

DCC Stakeholder Workshop

REACTIVE POWER EXCHANGE BETWEEN DISTRIBUTION AND TRANSMISSION NETWORKS

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Interface TSO-DSO concerning reactive power

- Background -

- Situation in the past:
 - Almost all DSO networks dominated by passive load whose reactive behavior cannot be influenced
 - Reactive (voltage) control performed by large power stations at the extra high voltage grid, ordered by the TSO
- Situation in the future:
 - Generation moving from extra high voltage level to lower voltage levels
 - ⇒ Few reactive capability available for the TSO
 - ⇒ Growing reactive capabilities in the DSO networks
- Challenge:
 - How to make best use of the dispersed reactive capabilities?

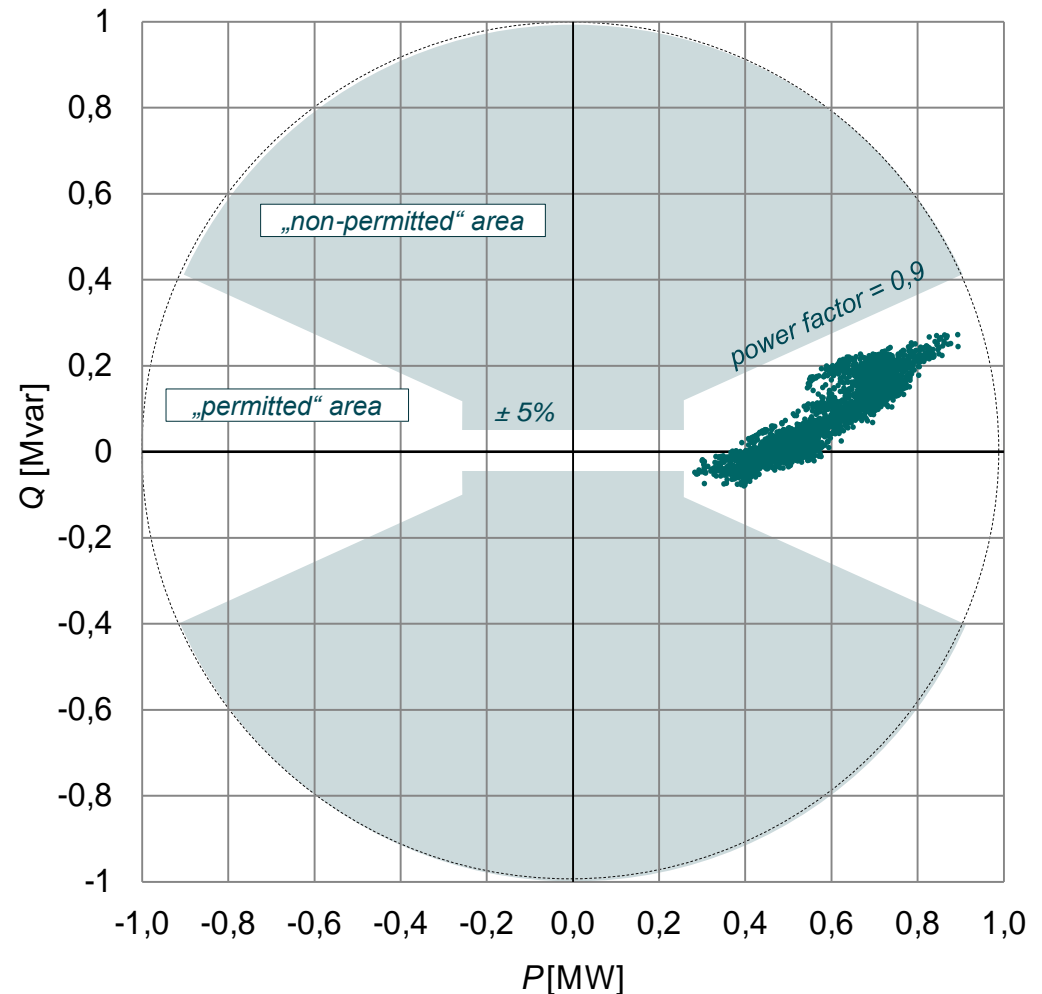
Interface TSO-DSO concerning reactive power

