Combined Heat and Power – Green Public Procurement Product Sheet

Green Public Procurement (GPP) is a voluntary instrument. This Product Sheet provides a summary of the GPP criteria developed for the Combined Heat and Power (CHP) product group. The 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 best products available on the market. These may require additional verification effort or a slight increase in cost compared to other products with the same functionality.

Within the core and comprehensive criteria, the guidance follows the various stages of a public procurement procedure and explains how best to integrate environmental criteria at each stage:

- Subject matter. It means the title of the tender, i.e. a short description of the product, works or service to be procured.
- Technical Specifications. Provide a clear, accurate and full description of the requirement and standard to which goods, works or services should conform. Description of the minimal technical specifications which all bids need to comply with. Set specific environmental criteria, including hurdles and levels that need to be met for specific products.
- Selection Criteria. It is based in the capacity / ability of the bidders to perform the contract. Assist in the identification of appropriate suppliers, for example to ensure adequately trained personnel or relevant environmental policies and procedures are in place.
- Award Criteria. The award criteria on the basis of which the contracting authority will compare the offers and base its award. Award criteria are not pass/fail criteria, meaning that offers of products that don't comply with the criteria may still be considered for the final decision, depending on their score on the other award criteria.
- Contract Performance Clause - Specify the conditions that must be met in the execution of the contract, for example as to how the goods or services are to be supplied, including information or instructions on the products to be provided by the supplier.

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

Where the verification for the criteria states that other appropriate means of proof can be used, this could include a technical dossier from the manufacturer, a test report from a recognised body, or other relevant evidence. The contracting authority will have to satisfy itself on a case by case basis, from a technical/legal perspective, whether the submitted proof can be considered appropriate.

1. Definition and Scope

The scope for the purposes of this GPP specification is defined further using the Cogeneration Directive as a basis. For the purposes of this GPP specification cogeneration is defined as 'the simultaneous generation of thermal energy and electrical and/or mechanical energy'. The criteria are applicable to cogeneration units, which shall mean a unit that can operate in cogeneration mode.

Where the criteria refer to different sizes of cogeneration unit i.e. small or micro, the following definitions shall apply:

- Micro cogeneration unit shall mean a cogeneration unit with a maximum capacity below 50 kWe.
- Small Scale Cogeneration shall mean cogeneration units with an installed capacity below 1 MWe.

The full range of CHP scales are included because of the likely GPP purchase of CHP plant by government organisations for the types of application listed in the background report. As well as the public sector buildings, such as schools and hospitals, CHP may also be purchased for smaller buildings, such as individual community housing or for district heating schemes at a range of scales.

It is important when deciding whether to choose CHP or not that the economically justifiable heat demands is taken into consideration as well as the electricity demand. The contracting authority should consider if there is sufficient heat demand to warrant CHP and also analyse the advantages and disadvantages of other options e.g. grid electricity before choosing CHP.

The electricity and heat outputs can also be used for cooling, however the cooling itself is not a direct output from the CHP plant, and is therefore not included or considered further in this GPP criteria. For example the heat generated from the CHP plant can be used to drive an absorption cooling unit or an air conditioning unit however, the effectiveness of the cooling will be a factor of the actual cooling unit and not the CHP plant. GPP criteria have been developed for air conditioning as part of a separate product group.

2. Key Environmental Impacts

The usual, main environmental benefit of CHP is in reduced fuel use compared to the conventional situation of separate electricity and heat generation, although it is not possible to avoid GHG emissions.

- Therefore the core criteria focus on overall energy efficiency and the associated primary energy savings.

- The comprehensive criteria, including award criteria, promote the development of primary energy saving (PES) beyond the minimum requirements and plant that go beyond the minimum requirements in terms of air emissions.

Key Environmental Impacts	GPP Approach
• Impact related to the extraction of fossil fuels • Increased fuel consumption in separate energy and heat production • Emission of carbon dioxide from the generation of energy and heat • Pollution of air from other emissions to air e.g. CO, NOx, SO, dust	• Promote the use of CHP units that convert fuels into heat and power with a maximum efficiency to save resources and to minimise greenhouse gas emissions • Promote the use of CHP that produce low emissions of air pollutants • Promote CHP, to reduce fossil fuel consumption when compared with the separate production of energy and heat • Use of high efficient CHP to contribute towards reductions in carbon dioxide emissions • Promote the use of CHP that produce low emissions of air pollutants • Encourage the use of high efficient CHP beyond the legislative requirements

Please note that the order of impacts does not necessarily translate to the order of their importance.

