ^oC).

Heating generator technology	**Organic carbon (OGC) emissions (mg/m^3, or mg/kWh)**
Biomass boilers	5 mg/m_N^3 (10% O_2)

Verification: Products holding a relevant Type 1 Ecolabel or that demonstrate compliance with relevant Type 1 Ecolabel criteria will be deemed to comply. Other appropriate means of proof will also be accepted.

If following the EU Ecolabel for heating generators, the verification is as follows:

A certificate signed by the manufacturer declaring compliance with these requirements shall be submitted to the awarding competent body, together with the relevant documentation.

The verification will be done following the standard specified in the table below

Number	**Title**
Biomass boilers	
EN 303-5	Heating boilers - Part 5: Heating boilers for solid fuels, hand and automatically stocked, nominal heat output of up to 300 kW - Terminology, requirements, testing and marking

Note: EN 303-5 is the only standard with specifications on how to test for OGC.

6. Carbon monoxide (CO) emissions limit

The carbon monoxide (CO) content in the exhaust gas must not exceed the values indicated in the table below. The units shall be given in mg/kWh of energy input or in mg/m_N^3.

Heating generator technology	CO emissions
Gas/liquid fuel boiler	25 mg/kWh
Biomass boiler	200 mg/m_N^3 (13% O_2)
Gas-driven hydronic heat pump	100 mg/m_N^3 (5% O_2)
Sorption (absorption and adsorption) hydronic heat pump	25 mg/kWh (gas)

Electrically-driven hydronic heat pump	No limit
Cogeneration	100 mg/m_N^3 (5% O_2) (Internal combustion engine, gas) 200 mg/m_N^3 (5% O_2) (Internal combustion engine, liq) 25 mg/kWh (Stirling, gas)

Verification: Products holding a relevant Type 1 Ecolabel or that demonstrate compliance with relevant Type 1 Ecolabel criteria will be deemed to comply. Other appropriate means of proof will also be accepted.

If following the EU Ecolabel for heating generators, the verification is as follows:

A certificate signed by the manufacturer declaring compliance with these requirements shall be submitted to the awarding competent body, together with the relevant documentation.

The verification will be done following the standards specified in the following table:

Number	Title
Gas boilers	
FprEN 15502-1: July 2010	Gas-fired heating boilers – Part 1: General requirements and tests (CEN)
Biomass boilers	
EN 303-5	Heating boilers - Part 5: Heating boilers for solid fuels, hand and automatically stocked, nominal heat output of up to 300 kW - Terminology, requirements, testing and marking

7. Particulate matter (PM) emissions limit

The particle matter (PM) content in the exhaust gas must not exceed the values indicated in the following table. The units shall be given mg/m_N^3.

Heating generator technology	Particle matter (PM)
Gas/liquid boiler	No limit
Biomass boiler	20 mg/m_N^3 (13% O_2) (pellet and wood log boilers) 30 mg/m_N^3 (13% O_2) (wood chips boilers)
Gas-driven hydronic heat pump	No limit
Electrically-driven hydronic heat pump	No limit
Cogeneration	1 mg/m_N^3 (5% O_2) for internal combustion engines using liquid fuels

Verification: Products holding a relevant Type 1 Ecolabel or that demonstrate compliance with relevant Type 1 Ecolabel criteria will be deemed to comply. Other appropriate means of proof will also be accepted.

If following the EU Ecolabel for heating generators, the verification is as follows:

A certificate signed by the manufacturer declaring compliance with these requirements shall be submitted to the awarding competent body, together with the relevant documentation.

The verification will be done following the standards specified in the following table:

Number	Title
Gas boilers	
FprEN 15502-1: July 2010	Gas-fired heating boilers – Part 1: General requirements and tests (CEN)
Biomass boilers	
EN 303-5	Heating boilers - Part 5: Heating boilers for solid fuels, hand and automatically stocked, nominal heat output of up to 300 kW - Terminology, requirements, testing and marking
Gas-driven heat pumps	
prEN 12309 – 2: 2000	Gas-fired absorption and adsorption air-conditioning and/or heat pump appliances with a net heat input not exceeding 70 kW
Cogeneration	
prEN 50465: 2010 Draft ed. 2.	Gas appliances – Combined Heat and Power appliance of nominal heat input inferior or equal to 70 kW (CEN)

8. Installation and user information

The following issues shall appear on the packaging, a leaflet attached to the product, or on a companion website:

- correct installation instruction,
- correct operation instruction,
- information concerning appropriate disposal at end-of-life,
- information on appropriate dimensions of heating generators for different building characteristics/size.

