EWEA
THE EUROPEAN WIND ENERGY ASSOCIATION

ENTSO-E NC RfG: FRT & Reactive Power

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FRT requirements (Article 15)

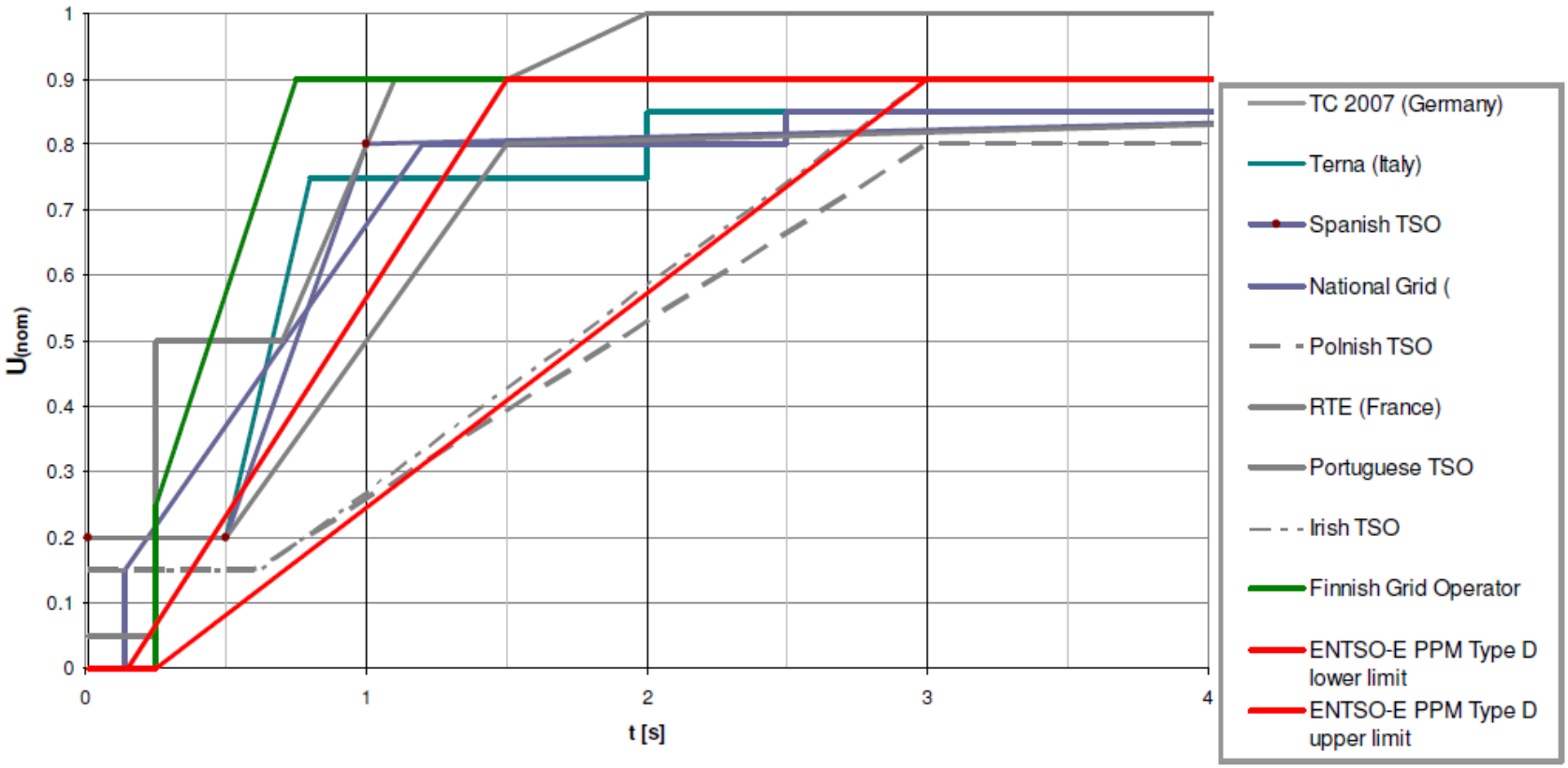
PRINCIPAL CONCERNS

- no coherence in the specification with respect to what is required at the Connection Point and what is required at the terminals of the Units.
- the FRT profiles are prone to wrong interpretation
- Specifications lacking clarity in several places,
- Some specifications more demanding than present codes, without proper justification
- For fast current injection after fault clearance, the NC prescribes implementation methods rather than required behavior / performance. In this way the required implementation lies close to many existing patents and prevents free trade in Europe.

