

chp QA

Compliance with EU CHP Directive and Changes to CHPQA

**CHPA Members Briefing
September 2007**



defra
Department for Environment
Food and Rural Affairs

chp QA

Mahmoud Abu-Ebid

CHPQA Programme Manager
on behalf of Defra



defra
Department for Environment
Food and Rural Affairs

Focus of Presentation

- **Proposed Changes to CHPQA Formulas**
- **Impact on Existing and New Schemes**
- **CHP Guarantee of Origin (CHPGO)**
- **EfW & Biomass CHP**
- **Discussion**

Background: EU CHP Directive

➤ Objective

“To establish a harmonised method for calculation of electricity from cogeneration and necessary guidelines for its implementation”

➤ Came into force in February 2004

➤ Member States had to implement the Directive within 2 years (by 21 Feb 2006)

➤ The Commission has established harmonised Reference Values for separate production of heat and electricity

Alternative Calculation Methods

- **Article 12** presents an option of applying alternative calculation methods
- Subject to the Commission's Approval
 - **Article 12.1** allows MS to use other methods to determine electricity from Cogeneration without using Annex II method
 - **Article 12.3** ...Until the end of 2010, MS can determine electricity from cogeneration without verifying that the CHP production fulfils the criteria in Annex III(a), if it is proved on a national level that the CHP production identified by such an alternative calculation methodology fulfils, on average, the criteria in Annex III(a).
 - **Article 12.1 and 12.3** are time restricted to 2010 while the method presented in **Article 12.2** has no time restriction.



Article 12.2!!

- The UK will comply with the Directive through **Article 12.2**
- **Article 12.2.....** "Member States may calculate primary energy savings from a production of heat and electricity and mechanical energy according to Annex III (c), without using Annex II to exclude the non-cogenerated heat and electricity...."
- ...Provided it fulfils the efficiency criteria in Annex III (a) (i.e **$PES \geq 10\%$**) and **$PES \geq Zero$** for Small scale and micro CHP
- And Schemes with **electrical capacity > 25 MWe** have to meet **overall efficiency $\geq 70\%$** . (NCV)

Still have to use Annex II for providing statistics and for issuing "Guarantee of Origin" certificates.

Additional Criteria!!!

- The Commission is considering the introduction of additional criteria to make sure that fiscal benefits are only given to scheme with net PES
- They proposing a **de-minimise limit of PES > 0% for whole plant**



Changes to CHPQA

Need to comply with Article 12.2 criteria, namely:

- Fulfil the efficiency criteria in Annex III (a)
 - *PES \geq Zero for Small scale and micro CHP ($\leq 1\text{MWe}$)*
 - *PES $\geq 10\%$ for scheme with TPC $> 1\text{ MWe}$*
- *Schemes with electrical capacity $> 25\text{ MWe}$ have to meet overall efficiency $\geq 70\%$. on NCV~ 63% on GCV*
- *We need to make sure GQCHP deliver these requirements*
- Need to make sure QI = 100 will deliver the PES values and overall efficiency value for schemes with TPC $> 25\text{MWe}$.

EU Reference values to be used

- A set of RVs developed by a team of Consultants
- These were agreed by Member States at the CHP Committee meeting in July 2006.
- Finally were published on 6th Feb 2007

