



HELLENIC REPUBLIC
MINISTRY FOR THE ENVIRONMENT
ENERGY AND CLIMATE CHANGE

Study for the Establishment of a CHP Guarantee of Origin System for Greece

The Options

February 2010

Executive summary

The overall objective of the Cogeneration Directive 2004/8/EC published on the 11th February 2004 is to increase energy efficiency and improve security of supply in the EU by creating a framework for the development of high efficiency cogeneration (or Combined Heat & Power 'CHP' as it is more commonly known). The Directive sets criteria to define high efficiency cogeneration, and makes provision for public support and to ensure fair access to markets for electricity from cogeneration.

Article 5 of the Directive provides for the issue of Guarantees of Origin, which specify the amount of electricity from high efficiency cogeneration (CHPGOs). The purpose of a CHP GOs is primarily to increase transparency, so that customers for electricity generated in Member States, can differentiate between that generated by high efficiency combined heat and power and electricity produced using other techniques (power stations and on site generation).

This requirement of Article 5 to provide, on request, producers of high-efficiency CHP electricity with a Guarantee of Origin certificate presents an additional administrative burden on the Greek Government. Schemes for the GO do not themselves imply a right to benefit from national support mechanisms (Article 5 (4)). Thus the Greek Government has the choice of:

1. Creating a CHPGO system where the CHPGO certificate has no financial value and will be issued on request, or
2. Establishing a CHPGO where any incentives for High efficiency Cogeneration would be channelled through CHPGO certificates.

Schemes for the guarantee of origin do not by themselves imply a right to benefit from national support mechanisms and thus CHPGO does not have to have financial value.

In discussing the CHPGO implementation route in this report, options have been considered for the two key tasks, namely data submission and subsequent issuing and tracking of CHPGOs.

We would suggest that the most appropriate way forward for Greece would be to introduce a system whereby Companies submit CHP data to a Competent Body. This takes into account the cost of programme development and certification and that CHPGO certification is likely to be the route whereby public support for high efficiency CHP is determined. The Competent Body, would be responsible for CHPGO certification, following the extraction and validation of the appropriate data. A separate body would then issue the CHPGO as an electronic certificate, probably adopting the European Energy Certificate System through joining the Association of Issuing Bodies (AIB). The option of the producer/generator determining the data required for the CHPGO and then submitting to the Competent Body is not recommended as, though cheaper, could lead to more chance of error and devaluing the reputation of the CHPGOs both inside and outside of Greece.

This report was prepared by AEA Technology UK, on behalf of and in co-operation with CRES. It outlines the options that the Greek Government is considering in introducing a CHPGO System. It also addresses the application procedure in terms of forms and guidance required.

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1. Introduction

The EU Directive 2004/8/EC on the promotion of cogeneration based on a useful heat demand in the internal energy market ("the Cogeneration Directive") entered into force on 21 February 2004. Member States were required to transpose its requirements into national law by 21 February 2006.

The Directive requires Member States to:

- 1) Promote high efficiency CHP wherever an economically justified potential is identified
- 2) Have a framework supporting installation and proper functioning of CHP
- 3) Analyse technical and economically viable potential and barriers (every 4 years).
- 4) Monitor and report on progress towards potential (annual task) and also to, which is the driver for this report,
- 5) Establish Guarantee of Origin (CHPGO) system

The purpose of this Directive¹ is to increase energy efficiency and improve security of supply by creating a framework for the promotion and development of high-efficiency cogeneration based on useful heat demand and primary energy savings in the internal energy market. It takes into account the specific national circumstances especially concerning climatic and economic conditions.

Under its Article 5, producers of electricity have the right to request a Guarantee of Origin certifying that electricity is produced from high-efficiency cogeneration, or CHP (combined heat and power) as it is more usually called in Greece and much of Europe. Member States should have ensured that this right could be exercised no later than 6 months after the harmonised efficiency reference values² were established (published in the Official Journal of the European Union (OJEU) on 21st December 2006) and must administer the CHPGO system themselves, or by means of bodies independent of generation.

The Directive contains 4 Annexes.

The cogeneration technologies covered by the Directive are listed in its Annex I:

ANNEX I

Cogeneration technologies covered by this Directive

- (a) Combined cycle gas turbine with heat recovery
- (b) Steam backpressure turbine
- (c) Steam condensing extraction turbine
- (d) Gas turbine with heat recovery
- (e) Internal combustion engine
- (f) Microturbines
- (g) Stirling engines
- (h) Fuel cells
- (i) Steam engines
- (j) Organic Rankine cycles
- (k) Any other type of technology or combination thereof falling under the definition laid down in Article 3(a)

¹ <http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:052:0050:0060:EN:PDF>

² http://www.energy.eu/directives/I_03220070206en01830188.pdf

and the detail on how to determine the quantity of electricity from cogeneration are laid down in Annex II (see Appendix 1 of this report) based the expected or actual operation of the unit under normal conditions of use (for microchip, the calculation may be based on certified values). The EU has published Guidelines³ clarifying the procedures and definitions laid down in Annex II to Directive 2004/8/EC.

The Guarantee of Origin must also specify the primary energy savings calculated in accordance with Annex III based on the harmonised efficiency reference values established by the Commission (see Appendix 2 of this report).

In order to be in full compliance with the EU Cogeneration Directive 2004/8/EC, Greece will have to introduce legislation to implement Article 5 of Directive, through secondary legislation in the form of a 'Statutory Instrument'⁴- attached here in an Appendix with an example from the UK, determine the appropriate mechanism for issuing CHP GO certificates and then put arrangements in place for their issue. The availability of GOs will enable customers for electricity to differentiate between electricity generated by high-efficiency CHP and electricity produced using other generation techniques.

The Centre for Renewable Energy Sources and Energy Saving (CRES) has been tasked by the Greek Government to take this forward and have sought assistance from AEA in doing so. CHPGOs are issued by the Competent Body of each Member State and mutually recognizable between countries. They do not by themselves imply any right to public support.

This report considers the options for implementation and establishment of a CHPGO for Greece taking into account the cost of programme development and certification. It covers the options available for both data submission and issuing and tracking CHPGOs, and proposes a way forward and addresses the application procedure in terms of the forms and guidance required.

³ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:338:0055:0061:EN:PDF>

⁴ http://www.opsi.gov.uk/si/si2007/uksi_20070292_en_1

2. What is a CHP Guarantee of Origin Certificate

Article 5 of the Directive outlines the background and requirement for GOs:

1) *On the basis of the harmonised efficiency reference values referred to in Article 4(1), Member States shall, not later than six months after adoption of these values, ensure that the origin of electricity produced from high-efficiency cogeneration can be guaranteed according to objective, transparent and nondiscriminatory criteria laid down by each Member State. They shall ensure that this guarantee of origin of the electricity enable producers to demonstrate that the electricity they sell is produced from high efficiency cogeneration and is issued to this effect in response to a request from the producer.*

2) *Member States may designate one or more competent bodies, independent of generation and distribution activities, to supervise the issue of the guarantee of origin referred to in paragraph 1.*

3) *Member States or the competent bodies shall put in place appropriate mechanisms to ensure that the guarantee of origin are both accurate and reliable and they shall outline in the report referred to in Article 10(1) the measures taken to ensure the reliability of the guarantee system.*

4) *Schemes for the guarantee of origin do not by themselves imply a right to benefit from national support mechanisms.*

5) *A guarantee of origin shall:*

— *specify the lower calorific value of the fuel source from which the electricity was produced, specify the use of the heat generated together with the electricity and finally specify the dates and places of production,*

— *specify the quantity of electricity from high efficiency cogeneration in accordance with Annex II that the guarantee represents,*

— *specify the primary energy savings calculated in accordance with Annex III based on harmonised efficiency reference values established by the Commission as referred to in Article 4(1).*

Member States may include additional information on the guarantee of origin.

6) *Such guarantees of origin, issued according to paragraph 1, should be mutually recognised by the Member States, exclusively as proof of the elements referred in paragraph 5. Any refusal to recognise a guarantee of origin as such proof, in particular for reasons relating to the prevention of fraud, must be based on objective, transparent and non-discriminatory criteria.*

7) *In the event of refusal to recognise a guarantee of origin, the Commission may compel the refusing party to recognise it, particularly with regard to objective, transparent and nondiscriminatory criteria on which such recognition is based.*

The CHPGO is an electronic certificate (or physical), which states, for the particular period of time requested, how much of the electricity generated by the CHP can be considered to be from 'high efficiency CHP' as defined by the Cogeneration Directive Annex II calculation. It also gives details of

the fuel used in the CHP and what the primary energy savings are compared to the separate generation of heat and electricity.

In summary, the certificate states:

- Quantity of electricity from high efficiency CHP (the detailed guidelines for the implementation and application of Annex II of the Directive were published in November 2008)
- Primary Energy Saving (PES) based on harmonised efficiency ref values (calculated using the Annex III method in the Directive)
- Lower Calorific Value (CV) of the fuel used to generate the electricity
- Use of electricity and heat generated
- Date and place where the generation occurs.

Appendix 4 provides further detail on the information to be contained in a CHPGO Certificate.

3. Options

3.1 Options considered

A Guarantees of Origin system comprises two key processes.

- a mechanism for a producer to submit data
- a mechanism for the issue of the Guarantee of Origin Certificate.

3.1.1 Data submission

Two options are considered for 'Data Submission' in the application process for a CHPGO.

Option A: Producer carries out full analysis and submits CHPGO data to the Competent Body (s) for verification and certification. This would require the Producer to:

- (a) Determine the quantity of CHP electricity, useful heat and energy inputs (fuel) in accordance with Annex II of the EU Cogeneration Directive and
- (b) Carry out a calculation of the Primary Energy Saving (PES) to determine the quantity of High Efficiency CHP Electricity in accordance with Annex III of the EU Cogeneration Directive.

Whilst asking the producer to carry out these calculations has the advantage that full responsibility lies with the applicant; there is the risk that other Member States will not consider the data, and thus the GO Certificate, reliable and accurate.

Option B: Producer submits operational data to Competent Body for analysis, validation and certification. The producer would be required to provide the electricity generated for the period being requested for the CHPGO along with other CHP scheme information (i.e. type and amount of fuel consumed, useful heat utilised etc.). An example of how a submission form might look like based on the UK form, is given in Appendix 5. The Competent Body would calculate the information required to issue the CHPGO (see Appendix 3) using Annex II and III methodology of the Directive as outlined in Option A. The resultant CHPGO would be issued by a separate Issuing Body, independent of electricity generation and issuing activities.

The main benefit of Option B would be to provide a system that is demonstrably accurate and reliable as required by the Directive. However it would be more expensive to the Greek Government as additional costs would be incurred by the Competent Body to carry out the calculation. This latter cost could, however, be passed on to the producer, if a charge were to be made for the issue of Guarantees of Origin.

This process would require an appeal system to be in place in case the producer wishes to challenge the analysis carried out by the Competent Body. The main risk is that the Greek Government could become liable if there is an error in the information on the CHPGO that leads to a financial loss for a project. This could be reduced if a right to appeal system were to be put in place to remove the liability. If used, this would, of course, impose an additional cost burden on the Government but if the right procedure is in place the appeals system would likely not need to be used.

Whilst not the least cost option, implementing Option B should maintain the integrity of the CHPGO and is the one recommended.

3.1.2 Issuing and Tracking CHPGOs

Two options are considered for issuing and tracking a CHPGO, namely the issuing of a physical certificate (Option A) or developing an electronic register (Option B). Whichever option is used, CHPGOs have to be accurate, resistant to fraud and be recognised by all Member States.

Option A: Using a physical certificate, it will be the responsibility of the producer to store and transfer the certificate as necessary. The CHPGO would only be transferred if the production site was sold to a new producer or electricity is exported to other sites in or outside of Greece. There is a risk that an appropriate authority cannot adequately track the movement or transfer of certificates. If the CHPGO had no monetary value, this risk would be small.

Option B: Building a new register requiring an online system with sufficient storage space to accommodate all CHPGOs, each with a unique identifier which ensures that can be tracked and transferred within the system. This will require producers to register and receive a secure log on.

Alternatively, an option worth considering is to carry out the proposed certification via the Association of Issuing Bodies (the AIB) for the purpose of exported High Efficiency Cogeneration electricity to other Countries in Europe. Member States and their designated competent bodies can join the AIB CHPGO system who can be contacted by e-mail at secgen@aib-net.org, or by phone on +44(0)1494 432323).

4. Costs

4.1 Costs to the scheme competent body

There will be costs associated with setting up the administrative procedures and providing guidance. In addition, if the Competent Body for the CHPGOs is to extract the data, there will be additional costs for doing this. It is generally thought best practice to recover costs where the benefit is to a defined party and is not mandatory. As this is the case for the issue of CHPGOs, which is at the request of producer, it is anticipated that the Greek Government will agree that producers can be charged. The charge would presumably aim to recover costs and would depend on the complexity of the scheme, with small CHP producers being charged significantly less than the large complex CHP producers.

4.2 Costs to the applicant

In addition to any costs charged by the Competent Body to the scheme for issuing a CHPGO Certificate, there will be costs in gathering together the information and completing the appropriate form.

There may also be additional costs to the producer associated with the installation of metering (fuel, electricity and heat).

However, the issue of a CHPGO is at the request of the producer and any costs will form part of the commercial decision to request one.

5. Enforcement and sanctions

It will be necessary to publicise the arrangements for CHP producers to obtain CHPGO for high-efficiency CHP generated electricity.

Enforcement is required to ensure that the CHPGO are reliable and accurate and accepted by other Member States.

As the option recommended for 'data submission' involves the Competent Body in calculating the information required to issue the CHPGO Certificates, the system should be demonstrably accurate and reliable, as required by the Directive.

