ENTSO-E – European Network Codes
RfG - Synchronous Power Generating Module – Definition issues

Antony Johnson
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Scope

- To provide clarification on the definition of “Synchronous Power Generating Module”, ‘Connection Point’ and “Maximum Capacity”
- Understand the intention of the definitions
- Suggest amendments to the RfG definitions if required

RfG Current Definitions

- 7. ‘**synchronous power generating module’** means an indivisible set of installations which can generate electrical energy such that the frequency of the generated voltage, the generator speed and the network voltage are in a constant ratio and thus in synchronism
- 14. ‘**connection point**’ means the interface at which the power generating module, demand facility, distribution system or HVDC system is connected to a transmission system, offshore network, distribution system, including closed distribution systems, or HVDC system, as identified in the connection agreement.
- 15. ‘**maximum capacity’** or ‘Pmax’ means the maximum continuous active power which a power generating module can produce, less any demand associated solely with facilitating the operation of that power generating module and not fed into the network as defined in the connection agreement or as agreed between the relevant system operator and the power generating facility owner.

Current GB Approach

- The current GB Grid Code specifies technical requirements on a power station basis (being Large, Medium or Small).
- For Synchronous plant, having defined the Power Station size the technical requirements are then defined on a Generating Unit basis (generally at the terminals) which in other words is broadly equivalent to the nameplate rating.
- There are a few cases (eg industrial sites) where the requirements are treated on the net export from the site – eg a chemical site where there may be generation and demand and the requirements are based on the net export (Embedded Generation less site demand) at the connection point to the Transmission or Distribution System. These are generally referred to as “Trading Sites”. The RfG approach does not allow for the “trading site” approach for new sites.
- For Power Park Modules, classification is still based on Large, Medium and Small Power Stations but the technical requirements are based on a Power Park Module basis, ie the requirements apply at each connection point in relation to the total connected capacity of the Power Park Module rather than the individual turbines within the Power Park Module.