- Particularities -

- Some TSOs have access to the reactive capabilities of relatively big generating units in the DSO network by advising them directly
 - Not much will change for them
- Other TSOs don't have this opportunity or the dispersed generation consists of many small units that cannot be advised directly
 - The only opportunity for those is to describe the reactive exchange between the TSO and the DSO, and such allowing the TSO indirectly to use the reactive capabilities in the DSO network
- Not every DSO network has a lot of reactive resources
 - Leave two options to the DSO:
 - Declare the connection point as passive or
 - Declare the connection point as active

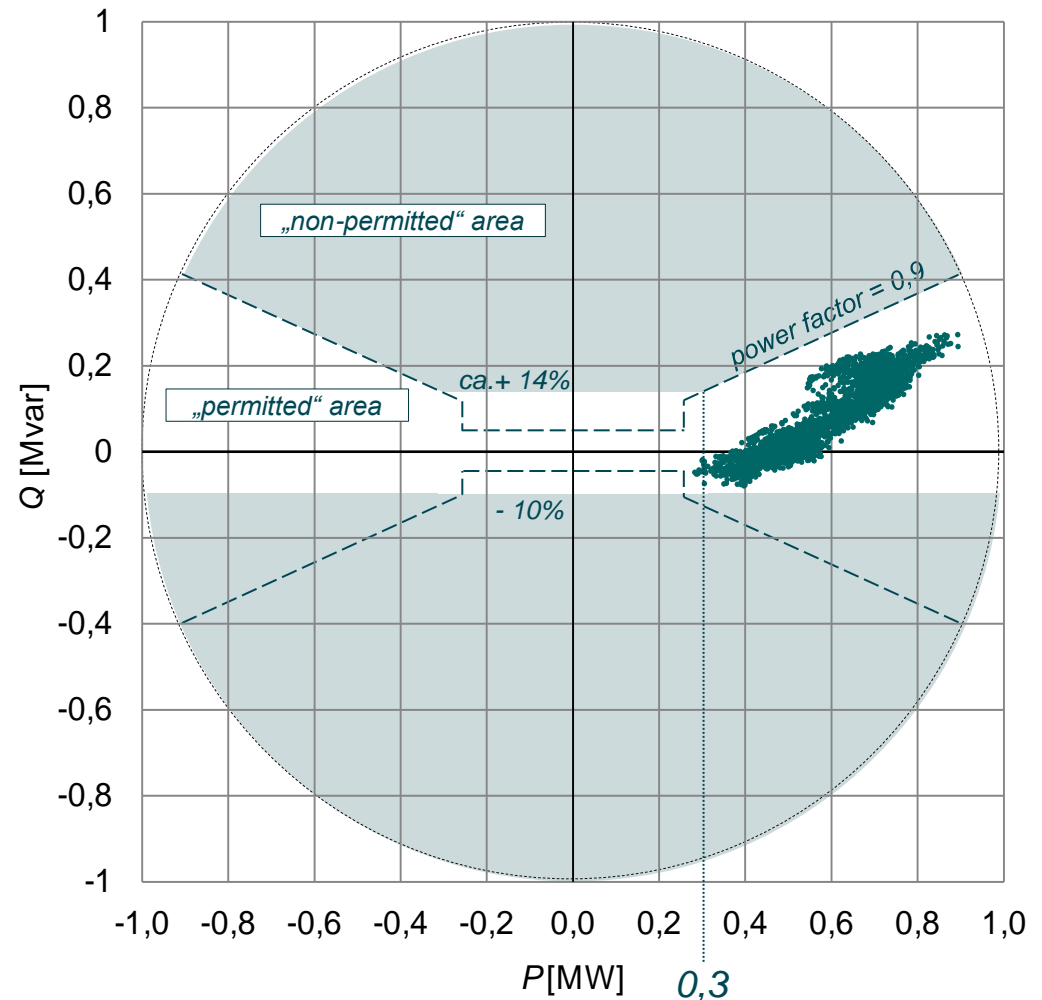
Passive Role of Transmission Connected Distribution Networks - Status Quo in the present DCC draft -

- Technical limits apply, which can be converted to „permitted“ areas and „non-permitted“ areas in a P-Q-Diagram
- Example: Behavior of a distribution network based on real ¼-h-measurement values ⇒
- The TSO **cannot actively** set a desired value for the reactive power exchange
👉 **Passive Status**



