Voltage regulation distribution transformers

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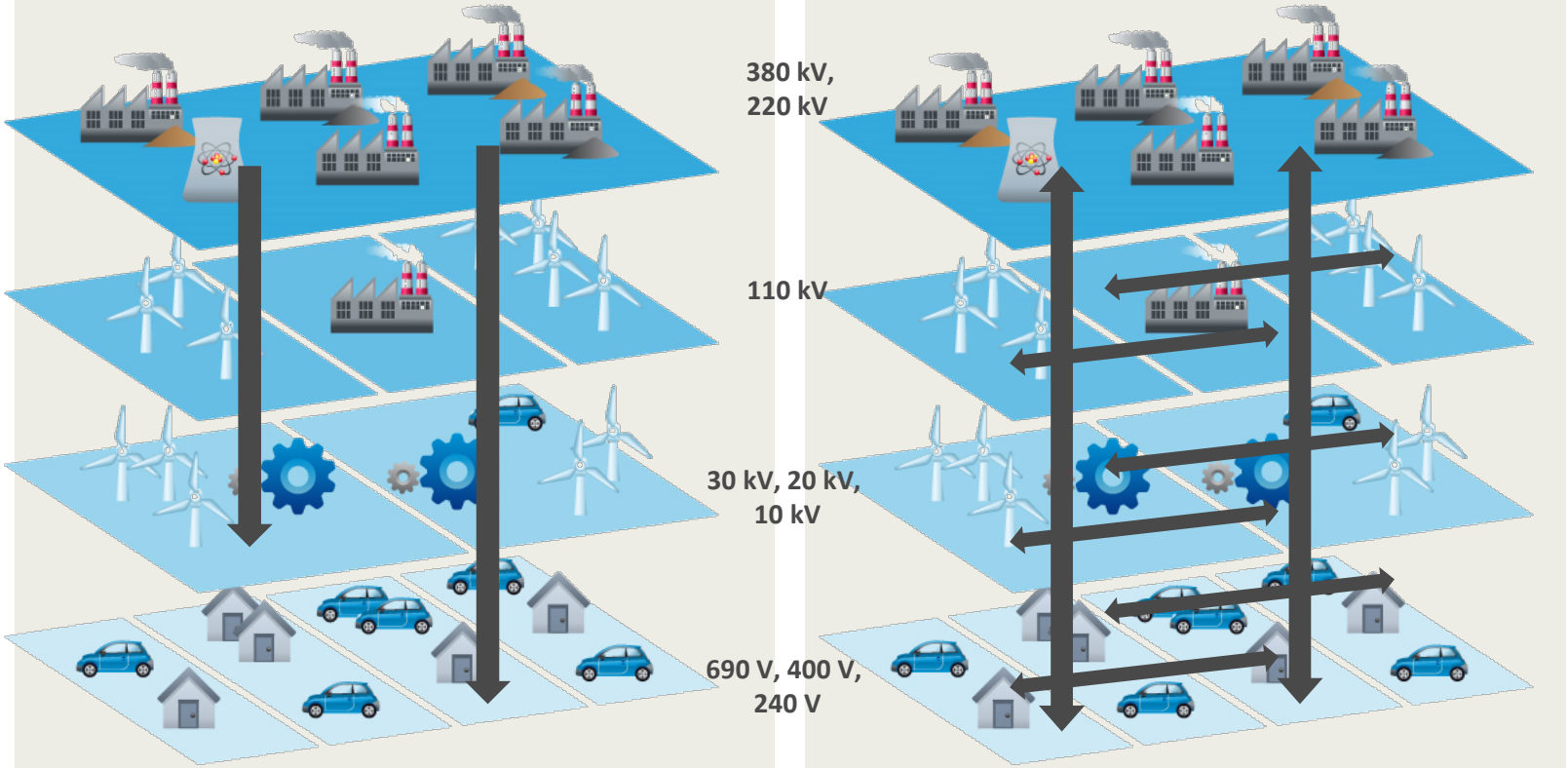
A PARADIGM SHIFT IN THE ENERGY NETWORK IS GOING ON

