TECHNISCHE UNIVERSITÄT WIEN
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ESEA
Institut für Energiesysteme und Elektrische Antriebe

Reactive Power Coordination at the HV / MV Grid Interface with the Increasing Share of Distributed Generation

from

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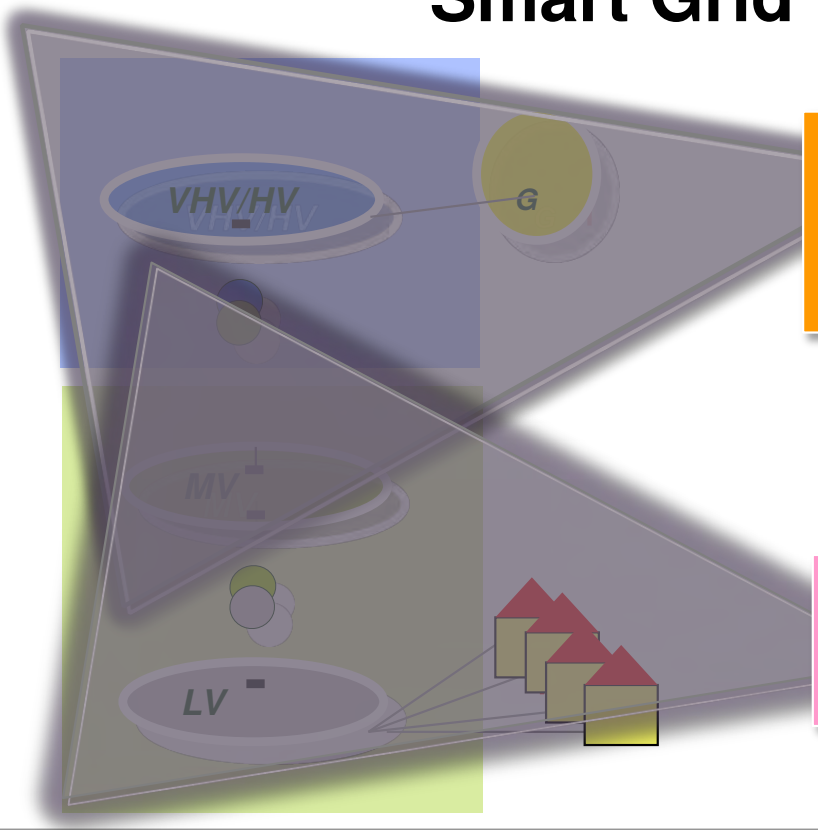
Smart Grids Week
Graz, 19-23.05.2014