Ref. Values

Matrix of Electricity Reference Values

Year of construction:	1996 and before	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006-2011
Type of fuel:											
Hard coal / coke	39.7%	40.5%	41.2%	41.8%	42.3%	42.7%	43.1%	43.5%	43.8%	44.0%	44.2%
Lignite / lignite briquettes	37.3%	38.1%	38.8%	39.4%	39.9%	40.3%	40.7%	41.1%	41.4%	41.6%	41.8%
Peat / peat briquettes	36.5%	36.9%	37.2%	37.5%	37.8%	38.1%	38.4%	38.6%	38.8%	38.9%	39.0%
Wood fuels	25.0%	26.3%	27.5%	28.5%	29.6%	30.4%	31.1%	31.7%	32.2%	32.6%	33.0%
Agricultural biomass	20.0%	21.0%	21.6%	22.1%	22.6%	23.1%	23.5%	24.0%	24.4%	24.7%	25.0%
Biodegradable (municipal) waste	20.0%	21.0%	21.6%	22.1%	22.6%	23.1%	23.5%	24.0%	24.4%	24.7%	25.0%
Non-renewable (municipal and industrial) waste	20.0%	21.0%	21.6%	22.1%	22.6%	23.1%	23.5%	24.0%	24.4%	24.7%	25.0%
Oil shale	38.9%	38.9%	38.9%	38.9%	38.9%	38.9%	38.9%	38.9%	38.9%	38.9%	39.0%
Oil (gas oil + residual fuel oil), LPG	39.7%	40.5%	41.2%	41.8%	42.3%	42.7%	43.1%	43.5%	43.8%	44.0%	44.2%
Biofuels	39.7%	40.5%	41.2%	41.8%	42.3%	42.7%	43.1%	43.5%	43.8%	44.0%	44.2%
Biodegradable waste	20.0%	21.0%	21.6%	22.1%	22.6%	23.1%	23.5%	24.0%	24.4%	24.7%	25.0%
Non-renewable waste	20.0%	21.0%	21.6%	22.1%	22.6%	23.1%	23.5%	24.0%	24.4%	24.7%	25.0%
Natural gas	50.0%	50.4%	50.8%	51.1%	51.4%	51.7%	51.9%	52.1%	52.3%	52.4%	52.5%
Refinery gas / hydrogen	39.7%	40.5%	41.2%	41.8%	42.3%	42.7%	43.1%	43.5%	43.8%	44.0%	44.2%
Biogas	36.7%	37.5%	38.3%	39.0%	39.6%	40.1%	40.6%	41.0%	41.4%	41.7%	42.0%
Coke oven gas, blast furnace gas, other waste gases, recovered waste heat	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%

Reference Values for Electricity

➤ Values are based on net calorific value and ISO conditions.

➤ Need to be corrected for:

- ambient temperature

{0.1%-point efficiency loss/gain for every degree above/below 15 °C}

- avoided grid losses

Grid loss correction factors

Voltage:	For electricity exported to the grid	For electricity consumed on-site
> 200 kV	1	0.985
100-200 kV	0.985	0.965
50-100 kV	0.965	0.945
0.4-50 kV	0.945	0.925
< 0.4 kV	0.925	0.860

Reference Values for Heat

- Values are based on NCV.
- RVs for hot water and steam boilers are the same.
- Condensate return ignored when calculating CHP steam efficiency (*the same as CHPQA*).
- Different values for direct use of exhaust gases (i.e direct drying). See table.....

Table of Heat Reference Values

Harmonised efficiency reference values for separate production of heat

Type of fuel:	Steam [*] /hot water	Direct use of exhaust gases ^{**}	
Solid	Hard coal / coke	88%	80%
	Lignite / lignite briquettes	86%	78%
	Peat / peat briquettes	86%	78%
	Wood fuels	86%	78%
	Agricultural biomass	80%	72%
	Biodegradable (municipal) waste	80%	72%
	Non-renewable (municipal and industrial) waste	80%	72%
	Oil shale	86%	78%
Liquid	Oil (gas oil + residual fuel oil), LPG	89%	81%
	Biofuels	89%	81%
	Biodegradable waste	80%	72%
	Non-renewable waste	80%	72%
Gaseous	Natural gas	90%	82%
	Refinery gas / hydrogen	89%	81%
	Biogas	70%	62%
	Coke oven gas, blast furnace gas + other waste gases	80%	72%

* Steam efficiencies should be lowered with 5 absolute %-points in case Member States that apply Article 12(2) of Directive 2004/8/EC include the condensate return in the calculations of a cogeneration unit.