If the CHPGO is to carry any monetary value, a system to fine producers that attempt to abuse the system will be required.

However, the Regulations should allow for revocation of CHPGOs, which were obtained on the basis of incorrect information.

6. Monitoring and review

Article 10 of the Directive lays out the requirements for Member States' reporting and this is where the majority of the cost to Government lies.

This Article states that Member States shall:

- Publish a report which, outlines the measures taken to ensure the reliability of the CHPGO system,
- Establish an analysis framework for assessing the national potential for the application of high-efficiency CHP
- Evaluate the existing legislative and regulatory frameworks with regard to authoritative procedures that are applicable to high-efficiency CHP and
- Provide an indication of the stage reached in managing and implementing the procedures.

This report is required every four years and will be produced by a Competent Body as part of the Directive transposition process.

7. Recommendations and Way Forward

The requirement of Article 5 to provide, on request, producers of high-efficiency CHP with a CHPGO presents an additional administrative burden on Greece.

Consideration has been given in this report to the options for the implementation of this Article.

The option chosen represents what the authors think is the most appropriate and involves an external body (a 'Competent Body') in calculating the information required to issue the Guarantee with an electronic certificate issued, with an Issuing Body being responsible for storing and issuing/transferring the certificate as necessary.

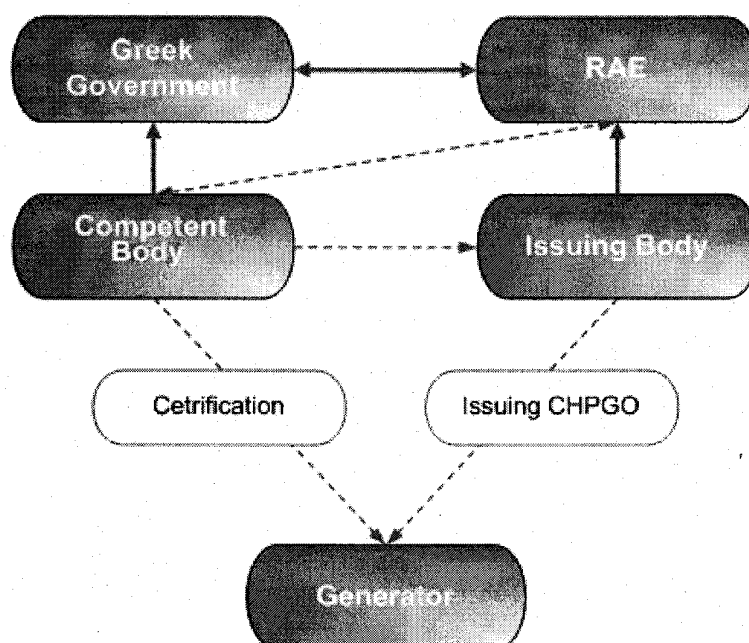
The Greek Government will possibly need to appoint a Competent Authority responsible for CHPGO certification. In other Member States, such as the UK, the appropriate Regulatory Authority is the 'Issuing Body'. In principle however, the issuing body is an organisation preferably independent of generation and distribution activities. In this sense the Greek Ministry of Environment, Energy and Climate change could keep this task.

The recommended way forward in terms of roles, responsibilities and procedures is outlined below:

7.1 Role of RAE

The RAE has overall responsibility for the development and the functioning of CHPGO on behalf of the Greek Government. Figure 1 shows the communications between the main stakeholders with the lines of communications between RAE, the Certifying and Issuing Bodies and with Industry. It is likely that information will be exchanged with other Government organisations, subject to provisions on confidentiality.

Figure 1 Main stakeholders in the CHPGO



7.2 Roles of the Competent Body

7.2.1 Structure

The Competent Body is appointed by the Government to manage and run CHPGO. They are responsible for the day-to-day functioning of the CHPGO submission and validation process, and issuing certificates that will be used as the basis for issuing the CHPGO.

The following roles form the elements of the Competent Body; one or more of these roles may be combined depending on the skills of the team.

- Programme Manager – to have overall management of CHPGO and to provide a point of contact with the Government Departments, RAE and other stakeholders, to help advise on CHPGO and to provide information to RAE. Manage the technical aspects of CHPGO, to provide advice on technical issues and to help in resolution of disputes.
- CHPGO Administrator – to manage the administrative elements of CHPGO. Provide a first point of contact with the public and to track subsequent contacts.
- CHPGO administrative staff
- CHPGO technical staff
- Database and data specialists
- Audit staff

7.2.2 Scope

The elements of CHPGO covered by the Competent Body are:

- Provision of CHPGO documentation (Application Guidelines; CHPGO Guidance Note, Application Form and other public domain documents)
- Processing and technical validation of CHPGO forms
- Preparation of certificates (the actual CHPGO will be issued by the 'Issuing Body')
- Site audits
- Handling CHPGO enquiries
- Resolution of disputes.

7.2.3 Responsibilities

- Put in place suitable quality assurance procedures.
- Maintain a website giving information on CHPGO and access to public domain documentation.
- Use appropriate electronic databases to record information received as part of the CHPGO scheme including:
 - record contact information for the Schemes
 - record information from the forms submitted for registration
 - perform the calculations necessary to assess the quality of the Schemes FOR CHPGO
 - output the information necessary to produce the CHPGO certification

- Set up a paper filing system to contain the forms submitted as part of CHPGO and any additional information generated.
- Set up a procedure for recording information to enable the processing of the forms to be tracked. Information to be recorded includes:
 - when forms are received;
 - when and by whom forms are processed including checks and entering data in the databases;
 - what actions are required, by when and by whom they are to be completed;
 - what communication there has been between CHPGO staff and the Scheme.
- Set up a procedure for planning and recording audits

All information received by the CHPGO Competent Body as part of that programme is Restricted / Commercial and should be clearly marked as such and procedures to ensure confidentiality should be used. Only the Government or its agents can use the information, for the sole purpose of CHPGO including collection and collation of national statistics.

7.2.4 Documentation

All Forms, Guidance Notes, and other documentation produced under CHPGO, should be in accordance with the CHPGO National Legislation, and shall be approved by Government and RAE. The procedure for provision of documentation in the public domain to Responsible Persons or to other interested parties is as follows:

- a) The CHPGO Competent Body should provide all CHPGO forms, Guidance Notes and other public domain documentation either electronically or in hard copy.
- b) The CHPGO Competent Body shall maintain a website from which the public domain documentation can be downloaded. The website should be updated periodically as and when new written material such as new guidance notes, updated versions of forms etc. have been generated and have passed through all the normal approval levels. New items will be highlighted to draw the user's attention to them.
- c) On request, hard copies of documents such as forms or Guidance Notes shall be sent to the Responsible Person or other interested party. In such cases the Competent Body staff shall aim to fulfil each request expediently and shall record the date on which the documentation was mailed or faxed to the Responsible Person or other interested party and the details of what documentation was sent.