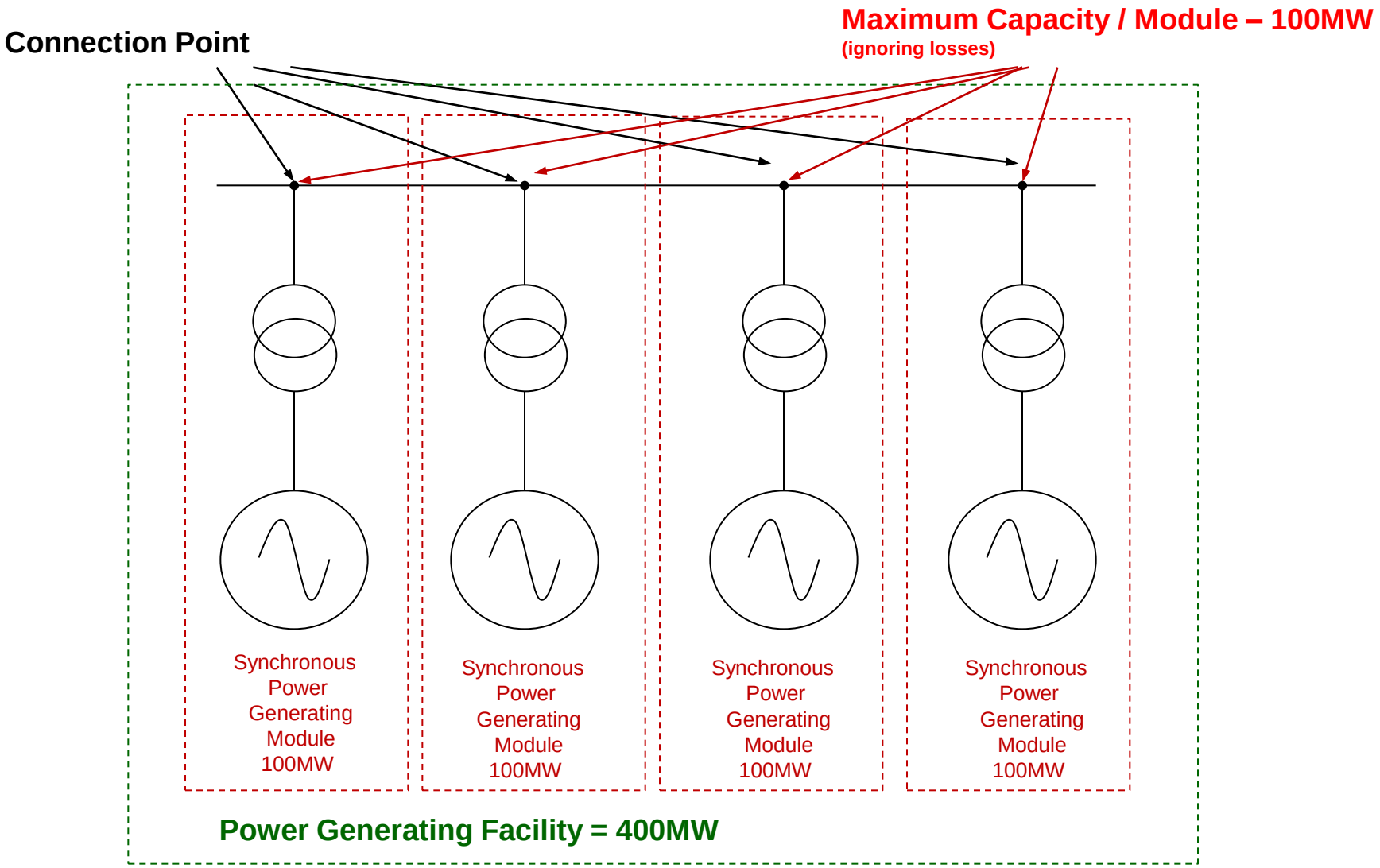
RfG Interpretation

- Unlike GB, RfG does not define the term “Power Station” or “Generating Unit”, but does define “Power Generating Module”. RfG does make reference to “units” although this is not a defined term. Unusually the term “alternator” is defined although it is not specifically tied to synchronous plant.
- In respect of synchronous plant, RfG defines the technical requirements on the basis of the terms “Power Generating Module”, “Connection Point” and “Maximum Capacity”
- The banding requirements are then covered in Article 5 although these levels can be reduced subject to National Governance in accordance with Article 7. This consultation process is currently in progress through the Grid Code / Distribution Code Working Group GC0048.
- Whereas (9) – provides further clarification – “The significance of power generating modules should be based on their size and their effect on the overall system. Synchronous machines should be classed on the machine size and include all the components of a generating installation that normally run indivisibly ….”

Proposed Banding (A - D)

RfG Type	Generator Capacity	Connection Voltage
A	800W-1MW	<110kV
B	1-50MW	<110kV
C	50-75MW	<110kV
D	≥75MW	≥ 110kV