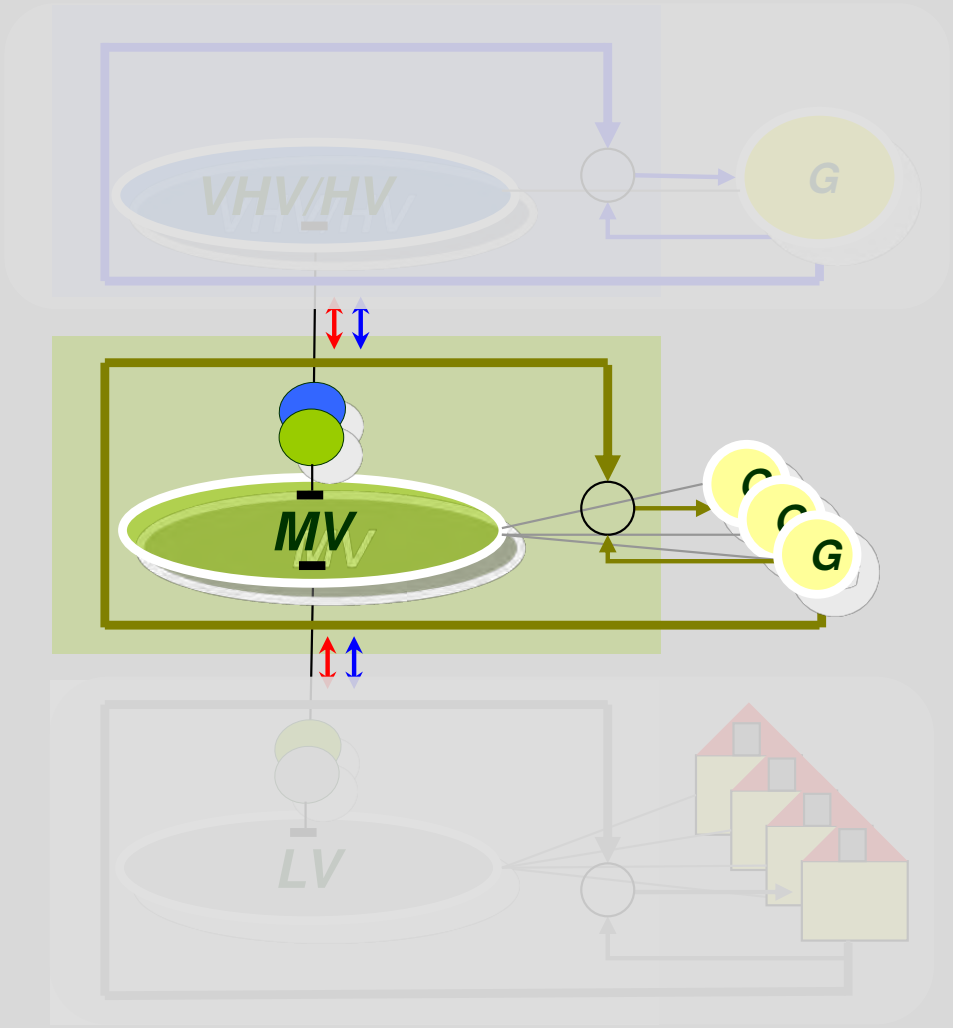
Smart Grid Projects



Projects to solve the problems in the transmission grid, which are caused by the uncontrolled reactive power flow fed from MV grid

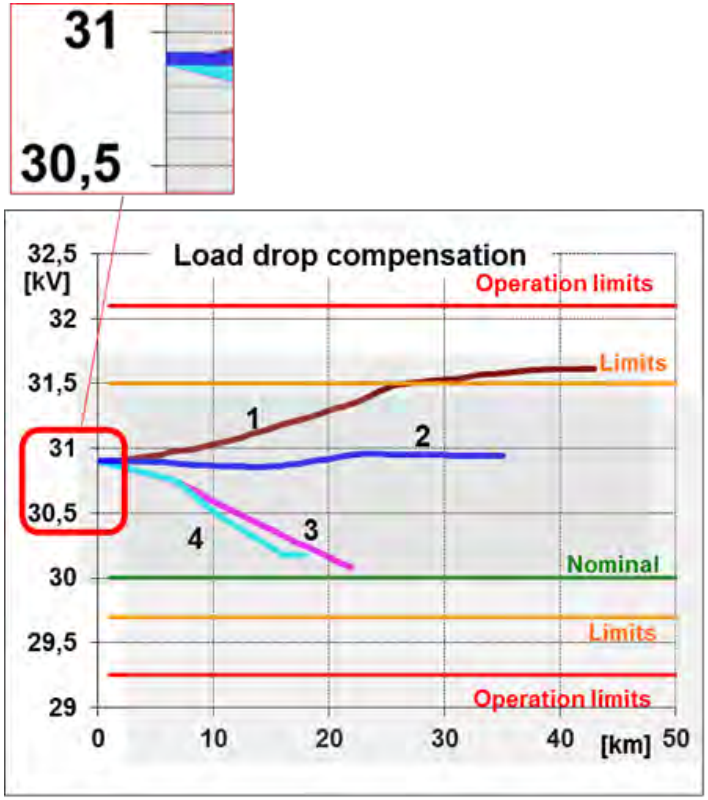
Projects to solve challanges in low voltage grid created from the PV penetration

