

CHP SCHEMES AND FISCAL BENEFITS

Worked examples on how to calculate fiscal
benefits for CHPQA certified schemes

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1. Carbon Price Support Liability

The Carbon Price Floor (CPF) is a UK Government policy implemented to support the EU Emissions Trading System (EU ETS). The CPF was introduced on 1 April 2013 to underpin the price of carbon at a level that drives low carbon investment, which the EU ETS has not achieved.

1.1. What is the CPF?

The CPF taxes fossil fuels used to generate electricity via Carbon Price Support rates set under the Climate Change Levy. The price floor consists of two components which are paid for by energy generators in two different ways: (i) The EU ETS allowance price; and (ii) the Carbon Support Price (CPS), which tops up the EU ETS allowance prices, as projected by the Government, to the carbon floor price target.

1.2. How CPF are charged

The CPF taxes fossil fuels used to generate electricity via CPS rates set under the Climate Change Levy.

The carbon floor price consists of two components which are paid for by energy generators in two different ways:

- The EU ETS allowance price. Generators purchase the EU ETS allowances through regular Government auctions or the carbon markets.
- The Carbon Support Price (CPS). This tops up EU ETS allowance prices, as projected by the Government, to the carbon floor price target. It is charged through a component of Climate Change Levy, in £/kWh, and applied to fuels used for electricity generation. The CPS rates of CCL are paid by owners of electricity generating stations. It is different to the CCL main rates paid by businesses for their energy supply.

The CPS rates of CLL are available here:

<https://www.gov.uk/government/publications/rates-and-allowances-climate-change-levy/climate-change-levy-rates>

1.3. CPS liability calculation formula

$$Q = \left(TFI - \frac{QHO}{\eta_{h,ref}} \right) \times \left(1 - \frac{MO}{TPO} \right)$$

Where:

Q	= Fuel for Electricity
TFI	= Total Fuel Input
QHO	= Quality Heat Output
TPO	= Total Power Output
MO	= Mechanical Power
$\eta_{h,ref}$	= Reference boiler efficiency (81%)

The Percentage of fuel input referable to Electricity Generation is given on the CHPQA certificate. To calculate fuels referable to the production of non-qualifying electricity use the following formula is applied:

$$R = Q \times \left(1 - \frac{ES}{TPO - MO} \right)$$

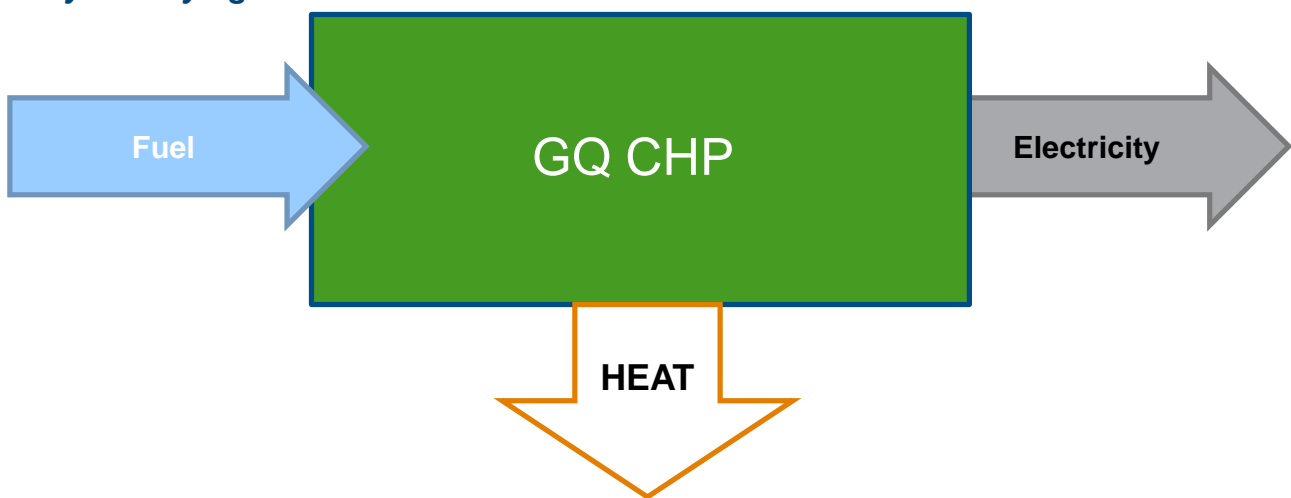
Where:

Q	= Fuel for Electricity
ES	= Electricity used on site (\leq QPO)
MO	= Mechanical Power
$\eta_{h,ref}$	= Reference boiler efficiency (81%)

2. Interaction of GQCHP scheme and CPS

CHP schemes who wish to claim CCL/CPS benefits need to apply for CHPQA certification. Based on their annual performance the scheme could be fully qualifying (i.e. they meet CHPQA Quality Index and power efficiency threshold) or partially qualifying. All performance parameters required to calculate the CCL/CPS liability for a given scheme are given on their certificate.

Fully Qualifying Schemes



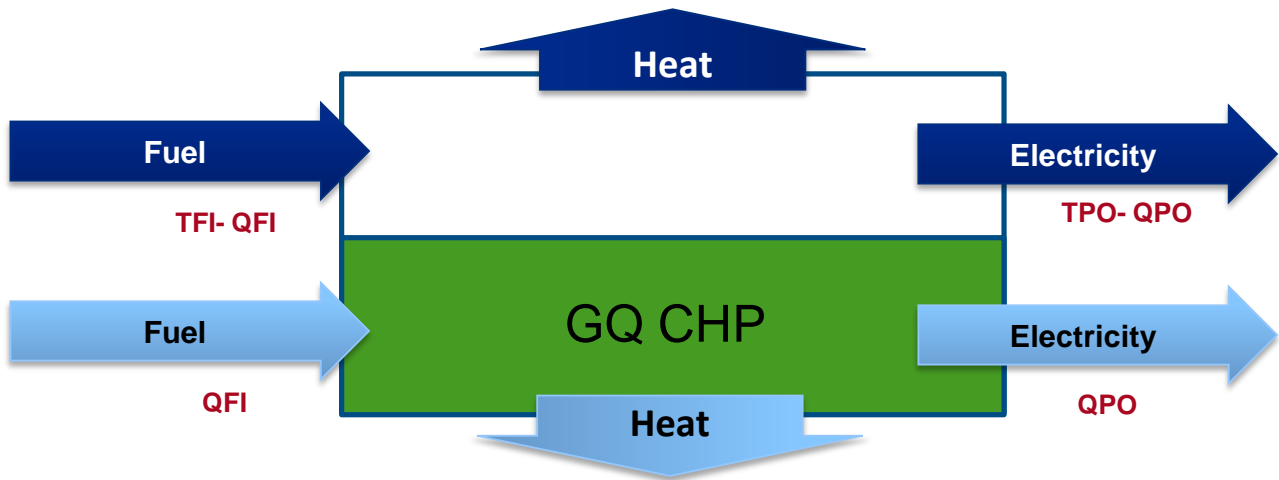
GQCHP schemes that are fully qualified with Capacity ≤ 2 MWe are;

- The fuel input is exempt from CPS
- Also exempt from CCL on fuel input
- Electricity output exempt from CCL (Direct Supply)

GQCHP schemes that are fully qualified with Capacity > 2 MWe are;

- The Fuel input exempt from CCL
- The Electricity output exempt from CCL (Direct supply).
- Fuel for heat (QHO) not liable to CPS rates
- Fuel input referable to electricity generation used on site not liable to CPS rates (from April 2015)

Partially Qualifying Schemes



GQCHP – Partially Qualified with Capacity $\leq 2\text{MWe}$

- No CPS liability
- Qualifying fuel input (QFI) exempt from CCL
- Qualifying power output (QPO) exempt from CCL where directly supplied

GQCHP – Partially Qualifying with Capacity $> 2\text{MWe}$

- Qualifying fuel input (QFI) exempt from CCL
- Qualifying power output (QPO) exempt from CCL if directly supplied
- Fuel for heat (QHO) not liable to CPS rates
- Fuel attributable to QPO used on site is not liable to CPS rates.