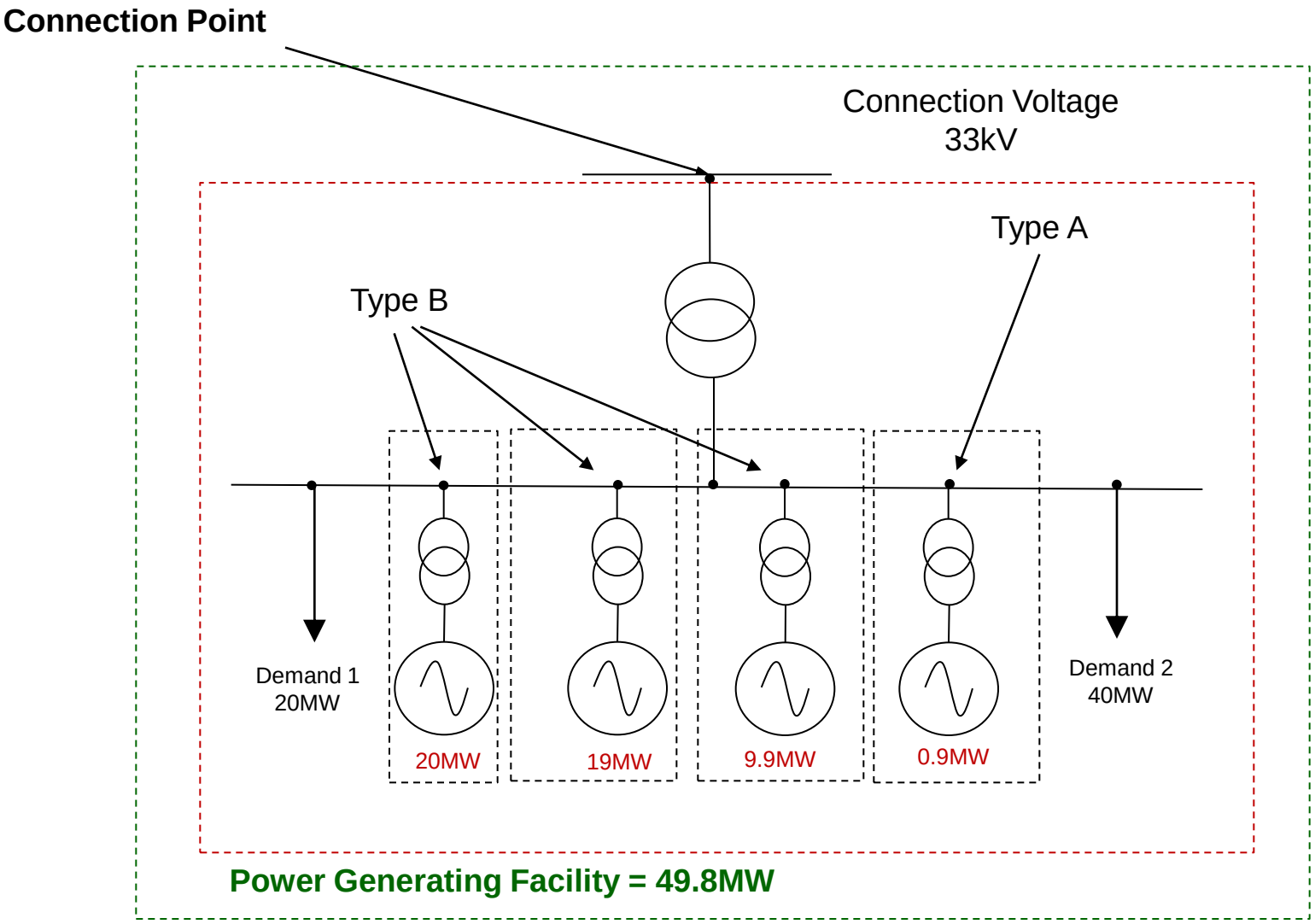
Example 1 – Four Synchronous Power Generating Modules / One Power Generating Facility



Example 1 – Four Synchronous Power Generating Modules / One Power Generating Facility

- Power Generating Facility = 400MW
- Four Synchronous Power Generating Modules each operated independently.
- Each Synchronous Power Generating Module = 100MW
- Maximum Capacity at each Connection Point = 100MW
- Each Synchronous Power Generating Module are classified as Type D
- Requirements defined

