

# HOLISTICA

## Application of OLTC Transformer and Distributed Generation for Voltage Control on Low Voltage Distribution Networks

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# Project Overview

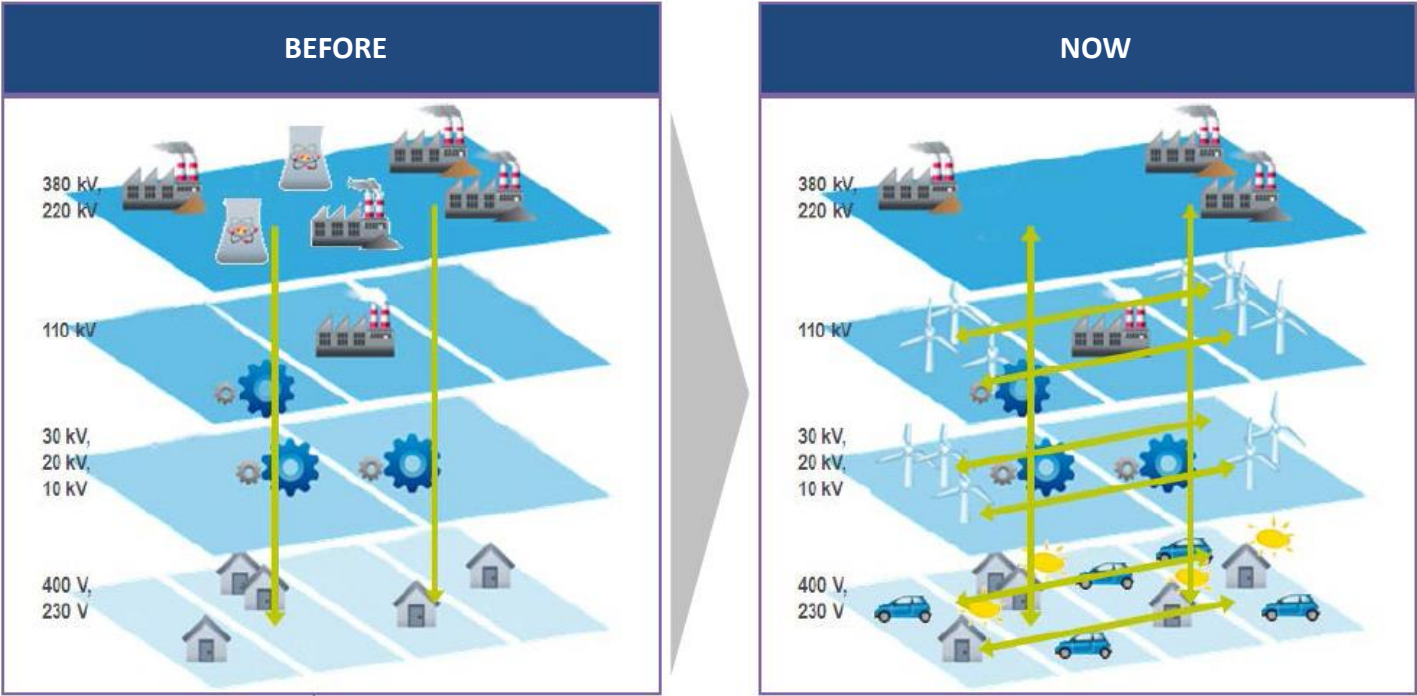
**Topic:** Holistic Optimization of Losses using an Improved Synergy of Technologies under an Innovative Coordination Algorithm