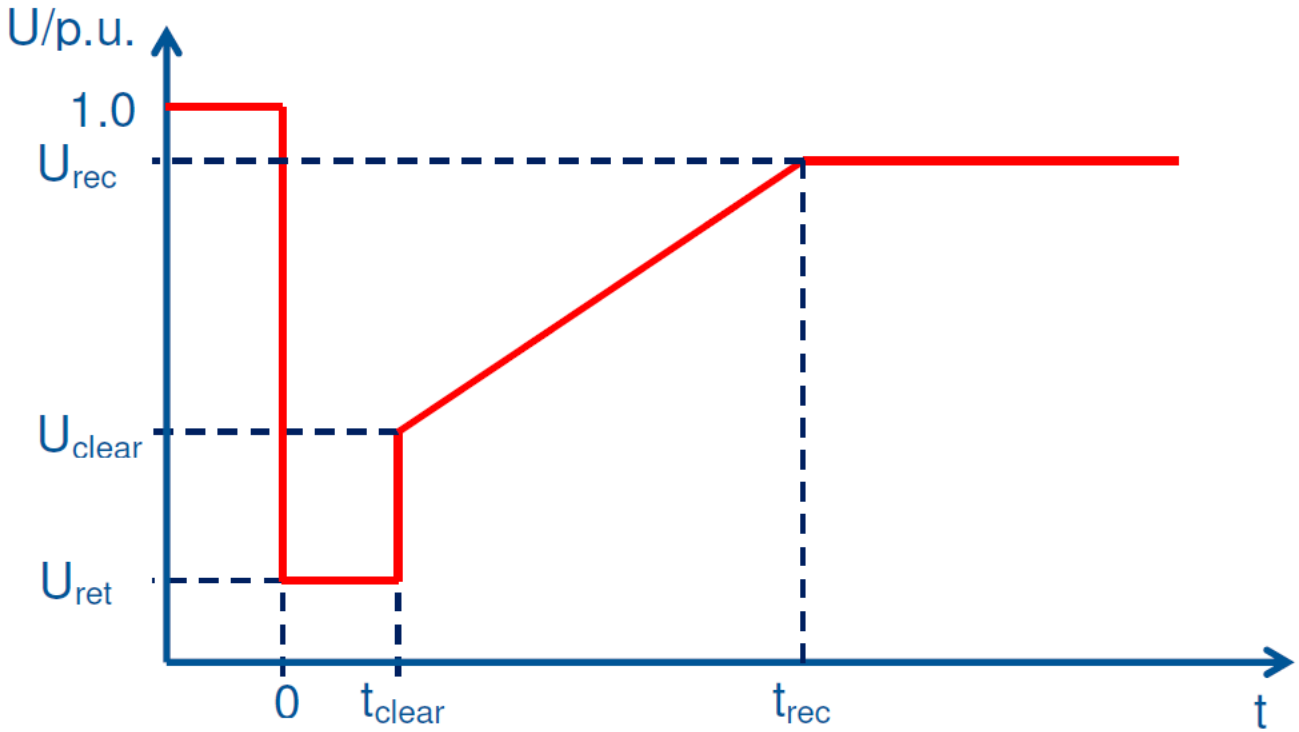
FRT requirements (Article 15)

- The changes required are multiple and fundamental
- can not be achieved by some editing in the text
- EWEA proposes to replace the contents of Article 15 paragraphs 2 and 3
- proposed text submitted in the webtool and available on request