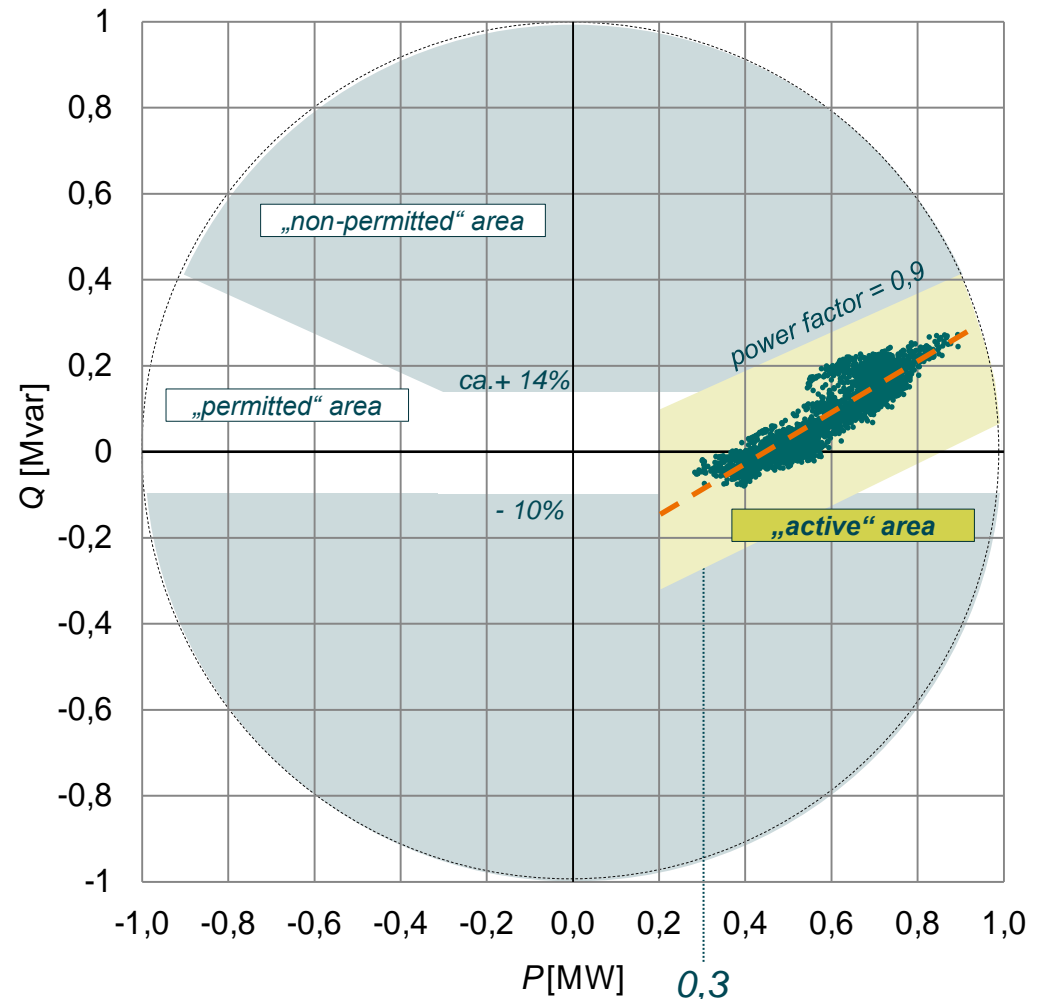
Passive Role of Transmission Connected Distribution Networks - Proposal -

- Deadband $\pm 5\%$ in central area of the diagram should be extended:
 - For small active power exchanges, high reactive power demands of TCDNs often is physically favorable (low load condition)
 - 5% will be very difficult to reach by cable-dominated distribution networks
- A constant negative limit for reactive power exchange would be sufficient
 - Current negative segments are not realistic ranges for TCDN operating points (the higher the load in either direction, the higher is the reactive need of the grid itself)