Verification: A certificate signed by the manufacturer declaring compliance with these requirements shall be submitted to the awarding competent body, together with the relevant documentation.

9. Hazardous substances and mixtures

In accordance with Article 6(6) of Regulation (EC) No 66/2010, the product or any article of it shall not contain substances referred to in Article 57 of Regulation (EC) No 1907/2006 nor substances or mixtures meeting the criteria for classification in the following hazard classes or categories in accordance with Regulation (EC) No 1272/2008 of the European Parliament and of the Council ([19]).

List of hazard statements and risk phrases:

Hazard statement ([20])	Risk Phrase ([21])

([19]) OJ L 353, 31.12.2008, p. 1.
([20]) As provided for in Regulation (EC) No 1272/2008.
([21])As provided for in Council Directive 67/548/EEC (OJ 196, 16.8.1967, p. 1).

H300 Fatal if swallowed	R28
H301 Toxic if swallowed	R25
H304 May be fatal if swallowed and enters airways	R65
H310 Fatal in contact with skin	R27
H311 Toxic in contact with skin	R24
H330 Fatal if inhaled	R23/26
H331 Toxic if inhaled	R23
H340 May cause genetic defects	R46
H341 Suspected of causing genetic defects	R68
H350 May cause cancer	R45
H350i May cause cancer by inhalation	R49
H351 Suspected of causing cancer	R40
H360F May damage fertility	R60
H360D May damage the unborn child	R61
H360FD May damage fertility. May damage the unborn child	R60/61/60-61
H360Fd May damage fertility. Suspected of damaging the unborn child	R60/63
H360Df May damage the unborn child. Suspected of damaging fertility	R61/62
H361f Suspected of damaging fertility	R62
H361d Suspected of damaging the unborn child	R63
H361fd May damage fertility. May damage the unborn child	R62-63
H362 May cause harm to breast fed children	R64
H370 Causes damage to organs	R39/23/24/25/26/27/28
H371 May cause damage to organs	R68/20/21/22
H372 Causes damage to organs	R48/25/24/23
H373 May cause damage to organs	R48/20/21/22
H400 Very toxic to aquatic life	R50/50-53
H410 Very toxic to aquatic life with long-lasting effects	R50-53
H411 Toxic to aquatic life with long-lasting effects	R51-53
H412 Harmful to aquatic life with long-lasting effects	R52-53
H413 May cause long-lasting effects to aquatic life	R53
EUH059 Hazardous to the ozone layer	R59
EUH029 Contact with water liberates toxic gas	R29
EUH031 Contact with acids liberates toxic gas	R31
EUH032 Contact with acids liberates very toxic gas	R32
EUH070 Toxic by eye contact	R39-41

The use of substances or mixtures in the final product which upon processing change their properties in a way that the identified hazard no longer applies is exempted from the above requirement.

Concentration limits for substances or mixtures meeting the criterion for classification in the hazard classes or categories listed in the table above, and for substances meeting the criterion of Article 57 (a), (b) or (c) of Regulation (EC) No 1907/2006, shall not exceed the generic or specific concentration limits determined in accordance with the Article 10 of Regulation (EC) No1272/2008. Where specific concentration limits are determined, they shall prevail against the generic ones.

Concentration limits for substances meeting criteria of Article 57 (d), (e) or (f) of Regulation (EC) No 1907/2006 shall not exceed 0.1 % weight by weight.

Derogations: The following substances or mixtures are specifically exempted from this requirement:

Articles with weight below 50 g	All hazard statements and risk phrases
Homogeneous parts of complex articles with weight below 50 g	All hazard statements and risk phrases
Nickel in stainless steel	All hazard statements and risk phrases

Verification: For each article and/or homogeneous part of complex articles with weight over 50 g the applicant shall provide a declaration of compliance with this criterion, together with related documentation, such as declarations of compliance signed by the suppliers of substances and copies of relevant Safety Data Sheets in accordance with Annex II to Regulation (EC) No 1907/2006 for substances or mixtures. Concentration limits shall be specified in the Safety Data Sheets in accordance with Article 31 of Regulation (EC) No 1907/2006 for substances and mixtures.