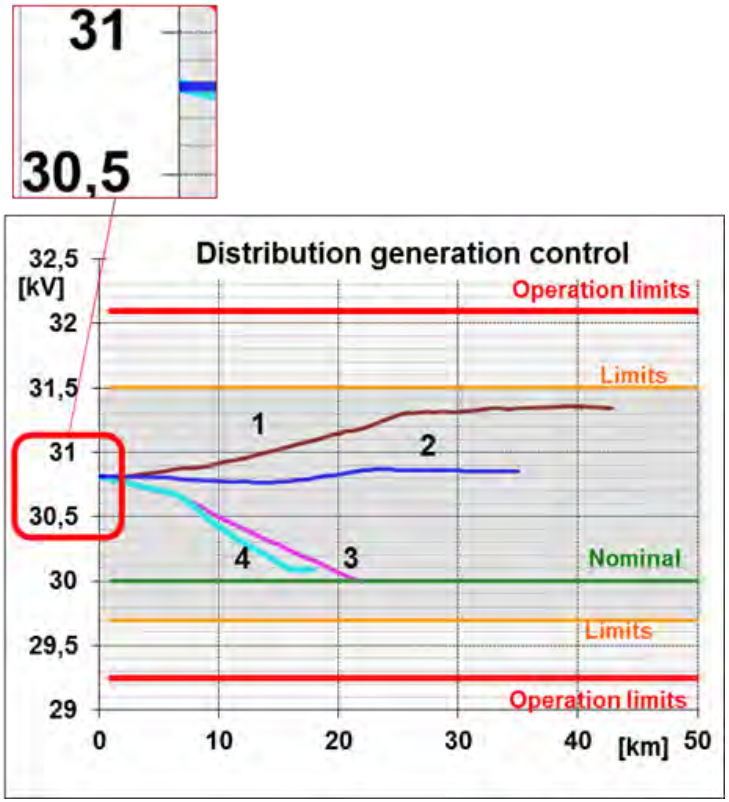
Power grid



Voltage control options in MV grid

Voltage profile

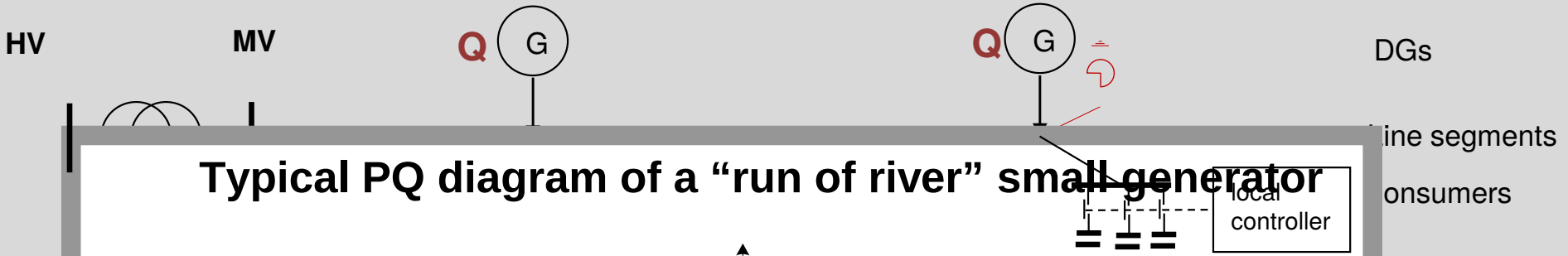




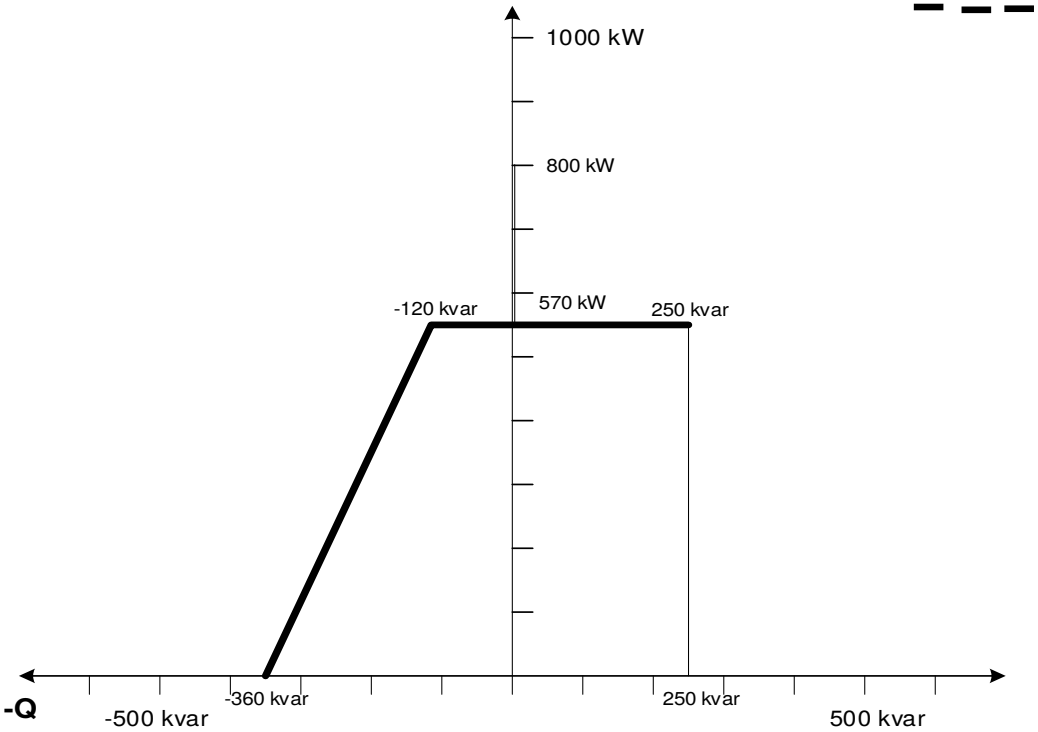
Source: ZUQDE -project

—— Only DGs - reactive power is controlled

Push down effect



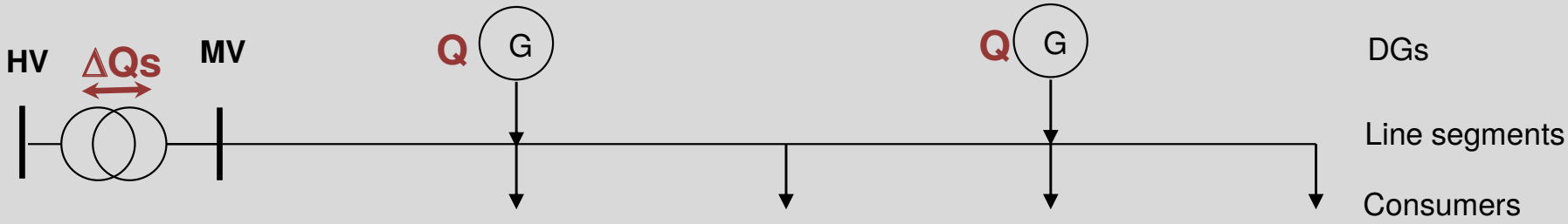
Typical PQ diagram of a "run of river" small generator