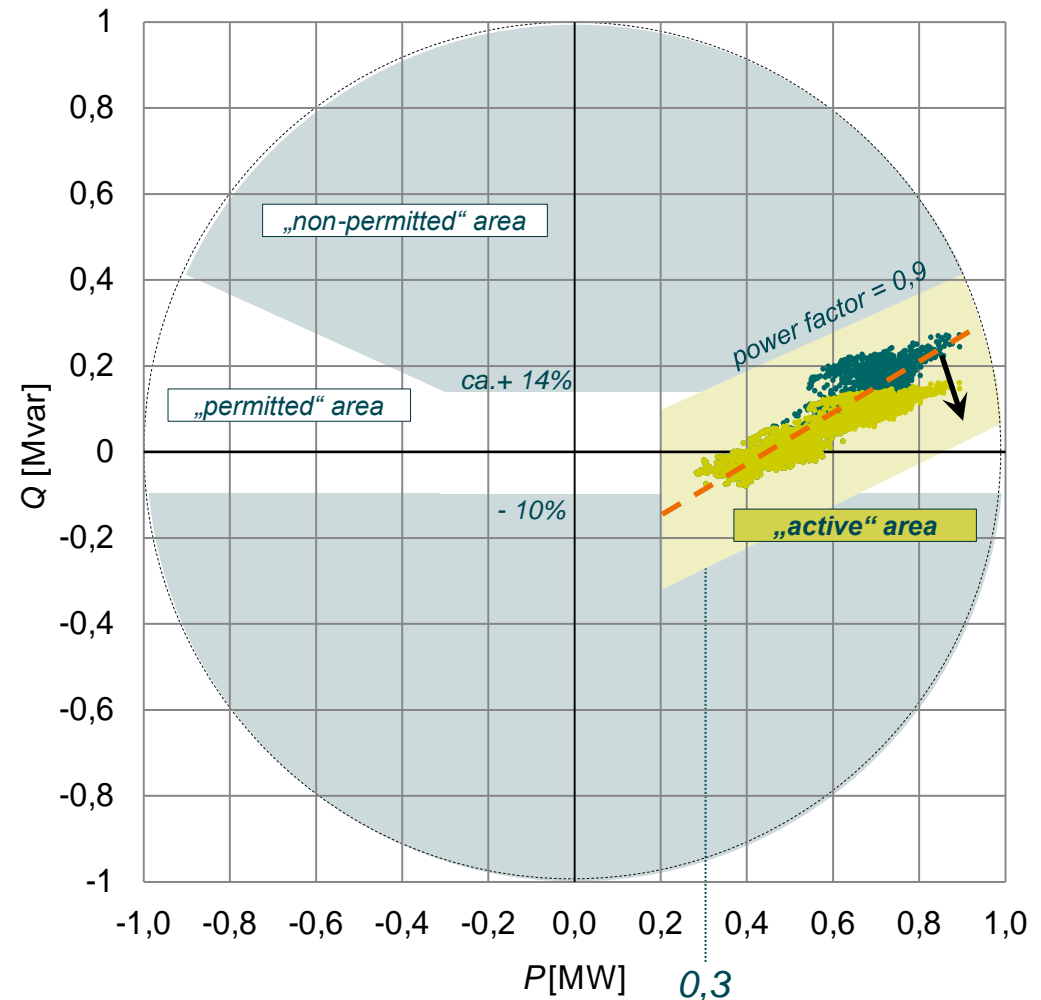
Active Role of Transmission Connected Distribution Networks: Proposal for an active mode for the reactive power interface

- The **Active Role** is an **option for DSOs** which can be activated in agreement with the relevant TSO and may be combined with financial incentives
- An **active area** is designed in cooperation between the TSO and the respective DSO taking into account the actively controllable reactive capability of the DSO network
- Example: Imaginable active area
- Beneficial behavior of an active distribution network:
 - The TSO can actively set a desired value for the reactive power exchange, which is followed or approached by the DSO
 - Thus, the interface between TSO and DSO is well defined and allows the use of actual reactive power requirements by the TSO