Traditional network operation
Load dependent, uni-directional, centralized

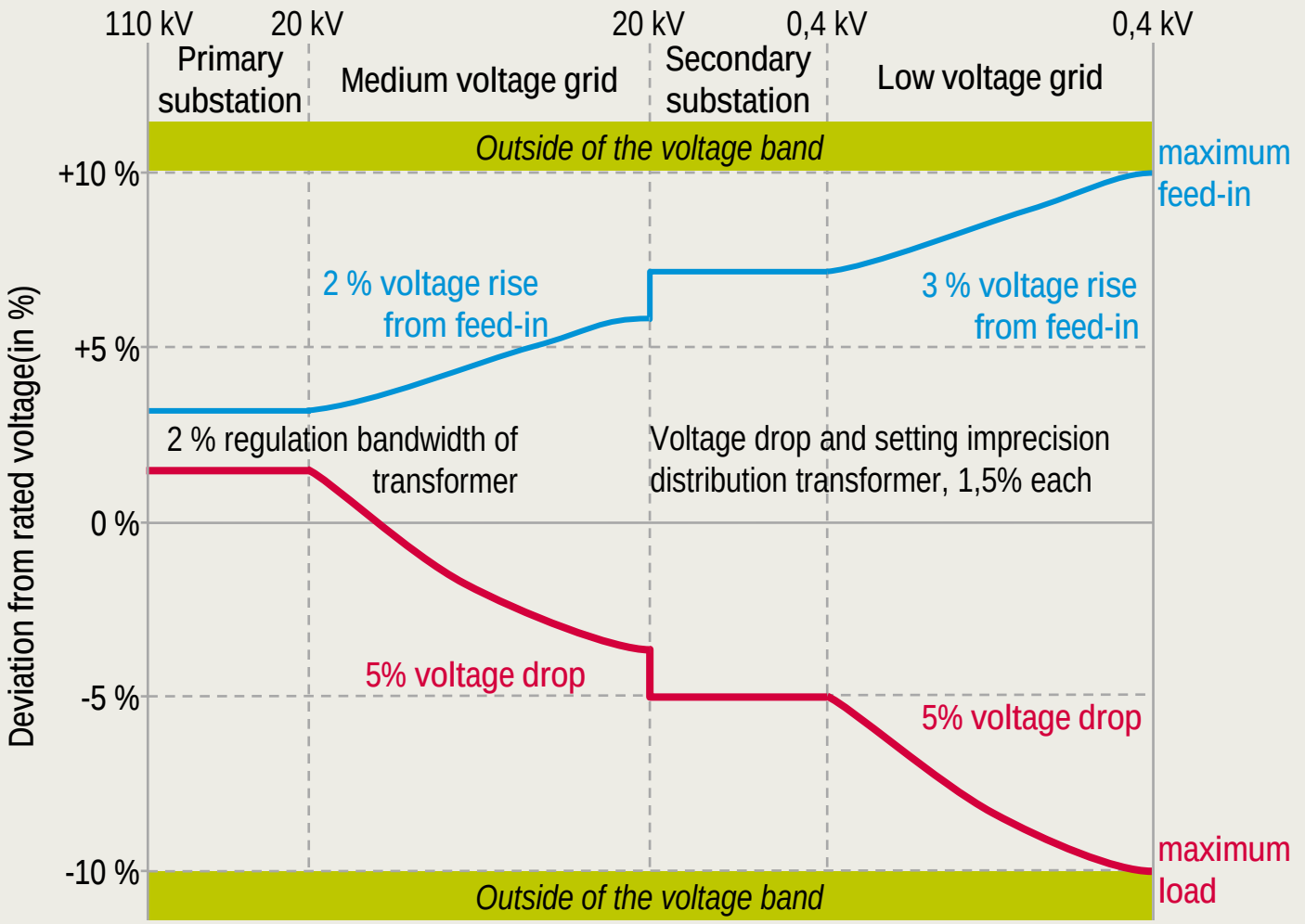
Future Network operation
Volatile, multi-directional, decentralized