10. Substances listed in accordance with Article 59(1) of Regulation (EC) 1907/2006

No derogation from the exclusion in Article 6(6) may be given concerning substances identified as substances of very high concern and included in the list foreseen in Article 59 of Regulation (EC) No 1907/2006, present in mixtures, in an article or in any homogenous part of a complex article in concentrations higher than 0.1% w/w. Specific concentration limits determined in accordance with Article 10 of Regulation (EC) No1272/2008 shall apply in case it is lower than 0,1% w/w.

Verification: The list of substances identified as substances of very high concern and included in the candidate list in accordance with Article 59 of Regulation (EC) No 1907/2006 can be found here:

http://echa.europa.eu/chem_data/authorisation_process/candidate_list_table_en.asp

Reference to the list shall be made on the date of application.

The applicant shall provide a declaration of compliance with this criterion, together with related documentation, such as declarations of compliance signed by the suppliers of substances and copies of relevant Safety Data Sheets in accordance with Annex II to Regulation (EC) No 1907/2006 for substances or mixtures. Concentration limits shall be specified in the Safety Data Sheets in accordance with Article 31 of Regulation (EC) No 1907/2006 for substances and mixtures.

AWARD CRITERIA
Additional points will be awarded for:

11. Sound power level

Additional points will be awarded for:

Declaration of sound power level. The tenderer should declare the sound power level of the heating generator unit. The sound power level shall be tested and stated in dB(A).

Additional points will be awarded if the sound power level is below limits established by the following formulas, as stated in the following table:

Heating generator technology	Sound power level, in dB(A)
Air-to-water heat pumps	Sound power level: **$L_{WAd} \leq 17 + 36 * lg (P_N+10)$ dB(A)** P_N is the design load Note: This formula allows also larger heat pumps to comply with these limits.
Cogeneration	Sound power level: **$L_{pAd,lim} \leq [25+20 * lg (P_{el}+15)]$ dB(A)** **$L_{pCd} \leq L_{pAd,lim} + 20$ dB(C)**

Implementation note:

Award criteria: Contracting authorities will have to indicate in the contract notice and tender documents how many additional points will be awarded for each award criterion. Environmental award criteria should, altogether, account for at least 10 to 15 % of the total points available. Where the award criterion is formulated in terms of "better performance as compared to the minimum requirements included in the technical specifications", points will be awarded in proportion to the improved performance.

Verification: A certificate signed by the manufacturer declaring compliance with these requirements shall be submitted to the awarding competent body, together with the relevant documentation. Testing shall be performance in accordance with EN 12102. The test report shall be submitted with the application.

12. Plastic parts

Additional points will be awarded if plastic parts meet the following criteria:

d. If any plasticiser substance in the manufacturing process is applied, it must comply with the requirements on hazardous substances set out in the corresponding comprehensive criteria on hazardous substances.

e. Plastic parts of articles or homogeneous parts of complex articles with weight 50 g or more shall not contain a chlorine content greater than 50 % by weight.

f. Plastic parts with weight 50 g or more shall be labelled according to ISO 11469, in order to facilitate recycling.

Implementation note:

Award criteria: Contracting authorities will have to indicate in the contract notice and tender documents how many additional points will be awarded for each award criterion. Environmental award criteria should, altogether, account for at least 10 to 15 % of the total points available. Where the award criterion is formulated in terms of "better performance as compared to the minimum requirements included in the technical specifications", points will be awarded in proportion to the improved performance.

Verification: The applicant shall provide a declaration of compliance with this criterion, together with related documentation, such as declarations of compliance signed by the suppliers of substances and copies of relevant Safety Data Sheets. The applicant shall provide information on the plasticisers used in the product. The applicant shall provide information on the maximum chlorine content of the plastic parts. A declaration of compliance signed by the plastic and biocides suppliers and copies of relevant safety data sheets about materials and substances shall also be provided to the awarding competent body. All biocides used shall be clearly indicated. The applicant shall provide information on the intentionally added substances used as flame retardants.

13. Product design for sustainability

Additional points will be awarded if the product meets criteria on:

- Promotion of reuse, recycling and generally sound end-of-life management
- Product quality/usability and lifetime extension

Implementation note:

Award criteria: Contracting authorities will have to indicate in the contract notice and tender documents how many additional points will be awarded for each award criterion. Environmental award criteria should, altogether, account for at least 10 to 15 % of the total points available.

Where the award criterion is formulated in terms of "better performance as compared to the minimum requirements included in the technical specifications", points will be awarded in proportion to the improved performance.

Verification: Products holding a relevant Type 1 Ecolabel or that demonstrate compliance with relevant Type 1 Ecolabel criteria will be deemed to comply. Other appropriate means of proof will also be accepted.

