

GUIDANCE NOTE 10

DEFINING GOOD QUALITY CHP - CRITERIA FOR GOOD QUALITY CHP

GN10.1

In assessing the quality of CHP Schemes, and qualification as Good Quality CHP for all or part of their inputs, outputs and capacity, there are a number of key criteria:

- **For Fuel Inputs under Annual and Initial Operation:**

Normally, a Scheme that qualifies as Good Quality CHP for its entire annual energy inputs is one where the power efficiency equals or exceeds 20%.

- **For Power Outputs under Annual Operation:**

A Scheme that qualifies, as Good Quality CHP for its entire annual power output is one where the Quality Index equals or exceeds 100. Normally, the QI Threshold is based on Annual Operation, but can be based on other periods, for example on the Heating Season in the case of Residential Community Heating (RCH) Schemes.

- **For Power Outputs under Initial Operation:**

A Scheme that qualifies as Good Quality CHP for its entire annual power output is one where the Quality Index equals or exceeds 95. Normally, the QI Threshold is based on Annual Operation, but it can be based on other periods, for example on the Heating Season in the case of RCH Schemes.

- **For Power Capacity under Annual Operation:**

An existing Scheme that qualifies as Good Quality CHP for its entire Capacity is one which achieves a QI of at least 100 at its Maximum Heat Output under Normal Operating Conditions.

- **For Proposed New Power Capacity:**

A proposed Scheme that qualifies as Good Quality CHP for its entire Capacity is one which at design, specification, tendering and approvals stages, achieves QI > 105 based on Design MaxHeat conditions and a Power Efficiency > 20%, under Annual Operation. MaxHeat operation is based on operation at the heat output that is expected to be exceeded for the hours specified in the CHPQA Standard and further explained in GN27 depending on the use of the CHP heat output.

GN10.2

The Quality Index (QI) provides a means of assessing the quality of CHP Schemes that takes account of the fact that power supplied is more valuable than heat supplied. It compares CHP to separate power-only and heat-only alternatives. The QI therefore offers scope for a major improvement over conventional methods of assessment, which are based simply on overall efficiency.

- Refer to GN24 for guidance on determination of Scheme Quality.

QI METHODOLOGY AND TREATMENT OF DIFFERENT PLANT

GN10.3

The QI methodology ensures validity across a broad spectrum of CHP plant and applications, considering all sizes, fuel and types of CHP technology. QI formulae have been developed and tested based around a simple general form (see GN10.6).

GN10.4

The methodology reflects the technical factors affecting the selection of CHP plant in different applications and circumstances. These factors include:

- Alternative power supply options to CHP, taking account of the generating technology that would otherwise be employed
- The improvement in generating efficiency that can be achieved with increasing scale
- Reduced transmission and distribution losses for smaller embedded generating plant, as compared to larger, network-connected generating plant
- A range of alternative heat-supply options. In industrial applications, CHP will typically displace boilers across a range of sizes, fuels, and thermal efficiencies. In Residential Community Heating, communal boilers, electric heating and small individual boilers are displaced by heat from CHP

GN10.5

In addition to these technical factors, it is essential to ensure that under all circumstances:

- CHP provides significant 'environmental and other benefits' compared to the best available energy supply alternatives.
- The QI provides an incentive to improve environmental performance.

The primary energy savings generated by GQCHP should ensure compliance with the CHPQA Standard. QI formulae have been derived such that GQCHP Schemes with total installed capacity of:

- < 1 MWe – should provide > 0% primary energy savings compared with the Directive's harmonised reference values for separate production of heat and electricity;
- > 1 MWe – should provide > 10% primary energy savings compared with the Directive's harmonised reference values for separate production of heat and electricity;
- > 25 MWe – should have an overall efficiency of above 70% (based on Net Calorific Value).

THE GENERAL FORM OF CALCULATION

GN10.6

The general form of the QI calculation is:

$$QI = X \times \text{Power Efficiency} + Y \times \text{Heat Efficiency}$$

Where:

Power Efficiency (η_{power}) = Total Power Output (MWh_e) / Total Fuel Input (MWh)

Heat Efficiency (η_{heat}) = Qualifying Heat Output (MWh_{th}) / Total Fuel Input (MWh)

X is a factor for power, related to alternative electricity supply options

Y is a factor for heat supply, related to alternative heat supply options

These factors vary to reflect particular classes of CHP plant and to guarantee primary energy savings when compared with alternative options.