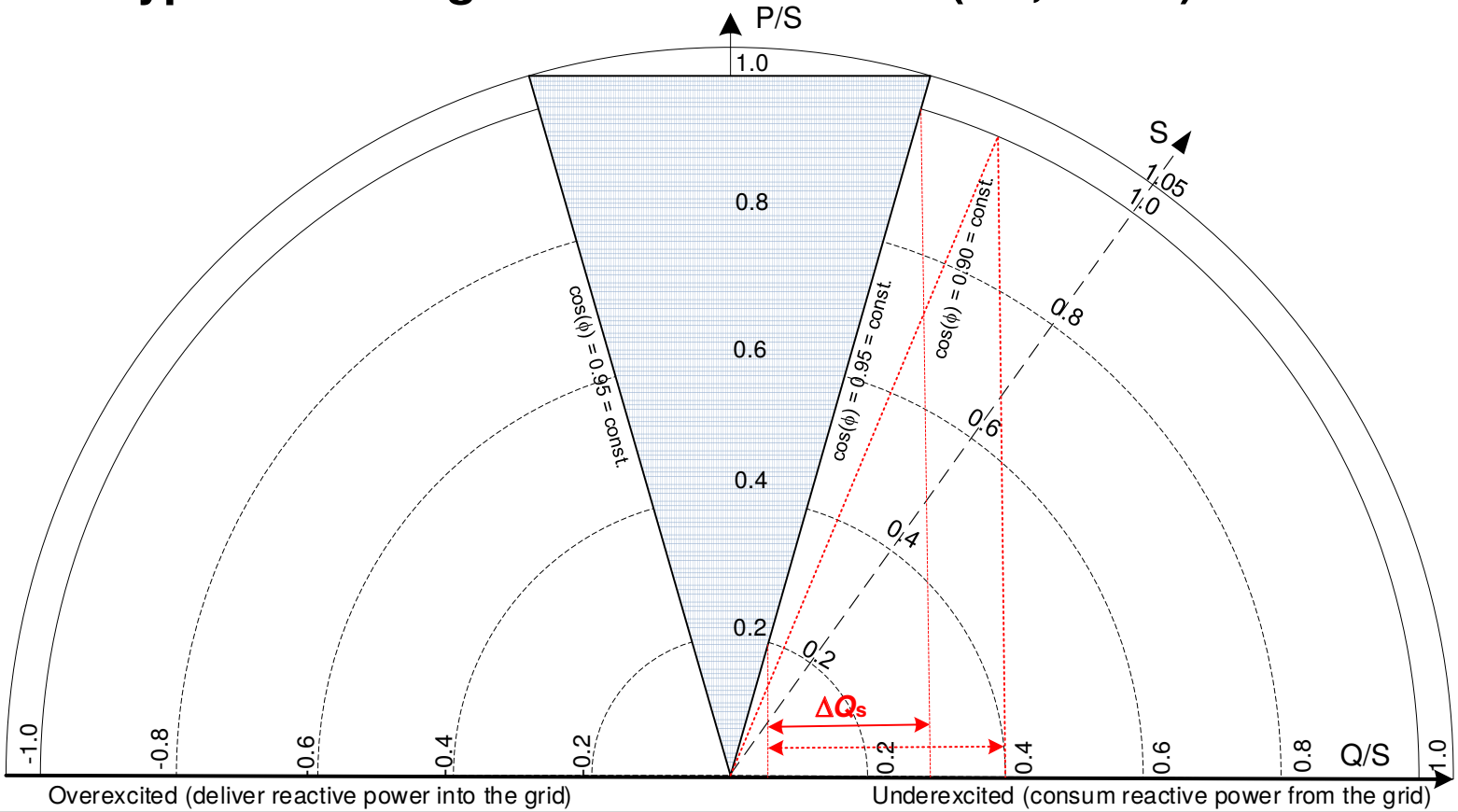
Grid C

"… Th *and the*
Facilit *oint for*
impor *ectricity*
betwe *factor*
betwe *power*
factor refers to the absorption of reactive power …"

The displacement effect



Typical PQ diagram of a an inverter (PV, Wind)