**Hosting facility:** SYSLAB of the Technical University of Denmark (DTU)

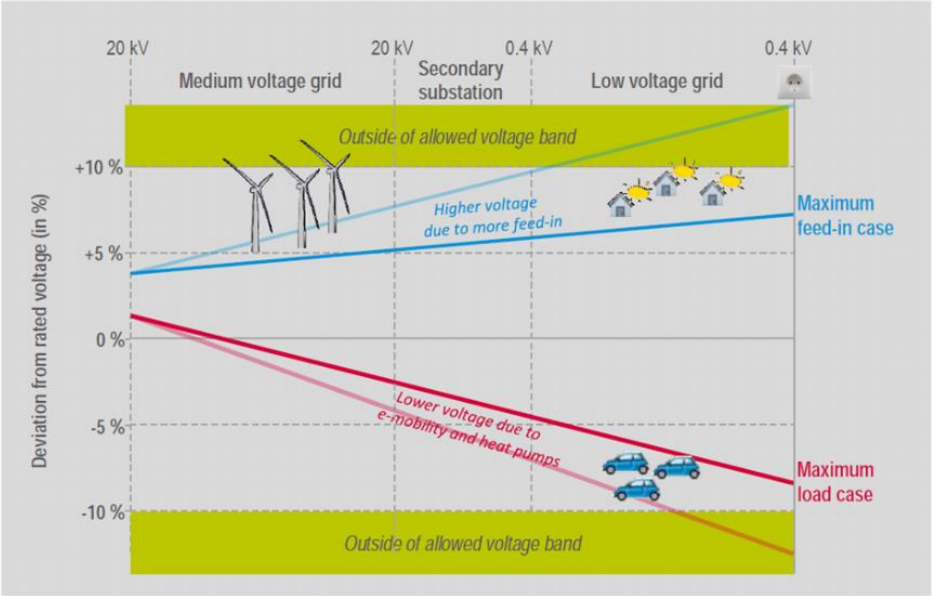
**Duration:** 09.09.2019 – 20.09.2019



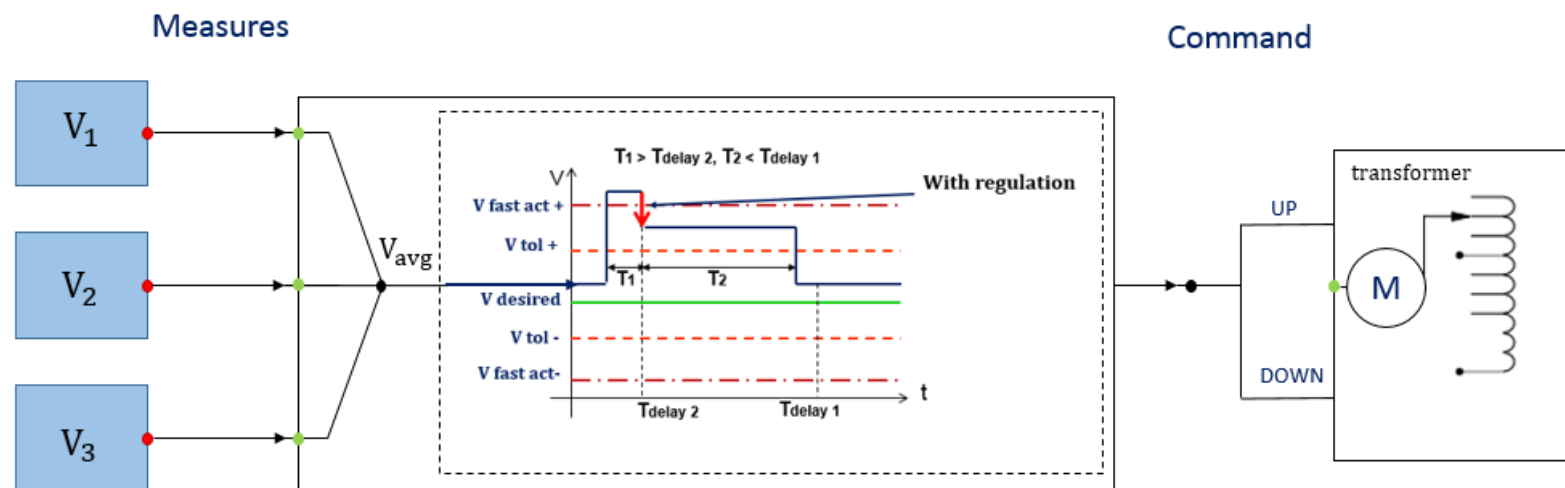
# Project Motivation



 **Over-/ Under voltages**



# Theoretical approach



## Key Performance Indicators:

Reduce Power Losses

Increase Hosting Capacity

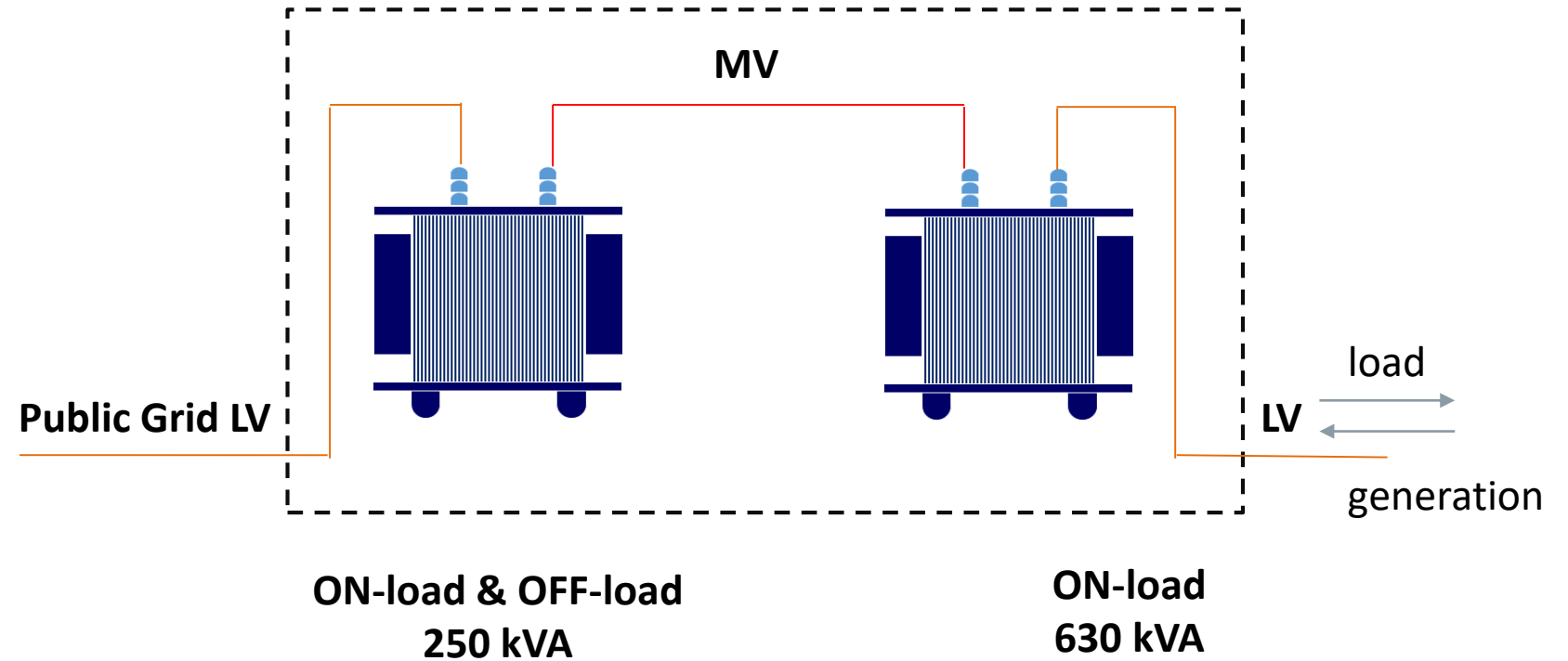
Improve Grid Stability by reducing  
the number of OLTC operations