- **Total Power Output (CHP_{TPo})** is the total registered annual power generation from a CHP Scheme (MWh_e) as measured at the generator terminals, plus the electrical equivalent of any qualifying mechanical power supplied by the Scheme.
- **Qualifying Heat Output (CHP_{QHo})** is the total registered amount of useful heat supplied annually from a CHP Scheme (MWh_{th}). It is the heat output that is demonstrably utilised to displace heat that would otherwise be supplied from other sources.
- **CHP Total Fuel Input (CHP_{TFI})** is the total registered annual fuel input to a CHP Scheme (MWh), based on Gross Calorific Value (GCV). This includes any fuel used for pilot burners or other 'parasitic' uses and fuels of all types whether Conventional or Alternative.

QUALITY INDEX FORMULAE

GN10.7

The Quality Index formulae set down in the CHPQA Standard cover the full range of CHP Scheme applications, sizes (CHP_{TPC}), technologies and fuels.

The Quality Index of a CHP Scheme is calculated using the appropriate formula as set out in the CHPQA Standard (relevant Issue depending on the type of Scheme and when it was first certified under CHPQA).

Guidance Note 44 (GN44) provides QI formulae that are separate from the CHPQA Standard formulae and which are relevant to the Renewables Obligation and Contracts for Difference schemes only. Refer to GN44 (relevant Issue depending on the type of Scheme and when it was first certified under CHPQA) for detailed guidance as to the application of the GN44 formulae.

CHP SCHEME SIZE:

CHP Total Power Capacity (CHP_{TPC}) is the registered maximum power generation capacity of the CHP Scheme (MWe), at International Standard Atmospheric conditions. It defines the size of the Scheme for the purpose of selecting the appropriate Quality Index formula. Where there is more than one electrical generator

in a Scheme, CHP_{TPC} shall include the total electrical capacity of all generators that can run together, i.e. the actual maximum generation capacity. Where a Scheme includes mechanical power output, this shall be converted to an equivalent electrical power output and included in CHP_{TPC} .

CHP SCHEME FUEL TYPE:

For Schemes that burn a mixture of fuels, separate QI formula for each type of fuel will be determined, with the X & Y coefficients weighted for each fuel fraction. These are then summed together to produce the overall weighted QI formula to be applied.

Qualifying recovered heat (waste heat) imported into the CHP Scheme is classed as an alternative fuel.

- Refer to GN14.7 for detailed guidance on Recovered Heat.
- Refer to GN24.10 for guidance on mixed fuels.

CRITERIA FOR CERTIFICATION OF 'GOOD QUALITY'

GN10.8

Most calculations for Self-Assessment require three sets of annual data: fuel used, power generated and heat supplied (all data are on a Gross Calorific Value or Higher Heat Value basis). From these, Power Efficiency, Heat Efficiency and QI are calculated.

GN10.9

Most CHP Schemes will meet the Good Quality CHP criteria for their entire capacity, fuel input and energy output. However, some CHP Schemes may not achieve either or both of the criteria identified in GN10.1. For such CHP Schemes the power generation and/or fuel input qualifying as Good Quality CHP is scaled back to recognise the reduced environmental benefits. These adjustments are outlined below (GN10.11 to 10.15) and ensure that it is clear what is, and is not, defined as part of a CHP Scheme and so eligible for benefits.

GN10.10

Schemes that do not achieve either or both the criteria necessary to qualify as Good Quality CHP, fuel input and energy output, may be eligible for reduced benefits (See GN10.11 to GN10.15).

CHP QUALIFYING FUEL INPUT (CHP_{QFI})

GN10.11

Qualifying Fuel Input (CHP_{QFI}) is the quantity of fuel that is considered to be used in Good Quality CHP.

- If the CHP Scheme achieves the relevant Power Efficiency Threshold, all fuel used is considered to be in Good Quality CHP
- For CHP Schemes with Power Efficiency below the threshold, the fuel input that is considered to be used in Good Quality CHP is the Total Fuel Input scaled back to the level at which the CHP Scheme would have achieved the Power Efficiency Threshold given the CHP_{TPO} . The remainder is not considered to be an input to Good

Quality CHP

- Refer to GN25 for guidance on calculating CHP_{QFI} .
- Refer to GN41 for guidance on Climate Change Levy (CCL) exemption.

GN10.12

Some Schemes use a mix of conventional fuels on which CCL may be due, and alternative fuels, which are not subject to CCL. If such a Scheme does not meet the relevant Power Efficiency Threshold, the CHP_{QFI} will need to be calculated.