Grid C

"… Th … the
Facility … for
import … city
betwee … ctor
betwee … wer
factor …

GENERATION

VHV / HV

MV

LV

P_D

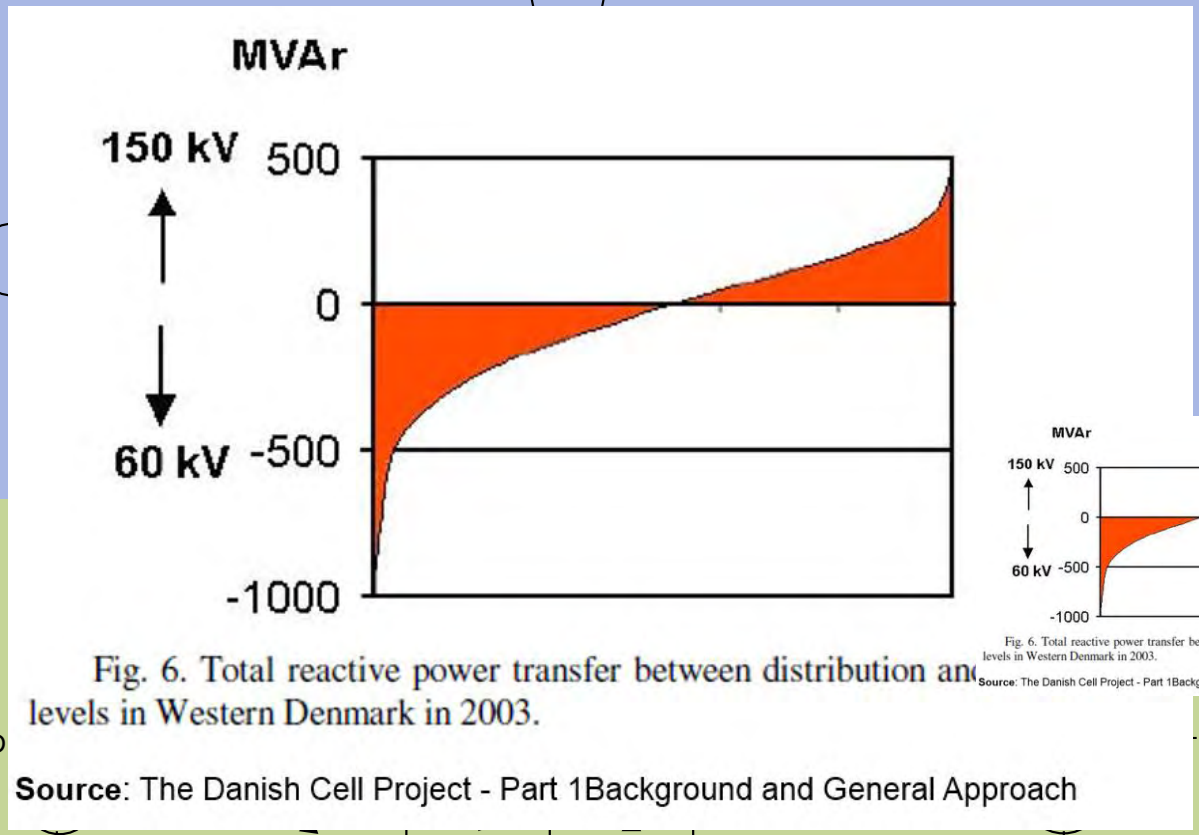


Fig. 6. Total reactive power transfer between distribution an levels in Western Denmark in 2003.

Source: The Danish Cell Project - Part 1Background and General Approach

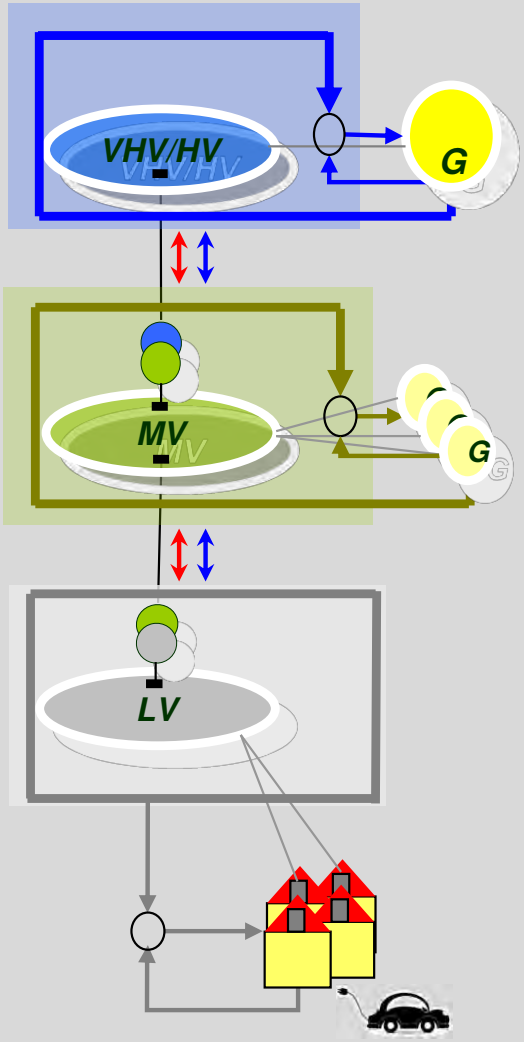
Fig. 6. Total reactive power transfer between distribution and transmission levels in Western Denmark in 2003.