3. GPP Criteria for Combined Heat and Power

3.1. Core GPP Criteria for Combined Heat and Power

SUBJECT MATTER
The purchase of efficient Combined Heat and Power equipment or plant.
TECHNICAL SPECIFICATIONS
1. To ensure efficient conversion of energy into heat or electricity, the unit shall have a minimum overall efficiency[1] of 75% in accordance with Annex II(a)(i) or 80% in accordance with Annex II(a)(ii),if primary energy savings is calculated in accordance with Annex III(b) or above 70%, if primary energy saving is calculated according to Annex III(c) for CHP plants with an electrical capacity larger than 25 MW in accordance with Article 12(2). [2] **Verification:** The bidder[3] shall provide written proof that the plant meets the required criteria for high efficiency CHP.

[1] 'overall efficiency' shall mean the annual sum of electricity and mechanical energy production and useful heat output divided by the fuel input used for heat produced in a cogeneration process and gross electricity and mechanical energy production

[2] All references to Annexes and Articles in this criterion relate to the Cogeneration Directive

[3] "Bidder" can be taken to mean the equipment supplier in the case of a packaged product or it may mean the project developer where the supplier of the combustion unit is not liable for the performance of the final installation. Verification should be sought from the most appropriate depending on the specific circumstances.

2. The CHP plant shall meet the requirements of high efficiency CHP as defined in the Cogeneration Directive (2004/8/EC) and outlined as follows:

- CHP units with an installed capacity of below $1MW_e$ must demonstrate positive energy savings compared to the separate production of heat and electricity using harmonised reference values. For micro-cogeneration units below 50 KWe the calculation of the primary energy saving may be based on certified values.
- CHP units with an installed capacity of above $1MW_e$ must demonstrate primary energy savings of at least 10 % compared to the separate production of heat and electricity using harmonised reference values[4].

Verification: Primary energy savings shall be demonstrated using the methodology outlined in Annex III of the Cogeneration Directive. The bidder shall provide written confirmation that this criteria will be met and under which specific operating conditions. For micro-cogeneration units certified data may be used.

3.2. Comprehensive GPP Criteria for Combined Heat and Power

SUBJECT MATTER

The purchase of efficient Combined Heat and Power equipment or plant.

TECHNICAL SPECIFICATIONS

1. To ensure efficient conversion of energy into heat or electricity, the unit shall have a minimum overall efficiency of 75% in accordance with Annex II(a)(i) or 80% in accordance with Annex II(a)(ii)[5],if primary energy savings is calculated in accordance with Annex III(b) or above 70%, if primary energy saving is calculated according to Annex III(c) for CHP plants with an electrical capacity larger than 25 MW in accordance with Article 12(2). [6]

Verification: The bidder shall provide written proof that the plant meets the required criteria for high efficiency CHP.

2. The CHP plant shall meet the requirements of high efficiency CHP as defined in the Cogeneration Directive (2004/8/EC) and outlined as follows:

- CHP units with an installed capacity of below $1MW_e$ must demonstrate positive energy savings compared to the separate production of heat and electricity using harmonised reference values. For micro-cogeneration units below 50 KWe the calculation of the primary energy saving may be based on certified values.
- CHP units with an installed capacity of above $1MW_e$ must demonstrate primary energy savings of at least 10 % compared to the separate production of heat and electricity using harmonised reference values

Verification: Primary energy savings shall be demonstrated using the methodology outlined in Annex III of the Cogeneration Directive. The bidder shall provide written confirmation that this criteria will be met and under which specific operating conditions. For micro-cogeneration units below 50 KWe, certified values may be

[4] The harmonised reference values allow a comparison of cogeneration with the best performing techniques using the same fuels for the separate production of heat and power.

http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:032:0183:0188:EN:PDF

[5] All references to Annexes and Articles in this criterion relate to the Cogeneration Directive

[6] 'overall efficiency' shall mean the annual sum of electricity and mechanical energy production and useful heat output divided by the fuel input used for heat produced in a cogeneration process and gross electricity and mechanical energy production

used.
AWARD CRITERIA
1. Additional points shall be awarded in proportion to the extent that the CHP plant exceeds the primary energy saving criteria outlined in Technical Specification 2. **Verification:** Declarations shall be provided as written proof by the bidder to the contracting authority.
2. Additional points shall be awarded in proportion to the extent that the CHP plant exceeds the relevant minimum requirements in relation to air emissions from exhaust gases. **Verification:** The bidder shall provide a technical dossier of the manufacturer or a test report from a recognized body[7] to demonstrate compliance with this award criterion.
3. Additional points shall be awarded in proportion to the extent that the CHP plant exceeds the overall efficiency criteria outlined in Technical Specification 1. **Verification:** Declarations shall be provided as written proof by the bidder to the contracting authority.