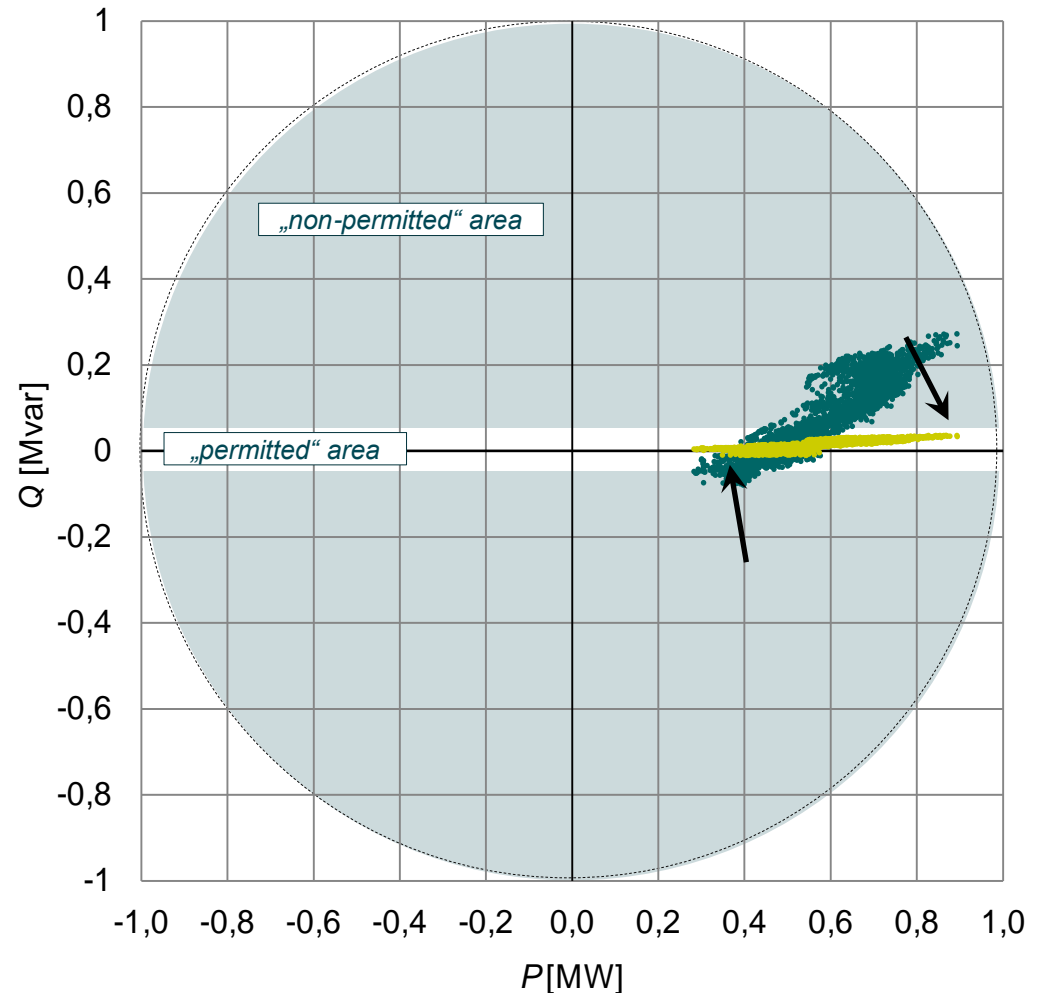
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Current provision in the DCC (Article 10 – 1d): Reactive power Exchange of $0 \text{ Mvar} \pm 5\%$

- Can be required by TSO where justified
- Philosophy: Everybody does his homework himself
- However, a reactive power exchange of 0 Mvar between transmission and distribution networks does not necessarily have to be the optimum for each situation!
- Requirement is a strict definition of the reactive power interface; however rather inflexible
- Implicitly it requires a large “active area”, otherwise it is not possible to maintain 0 Mvar all the time
- Example: Imaginable behavior of a distribution network if provision is **extremely interpreted**



Proposals for the Network Code

- Reconsider the technical parameters for the passive role of TCDNs
- Define cornerstones of a non-obligatory active role of TCDNs to allow for an effective design of reactive power interfaces between Transmission Networks and TCDNs. Keep it highly aggregated, leaving the details for agreement between TSO and DSO:
 - Bilateral agreement between DSO and TSO, including technical parameters, call-of, applicable time intervals, winter-/summer distinction, conditions for status change, etc.
 - Provision that the passively “permitted area” can actually be left under active mode if compliant with the agreement between DSO and TSO

**MANY THANKS FOR YOUR
ATTENTION**