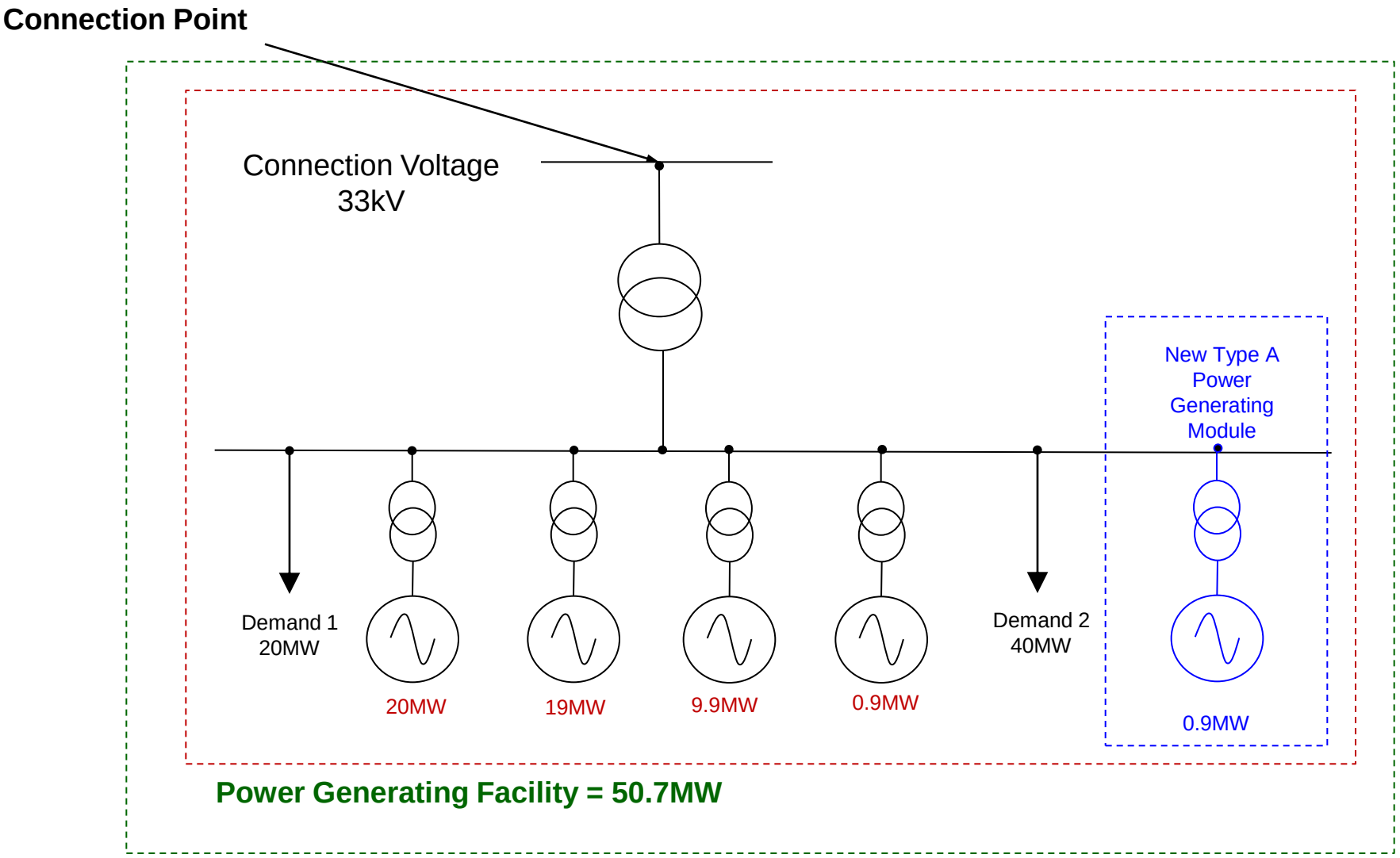
Example 2 – Multiple Synchronous Power Generating Modules within a Power Generating Facility with Demand



Example 2 – Multiple Synchronous Power Generating Modules within a Power Generating Facility with Demand

- Power Generating Facility = 49.8MW
- Four Synchronous Power Generating Modules
- Connection Point is below 110kV
- All are controlled independently
- One Synchronous Power Generating Module is 0.9MW hence type A
- The remaining Synchronous Power Generating Modules are between 1 and 50MW and therefore Type B