7.2.5 Procedures for Validation and Certification

The principal steps in the submission and validation are outlined below and can be divided into five Parts:

- Part 1 Scheme Identification
- Part 2 Scheme Energy Inputs and Outputs
- Part 3 Enabling Information
- Part 4 Data for Determination of non-CHP Heat and Associated Fuel
- Part 5 Data for Determination of "Full-CHP" Power to Heat Ratio

Part 1 SCHEME IDENTIFICATION AND SITE INFORMATION

1 Scheme Identification

The site name, company name and the unique site and Scheme reference numbers (provided by the Competent Body), should be provided with the data submission..

2 Declaration

A signed declaration should be enclosed. This is a statement by the Responsible Person confirming the validity of the information provided. Any queries that arise should be taken up with the Responsible Person.

Part 2 SCHEME ENERGY INPUTS AND OUTPUTS

3. Period of Operation for Guarantee of Origin

The period of operation for CHPGO given should be between three and twelve consecutive months, dependent on the Producer's specified period for the requested CHPGO.

4. Energy Inputs

The fuel energy inputs should be based on net calorific value (lower calorific value). Fuel inputs in any "heat-only" fired boilers must be identified and tabulated separately from other energy inputs. Similarly, equivalent fuel inputs in any "heat-only" process waste heat boilers must be identified and tabulated separately from other energy inputs. In some cases fuel is provided on a gross calorific value basis and will need to be converted to its net calorific value.

5. Power Outputs

The power generated by the CHP Scheme (power is gross generated i.e. measured at the generator terminals) should be given.

6. Useful Heat Outputs

The useful heat supplied by the CHP Scheme should be recorded. Heat outputs as steam should be reported in line with the Directive's Guidelines for Annex II implementation and the published Harmonised Reference Values. Heat outputs from any "heat-only" fired boilers must be identified and tabulated separately from other heat outputs. Similarly, heat outputs from any "heat-only" process waste heat boilers must be identified and tabulated separately from other heat outputs.

Nb Adjustments for metering uncertainties are not required under the Cogeneration Directive.

Part 3 ENABLING INFORMATION

7. CHP Scheme Data

In order that the Competent Body can determine the appropriate reference values for the separate generation of power and heat to determine the primary energy saving under Annex III of the Cogeneration Directive the producer must also provide:

- Year of commissioning
- Grid connection voltage (kV)
- Proportion (%) of heat used indirectly (e.g. steam or hot water) or directly (e.g. exhaust gases)
- Details of Prime movers (e.g. Gas Turbine or Reciprocating Engine only; whether scheme includes condensing or extraction/condensing turbine)
- What the total power capacity of the scheme is.

8. Fuels Data

Where the information on fuel is provided on a gross calorific value basis, these should be converted to a net calorific value basis. This information, along with the mean moisture content (for solid fuels) of the fuel as fired, will be used by the Competent Body to confirm the energy inputs (based on net calorific values) given. If solid fuel is used the applicant should have provided a copy of their energy input analysis (i.e. conversion from mass to equivalent MWh).

Part 4 DATA FOR DETERMINATION OF NON-CHP HEAT AND ASSOCIATED FUEL

9. Scheme non-CHP Heat Declaration

The applicant should have stated whether the Scheme has non-CHP heat outputs. Non-CHP heat is a heat output that is not associated with power generation. The Scheme has non-CHP heat outputs if, for example there is:

- A supplementary or auxiliary fired heat recovery boiler within the scheme generates steam that does not ALL flow through a steam turbine or steam engine to generate electrical or mechanical power
- A fired boiler within the scheme generates steam that does not ALL flow through a steam turbine or steam engine to generate electrical or mechanical power
- A process heat recovery boiler within the scheme generates steam that does not ALL flow through a steam turbine or steam engine to generate electrical or mechanical power.

10. Schemes with Fired Boilers that Do Not Fully Contribute to CHP Power Outputs

The producer should provide data as appropriate for each fired boiler in the Scheme. A fired boiler that does not fully contribute to CHP power outputs is one whose steam does not ALL pass through a steam turbine or steam engine to generate electrical or mechanical power. The applicant should have provided data for each boiler covering the total fuel input and/or steam output for the whole of the period covered by the application for CHPGO.

11. Schemes with Supplementary or Auxiliary fired Heat Recovery Boilers that Do Not Fully Contribute to CHP Power Outputs

Data should be provided, as appropriate, for each heat recovery boiler with supplementary firing facility in the Scheme. The total fuel input and/or steam output for the whole of the period covered by the application for CHPGO should be provided.

Part 5 DATA FOR DETERMINATION OF "FULL-CHP" POWER TO HEAT RATIO

13. Schemes Without Power Loss and No Heat Rejection

Power loss is the trade-off in power output that would occur at constant fuel input for an increase in heat outputs for schemes that include pass-out or condensing steam turbines.

A scheme without power loss is one that does not include either partially (extraction) or fully condensing steam turbines. Heat rejection occurs where some of the exhaust gases from a gas turbine or reciprocating engine are dumped to atmosphere without passing through a heat recovery boiler or direct heated equipment such as a dryer.

For the purposes of analysis short-term heat rejection during start-up or shutdown are ignored. A scheme without heat rejection is one that does not dump exhaust gases, or engine jacket water in the case of reciprocating engines, without heat recovery in normal operation.

If the scheme has no power loss and no heat rejection no further data is required and the CHPGO Form is completed.