- Refer to GN24.10 for guidance on mixed fuels.
- Refer to GN4 for guidance on CCL exemption with mixed fuels.

CHP QUALIFYING POWER OUTPUT (CHP_{QPO})

GN10.13

Qualifying Power Output (CHP_{QPO}) is the power that is considered to be generated in Good Quality CHP.

- If the CHP Scheme achieves the relevant QI Threshold, all power is considered to be generated in Good Quality CHP
- For CHP Schemes with a QI below the threshold, the Qualifying Power Output is the power output (MWh) from the CHP Scheme that would have achieved a QI Threshold, given the CHP_{QHO} . The remaining power is not considered to be generated in Good Quality CHP
 - Refer to GN26 for guidance on calculating CHP_{QPO} .

CHP QUALIFYING POWER CAPACITY (CHP_{QPC})

GN10.14

CHP Qualifying Power Capacity (CHP_{QPC}) is defined as follows:

For Power Capacity under Annual Operation (AO): An existing Scheme that qualifies as Good Quality CHP for its entire Capacity is one which achieves a QI of at least 100 at its Maximum Heat Output under Normal Operating Conditions.

For Proposed New Power Capacity: A proposed Scheme that qualifies as Good Quality CHP for its entire Capacity is one which at design, specification, tendering and approvals stages, achieves $QI > 105$ based on Design MaxHeat conditions and Power Efficiency $> 20\%$ under Annual Operation.

To qualify under MaxHeat Conditions, the Maximum Heat Output shall be maintained for an absolute minimum of not less than the following cumulative periods during AO:

- Industrial, commercial or institutional
($< 10\% CHP_{QHO}$ to Residential Users) 1,000 hours
- Mixed residential, institutional, commercial or industrial
($> 10\%$ residential) 750 hours
- Residential Community Heating (See GN30) 500 hours

For Schemes under AO, MaxHeat shall be based on actual performance. For

proposed, new Schemes, evidence shall be required to support predictions of future heat loads, for example, projected build-up of a Community Heating Scheme.

GN10.15

For CHP Schemes that do not meet the relevant QI threshold, CHP_{QPC} needs to be calculated. In simple terms, this calculation is the same method as for CHP_{QPO} , but using different data. Instead of being on the basis of fuel used, power output and heat supplied all in MWh on an annual basis, the relevant data are fuel used (MW), power capacity (MW) and heat capacity (MW), at MaxHeat conditions.

- Refer to GN27 for guidance on Calculating CHP_{QPC} .

INITIAL OPERATION (IO)

GN10.16

Initial Operation starts when the Responsible Person notifies the Administrator, in writing, that the Scheme has begun operating as a CHP (i.e. is delivering heat to a useful heat demand). For a Scheme serving an individual user or site, IO ends after the first complete calendar year of AO. For a Scheme serving Community Heating, IO ends after the first two complete AOs.

GN10.17

During Initial Operation, which starts when the Responsible Person notifies the Administrator that the Scheme has begun operating as a CHP, a reduced QI Threshold may apply.

- **For Power Outputs under Initial Operation:** A Scheme that qualifies as Good Quality CHP for its entire annual energy outputs is one where the Quality Index equals or exceeds 95. Normally, the QI Threshold is based on Annual Operation, but can be based on other periods, for example, on the Heating Season in the case of Residential Community Heating Schemes.

RESIDENTIAL COMMUNITY HEATING (RCH)

GN10.18

Residential Community Heating (RCH) is the centralised supply of heat, predominantly for Residential Users, for space heating and domestic hot water. Residential Use is defined by the Finance Act 2000.

- Refer to GN30 for guidance on RCH Schemes.

GN10.19

For CHP Schemes serving Residential Community Heating with a CHP_{TPC} of 2 MWe or greater, the Self-Assessment of QI in operation may be based on the seven-month Heating Season determined at the discretion of the Responsible Person, provided that the seven-month Heating Season months fall within a single AO. This could be January to April and October to December within a single AO.

GN10.20

Where such a Scheme does not meet the QI Threshold for Good Quality for all of its power output, then the determination of CHP_{QPO} shall be based on the same seven-

month Heating Season. CHP_{QFI} shall be determined on an annual basis, as normal.

GN10.21

Schemes below 2 MWe serving Residential Community Heating can also be assessed on a seven-month Heating Season, provided they comply with the normal CHPQA metering and reporting requirements for CHP Schemes over 2 MWe.