** The values for direct heat are to be used if the temperature is 250°C or higher.

Correction to Electricity Reference Values

CHP Size/Type Cat	Representative Fuel with Highest Power ref eff (CHPQA Worst Case)	Min PES Required	Min Overall Energy Efficiency Required NCV	Voltage (Worst Case)	Elec Use On-site/Export	EU Electricity Reference value (NCV)	Embedding Factor	Proposed Embedding Corrected Power ref (NCV)	Highest NCV:GCV of any fuel in cat	Proposed Embedding Corrected Power ref (GCV)
<=1MWe	Natural Gas	0%	0%	<0.4kVA	On-site	52.50%	0.860	45.15%	0.90	40.64%
1-10MWe	Natural Gas	10%	0%	0.4kV-50kV	On-site	52.50%	0.925	48.56%	0.90	43.71%
10-25MWe	Natural Gas	10%	0%	50-100kV	On-site	52.50%	0.945	49.61%	0.90	44.65%
25-50MWe	Natural Gas	10%	70%	50-100kV	Export	52.50%	0.965	50.66%	0.90	45.60%
50-100MWe	Natural Gas	10%	70%	100kV-200kV	Export	52.50%	0.985	51.71%	0.90	46.54%
100-200MWe	Natural Gas	10%	70%	>200kV	Export	52.50%	1.000	52.50%	0.90	47.25%
200-500MWe	Natural Gas	10%	70%	>200kV	Export	52.50%	1.000	52.50%	0.90	47.25%
> 500MWe	Natural Gas	10%	70%	>200kV	Export	52.50%	1.000	52.50%	0.90	47.25%
Fuel Cells<=1MWe	Natural Gas	0%	0%	<0.4kVA	On-site	52.50%	0.860	45.15%	0.90	40.64%
Fuel Cells 1-25MWe	Natural Gas	10%	0%	0.4kV-50kV	On-site	52.50%	0.925	48.56%	0.90	43.71%
Fuel Cells>25MWe	Natural Gas	10%	70%	0.4kV-50kV	On-site	52.50%	0.925	48.56%	0.90	43.71%
RE <= 1MWe	Natural Gas	0%	0%	<0.4kVA	On-site	52.50%	0.860	45.15%	0.90	40.64%
RE 1-25MWe	Natural Gas	10%	0%	0.4kV-50kV	Export	52.50%	0.925	48.56%	0.90	43.71%
Alt Fuel Schemes <=1MWe	Refinery Gas/Hydrogen	0%	0%	<0.4kVA	On-site	44.20%	0.860	38.01%	0.90	34.21%
Alt Fuel Schemes 1-25MWe	Refinery Gas/Hydrogen	10%	0%	0.4kV-50kV	On-site	44.20%	0.925	40.89%	0.90	36.80%
Alt Fuel Schemes>25MWe	Refinery Gas/Hydrogen	10%	70%	50-100kV	Export	44.20%	0.965	42.65%	0.90	38.39%
Biogas Waste Heat or Waste Gas Schemes<=1MWe	Biogas, Waste Gas or Waste Heat	0%	0%	<0.4kVA	On-site	35.00%	0.860	30.10%	0.90	27.09%
Biogas Waste Heat or Waste Gas Schemes 1-25MWe	Biogas, Waste Gas or Waste Heat	10%	0%	0.4kV-50kV	On-site	35.00%	0.925	32.38%	0.90	29.14%
Biogas Waste Heat or Waste Gas Schemes>25MWe	Biogas, Waste Gas or Waste Heat	10%	70%	50-100kV	Export	35.00%	0.965	33.78%	0.90	30.40%
Biomass or solid or liquid waste (Excl wood and biofuels) <=1MWe	Biodegradeable Waste/Biomass	0%	0%	<0.4kVA	On-site	25.00%	0.860	21.50%	0.93	20.00%
Biomass or solid or liquid waste (Excl wood and biofuels) 1-25MWe	Biodegradeable Waste/Biomass	10%	0%	0.4kV-50kV	On-site	25.00%	0.925	23.13%	0.93	21.51%
Biomass or solid or liquid waste (Excl wood and biofuels) >25MWe	Biodegradeable Waste/Biomass	10%	70%	50-100kV	Export	25.00%	0.965	24.13%	0.93	22.44%
Wood <=1MWe	Wood	0%	0%	<0.4kVA	On-site	33.00%	0.860	28.38%	0.93	26.39%
Wood 1-25 MWe	Wood	10%	0%	0.4kV-50kV	On-site	33.00%	0.925	30.53%	0.93	28.39%
Wood >=25MWe	Wood	10%	70%	50-100kV	Export	33.00%	0.965	31.85%	0.93	29.62%
Liquid Biofuels <=1MWe	Liquid Biofuels	0%	0%	<0.4kVA	On-site	44.20%	0.860	38.01%	0.95	36.11%
Liquid Biofuels 1-25MWe	Liquid Biofuels	10%	0%	0.4kV-50kV	On-site	44.20%	0.925	40.89%	0.95	38.84%
Liquid Biofuels >25MWe	Liquid Biofuels	10%	70%	50-100kV	Export	44.20%	0.965	42.65%	0.95	40.52%