14. Schemes with Heat Rejection but No Power Loss

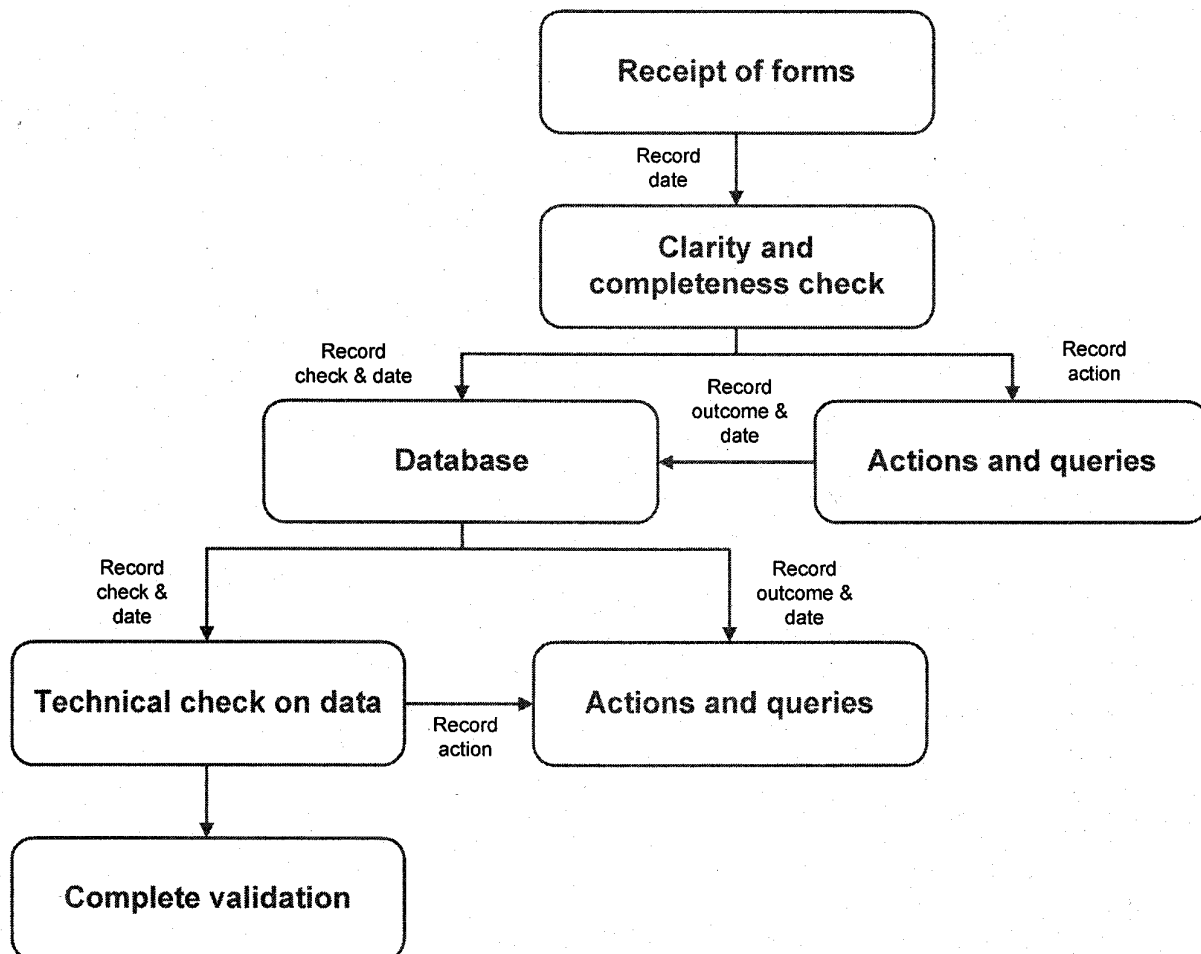
Data is required based on a test carried out over a period of at least two-hours with no heat rejection (i.e. exhaust gases and engine jacket water in the case of reciprocating engines, fully utilised). The test data and report should be included as an attachment to the CHPGO Form.

15. Schemes with Power Loss

Data is required based on a test carried out over a period of at least two-hours with no heat rejection (i.e. exhaust gases fully utilised). The test data and report should be included as an attachment to CHPGO Form.

How the submission form might be set out and structured in order to collect the above information is given in Appendix 5, based on the UK approach.

7.2.6 The Form Processing Procedure



Following validation, a Certificate will be generated and, once checked, will be passed to the producer/generator who will then communicate and register with the Issuing Body in relation to obtaining CHPGO.

7.3 Role of the Issuing Body

The Issuing Body is appointed by the Ministry of Environment, Energy and Climate Change to issue CHPGO. They are responsible for the day-to-day functioning of CHPGO in terms of issuing the CHPGO units based on certificates provided by the Competent Body. They will be responsible for the development of an appropriate database and a trading system for handling the movement of CHPGO within Greece and those exported to other Members States.

8. Definitions

The following definitions are defined in Article 3 of the Directive and shall apply in developing the CHPGO system

- Cogeneration or CHP shall mean the simultaneous generation in one process of thermal energy and electrical and/or mechanical energy
- Useful heat shall mean heat produced in a cogeneration process to satisfy an economically justifiable demand for heating or cooling
- High-efficiency cogeneration shall mean cogeneration meeting the criteria of Annex III of the Directive
- Harmonised Efficiency Reference Value shall mean the efficiency of the alternative separate productions of heat and electricity that the cogeneration process is intended to substitute

Appendix 1 – Calculation of electricity from cogeneration

Cogeneration Directive Annex II, Greek Cogeneration Law 3734/2009

Calculation of electricity from cogeneration

Calculation of electricity from cogeneration according to Annex II

Values used for calculation of electricity from cogeneration shall be determined on the basis of the expected or actual operation of the unit under normal conditions of use. For micro-cogeneration units the calculation may be based on certified values.

(a) Electricity production from cogeneration shall be considered equal to total annual electricity production of the unit measured at the outlet of the main generators;

(i) in cogeneration units of type (b), (d), (e), (f), (g) and (h) referred to in Annex I, with an annual overall efficiency set by Member States at a level of at least 75 %, and

(ii) in cogeneration units of type (a) and (c) referred to in Annex I with an annual overall efficiency set by Member States at a level of at least 80 %.

(b) In cogeneration units with an annual overall efficiency below the value referred to in paragraph (a)(i) (cogeneration units of type (b), (d), (e), (f), (g), and (h) referred to in Annex I) or with an annual overall efficiency below the value referred to in paragraph (a)(ii) (cogeneration units of type (a) and (c) referred to in Annex I) cogeneration is calculated according to the following formula:

$$E_{\text{CHP}} = H_{\text{CHP}} \cdot C$$

where:

E_{CHP} is the amount of electricity from cogeneration

C is the power to heat ratio

H_{CHP} is the amount of useful heat from cogeneration (calculated for this purpose as total heat production minus any heat produced in separate boilers or by live steam extraction from the steam generator before the turbine).

The calculation of electricity from cogeneration must be based on the actual power to heat ratio. If the actual power to heat ratio of a cogeneration unit is not known, the following default values may be used, notably for statistical purposes, for units of type (a), (b), (c), (d), and (e) referred to in Annex I provided that the calculated cogeneration electricity is less or equal to total electricity production of the unit:

Type of the unit	Default power to heat ratio, C
Combined cycle gas turbine with heat recovery	0.95
Steam backpressure turbine	0.45
Steam condensing extraction turbine	0.45
Gas turbine with heat recovery	0.55
Internal combustion engine	0.75

If Member States introduce default values for power to heat ratios for units of type (f), (g), (h), (i), (j) and (k) referred to in Annex I, such default values shall be published and shall be notified to the Commission.

(c) If a share of the energy content of the fuel input to the cogeneration process is recovered in chemicals and recycled this share can be subtracted from the fuel input before calculating the overall efficiency used in paragraphs (a) and (b).

(d) Member States may determine the power to heat ratio as the ratio between electricity and useful heat when operating in cogeneration mode at a lower capacity using operational data of the specific unit.

(e) The Commission has now, in accordance with the procedure referred to in Article 14(2), establish detailed guidelines for the implementation and application of Annex II, including the determination of the power to heat ratio, see the Commission's publication C(2008)7294.

(f) Member States may use other reporting periods than one year for the purpose of the calculations according to paragraphs (a) and (b).