# DTU's SYSLAB facilities



# Laboratory setup: Back-to-Back connection



## Laboratory scenarios and validation test:

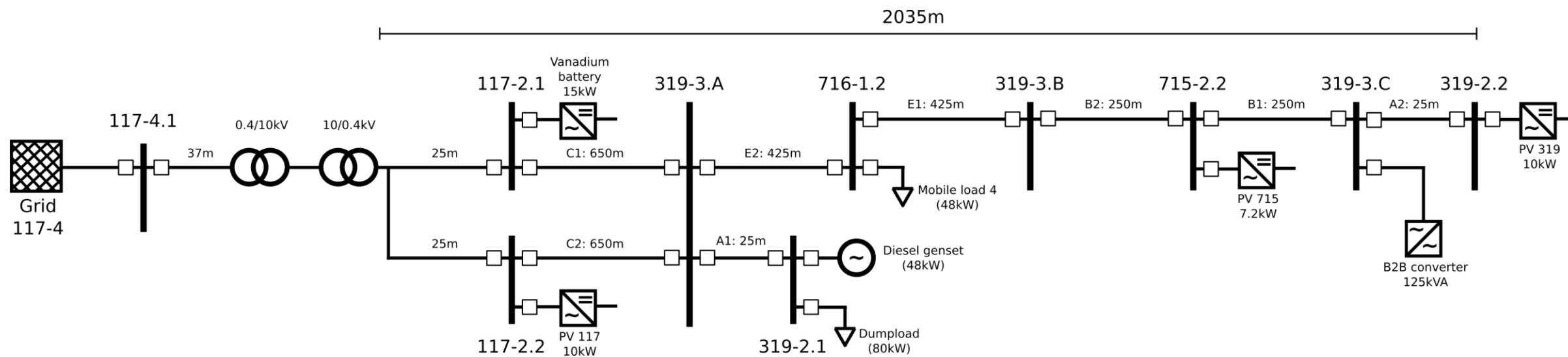
- Rural
- Urban
- Flexible

## Control strategies:

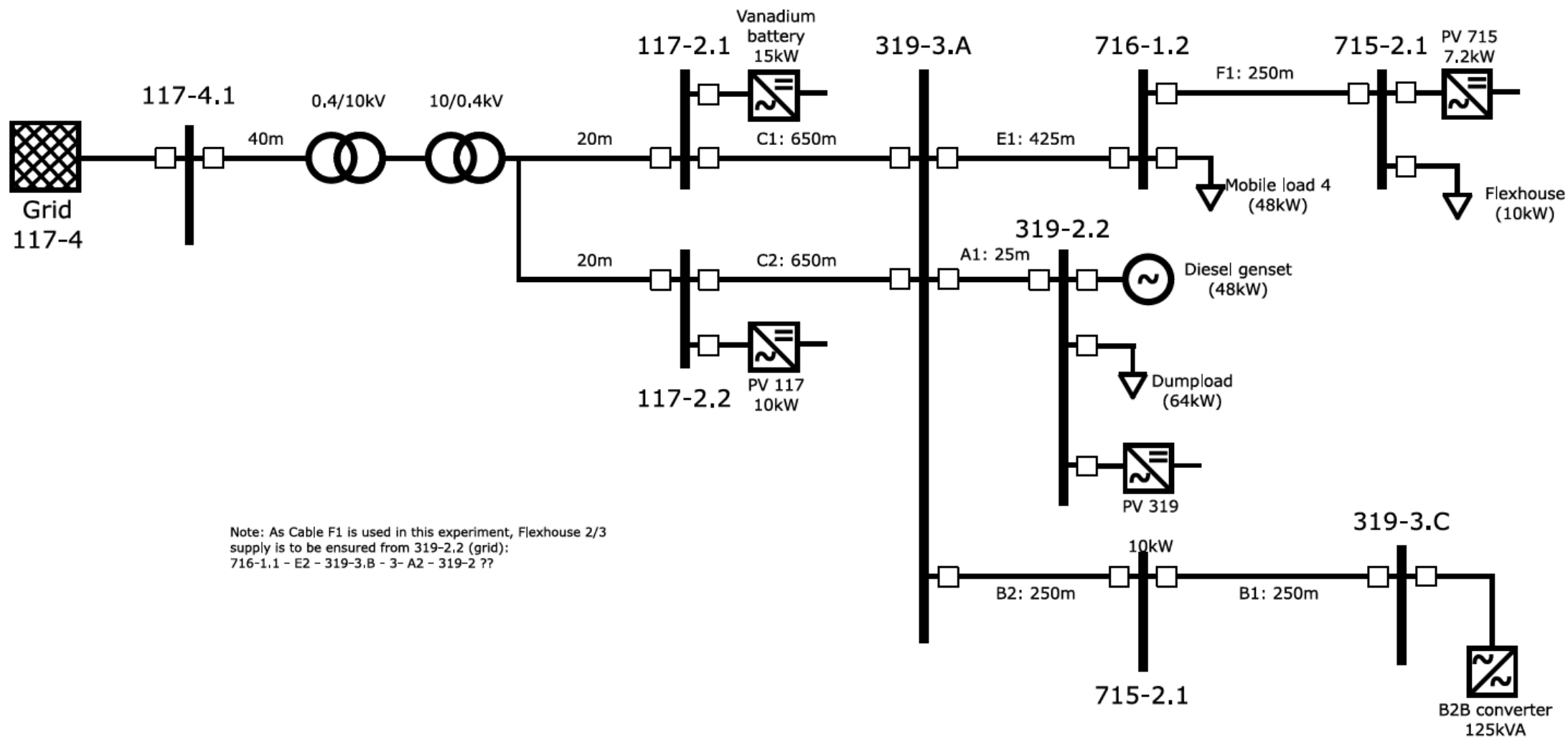
- No Control
- T-control
- Q-control
- QT-control



