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# Compliance with EU CHP Directive and Changes to CHPQA

**CHPQA Briefing**  
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# **Focus of Presentation**

- **EU CHP Directive & Proposed Changes to CHPQA Formulas**
- **Impact on Existing and New Schemes**
- **Fuel Definitions**
- **CHP Guarantee of Origin (CHPGO)**

# 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)

# Alternative Method - 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)*
  - *PES  $\geq$  10% for schemes larger than 1 MWe*
  - *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 schemes with net PES
- They proposing a **de-minimis 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  $> 25\text{MWe}$ .
- And QI of 100 should deliver at least 5% heat efficiency.

## EU Reference values to be used

- A set of RVs developed for separate generation of electricity and heat
- These were agreed by Member States at the CHP Committee meeting in July 2006.
- Finally were published on 6<sup>th</sup> Feb 2007

# Matrix of Electricity Reference Values

Year of construction:	1996 and before	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006-2011
<b>Type of fuel:</b>											
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%

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# 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

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

# 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 <sup>*</sup> /hot water	Direct use of exhaust gases <sup>**</sup>	
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

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CHP Size/Type Cat	Assumed Connection Voltage	Electricity Used On Site / Exported	Elec Embedding Factor	EU Reference Electrical Efficiency (NCV)	Embedding Corrected Reference Elec. Efficiency (NCV)	NCV:GCV ratio for fuel	Embedding Corrected Reference Elec. Efficiency (GCV)
Natural Gas <=1MWe	<0.4kVA	On Site	0.860	52.50%	45.15%	0.90	40.64%
Natural Gas 1-10MWe	0.4kV-50kV	On Site	0.925	52.50%	48.56%	0.90	43.71%
Natural Gas 10-25MWe	50kV-100kV	On Site	0.945	52.50%	49.61%	0.90	44.65%
Natural Gas 25-50MWe	50kV-100kV	Export	0.965	52.50%	50.66%	0.90	45.60%
Natural Gas 50-100MWe	100kV-200kV	Export	0.985	52.50%	51.71%	0.90	46.54%
Natural Gas 100-200MWe	>200kV	Export	1.000	52.50%	52.50%	0.90	47.25%
Natural Gas 200-500MWe	>200kV	Export	1.000	52.50%	52.50%	0.90	47.25%
Natural Gas > 500MWe	>200kV	Export	1.000	52.50%	52.50%	0.90	47.25%
Oil <=1MWe	<0.4kVA	On Site	0.860	44.20%	38.01%	0.95	36.11%
Oil 1-25MWe	50kV-100kV	On Site	0.945	44.20%	41.77%	0.95	39.68%
Oil>25MWe	>200kV	Export	1.000	44.20%	44.20%	0.95	41.99%
Coal<=1MWe	<0.4kVA	On Site	0.860	44.20%	38.01%	0.93	35.35%
Coal 1-25MWe	50kV-100kV	On Site	0.945	44.20%	41.77%	0.93	38.85%
Coal>25MWe	>200kV	Export	1.000	44.20%	44.20%	0.93	41.11%
By-Product Gases <=1MWe	<0.4kVA	On Site	0.860	44.20%	38.01%	0.90	34.21%
By-Product Gases 1-25 Mwe	50kV-100kV	On Site	0.945	44.20%	41.77%	0.90	37.59%
By-Product Gases >25MWe	>200kV	Export	1.000	44.20%	44.20%	0.90	39.78%
Biogas<=1MWe	Any	No correction	1.000	42.00%	42.00%	0.90	37.80%
Biogas 1-25MWe	Any	No correction	1.000	42.00%	42.00%	0.90	37.80%
Biogas>25MWe	Any	No correction	1.000	42.00%	42.00%	0.90	37.80%
Waste Gas or Waste Heat <=1MWe	<0.4kVA	On Site	0.860	35.00%	30.10%	0.90	27.09%
Waste Gas or Waste Heat 1-25 Mwe	50kV-100kV	On Site	0.945	35.00%	33.08%	0.90	29.77%
Waste Gas or Waste Heat >25MWe	>200kV	Export	1.000	35.00%	35.00%	0.90	31.50%
Liquid Biofuels <=1MWe	<0.4kVA	On Site	0.860	44.20%	38.01%	0.95	36.11%
Liquid Biofuels 1-25MWe	50kV-100kV	On Site	0.945	44.20%	41.77%	0.95	39.68%
Liquid Biofuels >25MWe	>200kV	Export	1.000	44.20%	44.20%	0.95	41.99%
Bio-degradeable Liquid waste <=1MWe	<0.4kVA	On Site	0.860	25.00%	21.50%	0.95	20.43%
Bio-degradeable Liquid waste 1-25MWe	50kV-100kV	On Site	0.945	25.00%	23.63%	0.95	22.44%
Bio-degradeable Liquid waste >25MWe	>200kV	Export	1.000	25.00%	25.00%	0.95	23.75%
Agricultural biomass or bio-degradeable solid waste <=1MWe	<0.4kVA	On Site	0.860	25.00%	21.50%	0.93	20.00%
Agricultural biomass or bio-degradeable solid waste 1-25MWe	50kV-100kV	On Site	0.945	25.00%	23.63%	0.93	21.97%
Agricultural biomass or bio-degradeable solid waste >25MWe	>200kV	Export	1.000	25.00%	25.00%	0.93	23.25%
Wood Fuels <=1MWe	Any	No correction	1.000	33.00%	33.00%	0.93	30.69%
Wood Fuels 1-25 MWe	Any	No correction	1.000	33.00%	33.00%	0.93	30.69%
Wood Fuels >=25MWe	Any	No correction	1.000	33.00%	33.00%	0.93	30.69%