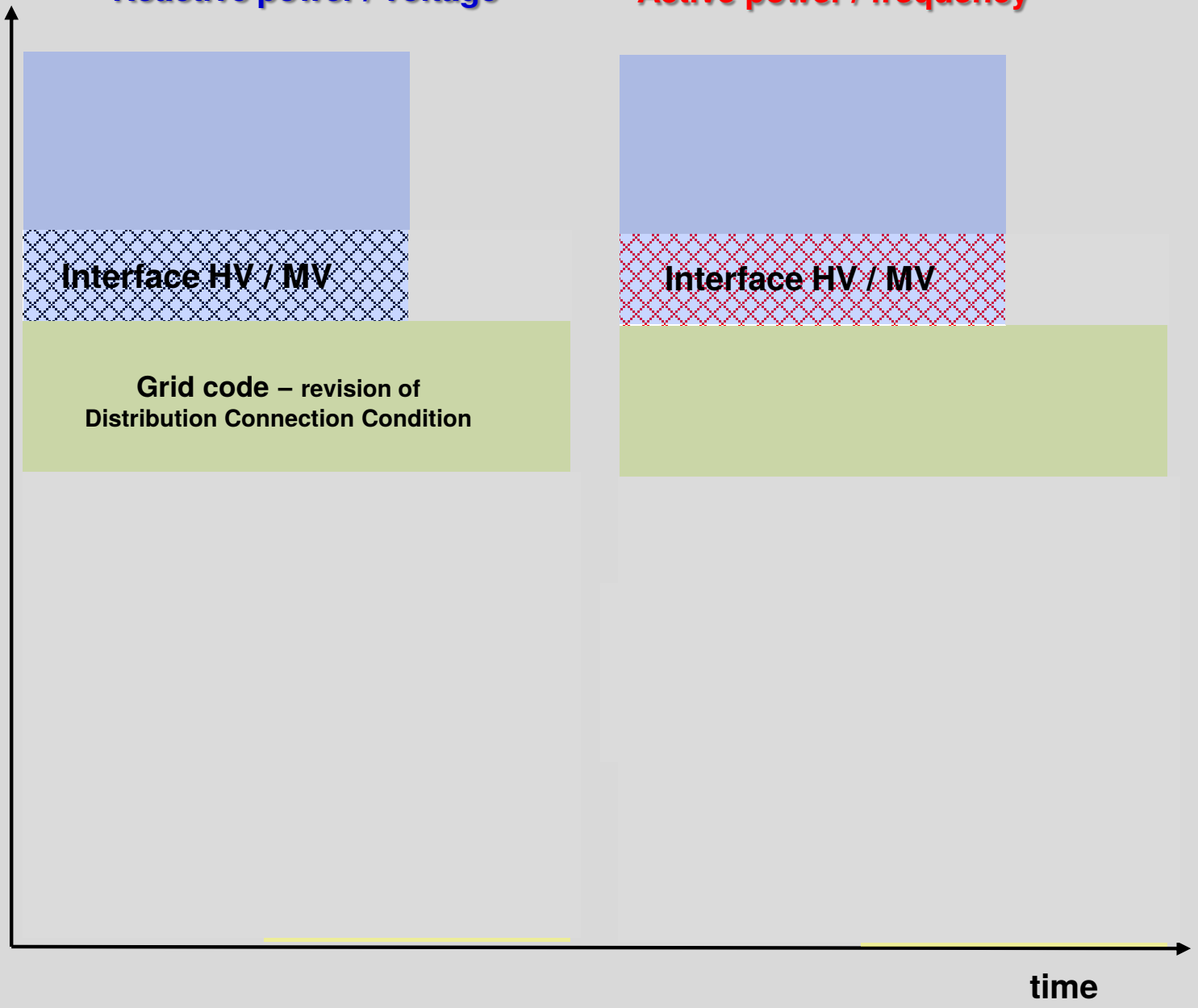
Source: The Danish Cell Project - Part 1Background and General Approach