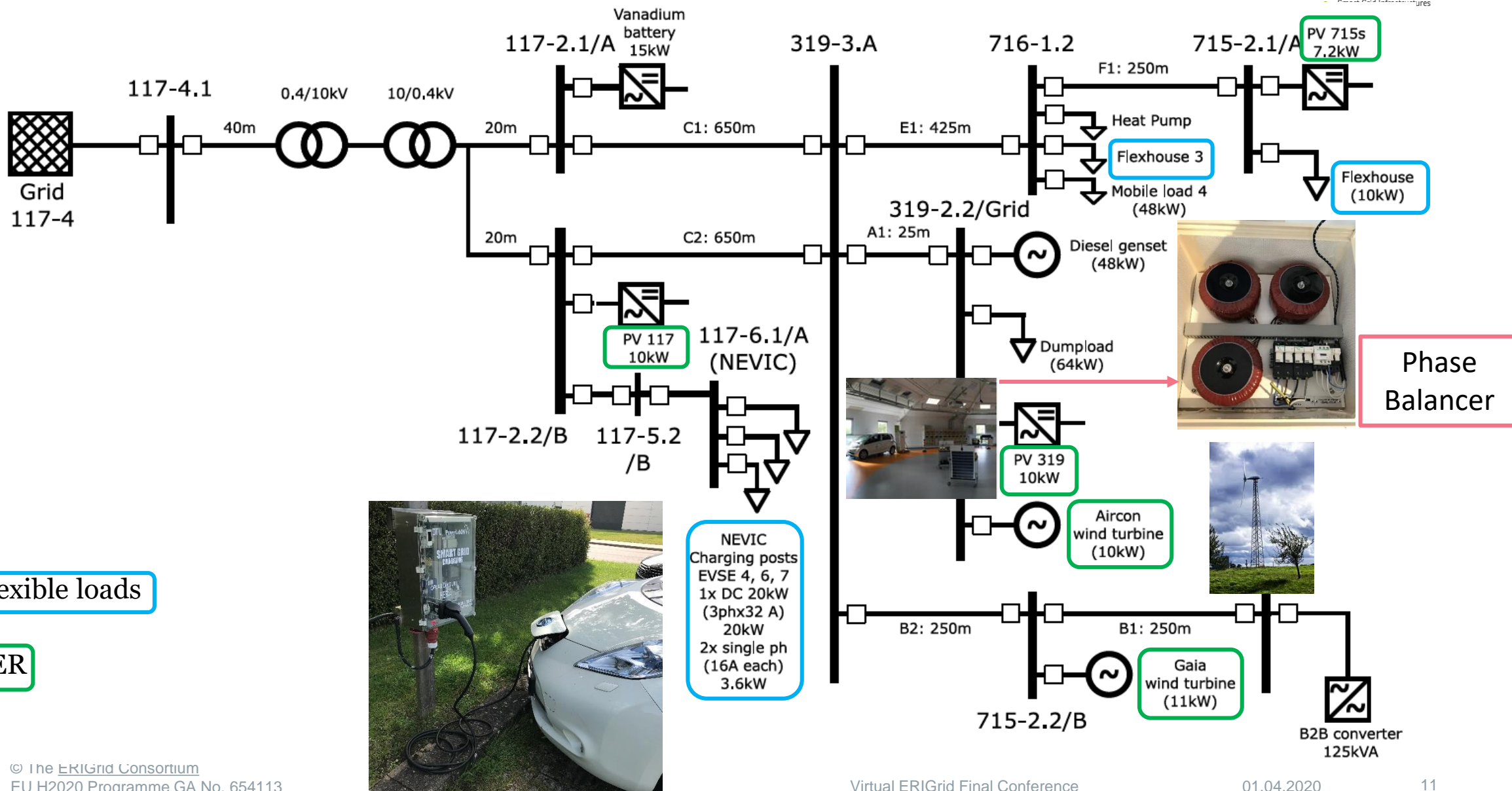
# Single line diagram: RURAL



# Single line diagram: URBAN



# Single line diagram: FLEXIBLE

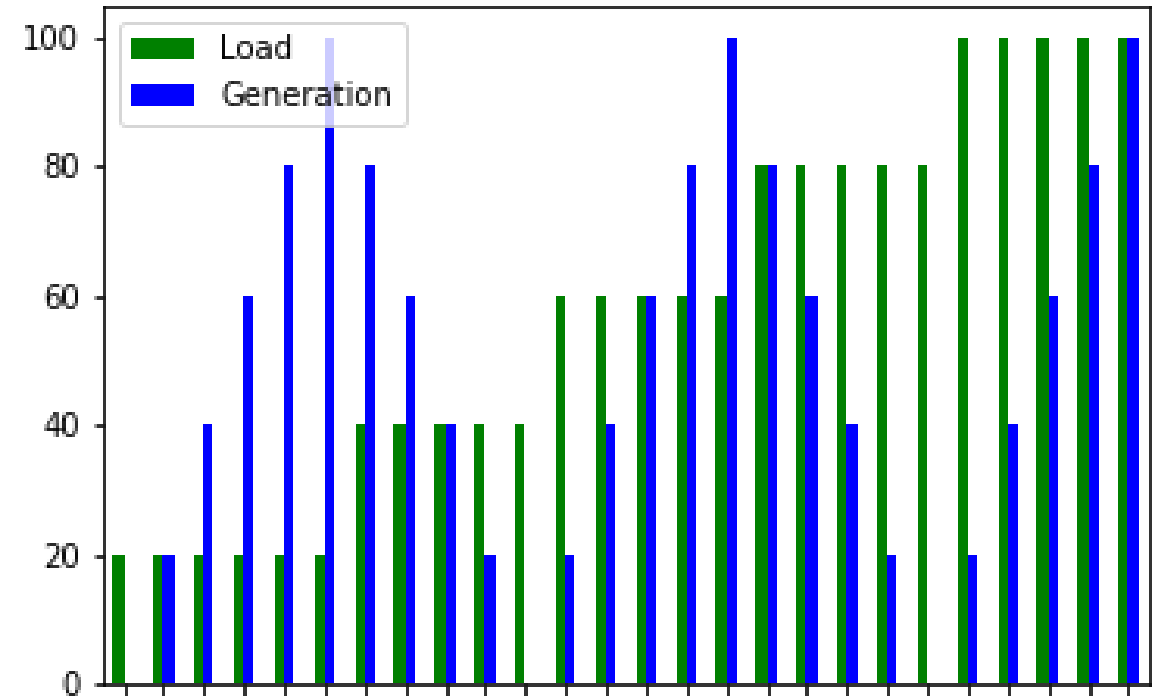