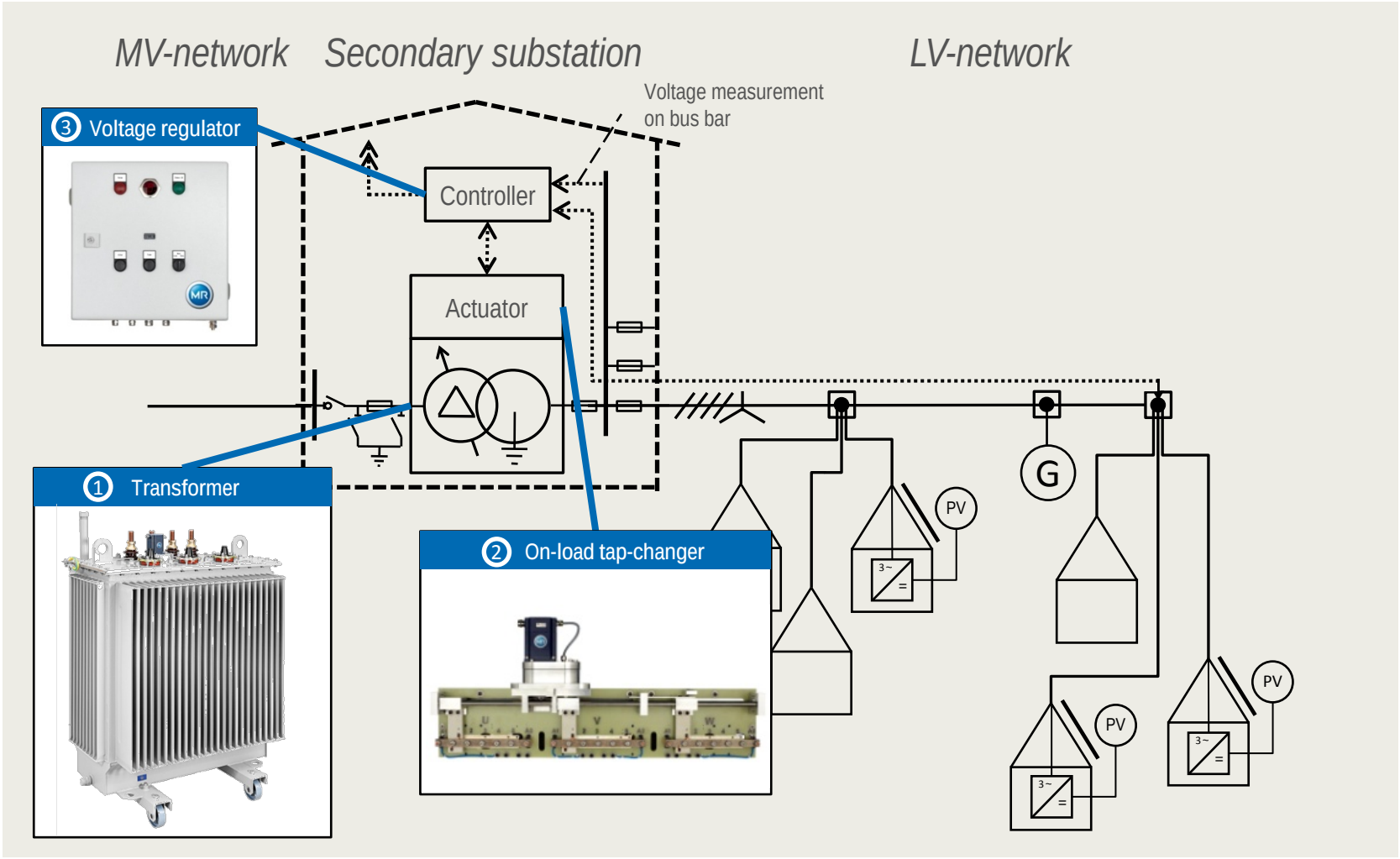
VOLTAGE BAND VIOLATIONS CONSTRAIN THE FEED-IN OF RENEWABLES IN THE DISTRIBUTION NETWORK

Situation today:

- DIN EN 50160 voltage band
- Network planning based on „worst-case“-calculations