Black out

Voltage collaps

Guidelines for further development in smart grids





Conclusions

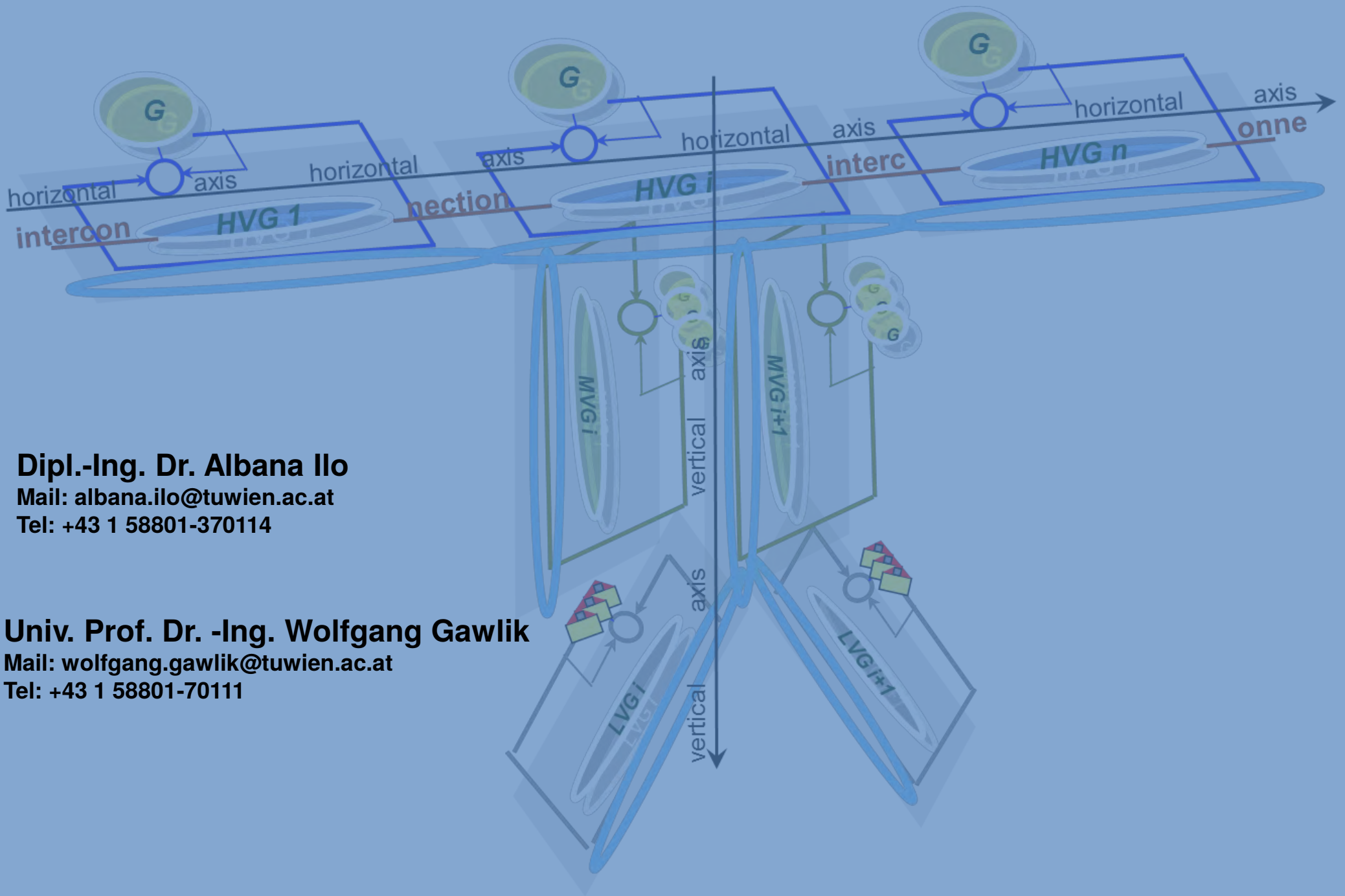
- The actual Grid Code does not promote the increasing of DG-share on MV. The **revision of „Distribution Connection Condition“** is essential**.**

- The increase of DG-share in MV produces an uncontrolled reactive power flow in the corresponding HV grid

- Using **network expansion** to increase the DG-share in MV network can solve the issue of the grid voltage, but it **does not limit the uncontrolled flow of the reactive power in the corresponding HV grid**

- Smart Grid issues can be successfully treated only under the consideration of a **power system overall model**

- The DG-share on MV / LV grid can only be increased after the stabilization of the interface HV / MV.



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