If following the EU Ecolabel for heating generators, the verification is as follows:

A certificate signed by the manufacturer declaring compliance with these requirements shall be submitted to the awarding competent body, together with the relevant documentation.

CONTRACT PERFORMANCE CLAUSES

The following instructions should be provided by the manufacturer or supplier for **central hydronic heating generators:**

Sales information:
The buyer must be provided with guidance and information on the energy consumption of the system and how this can be limited. Information must also be provided on the availability of manageable circulation pumps, which will reduce the system's own electricity consumption considerably.

Installation Instructions:
In a separate, clearly-marked section the installation instructions must provide details on what air pollution values the flue gas must have during the operating phase (see the section on emissions to the atmosphere) and how the burner can be adjusted in order to achieve this.

The installation instructions must as a minimum contain the following:

1. The burner must be adjusted with the aid of measuring gauges for measuring CO, O_2 or CO_2, NO_x, temperature and soot to ensure that none of the threshold values provided for in the section on air pollution are exceeded.

2. Holes must be made for measuring gauges in the same location as used in laboratory testing, i.e. between the boiler and the chimney.

3. Measurement results must be recorded in a special form or diagram, one copy of which is retained by the end user.

4. Burners must be installed by fitters who have been fully trained in accordance with the requirements in the selection criteria outlined above.

5. In the case of technology involving low flue gas temperatures (< 120°C), the system must be equipped with corrosion retarding technology (applies only to oil burner/boiler combinations). Recommendation that the chimney ought to be protected against condensate with low pH, e.g. by neutralization of the condensate

6. After the installation of the boiler, its control settings ("heating curve") are to be adjusted properly.

Information must also be provided on who the fitter can approach for guidance on installation.

The information specified in the installation instructions must also be clearly shown in the operating instructions.

Instructions for use for the buyer / end user

The information for the end user must be clear and comprehensible. It must provide information on:

1. The importance of regular service and maintenance and the use of the correct type of fuel oil, natural gas or oil or, if applicable, gas made from renewable energy, stating the type recommended to achieve economical operations and lower energy consumption, low emissions and a long useful life for the appliance.

2. Guidance on service and maintenance and what work can be performed by the end user and what work must not be attempted by the end user.

3. What demands the end user should make of service personnel in order to ensure that the service provided is of good quality. This includes ensuring that the service personnel have the correct measuring equipment and have received training in the installation and operation of burners.

4. That energy consumption and emissions can be reduced by means of automatic feed temperature adjustment.

5. How the measured values should be interpreted and how they can be improved, if applicable. Ranges of values must be provided for what are acceptable and unacceptable emission levels. In the case of burners, a range of up to 20 % of the threshold value is regarded as acceptable. This does not apply at the time of installation, only at subsequent services.

6. Information on electricity demand for burner/boiler combination.

7. A request that burner and boiler be delivered to a recycling centre after the end of their working life and not dumped outside of an approved waste management facility.

8. Oil-fired installations: End users should be urged to have their oil tank checked to avoid leakages into the ground.

9. Addresses and telephone numbers at which the buyer can seek further information and details of trade organisations or other sources of information.

Verification: Declarations shall be provided as written proof by the supplier to the contracting authority.

The following instructions should be provided for **solid biomass boilers**:

Installation manual:

The installation manual shall contain technical data about the boiler.

The manufacturer shall notify that a hot-water tank must be installed with a manual feed boiler.

Information on the required size of water tank shall be included.

The manufacturer/reseller must recommend qualified fitters in the installation manual, marketing material or in some other way. The installation manual must clearly state the importance of installation being performed by a qualified technician as instructed. The installation instructions shall cover:

- Necessary volume of air for combustion.
- Distance from combustible materials.
- Space required for operation, maintenance and chimney sweeping.
- Type of gas flue to which the boiler can be connected with regard to flue gas temperature, height and area.

- Instructions for the design of fuel storage.

Other necessary installation information according to EN 303-5 must be included.

Information on the heat contribution that the heating system can provide.

Operating and maintenance instructions:

The manufacturer must ensure that the customer is supplied with operating and maintenance instructions. These shall include:

- The type of fuel used during testing.
- A description of how various fuels affect output and emissions.

- Recommendations as to the grade, size and moisture content of wood fuel.
- Handling and storage recommendations for the biofuel.
- Lighting instructions.
- Stocking instructions.
- Cleaning instructions and checks.