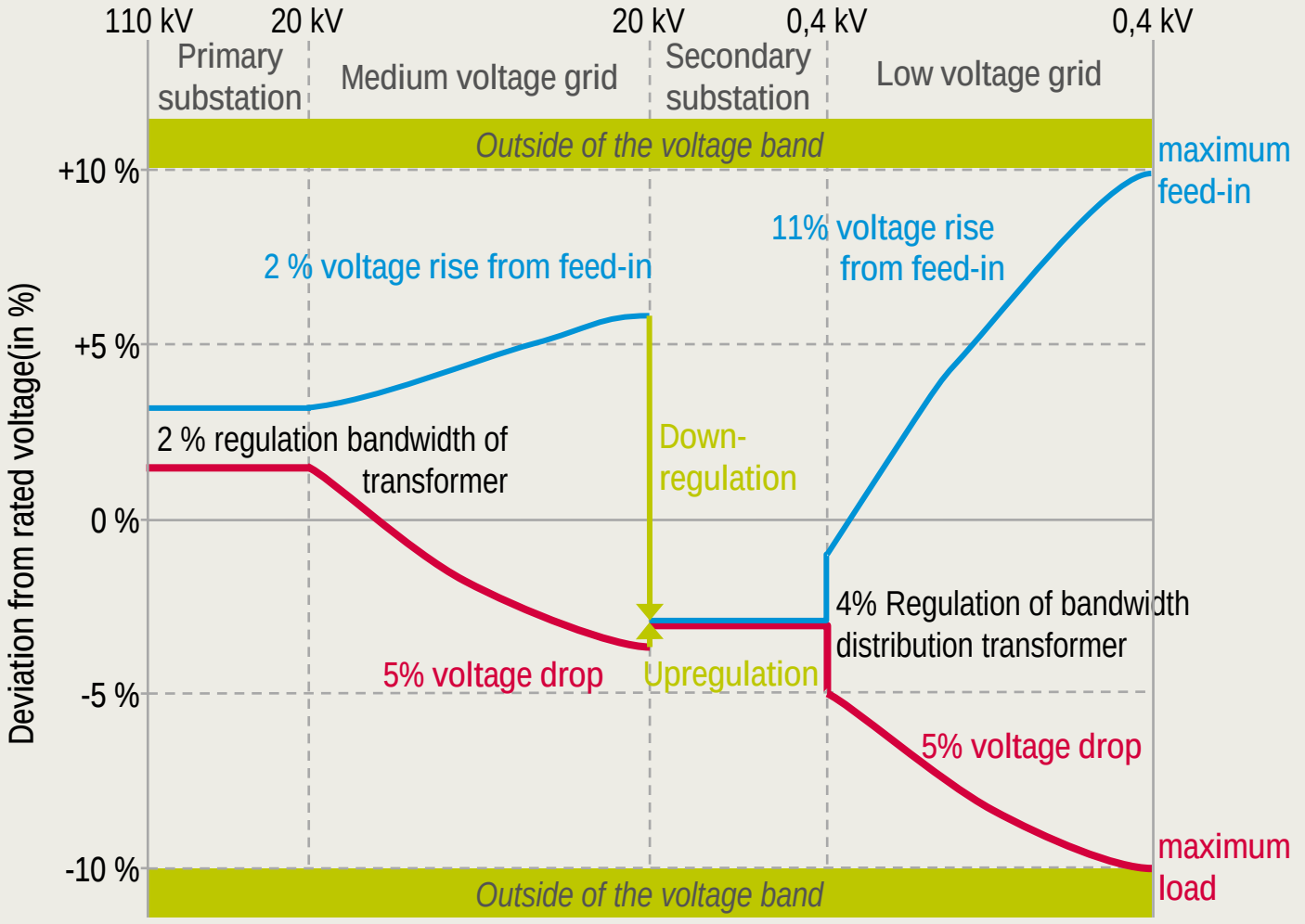


VOLTAGE REGULATION DISTRIBUTION TRANSFORMERS ARE AN INNOVATIVE SOLTION WITH PROVEN TECHNOLOGY



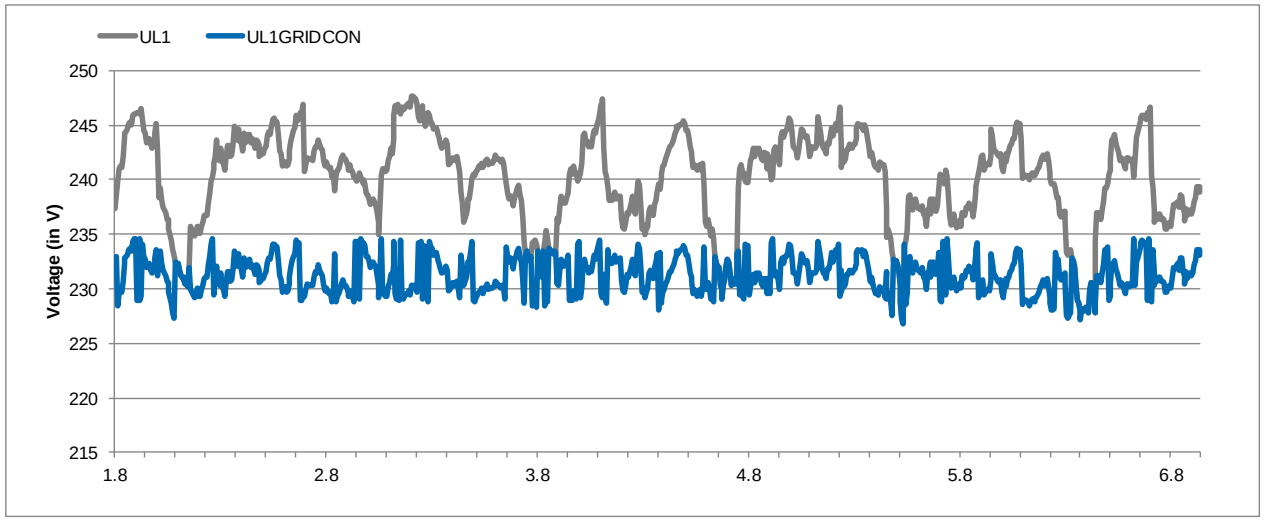