3. Worked Example 1 - Fully Qualifying >2MWe

3.1. Scheme with no electricity export

Following parameters are given on the CHPQA Certificate for the CHP Scheme;

- TPC = 3.60 MWe
- TFI = 61,600 MWh
- TPO = 23,700 MWh
- QHO = 19,500 MWh
- η_p = 38.5 %
- QI = 102.87

There is no mechanical output (MO), so $MO = 0$

First calculate the portion of fuel for electricity generation, Q

$$Q = \left(TFI - \frac{QHO}{\eta_{h,ref}} \right) \times \left(1 - \frac{MO}{TPO} \right)$$

Fuel for Electricity, Q

$$Q = \left(61600 - \frac{19500}{81\%} \right) \times \left(1 - \frac{0}{23700} \right)$$

= 37526 MWh (this is 61% of the TFI)

Fuel subject to CPS:

$$R = Q \times \left(1 - \frac{ES}{TPO - MO} \right)$$

For this scheme there is no electricity export to the grid and therefore electricity used onsite (ES) = 100% of TPO.

$$R = 37526 \times \left(1 - \frac{23700 \times 1}{23700 - 0}\right)$$

R = 0MWh

Therefore, $R/TFI = 0\%$

This means 100% of TFI is **exempt** from CPS for this CHP scheme operation.

3.2. Scheme with electricity export

Following parameters are given on the CHPQA Certificate for the CHP Scheme;

- TPC = 3.60 MWe
- TFI = 61,600 MWh
- TPO = 23,700 MWh
- QHO = 19,500 MWh
- η_p = 38.5 %
- QI = 102.87

There is no mechanical output (MO), so MO = 0

First calculate the portion of fuel for electricity generation, Q

$$Q = \left(TFI - \frac{QHO}{\eta_{h,ref}}\right) \times \left(1 - \frac{MO}{TPO}\right)$$

Fuel for Electricity, Q

$$Q = \left(61600 - \frac{19500}{81\%}\right) \times \left(1 - \frac{0}{23700}\right)$$

= 37526 MWh (this is 61% of the TFI)

Fuel subject to CPS:

$$R = Q \times \left(1 - \frac{ES}{TPO - MO}\right)$$

For this scheme there is 10% electricity export to the grid and therefore electricity used onsite (ES) = 90% of TPO.

$$R = 37526 \times \left(1 - \frac{23700 \times 0.9}{23700 - 0}\right)$$

R = 3752.6 MWh

Therefore, $R/TFI = \frac{3752.6}{61600} = 6.09\%$

This means 93.91% of TFI is **exempt** from CPS.

4. Worked Example 2 – Partially Qualifying >2MWe

Following parameters are given on the CHPQA Certificate for the CHP Scheme;

- TPC = 7.2 MWe
- TFI = 57,000 MWh
- TPO = 9,500 MWh
- QHO = 21,000 MWh
- η_p = 16.6 % (*failed power efficiency threshold 20%*)
- QI = 73.97 (*failed QI threshold of 100*)
- QFI = 48,000 MWh
- QPO = 5,800 MWh

There is no mechanical output (MO), so MO = 0

First calculate the portion of fuel for electricity generation, Q

$$Q = \left(TFI - \frac{QHO}{\eta_{h,ref}} \right) \times \left(1 - \frac{MO}{TPO} \right)$$

Fuel for Electricity, Q

$$Q = \left(57000 - \frac{21000}{81\%} \right) \times \left(1 - \frac{0}{9500} \right)$$

= 31000 MWh (this is 54.4% of the TFI)

Fuel subject to CPS:

$$R = Q \times \left(1 - \frac{ES}{TPO - MO} \right)$$

For this scheme there is no electricity export to the grid and therefore electricity used onsite (ES) = 100% of TPO.

$$R = 31000 \times \left(1 - \frac{5800 \times 1}{9500 - 0} \right)$$

R = 12100 MWh

Therefore, $R/TFI = \frac{12000}{57000} = 21.2\%$

This means 78.8% of TFI is **exempt** from CPS for this CHP scheme operation.