Calculation of electricity from cogeneration according to Greek Cogeneration Law 3734/2009

The methodology is included in Article 5 of Law 3734/2009 on the "promotion of cogeneration two or more useful energy sources". In addition, methodological issues are also included in Ministerial Decision Δ5-Η/Γ/Φ 1/οικ.15606 "definition of reference values for separate generation of electricity and heat" and Ministerial Decision Δ5-Η/Γ/Φ 1/οικ.15641 "definition of a detailed methodology for calculating the co-generated electricity and the efficiency of CHP".

Appendix 2 – Calculation primary energy savings from cogeneration

Cogeneration Directive Annex III (b)-Greek Cogeneration Law 3734/2009

Calculation of primary energy savings

Calculation of primary energy savings from cogeneration according to Annex III (b)

The amount of primary energy savings provided by cogeneration production defined in accordance with Annex II shall be calculated on the basis of the following formula:

Where:

$$PES = \left(1 - \frac{\frac{1}{\frac{CHP H\eta}{Ref H\eta} + \frac{CHP E\eta}{Ref E\eta}}}{1} \right) \times 100 \%$$

1. PES is primary energy savings.
2. CHP H η is the heat efficiency of the cogeneration production defined as annual useful heat output divided by the fuel input used to produce the sum of useful heat output and electricity from cogeneration.
3. Ref H η is the efficiency reference value for separate heat production.
4. CHP E η is the electrical efficiency of the cogeneration production defined as annual electricity from cogeneration divided by the fuel input used to produce the sum of useful heat output and electricity from cogeneration. Where a cogeneration unit generates mechanical energy, the annual electricity from cogeneration may be increased by an additional element representing the amount of electricity, which is equivalent to that of mechanical energy. This additional element will not create a right to issue guarantees of origin in accordance with Article 5.
5. Ref E η is the efficiency reference value for separate electricity production.

Calculation of primary energy savings from cogeneration according to Greek Cogeneration Law 3734/2009

Relevant calculations are included in Article 6 of Law 3734/2009 on the "promotion of cogeneration two or more useful energy sources". In addition, methodological issues are also included in Ministerial Decision Δ5-Η/Γ/Φ 1/οικ.15606 "definition of reference values for separate generation of electricity and heat" and Ministerial Decision Δ5-Η/Γ/Φ 1/οικ.15641 "definition of a detailed methodology for calculating the co-generated electricity and the efficiency of CHP".

Appendix 3 – Information to be supplied with a request for a CHPGO Certificate

Information to be supplied with a request for a CHPGO Certificate

1. The name and address and, if a company, the registered number, of the person requesting the issue of the CHPGO certificate
2. Whether the person requesting the issue of the CHPGO certificate is the producer of the electricity in respect of which the CHPGO certificate is requested and, if not, the name and address and, if a company, the registered number, of the producer.
3. The beginning and end of the period covered by the request.
4. The place where the electricity in respect of which the CHPGO certificate is requested was produced, and the name, if any, of the plant.
5. The quantity of electricity in respect of which the CHPGO certificate is requested, together with the total quantity of electricity produced by the plant during the period covered by the request.
6. The primary fuel source from which the electricity was produced.
7. The heat to power ratio of the plant.
8. The amount of useful heat utilised during the period covered by the request.
9. Such further information as the Competent Body may, in the particular circumstances of the case, reasonably require—
 - (a) for the purposes of ascertaining the accuracy of the information required to be provided or
 - (b) to enable the Competent Body to be satisfied that any electricity produced is from high-efficiency cogeneration.

Appendix 4 – Information to be contained in a CHPGO Certificate

Information to be contained in a CHPGO Certificate

- 1.** The name and address and, if a company, the registered number, of the person to whom the CHPGO certificate has been, or was originally, issued.
- 2.** The date of issue of the CHPGO certificate
- 3.** An identifier.
- 4.** The beginning and end of the period to which the CHPGO certificate relates.
- 5.** The place where the electricity to which the CHPGO certificate relates was produced and the name, if any, of the plant.
- 6.** The lower calorific value of the fuel source from which the electricity was produced.
- 7.** The use of the heat generated together with the electricity produced during the period to which the CHPGO certificate relates.
- 8.** The quantity of electricity from high-efficiency cogeneration calculated in accordance with Annex II of the Cogeneration Directive.
- 9.** The primary energy savings calculated in accordance with Annex III(b) of the Cogeneration Directive.
- 10.** The primary fuel source from which the electricity was produced.
- 11.** The quantity of fuel from which the electricity was produced.
- 12.** The amount of heat utilised during the period to which the CHPGO certificate relates.
- 13.** The achieved power efficiency.
- 14.** The achieved overall efficiency.
- 15.** The total quantity of electricity generated over the period to which the CHPGO relates.

Appendix 5 – Example CHPGO submission form (based on the UK's scheme)

Example CHPGO Submission Form (based on the UK's scheme)

Form CHPGO – Provision of Data for the Assessment of High Efficiency CHP Power Generation for the purpose of Guarantee of Origin

NOTES:

- This Form will enable you to provide the information to permit determination of the proportion of your CHP Scheme is High Efficient CHP for Guarantee of Origin (CHPGO) as defined in the EU Cogeneration Directive 2004/8/EC, based on operational data for a period of between three and twelve consecutive months
- You need to resubmit this Form for each period for which CHPGO is claimed
- The Guidance Note GN CHPGO has been written to help you complete this Form
- Information provided on this Form will be stored electronically and treated in the strictest commercial confidence. Only the Government or its agents will use it, for the sole purpose of certification of the CHPGO of CHP power generation
- This Form should be completed and returned to *the competent body*...

Content of Form CHPGO:

Part 1	Scheme Identification and Declaration & Attachments
Part 2	Scheme Energy Inputs and Outputs
Part 3	Enabling Information
Part 4	Data for Determination of Non-CHP Heat and Associated Fuel
Part 5	Data for Determination of "Full-CHP" Power to Heat Ratio
Part 6	Addendum

Abbreviations:

Within this Form the following abbreviations are used:

ST	= steam turbine
GT	= gas turbine
RE	= reciprocating engine
FB	= fired boiler
HRB	= heat recovery boiler
EX/CO	= extraction/condensing (ST)
CO	= fully condensing (ST)
TEG	= turbine exhaust gas

Part 1 - Scheme Identification and Declaration & Attachments

1. SCHEME IDENTIFICATION

Site Name	
Company Name	

2. DECLARATION & attachments

- I confirm that I am the nominated Responsible Person (RP) for the operation of the Scheme
- I confirm that I have supplied all necessary information, as required for CHPGO of power generation and that all information provided in this form is correct and conforms to the requirements set out in the Guidance Note
- I undertake to inform the Programme Administrator should any of the above details change

Signature

Date

Name _____

(block capitals)

Position

(block capitals)

List of attachments

<i>Number</i>	<i>Title</i>	<i>Attached</i> enter Yes or No
1.	Derivation of internal steam use	
2.	Derivation of boiler mean thermal efficiency	
3.	Derivation of proportion of FB steam not contributing to power generation in STs	
4.	Derivation of proportion of HRB steam not contributing to power generation in STs	
5.	Exhaust gases by-passing HRB	
6.	Derivation of dryer useful heat from TEG alone	
7.	Data and report on test with no heat rejection	
8.	Test data and derivation of power loss coefficient	
9.	Schematic scheme energy diagram	
10.		