VOLTAGE REGULATION DISTRIBUTION TRANSFORMERS DECOUPLE MV AND LV VOLTAGE

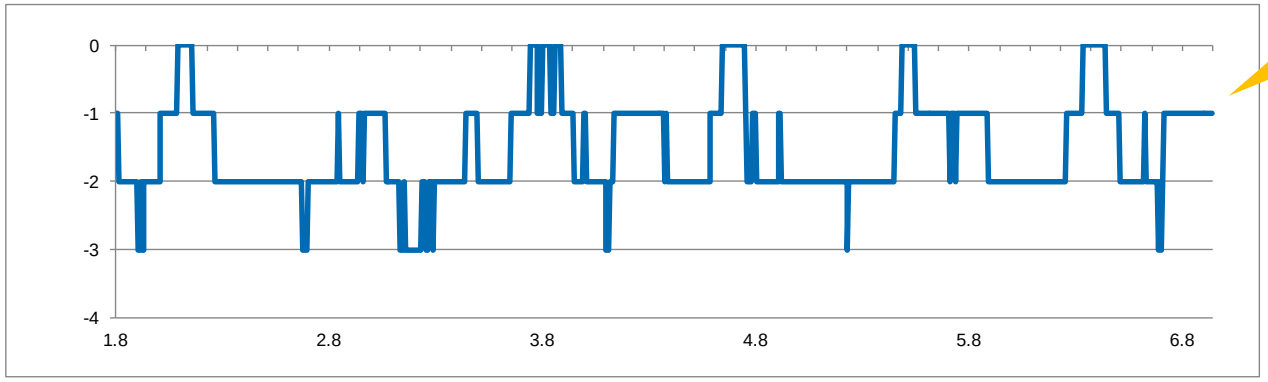
- DIN EN 50160 voltage band
- Network planning based on „worst-case“-calculations