# Proposed Changes to CHPQA X and Y values

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CHP Size/Type Cat	Current X	Current Y	Proposed X	Proposed Y
Natural Gas <=1MWe	230	125	249	115
Natural Gas 1-10MWe	220	125	195	115
Natural Gas 10-25MWe	205	125	191	115
Natural Gas 25-50MWe	190	125	186	115
Natural Gas 50-100MWe	185	125	179	115
Natural Gas 100-200MWe	180	125	176	115
Natural Gas 200-500MWe	170	125	173	115
Natural Gas > 500MWe	160	125	172	115
Oil <=1MWe	230	125	249	115
Oil 1-25MWe	220 or 205	125	191	115
Oil>25MWe	190-160	125	176	115
Coal<=1MWe	230	125	249	115
Coal 1-25MWe	220 or 205	125	191	115
Coal>25MWe	190-160	125	176	115
By-Product Gases <=1MWe	240	125	294	120
By-Product Gases 1-25 Mwe	240	125	221	120
By-Product Gases >25MWe	240	125	193	120
Biogas<=1MWe	300	125	285	120
Biogas 1-25MWe	300	125	251	120
Biogas>25MWe	300	140	193	120
Waste Gas or Waste Heat <=1MWe	300	140	329	120
Waste Gas or Waste Heat 1-25 Mwe	300	140	299	120
Waste Gas or Waste Heat >25MWe	300	140	193	120
Liquid Biofuels <=1MWe	400	140	275	120
Liquid Biofuels 1-25MWe	400	140	191	120
Liquid Biofuels >25MWe	400	140	176	120
Bio-degradeable Liquid waste <=1MWe	300	140	275	120
Bio-degradeable Liquid waste 1-25MWe	300	140	260	120
Bio-degradeable Liquid waste >25MWe	400	140	176	120
gricultural biomass or bio-degradeable solid waste <=1MWe	400	140	370	120
gricultural biomass or bio-degradeable solid waste 1-25MWe	400	140	370	120
gricultural biomass or bio-degradeable solid waste >25MWe	400	140	220	120
Wood Fuels <=1MWe	400	140	329	120
Wood Fuels 1-25 MWe	400	140	279	120
Wood Fuels >=25MWe	400	140	220	120

# Correction for year of construction

CHP Size/Type Cat	Proposed X For New Schemes	Age of Plant Correction Factor (Jan 2001-Dec 2005)	Age of Plant Correction Factor (Jan 2006-Dec 2010)	Age of Plant Correction Factor (after 1 Jan 2011)
Natural Gas <=1MWe	249.00	1.0208	1.0028	1.00
Natural Gas 1-10MWe	195.00	1.0266	1.0053	1.00
Natural Gas 10-25MWe	191.00	1.0240	1.0027	1.00
Natural Gas 25-50MWe	186.00	1.0081	1.0063	1.00
Natural Gas 50-100MWe	179.00	1.0025	1.0025	1.00
Natural Gas 100-200MWe	176.00	1.0003	1.0003	1.00
Natural Gas 200-500MWe	173.00	1.0000	1.0000	1.00
Natural Gas > 500MWe	172.00	1.0023	1.0023	1.00
Oil <=1MWe	249.00	1.0208	1.0028	1.00
Oil 1-25MWe	191.00	1.0240	1.0027	1.00
Oil>25MWe	176.00	1.0052	1.0052	1.00
Coal<=1MWe	249.00	1.0208	1.0028	1.00
Coal 1-25MWe	191.00	1.0240	1.0027	1.00
Coal>25MWe	176.00	1.0052	1.0052	1.00
By-Product Gases <=1MWe	294.00	1.0449	1.0063	1.00
By-Product Gases 1-25 Mwe	221.00	1.0551	1.0084	1.00
By-Product Gases >25MWe	193.00	1.0020	1.0020	1.00
Biogas<=1MWe	285.00	1.0447	1.0072	1.00
Biogas 1-25MWe	251.00	1.0484	1.0059	1.00
Biogas>25MWe	193.00	1.0020	1.0020	1.00
Waste Gas or Waste Heat <=1MWe	329.00	1.0025	1.0025	1.00
Waste Gas or Waste Heat 1-25 Mwe	299.00	1.0028	1.0028	1.00
Waste Gas or Waste Heat >25MWe	193.00	1.0020	1.0020	1.00
Liquid Biofuels <=1MWe	275.00	1.0000	1.0000	1.00
Liquid Biofuels 1-25MWe	191.00	1.0655	1.0115	1.00
Liquid Biofuels >25MWe	176.00	1.0000	1.0000	1.00
Bio-degradeable Liquid waste <=1MWe	275.00	1.0000	1.0000	1.00
Bio-degradeable Liquid waste 1-25MWe	260.00	1.0015	1.0015	1.00
Bio-degradeable Liquid waste >25MWe	176.00	1.0000	1.0000	1.00
Agricultural biomass or bio-degradeable solid waste <=1MWe	370.00	1.0014	1.0014	1.00
Agricultural biomass or bio-degradeable solid waste 1-25MWe	370.00	1.0014	1.0014	1.00
Agricultural biomass or bio-degradeable solid waste >25MWe	220.00	1.0000	1.0000	1.00
Wood Fuels <=1MWe	329.00	1.1112	1.0137	1.00
Wood Fuels 1-25 MWe	279.00	1.1306	1.0156	1.00
Wood Fuels >=25MWe	220.00	1.0000	1.0000	1.00