Part 2 - Scheme Energy Inputs and Outputs

3. PERIOD OF OPERATION FOR GUARANTEE OF ORIGIN

The energy inputs and outputs declared in Sections 4, 5 and 6 are based on _____ hours of operation of the CHP Scheme over a period from _____ to _____ (show month and year).

4. ENERGY INPUTS

- Record below the fuel inputs to the CHP Scheme for the required period (minimum 3 months). Each meter reading should be identified by meter tag number or by calculation number.
- All fuel energy inputs should be based on **net calorific value (lower calorific value)**. Imported heat is to be included as equivalent fuel input. In some cases, fuels are provided based on gross calorific value, in such cases the gross/ net calorific value ratio assumed needs to be provided in Part 3, along with the mean moisture content of the fuel, as fired.

Tag & Calc. No.						
Fuel						
Mont h	Year	MWh	MWh	MWh	MWh	MWh
JAN						
FEB						
MAR						
APR						
MAY						
JUN						
JUL						
AUG						
SEP						
OCT						
NOV						
DEC						
Totals						

TOTAL FUEL AND ENERGY INPUTS = CHP_{TFI} = _____ MWh
in period covered by application

Note: If additional sheets have been used, enter CHP_{TFI} on the first sheet only.

5. ELECTRIC ENERGY OUTPUTS

- Record the power generated by the CHP Scheme (**power is gross generated** i.e. measured at the generator terminals)
- Each meter reading should be identified by meter tag number given on the attached schematic energy diagram or, where determined by indirect methods, by calculation number
- Mechanical power should be included and reported as equivalent electrical output identified by calculation number

Tag & Calc. No.						
Power plant						
Month	Year	MWh	MWh	MWh	MWh	MWh
JAN						
FEB						
MAR						
APR						
MAY						
JUN						
JUL						
AUG						
SEP						
OCT						
NOV						
DEC						
Totals						

TOTAL ELECTRIC ENERGY GENERATED = CHP_{TPO} = _____ MWh
 in period covered by application, of which:
 _____ MWh exported to grid & _____ MWh used on site

Note: If additional sheets have been used enter CHP_{TPO} on the first sheet only.

6. USEFUL HEAT OUTPUTS

Record below the useful heat supplied by the CHP Scheme and identify where the heat is supplied

- Each meter reading should be identified by meter tag number given on the attached schematic energy diagram or, where determined by indirect methods, by calculation number

Tag & Calc. No.						
Heat output						
Month	Year	MWh	MWh	MWh	MWh	MWh
JAN						
FEB						
MAR						
APR						
MAY						
JUN						
JUL						
AUG						
SEP						
OCT						
NOV						
DEC						
Totals						

TOTAL HEAT OUTPUT = CHP_{THO} = _____ MWh
in period covered by application

Note: If additional sheets have been used enter CHP_{QHO} on the first sheet only.
Now proceed to Part 3

Part 3 - Enabling Information

CHP SCHEME DATA

Year of commissioning _____
Grid connection voltage _____ kV
Use of heat <div style="margin-left: 100px;">Indirect use (e.g. steam or hot water) _____ MWh</div> <div style="margin-left: 100px;">Direct use (e.g. exhaust gases) _____ MWh</div>
Prime movers <div style="margin-left: 100px;">Scheme includes a GT or RE only (Y or N) _____</div> <div style="margin-left: 100px;">Scheme includes CO or EX/CO ST (Y or N) _____</div>
Total power capacity (TPC) of Scheme _____ MW

FUELS DATA

Fuels used and gross/net calorific value					
	Tick Fuels used	Moisture content as fired	Net CV (kJ/kg)	Claimed gross/net CV (dry)	Default gross/net CV (dry)
N Gas				1.11	1.11
Fuel Oil				1.060	1.060
Coal				1.050	1.050
Refinery Gas					1.109
Low CV gases					1.109
Wood fuels					1.077
Solid biowaste					1.077
Liquid biofuels					1.077
Liquid biowaste					1.077
Biogas					1.077
Lignite				1.050	1.050
Peat				1.050	1.050
Waste heat				1.000	1.000

➤ Proceed to Part 4

Part 4 – Data for Determination of non-CHP heat and associated fuel

9. SCHEME NON-CHP HEAT DECLARATION

Scheme has non-CHP heat outputs (Yes or No) _____

If "No" non-CHP heat outputs ➤ Proceed to Part 5

10. SCHEMES WITH FIRED BOILERS THAT DO NOT FULLY CONTRIBUTE TO CHP POWER OUTPUTS

Enter data in Sections 10.1 and/or 10.2 and/or 10.3 as appropriate for each FB in the Scheme.

10.1 Boiler fuel input and steam generation metered

Fired boiler (s) ID	Tag No			
Fired boiler fuel	MWh (net)			
Fuel 1 – type/%	- / %			
Fuel 2 – type/%	- / %			
Fuel 3 – type/%	- / %			
Fired boiler steam	tonnes			
Boiler steam pressure	bar(abs)			
Boiler steam temperature	°C			
Boiler steam sp enthalpy (10°C datum)	kJ/kg			
Internal steam use (Note 1)	%			
Proportion of FB steam not contributing to power generation in STs (steam supplied directly to process) (Note 2)	%			

Note 1 – Supporting information to be appended as Attachment 1

Note 2 – Supporting information to be appended as Attachment 3

10.2 Boiler fuel input metered but steam generation not metered

Fired boiler ID	Tag No			
Fired boiler fuel	MWh (net)			
Fuel 1 – type/%	- / %			
Fuel 2 – type/%	- / %			
Fuel 3 – type/%	- / %			
Boiler steam pressure	bar(abs)			
Boiler steam temperature	°C			
Boiler steam sp enthalpy (10°C datum)	kJ/kg			
Boiler feedwater temperature	°C			
Boiler feedwater sp enthalpy (10°C datum)	kJ/kg			
Mean boiler thermal efficiency (net cv) (Note 1)	%			
Internal steam use (Note 2)	%			
Proportion of FB steam not contributing to power generation in STs (steam supplied directly to process) (Note 3)	%			

Note 1 – Supporting information to be appended as Attachment 2

Note 2 – Supporting information to be appended as Attachment 1

Note 3 – Supporting information to be appended as Attachment 3

10.3 Boiler steam generation metered but fuel not metered

Fired boiler ID	Tag No			
Fired boiler steam	tonnes			
Boiler steam pressure	bar(abs)			
Boiler steam temperature	°C			
Boiler steam sp enthalpy (10°C datum)	kJ/kg			
Boiler feedwater temperature	°C			
Boiler steam sp enthalpy (10°C datum)	kJ/kg			
Mean boiler thermal efficiency (net cv) (Note 1)	%			
Fuel 1 – type/% (estimated)	- / %			
Fuel 2 – type/% (estimated)	- / %			
Fuel 3 – type/% (estimated)	- / %			
Internal steam use (Note 2)	%			
Proportion of FB steam not contributing to power generation in STs (Note 3)	%			

Note 1 – Supporting information to be appended as Attachment 2

Note 2 – Supporting information to be appended as Attachment 1

Note 3 – Supporting information to be appended as Attachment 3

11 SCHEMES WITH SUPPLEMENTARY/AUXILIARY FIRING OF HRBS THAT DO NOT FULLY CONTRIBUTE TO CHP POWER OUTPUTS

Enter data in Sections 11.1 and/or 11.2 as appropriate for each HRB included in the Scheme.