Verification: Products holding a relevant Type 1 Ecolabel or that demonstrate compliance with relevant Type 1 Ecolabel criteria will be deemed to comply. Other appropriate means of proof will also be accepted.

Finally, for all types of heating generators:

The manufacturer shall ensure availability of spare parts for 10 years for the boiler, starting from the date of purchase.

Verification: The manufacturer shall provide credible proof that this clause will be met.

3.3. Explanatory Notes

1. The contracting authority should ensure that the heating generator they are proposing to purchase meets any necessary law and regulations in the area and country that it will be used. This may include, but not be limited to laws and regulations relating to planning, environment and safety.

2. The system should be designed with adequate control systems to ensure temperature and heating demand can be controlled sufficiently to meet local requirements.

3. 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.

4. Where fully or suitably trained staff are required to be used the contracting authority should ensure they are satisfied this requirement is met by requesting training records, details of experience, formal qualifications as appropriate. The requirements may vary between different Member States.

5. Award criteria: Contracting authorities will have to indicate in the contract notice and tender documents how many additional points will be awarded for each award criterion. Environmental award criteria should, altogether, account for at least 10 to 15 % of the total points available.

4. Cost Considerations

In the development of Green Public Procurement 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 (using a life-cycle perspective) 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.

Heating generators 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 minimal part of the total life-cycle cost of the products. A number of available studies on cost considerations in GPP[22] have also 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[23] presents a detailed life-cycle cost analysis of heating generators, and a summary of key conclusions is presented here.

The total life-cycle costs of the different heating generator options (including purchase, maintenance and running costs) are found to be very susceptible to current energy costs. In

[22] "Costs and Benefits of Green Public Procurement in Europe", Öko-Institut e.V. and ICLEI, 2007

[23] In: "Development of European Ecolabel and Green Public Procurement Criteria for Hydronic Central Heating Generators. Draft Report. Product definition, market analysis and technical analysis " (June 2011), http://susproc.jrc.ec.europa.eu/heating/stakeholders.html

particular, some studies[24] have shown that governmental decisions on energy tariffs may render a boiler option from positive economic effects to negative economic effects. Especially electric heat pumps and cogeneration boilers appear sensitive to such effects.

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

Specific data on life cycle costs for different heating generators evaluated can be found in Part 3.3 ("Improvement potential") of the technical background report available at the project website[25]. Table 2 (from the technical report) gives the life cycle costs at LLCC and BAT levels. It shows savings at LLCC level of up to 16% for the smaller size classes (up to L) and 30-46% for the largest sizes. 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.

Table 2. Life cycle costs and savings LLCC- and BAT- levels versus base case level.

Size-Class	**BaseCase lifecycle costs**	**LLCC lifecycle costs**	**BAT lifecycle costs**	**LLCC** savings	**LLCC saving in %**	**BAT saving**	**BAT Savings in %**
XXS	€ 9.085	€ 8.716	€ 10.943	€ 369	4%	-€ 1.858	-20%
S	€ 14.172	€ 12.313	€ 13.352	€ 1.859	13%	€ 820	6%
M	€ 18.750	€ 15.797	€ 16.859	€ 2.953	16%	€ 1.891	10%
L	€ 24.119	€ 20.259	€ 21.262	€ 3.860	16%	€ 2.857	12%
XL	€ 57.697	€ 37.851	€ 38.668	€ 19.846	34%	€ 19.029	33%
XXL	€ 108.111	€ 65.623	€ 73.738	€ 42.488	39%	€ 34.373	32%
3XL	€ 272.770	€ 164.057	€ 190.187	€ 107.943	40%	€ 81.813	30%
4XL	€ 904.288	€ 487.237	€ 495.964	€ 417.051	46%	€ 408.324	45%
Calculated with Ecoboiler Integrated model version 5a							

The BAT (Best Available Technology) or BNAT (Best Not yet 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.

[24] magazine VV+, March 2010, p.178
[25] In: "Development of European Ecolabel and Green Public Procurement Criteria for Hydronic Central Heating Generators. Draft Report. Product definition, market analysis and technical analysis ", June 2011, http://susproc.jrc.ec.europa.eu/heating/stakeholders.html

- The energetic benefits are highly dependent on the climate, especially with air-based heat pumps and of course with solar energy.
- As a result of the above, the pay-back time will vary widely per country and circumstance.