FRT profiles exceeding current requirements



Generic FRT Profile for PPMs (all types)



	Connection Point < 110 kV	Connection Point ≥ 110 kV
U_{ret} [p.u.]	0.05 – 0.15	0
U_{clear} [p.u.]	≥ 0.15	≥ 0.15
U_{rec} [p.u.]	0.9	as per table 5.1 and 5.2
t_{clear} [sec]	≤ 0.25	≤ 0.25
t_{rec} [sec]	1.5 – 3.0	1.5 – 3.0

Table 1: Parameters for FRT profile (explanation for figure 1)

Reactive power (Article 16)

PRINCIPAL CONCERNS

- specifications of the U/Q/Pmax – capability significantly more demanding than present codes - proper justification including a cost-benefit analysis is lacking.
- Need for making distinction between > 110 kV and below to take into consideration inherent characteristics of distribution and transmission: EWEA proposal
- The clauses and specification lack of clarity in several clauses and paragraphs.
- capability to provide or absorb Reactive Power only to be required when generating active power.

Reactive power (Article 16)

- specifications of the U/Q/Pmax – capability significantly more demanding than present codes - especially for distribution networks. Proper justification including a cost-benefit analysis is lacking.
- Need for making distinction between > 110 kV and below to take into consideration inherent characteristics of distribution and transmission: EWEA proposal
- The clauses and specification lack of clarity in several clauses and paragraphs.
- capability to provide or absorb Reactive Power only to be required when generating active power.

Reactive power (Article 16)

EWEA proposes

- to replace the entire present contents from Article 16 (3) (a) to Article 16 (3) c) 4) with the parts of proposed text relevant for Type C Power Park Modules

- to add these parts of proposed text relevant for Type D Power Park Modules as new paragraphs to Article 17 where regarded as most suitable.

Reactive Power: U-Q/Pmax <110 kV

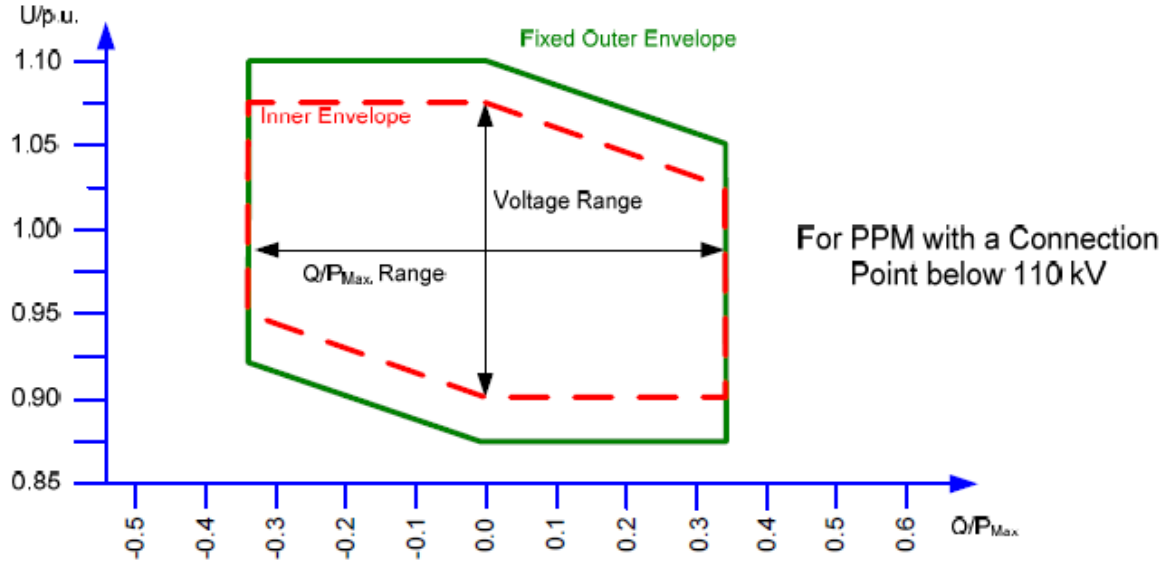


Figure 10.1 U-Q/P_{Max}-profile for Power Park Modules with a Connection Point below 110 kV by the Voltage at Connection Point, expressed by the ratio of its actual voltage value U and its nominal value of U in per unit, against the ratio of the Reactive Power capability (Q) and the Maximum Capacity (P_{Max}) of a Power Park Module.