11.1 HRB SF/AF fuel input metered

HRB ID	Tag No			
HRB SF/AF fuel	MWh (net)			
Fuel 1 – type/%	- / %			
Fuel 2 – type/%	- / %			
Fuel 3 – type/%	- / %			
Boiler steam pressure	bar(abs)			
Boiler steam temperature	°C			
Boiler steam sp enthalpy (10°C datum)	kJ/kg			
Boiler feedwater temperature	°C			
Boiler steam sp enthalpy (10°C datum)	kJ/kg			
Supp. fuel / (supp. + aux. fuel)	%			
Internal steam use (Note 1)	%			
Proportion of HRB steam not contributing to power generation in STs (supplied directly to process) (Note 2)	%			

Note 1 – Supporting information to be included in Attachment 1

Note 2 – Supporting information to be included in Attachment 4

11.2 HRB SF/AF fuel input not metered

HRB ID	Tag No			
Steam generated from unfired GT or RE exhaust (Note 1)	tonnes/MWe			
Power generated by associated GT or RE	MWh			
Exhaust gases by-passing HRB (Note 1)	%			
HRB total steam generated	tonnes			
Boiler steam pressure	bar(abs)			
Boiler steam temperature	°C			
Boiler steam sp enthalpy (10°C datum)	kJ/kg			
Boiler feedwater temperature	°C			
Boiler steam sp enthalpy (10°C datum)	kJ/kg			
Supp. fuel / (supp. + aux. fuel)	%			
Fuel 1 – type/% (estimated)	- / %			
Fuel 2 – type/% (estimated)	- / %			
Fuel 3 – type/% (estimated)	- / %			
Internal steam use (Note 2)	%			
Proportion of HRB steam not contributing to power generation in STs (supplied directly to process) (Note 3)	%			

Note 1 – Supporting information to be included in Attachment 5

Note 2 – Supporting information to be included in Attachment 1

Note 3 – Supporting information to be included in Attachment 4

12. SCHEMES WITH SUPPLEMENTARY/AUXILIARY FIRING OF DIRECT-FIRED EQUIPMENT (E.G. DRYERS)

Enter data in Sections 12.1 and/or 12.2 as appropriate for each equipment item (e.g. dryer) included in the Scheme.

12.1 SF/AF fuel input metered

Equipment ID	Tag No			
SF/AF fuel fired	MWh (net)			
Fuel 1 – type/%	- / %			
Fuel 2 – type/%	- / %			
Fuel 3 – type/%	- / %			
Supp. fuel / (supp. + aux. fuel)	%			

12.2 SF/AF fuel input not metered

Equipment ID	Tag No			
Fuel 1 – type/% (estimated)	- / %			
Fuel 2 – type/% (estimated)	- / %			
Fuel 3 – type/% (estimated)	- / %			
Supp. fuel / (supp. + aux. fuel)	%			
Total heat output to user (incl. SF/AF)				
Useful heat from TEG alone (repeat dryer calc based on TEG alone, i.e. dryer inlet temp = TEG temp (Note 1))	%			

Note 1 – Supporting information to be appended as Attachment 6

➤ Proceed to Part 5

Part 5 - Data for Determination of "Full-CHP" Power to Heat Ratio

13. SCHEMES WITHOUT POWER LOSS & NO HEAT REJECTION

Scheme has NO heat rejection (Yes or No)	_____
Scheme has NO power loss (no CO or EX/CO STs)	_____

If "Yes" to both the above ➤ This Form is completed

14. SCHEMES WITH HEAT REJECTION BUT NO POWER LOSS

Enter data based on a test carried out with no heat rejection.

Test results with no heat rejection (after deduction of non-CHP heat and associated fuel) (Note 1)		
Fuel input	MW (net)	
Power output	MW	
Heat output	MW	

Note 1 - Test data and report, including the deduction of non-CHP heat and associated fuel, to be appended as Attachment 7

15. SCHEMES WITH POWER LOSS

Enter data based on a test carried out with no heat rejection.

Test results with no heat rejection (after deduction of non-CHP heat and associated fuel) (Note 1)		
Fuel input	MW (net)	
Power output	MW	
Heat output	MW	
Steam to process users	tonnes/h	
Steam condensed in ST condensers	tonnes/h	
Power loss coefficient, Ξ (Note 2)		

Note 1 - Test data and report, including the deduction of non-CHP heat and associated fuel, to be appended as Appendix 7

Note 2 - Test data and derivation of power loss coefficient to be appended as Appendix 8

Part 6 ADDENDUM

I Authorised Signors Details

Are you the authorised person Yes/No

If not please provide below details of the authorised person

Title: Mr / Miss / Mrs First Name(s):.....

Last Name:.....

Company Name:.....

Company registered number:

Address:

Title/ Number

Address:.....

.....

City:.....

State:.....

Country:.....

Contact Tel (including international code):

II Statement

As the person making the request for the issue of a CHPGO you state that in respect of the electricity which is the subject of the request — you are

(a) entitled to the issue of a CHPGO under these Regulations; and

(b) have not made and do not intend to make a request for the issue of a CHPGO to any person outside Greece.

Print Name:

Signature:..... Date:...../...../20.....

III Electricity production details

Are you the Producer of the electricity subject to the CHPGO? Yes / No

If YES go to section IV

If NO complete section III

III Electricity Producer's details

Company Name of Electricity producer:

Company registered number of Electricity producer:.....

Company address

Title/ Number

Address:.....

.....

.....

City:.....
State:.....
Country:.....

Contact Tel (including international code):

The "electricity production site" is defined as the place where the electricity in respect to the CHPGO is produced.

Electricity production site name:

Electricity production site address

Title/ Number

Address:.....

.....

.....

City:.....

State:.....

Country:.....

Electricity production site contact Tel (including international code):

.....

IV CHPGO Details

The CHPGO is requested from

(date)/...../ 20..... to (date)/...../ 20.....

Electrical Energy produced in respect to CHPGO:.....MWh and the total electricity produced by the electricity production site during the period the CHPGO was requested.

➤ This Form is now completed