Even larger savings are possible by adding complementing equipment: thermostats with better response can improve the central heating efficiency by optimizing the boiler heat output to the (expected) heat demand, heat pumps using ambient heat and/or solar thermal systems reduce the fossil fuel or electric energy input. The model was extended to incorporate these technologies as well. More detailed cost data can be found in the technical background report.

5. Relevant EU legislation and information sources

5.1. EU legislation

· The Energy Performance of Buildings Directive (EPBD) 2002/91/EC
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:001:0065:0071:EN:PDF

· Directive to limit carbon dioxide emissions by improving energy efficiency (SAVE) 93/76/EEC
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31993L0076:EN:HTML

· Directive on Waste Electrical and Electronic Equipment (WEEE) 2002/96/EC:
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32002L0096:EN:HTML

· Directive on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment 2002/95/EC:
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32002L0095:EN:HTML

· Low Voltage Directive (LVD) 73/23/EEC
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31973L0023:EN:HTML

· Electromagnetic Compatibility Directive (EMC) 2004/108/EC
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:390:0024:0037:EN:PDF

· Directive on the Eco-design Requirements for Energy-related Products (ErP) 2009/125/EC
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2005:191:0029:0058:EN:PDF

· Council Directive 93/68/EEC of 22 July 1993 amending Directives 87/404/EEC (simple pressure vessels), 88/378/EEC (safety of toys), 89/106/EEC (construction products), 89/336/EEC (electromagnetic compatibility), 89/392/EEC (machinery), 89/686/EEC (personal protective equipment), 90/384/EEC (non-automatic weighing instruments), 90/385/EEC (active implantable medicinal devices), 90/396/EEC (appliances burning gaseous fuels), 91/263/EEC (telecommunications terminal equipment), 92/42/EEC (new hot-water boilers fired with liquid or gaseous fuels) and 73/23/EEC (electrical equipment designed for use within certain voltage limits)
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31993L0068:EN:HTML

· Energy Labelling Framework Directive (ELD) 92/75/EEC
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31992L0075:EN:NOT

· The Construction Products Directive (CPD) 89/106/EEC
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31989L0106:EN:HTML

- Boiler Efficiency Directive (GAD) 92/42/EEC
  http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31992L0042:EN:HTML

- The Gas Appliance Directive (GAD) 90/396/EEC
  http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31990L0396:EN:HTML

- Machinery Directive 98/37/EC
  http://europa.eu/eur-lex/pri/en/oj/dat/1998/l_207/l_20719980723en00010046.pdf

- Pressure Equipment Directive (PED) 97/23/EC
  http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31997L0023:EN:HTML

- Directive on Packaging and Packaging Waste 94/62/EC
  http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31994L0062:EN:HTML

- Commission Decision (97/129/EC) of 28 January 1997 establishing the identification system for packaging materials pursuant to European Parliament and Council Directive 94/62/EC on pack
  http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31997D0129:EN:HTML

- REACH Regulation EC 1907/2006
  http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:396:0001:0849:EN:PDF

- Fluorinated Gases Regulation EC 2037/2000
  http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32000R2037:EN:NOT

- Directive on the Promotion of Energy from Renewable Energy Sources
  http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0016:0062:EN:PDF

- Action Plan for Energy Efficiency: Realising the Potential COM(2006) 545 final
  http://ec.europa.eu/energy/action_plan_energy_efficiency/doc/com_2006_0545_en.pdf

5.2. Ecolabels and other criteria sources

- Blue Angel
  http://www.blauer-engel.de/
  RAL-UZ 39 Special Gas Boilers
  RAL-UZ 41 Combined Burner and Boiler units equipped with Gas Burner and Fan
  RAL-UZ 46 Combined oil-burner and boiler units
  RAL-UZ 61 Low-emission and Energy-saving Gas-fired Calorific-Value Heating Devices
  RAL-UZ 112 Wood Pellets Boilers

- Nordic swan
  Boilers and burners for liquid and gas fuels
  http://www.svanen.nu/Default.aspx?tabName=CriteriaDetailEng&menuItemID=7056&pgr=7

  Solid biomass boilers
  http://www.svanen.nu/Default.aspx?tabName=CriteriaDetailEng&menuItemID=7056&pgr=60

- Energy star
  http://www.energystar.gov/ia/partners/product_specs/eligibility/boilers_elig.pdf

- SEDBUK
  www.sedbuk.com

· Central Heating System Specification (CHeSS) Year 2005
http://www.energysavingtrust.org.uk/uploads/documents/housingbuildings/CE51%20Final.pdf