Synchronous Area	Maximum range of Q/P_{max}	Maximum range of steady state voltage level in PU
Continental Europe	0.66	0.175
Nordic	0.66	0.150
Great Britain	0.66	0.100
Ireland	0.66	0. 175
Baltic States	0.66	0. 175

Table 7: Parameters for the inner envelope in figure 10.1 for PPM with a Connection Point below 110 kV

Reactive Power: U-Q/Pmax >110 kV

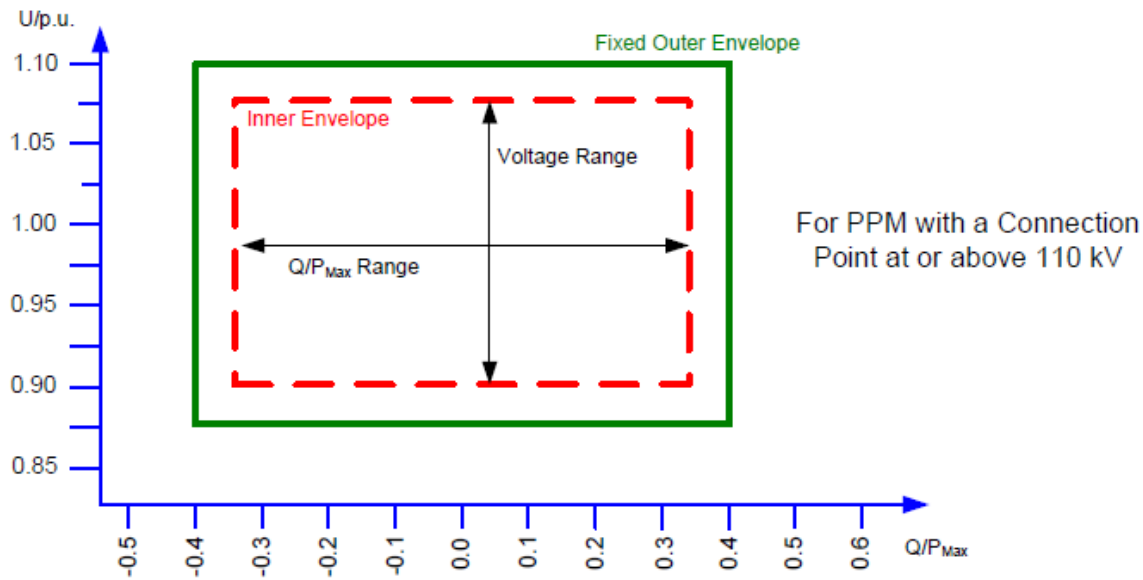


Figure 10.2 U-Q/P_{max}-profile for Power Park Module with a Connection Point at or above 110 kV by the Voltage at the Connection Point, expressed by the ratio of its actual Voltage value U and its nominal value of U in per unit, against the ratio of the Reactive Power capability (Q) and the Maximum Capacity (P_{max}) of a Power Park Module.

Synchronous Area	**Maximum range of Q/P_{max}**	**Maximum range of steady state voltage level in PU**
Continental Europe	0.75	0.225
Nordic	0.66	0.150
Great Britain	0.66	0.100
Ireland	0.66	0.218
Baltic States	0.75	0.220

Table 7: Parameters for the inner envelope in figure 10.2 for Power Park Module with a Connection Point at or above 110 kV