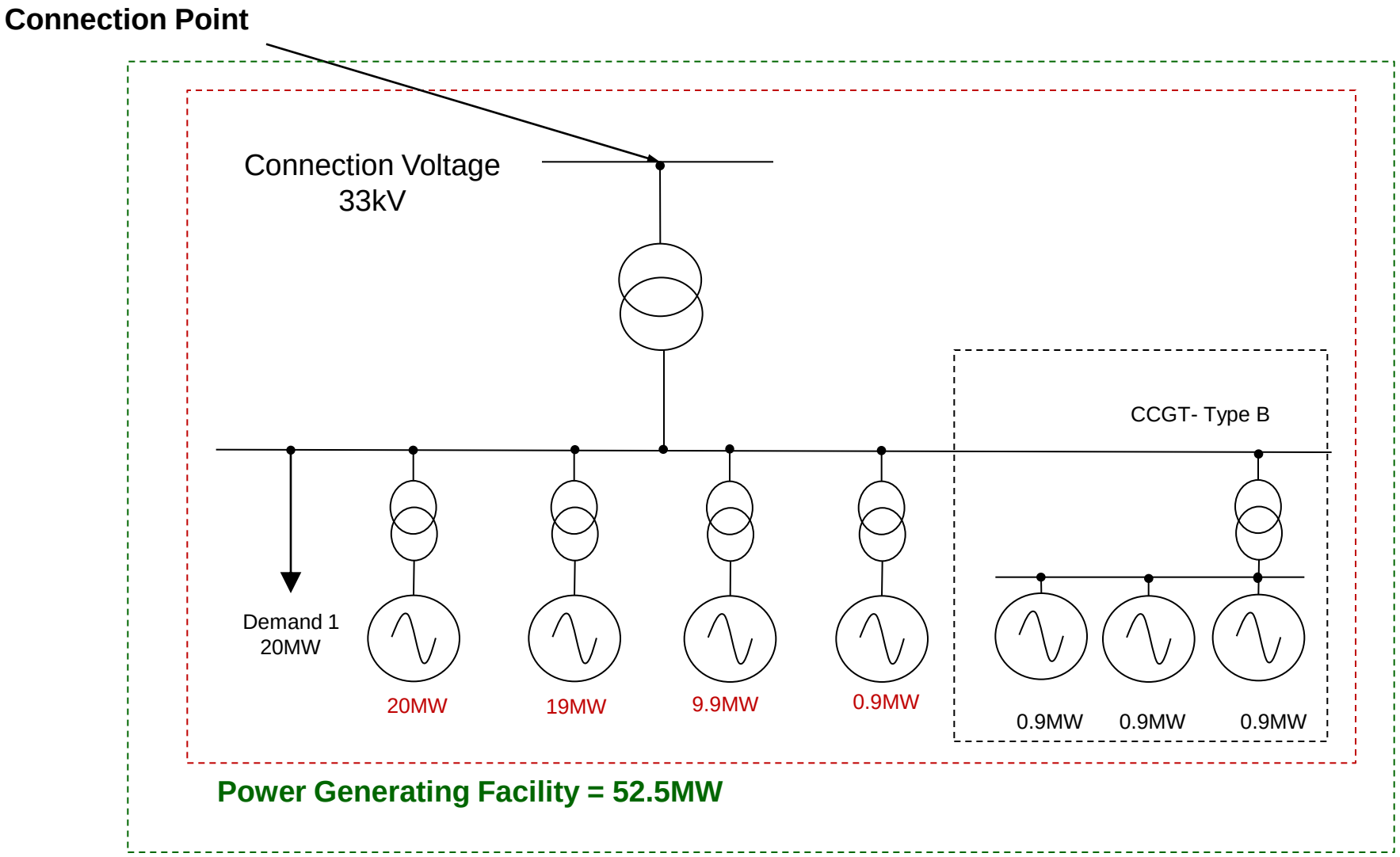
Example 3 – Existing Embedded Power Generating Modules and on site demand with the addition of a new Power Generating Module



Example 3 – Existing Embedded Generating Units and on site demand with the addition of a new Power Generating Module

- Existing Power Generating Modules remain unchanged
- The new Synchronous Power Generating Module operates independently of the other Synchronous Power Generating Modules
- The new Synchronous Power Generating Module is 0.9MW and connected below 132kV and therefore Type A