3.3. Explanatory Notes

1. The contracting authority shall have regard to local circumstances (building types and sizes, heating and energy demand, potential fuel sources etc) and undertake a market survey to determine the best available technology for to meet their identified need. The CHP plant should as a minimum meet the requirements of the Cogeneration Directive in terms of efficiency and primary energy savings and have been selected to meet most, if not all, of the site's heat and electricity demands. It is important when deciding whether to choose CHP or not that the economically justifiable heat demands is taken into consideration as well as the electricity demand. The contracting authority should consider if there is sufficient heat demand to warrant CHP and also analyse the advantages and disadvantages of other options e.g. grid electricity before choosing CHP.

2. The contracting authority needs to ensure that where PES meet the core criteria, that they are satisfied the operating conditions for the CHP plant will match those used by the supplier when calculating the PES. It is therefore important to ensure the supplier provides full details of the operating conditions and the amount of electricity produced by high efficient CHP used for the PES calculation. The PES calculation should use the implementation guidelines for the calculation of electricity established by Commission Decision 2008/952/EC[8].

3. To maximise the benefits of CHP plant the contracting authority should ensure that appropriate energy efficiency increasing measures are implemented, for example thermal insulation.

4. 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.

[7] A recognised body would include an appropriate test house, with the required expertise/accreditations for undertaking the relevant emissions testing.

[8] Commission Decision establishing detailed guidelines for the implementation and application of Annex II to Directive 2004/8/EC.

5. The contracting authority shall ensure that the CHP plant meets the requirements of any European and National Legislation with respect to air emissions. European Legislation that may be directly relevant depending on the size and types of CHP plant purchased include the IPPC Directive, Large Combustion Plant Directive and the Waste Incineration Directive, however other legislation or Directive may also be applicable depending on the specific circumstances and location.

6. The contracting authority should ensure the noise impacts of the CHP plant are taken into account where applicable and that any local standards are met.

7. Examples of proof that may be acceptable include test reports, technical reports/dossiers or specifications

4. Cost Considerations

The initial investment in CHP can be significant and payback can take a number of years. Therefore in order to maximise cost savings resulting from the increased efficiency gained through the use of both electricity and heat generated the feasibility of the CHP plant needs to be fully assessed. In order to compare the cost of CHP in relation to other technology options it is important that the full life cycle costs of CHP and the alternative options are considered. This will include not only the investment costs, but also the operational, maintenance and de-commissioning/disposal costs.

The economic viability of a CHP plant will depend on the demand for heat and electricity. These two factors must be accurately assessed when looking into the feasibility of a CHP scheme to ensure the sizing of the plant is correct and thus ensure long-term viability. Where plant is sized incorrectly, for example where not all of the heat is utilised, the economic viability of the CHP scheme will be negatively affected.

The main running costs for CHP is the fuel input, therefore the longer term cost benefits of the plant will be greatly influenced by the cost of fuel, for example gas, which is still the predominant fuel type used in CHP. This is important when setting up a fuel supply contract and future increases need to be carefully considered to ensure the CHP plant will remain economically viable in the longer term.

Maintenance costs may also be an important cost consideration and will depend on the size and type of plant. It is important these are considered as the CHP plant will need to be maintained in accordance with the supplier instructions to ensure effective performance is maintained. If the plant does not operate at its optimum then the other benefits will be affected, for example primary energy savings.

To maximise savings in relation to the initial capital investment, running hours (and equivalent full load running hours) should be as long a possible, therefore sizing is important[9]. If the plant is idle this will reduce the potential savings. Effective maintenance will also ensure any downtime is minimised.

In order to give some examples, there are a number of CHP plant in the UK that have demonstrated significant costs savings. These are across a range of scales and used in a variety of different buildings.

