GUIDANCE NOTE 24

DETERMINATION OF SCHEME QUALITY

QUALITY INDEX

GN24.1

One of two basic parameters for assessing a CHP Scheme is the Quality Index (QI). This is a measure of the overall energy efficiency of a CHP Scheme that takes account of the relative values, in energy terms, of power and heat. A description of the QI concept and its uses for the assessment of CHP Schemes are given in Guidance Note 0.

CALCULATION OF CHP SCHEME EFFICIENCY

GN24.2

The Quality Index is a measure of the overall energy efficiency of a CHP Scheme that takes account of the relative values, in energy terms, of power and heat.

- **Power Efficiency** is the total power generated in MWh (including the electrical equivalent of mechanical power outputs) during the Self-Assessment period expressed as a percentage of the total fuel (and heat) inputs in MWh during the period
- **Heat Efficiency** is the total useful heat outputs (heat supply) in MWh during the Self-Assessment period expressed as a percentage of the total fuel (and heat) inputs in MWh during the period

$$\eta_{power} = CHP_{TPO}/CHP_{TFI} \quad \& \quad \eta_{heat} = CHP_{QHO}/CHP_{TFI}$$

Efficiency values shall be based on the Gross Calorific Value (GCV) of the input fuel.

GN24.3

Where any component of the energy inputs to a Scheme has an uncertainty in excess of the acceptable level of uncertainty that is deemed 'best practice' as set out in GN13.10, the CHP_{TFI} must be multiplied by the overall adjustment factor F_{OI} for the purpose of deriving the power efficiency and heat efficiency. F_{OI} must be derived as per GN19.

- Refer to GN17 for guidance on Uncertainty in Metered Inputs and Outputs.
- Refer to GN18 for guidance on the Determination of Uncertainty in Calculated Energy Inputs and Outputs.
- Refer to GN19 for guidance on the Adjustment of Energy Inputs and Outputs for Excessive Uncertainty.

GN24.4

Where any component of the power outputs from a Scheme has an uncertainty in excess of the acceptable level of uncertainty that is deemed 'best practice' as set out in GN15.6, the CHP_{TPO} must be multiplied by the overall adjustment factor F_{OP} for the purpose of deriving the power efficiency. F_{OP} must be derived as per GN19.

GN24.5

Where any component of the heat outputs from a Scheme has an uncertainty in excess of the acceptable level of uncertainty that is deemed 'best practice' as set out in GN13.10, the CHP_{QHO} must be multiplied by the overall adjustment factor F_{OH} for the purpose of deriving the heat efficiency. F_{OH} must be derived as per GN19.

GN24.6

Where adjustments to account for excessive uncertainty are necessary, the calculations of power efficiency and heat efficiency become:

$$\eta_{power} = (CHP_{TPO} \times F_{OP}) / (CHP_{TFI} \times F_{OI})$$

$$\eta_{heat} = (CHP_{QHO} \times F_{OH}) / (CHP_{TFI} \times F_{OI})$$

POWER EFFICIENCY THRESHOLD

GN24.7

CHP Schemes where both the Power Efficiency and the QI equal or exceed stipulated threshold values qualify as Good Quality for their entire capacity, fuel input and energy output.

GN24.8

The Power Efficiency Threshold is set at 20%. If the threshold value is equaled or exceeded, all of the fuel inputs qualify as Good Quality CHP. CHP Schemes that fail to meet their Power Efficiency Threshold must calculate their CHP Qualifying Fuel Input (CHP_{QFI}), which is the proportion of the fuel input that qualifies as an input to Good Quality CHP.

- Refer to GN25 for guidance on CHP_{QFI}.

CALCULATING THE QUALITY INDEX (QI)

GN24.9

The general Form of the QI definition is:

$$QI = (X \times \eta_{power}) + (Y \times \eta_{heat})$$

X is a coefficient related to alternative power supply options. Similarly, Y is a coefficient for heat generation, related to alternative heat supply options. The values of X and Y vary for different Scheme capacities and fuel types, and also for date of first certification of the Scheme. Refer to the CHPQA Standard for full details and identification of the appropriate QI definition for a given Scheme.

GN24.10

Where a Scheme utilises more than one fuel, weighted mean values for X and Y shall be used for the definition and calculation of QI.

Weighted mean values are calculated in proportion to the fractional energy input from each fuel burned.

$$X = F1 \times X1 + F2 \times X2 + F3 \times X3 + F4 \times X4$$

$$Y = F1 \times Y1 + F2 \times Y2 + F3 \times Y3 + F4 \times Y4$$

Where:

F1, F2, F3, F4 are the fractional energy inputs from fuel types 1, 2, 3 and 4 respectively and the sum of (F1 + F2 + F3 + F4) = 1.0. The calculation of F1, F2, etc. shall be based on the energy inputs in the submission (i.e. without adjustment for excess uncertainty).

X1, X2, X3, X4 are the X values for fuels 1, 2, 3 and 4 respectively.

Y1, Y2, Y3, Y4 are the Y values for fuels 1, 2, 3 and 4 respectively.

CALCULATION OF THE QUALITY INDEX

GN24.11

Annual figures for fuel used (including heat imports, where applicable), power generated (including the electrical equivalent of mechanical power outputs, where applicable) and heat outputs are the sums of the 12 monthly figures reported on in the submission, except for CHP Schemes supplying Residential Community Heating. For the calculation of power efficiency and heat efficiency over the self-assessment period, overall adjustment factors for excess uncertainty in energy inputs (F_{OI}), power outputs (F_{OP}) and heat outputs (F_{OH}) as set out in GN24.3 - GN24.6 shall be used where necessary.

GN24.12

For CHP Schemes serving Residential Community Heating with a CHP_{TPC} > 2 MW_e 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 Heating Season months fall within a single Annual Operation (AO). Where such a Scheme does not meet the QI Threshold for Good Quality CHP for all of its power output, then the determination of CHP_{QPO} shall be based on the same 7-month Heating Season. CHP_{QFI} shall be determined on an annual basis, as normal. Schemes ≤2 MW_e can also be assessed on the Heating Season, provided they comply with the normal CHPQA metering and reporting requirements.

- Refer to GN30 for guidance on Residential Community Heating.

QUALITY INDEX THRESHOLD

GN24.13

The QI Threshold is set at 100 except for new CHP Schemes in their initial period of operation when a QI Threshold of 95 applies. If the threshold value is equaled or exceeded, all of the power generated qualifies as Good Quality CHP. CHP Schemes that fail to meet the QI Threshold must calculate their CHP Qualifying Power Output (CHP_{QPO}) and CHP Qualifying Power Capacity (CHP_{QPC}).

- Refer to GN26 for guidance on CHP_{QPO}.
- Refer to GN27 for guidance on CHP_{QPC}.