Proposed Changes to CHPQA X and Y values

CHP Size/Type Cat	Current X	Current Y	Proposed X	Proposed Y
<=1MWe (Nat Gas or Mineral Oil)	230	125	255	115
1-10MWe (Nat Gas or Mineral Oil)	220	125	198	115
10-25MWe (Nat Gas or Mineral Oil)	205	125	194	115
25-50MWe (Nat Gas or Mineral Oil)	190	125	187	115
50-100MWe (Nat Gas or Mineral Oil)	185	125	179	115
100-200MWe (Nat Gas or Mineral Oil)	180	125	176	115
200-500MWe (Nat Gas or Mineral Oil)	170	125	173	115
> 500MWe (Nat Gas or Mineral Oil)	160	125	172	115
Coal	NA	NA	203	115
Fuel Cells<=1MWe	180	125	247	115
Fuel Cells 1-25MWe	180	125	213	115
Fuel Cells>25MWe	180	125	187	115
RE <= 1MWe (Nat Gas or Mineral Oil)	200	125	249	115
RE 1-25MWe (Nat Gas or Mineral Oil)	200	125	211	115
Alternative Fuel Schemes <=1MWe	240	125	262	115
Alternative Fuel Schemes 1-25MWe	240	125	220	115
Alternative Fuel Schemes>25MWe	240	125	172	115
Biogas Waste Heat or Waste Gas Schemes<=1MWe	300	140	247	120
Biogas Waste Heat or Waste Gas Schemes 1-25MWe	300	140	208	120
Biogas Waste Heat or Waste Gas Schemes>25MWe	300	140	184	120
Biomass or solid or liquid waste (Excl wood and biofuels) <=1MWe	400	140	380	120
Biomass or solid or liquid waste (Excl wood and biofuels) 1-25MWe	400	140	366	120
Biomass or solid or liquid waste (Excl wood and biofuels) >25MWe	400	140	202	120
Wood <=1MWe	400	140	329	120
Wood 1-25 MWe	400	140	273	120
Wood >=25MWe	400	140	202	120
Liquid Biofuels <=1MWe	400	140	239	115
Liquid Biofuels 1-25MWe	400	140	198	115
Liquid Biofuels >25MWe	400	140	170	115

Maximizing Benefits for CHP Schemes in the UK

Analysis based on agreed Reference Values

	Modified CHPQA to comply with Article 12.2		Based on EU Directive Annex II	
	GQ CHP to provide PES>0% for all schemes	GQ CHP to provide PES>10% for schemes >1MWe	with PES >0% for all schemes	with PES >10% for schemes >1MWe (Cliff Edge Scenario)
Number of schemes	835	835	835	766
Total Good Quality CHP capacity (MW)	5,003	5,003	5,003	5,003
Total Power Output (MWh)	46,687,800	46,687,800	46,687,800	46,687,800
Total Good Quality Power output (MWh)	25,132,840	22,993,300	21,393,000	15,149,000
Total Likely Benefits (Euros)	156,703,257	143,363,226	133,385,355	94,454,015
Reduction in Benefits (Euros)		13,340,032	23,317,902	62,249,242
% reduction in benefits		8.5%	14.9%	39.7%