## Load-Generation cases

P gen [kW] / $\sigma$	0 ... 1.5
BAT	12
DIESEL	24
B2B	26
Total	50

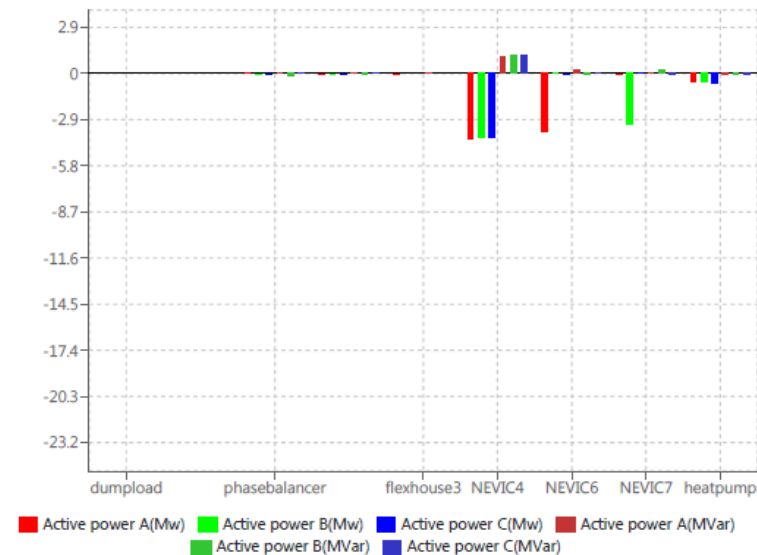
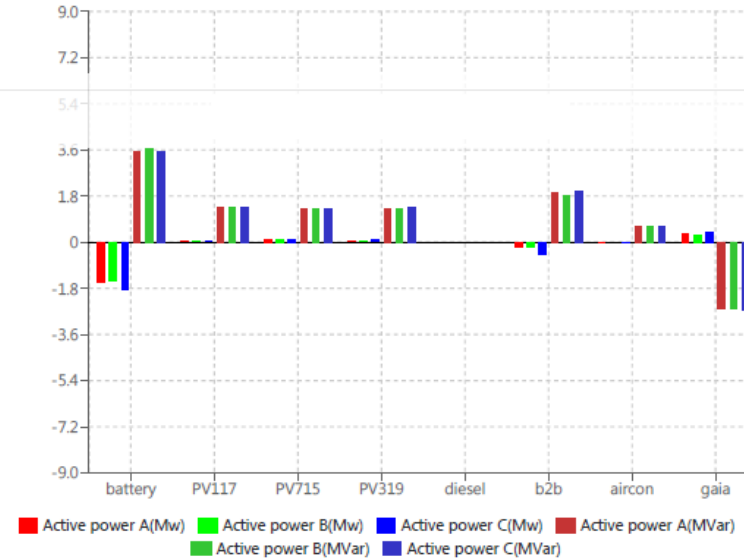
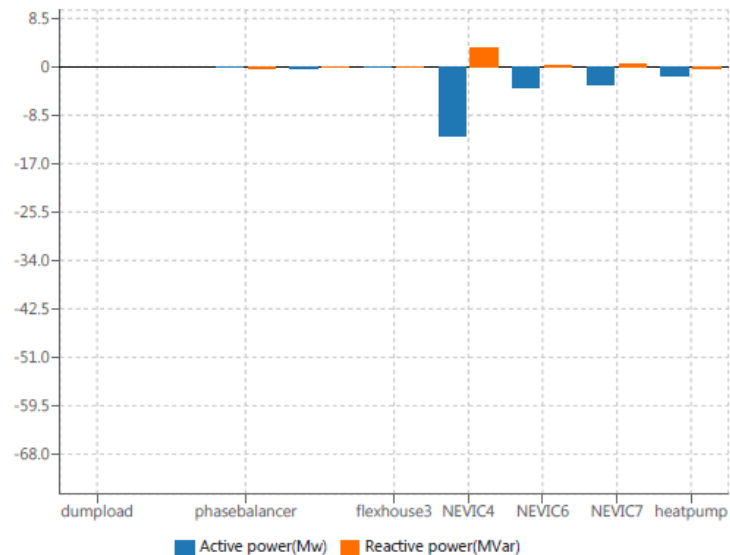