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# Alternative Fuels–For existing schemes

- **Alternative Fuel Gases** such as by-products from industrial processes, for example blast furnace gas, coke oven gas and refinery fuel gas, which may include constituents such as hydrogen, ethane, propane etc.
- **Biogas or renewable fuels** (such as sewage gas), waste gases (such as carbon monoxide or volatile organic compounds), or
- **Waste heat** (such as the exhaust gas from high temperature processes, or as a product of exothermic chemical reactions)
- **Biomass or solid waste** (such as woodchips, municipal solid waste, industrial solid waste, hospital waste) or
- **Liquid waste** (such as spent solvents, recycled used oil and refinery asphaltic oil)

# Alternative Fuels – For New schemes

1. **By-Product Gases**: products from industrial processes, (such as blast furnace gas, coke oven gas and refinery fuel gas).
2. **Biogas**: Fuel gas produced by the anaerobic digestion (AD) of biological materials (such as sewage gas, landfill gas, AD of food processing waste, pharmaceutical waste and municipal waste)
3. **Waste Gas or Heat**: waste gases (such as carbon monoxide or volatile organic compounds), or waste heat from industrial process (such as high temperature processes, exothermic chemical reactions)
4. **Liquid Bio-fuels**: Manufactured liquid bio-fuels as defined in the EU Bio-fuels Directive (such as bio-diesel, bio-ethanol)
5. **Liquid Waste**: Material of biological or non-biological origin from domestic and industrial activity (such as tallow, fats and biological oils, etc)
6. **Biomass or Solid Waste**
  - **Biomass** - such as energy crops, agricultural residues, straw, milling residues
  - **Solid Waste**- such as contaminated waste wood, municipal & industrial solid waste, hospital waste
7. **Wood Fuels**: Clean (uncontaminated) wood (such as clean woodchips, forest residues, clean industrial wood waste)

*For further details see GN 14*

# Impact on CCL Benefits

*Analysis based on agreed Reference Values – 2005 Data*

	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	895	895	895	895
Total Good Quality CHP capacity (MW)	5,649	5,649	5,649	5,649
Total Power Output (MWh)	50,675,520	50,675,520	50,675,520	50,675,520
Total Good Quality Power output (MWh)	29,120,480	27,387,600	23,220,000	16,442,900
Total Likely Benefits (£/year)	125,218,064	117,766,680	99,846,000	70,704,470
Reduction in Benefits (£/year)		7,451,384	25,372,064	54,513,594
% reduction in benefits		6.0%	20.3%	43.5%

# Time Scale Implementations

## 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 1 Jan 2011.

# Definitions for CHPQA Standard

## Issue 2

- **Existing Schemes** are those schemes that were in the planning stages, under construction or in operation and were registered as such with CHPQA before 1 January 2007.
- **New Schemes** - any other Schemes that failed to register with CHPQA before 1 Jan 2007.

# QI Threshold

For Schemes **in Operation**:

- Quality Index (QI)  $\geq 100$
- Based on actual heat figure

For **New & Upgraded** Schemes based on Design Data

- Quality Index (QI)  $\geq 105$  and
- Based on Design Maximum heat figure

## Next Steps?

- QI formulas, X & Y values finalised
- CHPQA Standard Issue 2 with Defra for publication
- Working on CHPQA GNs and electronic forms

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**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, developed 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.

## To summarise

- Modified X&Y values to accommodate the EU CHP Directive's Harmonised Reference Values and Comply with Article 12.2
- CHPQA Standard Issue will be published Soon!!
- This will apply to New Schemes from 1 Jan 2007 and Existing Schemes from 1 Jan 2011.
- You will have over 3 years to improve the performance of failing Schemes.

*If you have concerns on the impact of these changes on your CHP Scheme please write to the  
CHPQA Administrator*