Correction for year of construction

CHP Size/Type Cat	Proposed Y	Proposed X	X Age correction needed for Age Gp1 Refs	X Age correction needed for Age Gp2 Refs	Effective X for Age Gp1 Refs	Effective X for Age Gp2 Refs
<=1MWe (Nat Gas or Mineral Oil)	115	255	1.0054	1.0229	256.38	260.84
1-10MWe (Nat Gas or Mineral Oil)	115	198	1.0055	1.0251	199.09	202.97
10-25MWe (Nat Gas or Mineral Oil)	115	194	1.0045	1.0241	194.87	198.68
25-50MWe (Nat Gas or Mineral Oil)	115	187	1.0027	1.0027	187.50	187.50
50-100MWe (Nat Gas or Mineral Oil)	115	179	1.0025	1.0025	179.45	179.45
100-200MWe (Nat Gas or Mineral Oil)	115	176	1.0003	1.0003	176.05	176.05
200-500MWe (Nat Gas or Mineral Oil)	115	173	1.0000	1.0000	173.00	173.00
> 500MWe (Nat Gas or Mineral Oil)	115	172	1.0023	1.0023	172.40	172.40
Coal>25MWe	115	203	1.0010	1.0010	203.20	203.20
Fuel Cells<=1MWe	115	247	1.0028	1.0042	247.69	248.04
Fuel Cells 1-25MWe	115	213	1.0054	1.0249	214.15	218.30
Fuel Cells>25MWe	115	187	1.0027	1.0027	187.50	187.50
RE <= 1MWe	115	249	1.0028	1.0208	249.70	254.18
RE 1-25MWe	115	211	1.0029	1.0224	211.61	215.73
Alt Fuel Schemes <=1MWe	115	262	1.0052	1.0409	263.36	272.72
Alt Fuel Schemes 1-25MWe	115	220	1.0082	1.0487	221.80	230.71
Alt Fuel Schemes>25MWe	115	172	1.0023	1.0023	172.40	172.40
Biogas Waste Heat or Waste Gas Schemes<=1MWe	120	247	1.0015	1.0015	247.37	247.37
Biogas Waste Heat or Waste Gas Schemes 1-25MWe	120	208	1.0015	1.0015	208.31	208.31
Biogas Waste Heat or Waste Gas Schemes>25MWe	120	184	1.0011	1.0011	184.20	184.20
Biomass or solid or liquid waste (Excl wood and biofuels) <=1MWe	120	380	1.0015	1.0015	380.57	380.57
Biomass or solid or liquid waste (Excl wood and biofuels) 1-25MWe	120	366	1.0013	1.0013	366.48	366.48
Biomass or solid or liquid waste (Excl wood and biofuels) >25MWe	120	202	1.0013	1.0013	202.26	202.26
Wood <=1MWe	120	329	1.0117	1.1092	332.85	364.93
Wood 1-25 MWe	120	273	1.0133	1.1160	276.63	304.67
Wood >=25MWe	120	202	1.0013	1.0013	202.26	202.26
Liquid Biofuels <=1MWe	115	239	1.0048	1.0378	240.15	248.03
Liquid Biofuels 1-25MWe	115	198	1.0091	1.0497	199.80	207.84
Liquid Biofuels >25MWe	115	170	1.0002	1.0002	170.03	170.03

Next Steps?

- Harmonised Reference values (Electricity & Heat) have now been published
- Currently reviewing the CHPQA Standard & QI formulas
- Working on CHPQA GNs and electronic forms
- Defra to Approve changes
- Host briefing workshop(s) to inform RPs of the changes and likely impact on their fiscal benefits.

Time Scale for implementations

- Full review of CHPQA Standard, QI formulas and GNs by end of Sept 2007
- Defra to publish version II of “CHPQA Standard” by Nov. 2007.
- Finalise CHPQA Guidance Notes and procedures by Oct/Nov 07

Time Scale Implementations (2)

For New Schemes:

- From 1 Jan 2007 Article 12.2 criteria will apply to all new applications for new CHP schemes **(F3 applications)**

For Existing Schemes:

- Defra informed the Commission the UK will **move to the Harmonised RVs** under the CHPQA programme **by 2010**
- New QI formulas will come into force from Jan 2011.

What Else?

CHP Guarantee of Origin (CHPGO)



CHP Guarantee of Origin (CHPGO) Certificates

- Article 5 of the Directive requires MS, **not later than 6 months** after adoption of the Harmonised Efficiency Reference Values, to ensure that CHPGO Certificates are available for electricity from high efficiency Cogeneration
- This obligation came into effect in **August 2007**
- Defra already informed the Commission that Public support for CHP in the UK is not based on the CHPGO, and it will continue to be based on CHPQA Certificates
- CHPGO are not mandatory....should be **requested by the CHP operator/owner**

Guarantee of Origin Certificates cont.

- Applicants will have to pay the costs of issuing these CHPGO
- Expect low demand for CHPGO developing a simple system for issuing
- Administered by CHPQA Administrator
- Guidance Notes & Forms placed on CHPQA website in August 2007
- CHPGOs are based on the Directive's Annex II method and would require full analysis.

chip QA

DISCUSSION