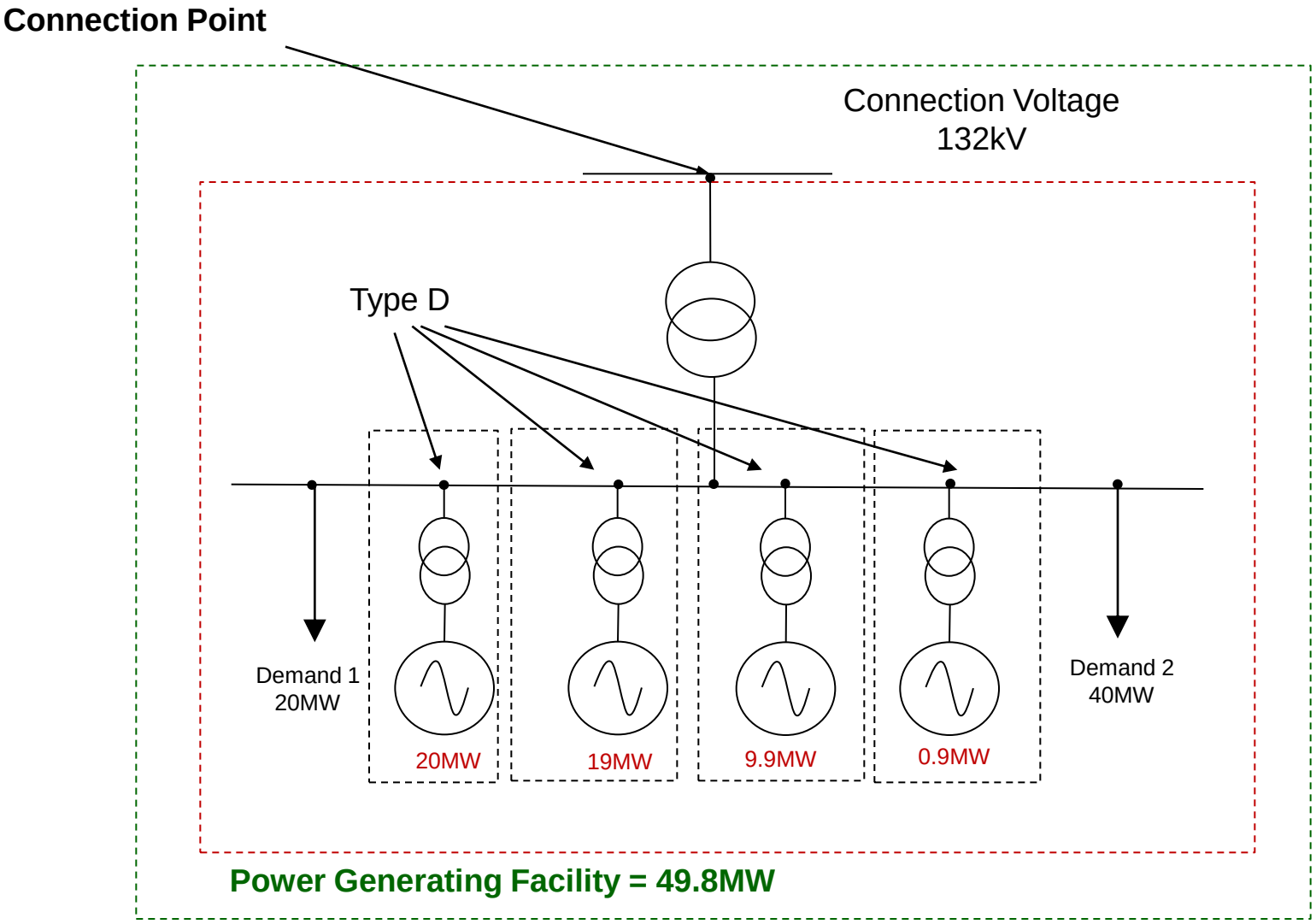
Example 4 – Multiple Synchronous Power Generating Modules within a Power Generating Facility including a CCGT



Example 4 – Multiple Synchronous Power Generating Modules within a Power Generating Facility including a CCGT

- Existing Power Generating Modules remain unchanged
- The GGCT cannot be operated independently and therefore would be treated as Type B on the basis that the cumulative capacity is 3 x 0.9 = 2.7MW

Example 5 – Multiple Synchronous Power Generating Modules within a Power Generating Facility with Demand and connected at 132kV



Example 5 – Multiple Synchronous Power Generating Modules within a Power Generating Facility with Demand and connected at 132kV

- Same as Example 2 but connected at 132kV
- Power Generating Facility = 49.8MW
- Four Synchronous Power Generating Modules
- Connection Point is at 132kV and therefore above 110kV
- All are controlled independently
- Since the Connection Point is at 132kV then all the Synchronous Power Generating Modules are Type D.

Summary

- It is believed that the current ENTSO-E definitions are adequate but do require some interpretation
- It is suggested that as part of a Connection Offer (or modification thereto) the classification and banding is clearly stated and reasons why.
- Generally most industrial sites in GB are historic and therefore will not be caught by the new requirements.
- RfG will capture new units within a complex. For a plant with a connection point below 132kV the requirements applicable to the new unit would be based on nameplate rating only.
- For a site which is connected at 132kV or above any new unit would need to satisfy the Type D requirements.