Reactive Power: P-Q/Pmax <110 kV

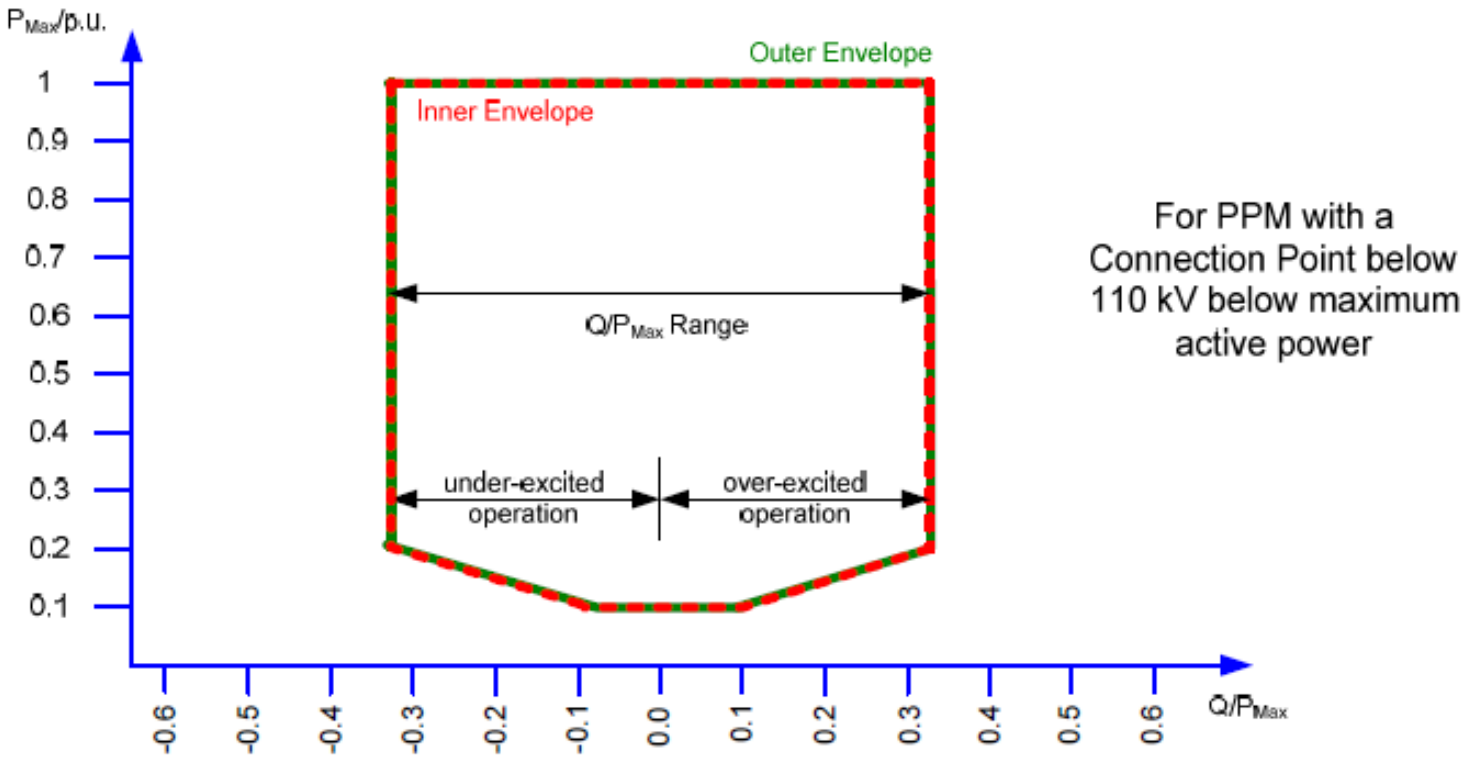


Figure 11.1 - P-Q/P_{max}-profile of a Power Park Module with a Connection Point below 110 kV. The diagram represents a P-Q/P_{max}-profile by the Active Power, expressed by the ratio of its actual value and the Maximum Capacity in per unit, against the ratio of the Reactive Power capability (Q) and the Maximum Capacity (P_{max}) of a PPM.