[9] Combined Heat and Power for Buildings: Selecting, installing and operating CHP in buildings – a guide for building service engineers. (http://files.harc.edu/Sites/GulfCoastCHP/ProjectDevelopment/UKGoodPracticeGuide.pdf)

Table 1: Summary of CHP plant and cost savings[10]

York University	Campus buildings	1995	1030 kW_e engine	€187,500	4
London Borough of Enfield	Southbury Leisure Centre	2002	80 kW_e micro turbine	€15,000 (projected)	6 (projected)
Freeman Hospital, Newcastle	Acute services hospital	1997	2 x 1.35 MW_e spark ignition engines	€337,500	N/A
Southampton City Council	Various large public and commercial buildings – community heading	1998	5.7 MW_e engine	€312,500 11,000 tonnes of CO_2	N/A

In addition to these UK examples, COGEN has provided details of some smaller scale projects. These also demonstrate savings that can be made and pay back times[12].

Vlagtwedde (NL)	Living and working quarters	2008	5.5 kWe	€3700 cost reduction	Pay back time 4 years
Schiphol airport	Ibis Hotel	2007	130 kWe	€75,000 cost reduction	Payback time <3 years

5. Relevant EU legislation and information sources

5.1. EU legislation

- Directive 2004/8/EC on the promotion of cogeneration based on useful heat demand in the internal energy market and amending Directive 92/42/EEC http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:052:0050:0060:EN:PDF

- Decision 2007/74/EC of 21 December 2006, establishing harmonised efficiency reference values for separate production of electricity and heat in application of Directive 2004/8/EC of the European Parliament and of the Council http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:032:0183:0188:EN:PDF

- Commission Decision (2008/952/EC) of 19 November 2008 establishing detailed guidelines for the implementation and application of Annex II to Directive 2004/8/EC http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:338:0055:0061:EN:PDF

10 http://www.lboro.ac.uk/service/estates/pages/downloads/GPG388.pdf
11 Savings have been converted from Pounds Sterling to Euros using an exchange rate of € 1.25 to £1
12 http://www.miniwkk.info/referenties/
13 Savings have been converted from Pounds Sterling to Euros using an exchange rate of € 1.25 to £1

- Energy Performance of Buildings Directive (EPBD) 2010/31/EU
  http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:153:0013:0035:EN:PDF

- Directive 2003/54/EC concerning common rules for the internal market in electricity and repealing Directive 96/92/EC
  http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:176:0037:0055:EN:PDF

- Directive 2009/72/EC concerning rules for the internal market in electricity and repealing Directive 2003/54/EC
  http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:211:0055:0093:EN:PDF

- Directive on the Promotion of Energy from Renewable Energy Sources 2009/28/EC
  http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0016:0062:en:PDF

- Directive 2008/1/EC concerning integrated pollution prevention and control (Codified version)
  http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:024:0008:0029:EN:PDF

- The Classification, Packaging and Labelling of Dangerous Substances Directive 67/548/EEC
  http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31967L0548:EN:HTML

- The CLP Regulation (EC) No 1272/2008
  http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:353:0001:1355:en:PDF

- Directive on the Energy End-use Efficiency and Energy Services 2006/32/EC
  http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:114:0064:0064:en:pdf

- Resolution on the communication from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions on a Community strategy to promote combined heat and power (CHP) and to dismantle barriers to its development (COM(97)0514 - C4-0596/97)
  http://www.europarl.europa.eu/pv2/pv2?PRG=CALDOC&TPV=DEF&FILE=980515&SDOCTA=7&TXTLST=1&POS=1&LASTCHAP=7&Type_Doc=FIRST&LANGUE=EN

- Communication from the Commission to the European Council and the European Parliament – An Energy Policy For Europe (COM(2007)1)
  http://ec.europa.eu/energy/energy_policy/doc/01_energy_policy_for_europe_en.pdf

- Directive establishing a framework for the setting of Ecodesign Requirements for Energy-related Products 2009/125/EC:
  http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:285:0010:0035:en:PDF

5.2. Ecolabels and other criteria sources

- Blue Angel – Small-Scale Gas-Fired Cogeneration Modules RAL-UZ 108
  http://www.blauer-engel.de/englisch/vergabe/download_uz_e/e-UZ-108.pdf

- Blue Angel – Small-Scale Liquid-Fired Cogeneration Modules RAL-UZ 109

http://www.blauer-engel.de/englisch/vergabe/download_uz_e/e-UZ-108.pdf

- UK CHPQA Scheme
  http://www.chpqa.com/