STABLE VOLTAGE AS A RESULT OF DEPLOYING A VOLTAGE REGULATION DISTRIBUTION TRANSFORMER

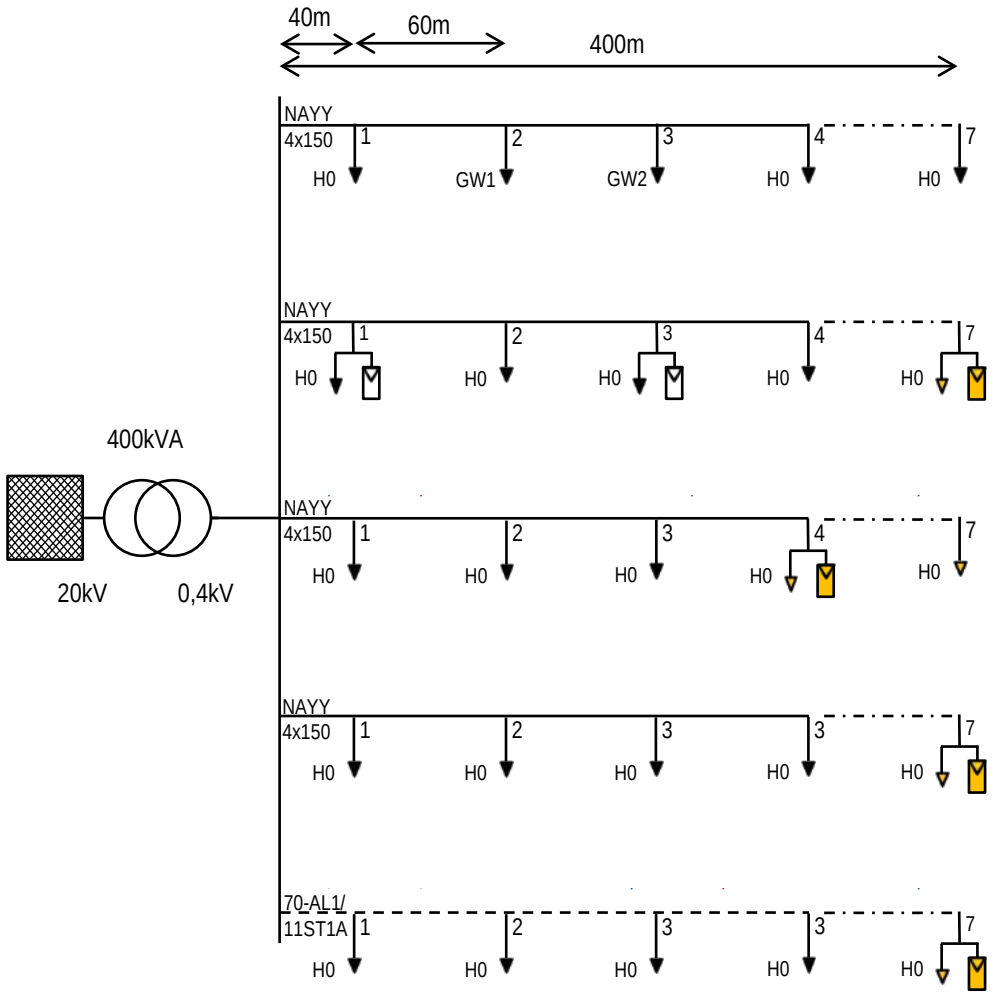
One week of data





12 operations per day in average

EXAMPLE: LOW VOLTAGE NETWORK AT BRINK OF VOLTAGE BAND VIOLATION



94,6%...107,5% Voltage based on U_n= 230V

Connection point with U = 1,1* U_n

PV feed-in

Load

Connection point with U > 1,1* U_n

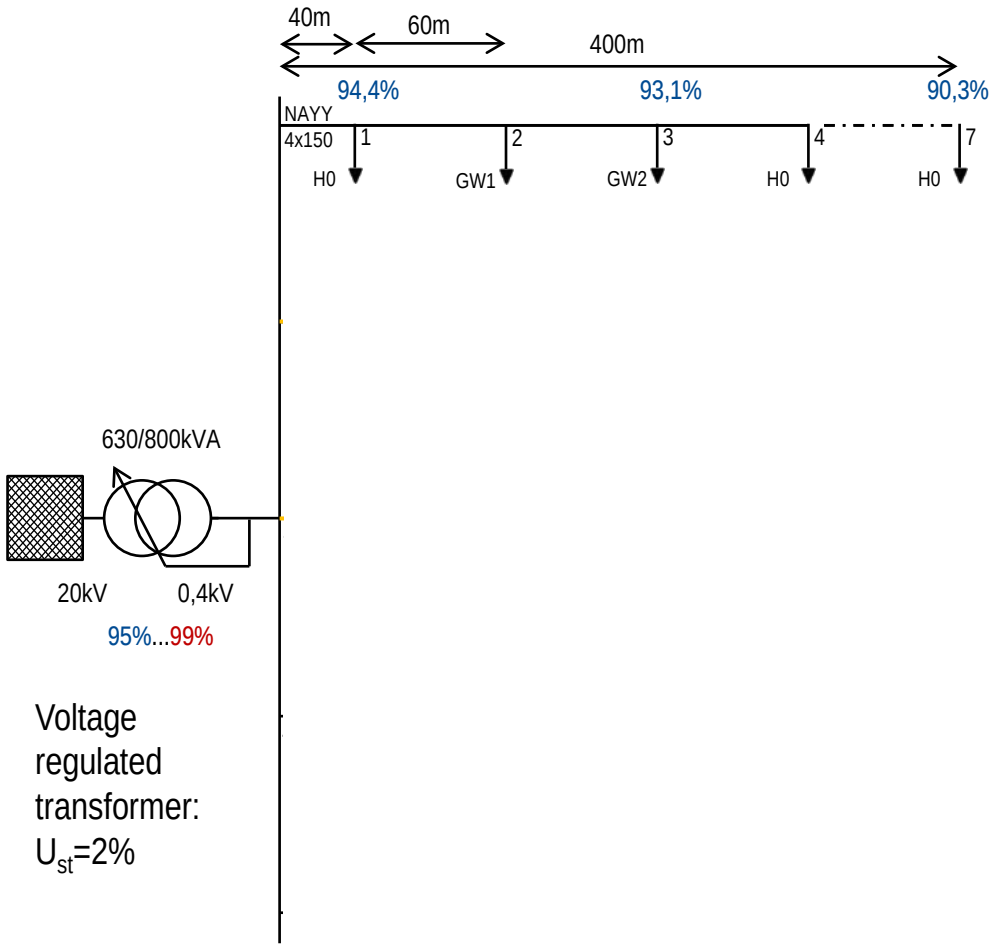
Asset with utilization = 100%

Utilization/ PV-capacity

Grid data

- 4 feeders NAYY 4x150mm²
- 1 feeder 70-AL1/11-ST1A
- 7 connections per feeder
- Feeder length: 400m
- Connetion gap: 60m
- 33 H0-custuomers
- 2 industrials (feeder 1)
- Total load: 125kW

EXAMPLE: 1.9 TO 3.7 TIMES MORE CAPACITY FOR RENEWABLES WITH VOLTAGE REGULATED TX's



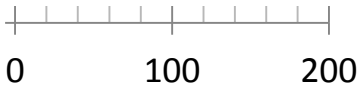
Utilization/ PV-capacity

46%

Possible P_{PV} [kW] per feeder

Factor

■ w/o regulated TX ■ w/ regulated TX



94,6%...107,5% Voltage based on U_n= 230V

Connection point with U = 1,1* U_n

PV feed-in

Load

Connection point with U > 1,1* U_n

Asset with utilization = 100%

SUMMARY

- **Voltage band violations are the main problem** resulting from feeding renewable energies into the distribution network
- Voltage regulated distribution transformers transfer **proven technology** from the transmission network into the distribution network
- Voltage regulated distribution transformers are **effective and efficient**
  - Increase of **capacity for renewables in distribution networks by factor 2 to 4** without the need for conventional grid expansion
  - **Cost savings** compared to conventional grid expansion

THE POWER BEHIND POWER.

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