GUIDANCE NOTE 27

DETERMINATION OF CHP QUALIFYING POWER CAPACITY

Qualifying Power Capacity (CHP_{QPC})

GN27.1

CHP_{QPC} is the maximum power generating capacity of the CHP Scheme that can be considered to be generated in Good Quality CHP.

GN27.2

CHP Qualifying Power Capacity (CHP_{QPC}) is all or a proportion of the rated power output or Total Power Capacity (CHP_{TPC}) of the CHP Scheme.

For Schemes that achieve or exceed the QI Threshold under long term annual operation (LTAO) the CHP_{QPC} is equal to the CHP_{TPC} of the Scheme.

Schemes that do not meet the above criterion must calculate the Quality Index at maximum heat output under Normal Operating Conditions (MaxHeat).

If the CHP Scheme achieves the relevant QI Threshold (100 for Schemes in operation or 105 for Schemes in the development stages) at these conditions ($QI_{MaxHeat}$), the CHP_{QPC} is equal to the CHP_{TPC} of the Scheme.

GN27.3

For Schemes with a $QI_{MaxHeat}$ less than the QI threshold, CHP_{QPC} needs to be calculated. In simple terms this calculation is the same method as for CHP_{QPO} but uses different data. Instead of being on the basis of fuel used, power generated and heat supplied (all in MWh) on an annual basis, the relevant data are fuel used (MW), power generated (MW) and heat supplied (MW), at maximum heat output under normal operating conditions.

CALCULATING $QI_{(MAXHEAT)}$

GN27.4

Maximum Heat Output under Normal Operating Conditions varies with application as some Schemes have very distinct patterns of heat demand that can cycle over varying periods. It is expected that Responsible Persons will take this into account when deciding the specific periods of output to count towards their aggregate Maximum Heat Output.

To qualify as Normal Operating Conditions, the Maximum Heat Output shall be maintained for an absolute minimum of not less than the following cumulative periods during Annual Operation:

Industrial, commercial or institutional	1,000 hours
	(<10% CHP_{QHO} to Residential Users)
Mixed residential, institutional, commercial or industrial	750 hours
	(≥10% residential)
Residential Community Heating	500 hours

Interpolate MaxHeat from your heat load duration curve complying with the requirements discussed above.

- For guidance on how to produce the heat load duration curve see GN12.5.

GN27.5

Having established the maximum heat output at NOC, the CHP Scheme's power output and fuel inputs **at these conditions** are required. For existing CHP Schemes these may be obtained by selecting from recorded operating data representative samples that are close to the required heat output condition. If this is done manually, sufficient samples should be taken to ensure that the figures selected are representative. For new CHP Schemes the process flow-sheet case closest to the required load may be adequate. Alternatively, where the required heat load lies between the equipment maximum design case and a lower, average, flow-sheet case, interpolation may be appropriate.

GN27.6

The determination of $QI_{MaxHeat}$ using the 'MaxHeat' data requires the calculation of Power Efficiency and Heat Efficiency and the use of the appropriate X and Y factors.

CALCULATING QUALIFYING POWER CAPACITY

GN27.7

To determine the CHP_{QPC} where a CHP Scheme **does not include a condensing steam turbine**, the calculation is as follows (based on MaxHeat conditions):

Step 1 Calculate the new Heat Efficiency required to achieve the threshold QI_{th} (100 for Schemes in operation or 105 for Schemes in the development stages) at MaxHeat from:

$$\text{New } \eta_{Heat} = (QI_{th} - (X \times \eta_{Power})) / Y$$

Where:

η_{Power} = Power Efficiency; and η_{Heat} = Heat Efficiency

Step 2 Calculate the Equivalent Heat-to-Power ratio.

$$\text{Equivalent Heat-to-Power ratio} = \text{New } \eta_{Heat} / \eta_{Power}$$

Step 3 Calculate the Qualifying Power Capacity.

$$CHP_{QPC} = \text{MaxHeat} / \text{Equivalent Heat-to-Power ratio}$$

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 MaxHeat must be multiplied by the overall adjustment factor F_{OH} for the purpose of deriving the CHP_{QPC}. F_{OH} must be derived as set out in GN19. In such cases CHP_{QPC} becomes:

$$CHP_{QPC} = \text{MaxHeat} \times F_{OH} / \text{Equivalent Heat-to-Power ratio}$$

GN27.8

To determine the CHP_{QPC} where a CHP Scheme **includes a condensing steam turbine**, the calculation is as follows (based on MaxHeat conditions):

Step 1 Determine the Z ratio for the CHP Scheme (see GN28).

Step 2 Calculate New Heat Efficiency required to achieve the QI Threshold at MaxHeat from:

$$\text{Change in } \eta_{Heat} = \text{Change in QI } /(Y - (X / Z \text{ ratio}))$$

$$\text{New } \eta_{Heat} = \text{Change in } \eta_{Heat} + \eta_{Heat}$$

Step 3 Calculate the new Power Efficiency required to achieve the QI Threshold at MaxHeat from:

$$\text{Change in } \eta_{Power} = \text{Change in } \eta_{Heat} / Z \text{ ratio}$$

$$\text{New } \eta_{Power} = \eta_{Power} - \text{Change in } \eta_{Power}$$

Step 4 Calculate Equivalent Heat-to-Power ratio at MaxHeat.

$$\text{Equivalent Heat-to-Power ratio} = \text{New } \eta_{Heat} / \text{New } \eta_{Power}$$

Step 5 Calculate the Qualifying Power Capacity.

$$CHP_{QPC} = \text{MaxHeat} / \text{Equivalent Heat-to-Power ratio}$$

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 MaxHeat must be multiplied by the overall adjustment factor F_{OH} for the purpose of deriving the CHP_{QPC}. F_{OH} must be derived as set out in GN19. In such cases CHP_{QPC} becomes:

$$CHP_{QPC} = \text{MaxHeat} \times F_{OH} / \text{Equivalent Heat-to-Power ratio}$$