Reactive Power: P-Q/Pmax >110 kV

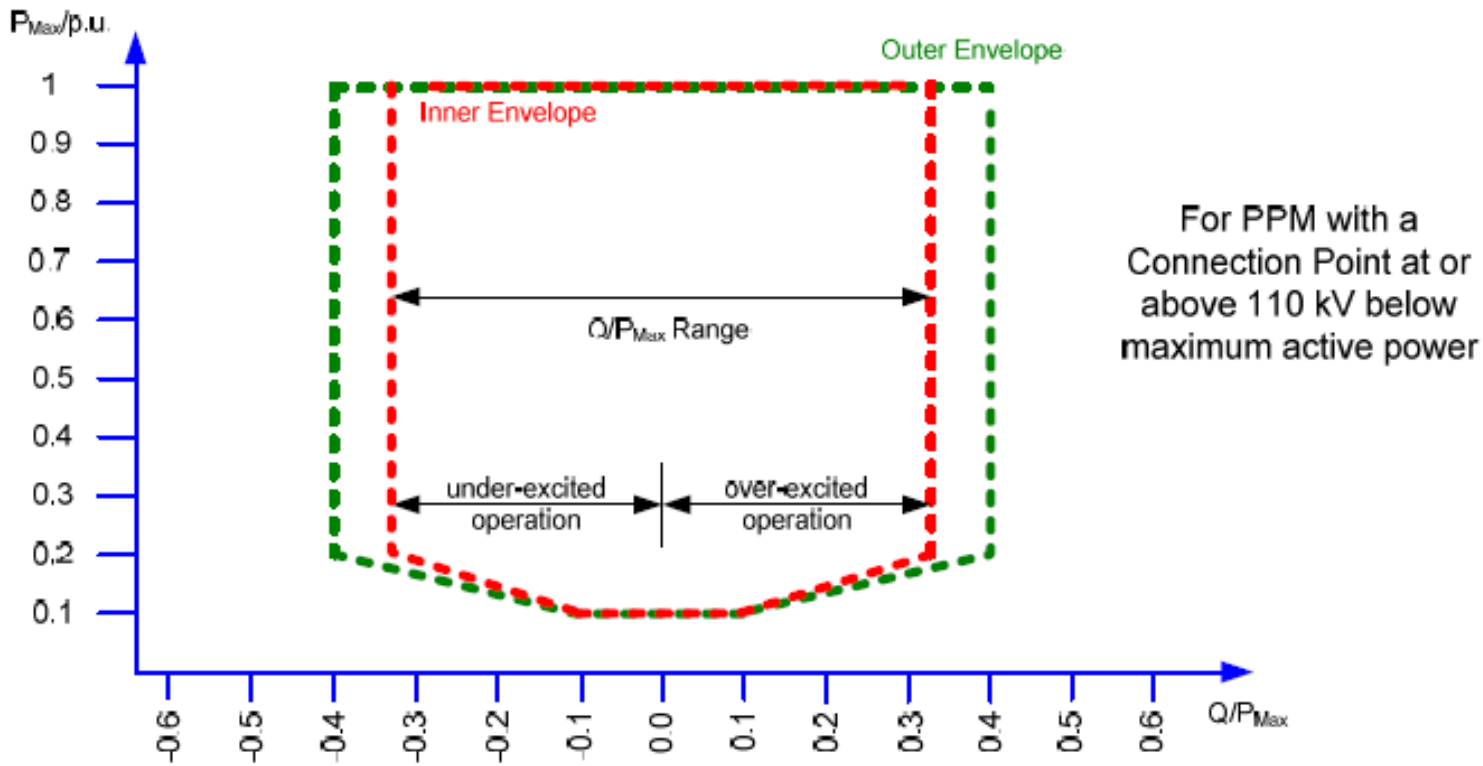


Figure 11.2 - P-Q/P_{max}-profile of a PPM with a Connection Point at or above 110 kV Power Park Module. The diagram represents a P-Q/P_{max}-profile by the Active Power, expressed by the ratio of its actual value and the Maximum Capacity in per unit, against the ratio of the Reactive Power capability (Q) and the Maximum Capacity (P_{max}) of a PPM.