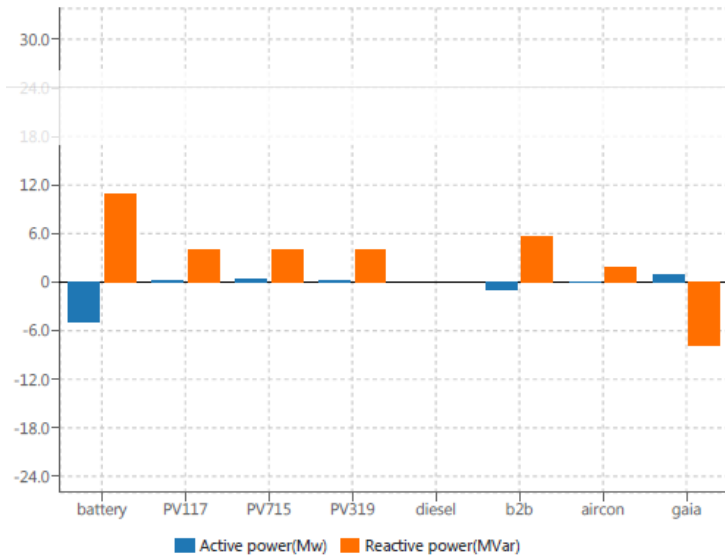
Load [kW] / $\sigma$	0 ... 1.5
Dumload	18
Mobile load	15
Total	33

Q gen [kVar] / $\sigma$	0 ... 1.5
PV <sub>319</sub>	10
PV <sub>117</sub>	10
PV <sub>715</sub>	10
BAT	10
Total	40

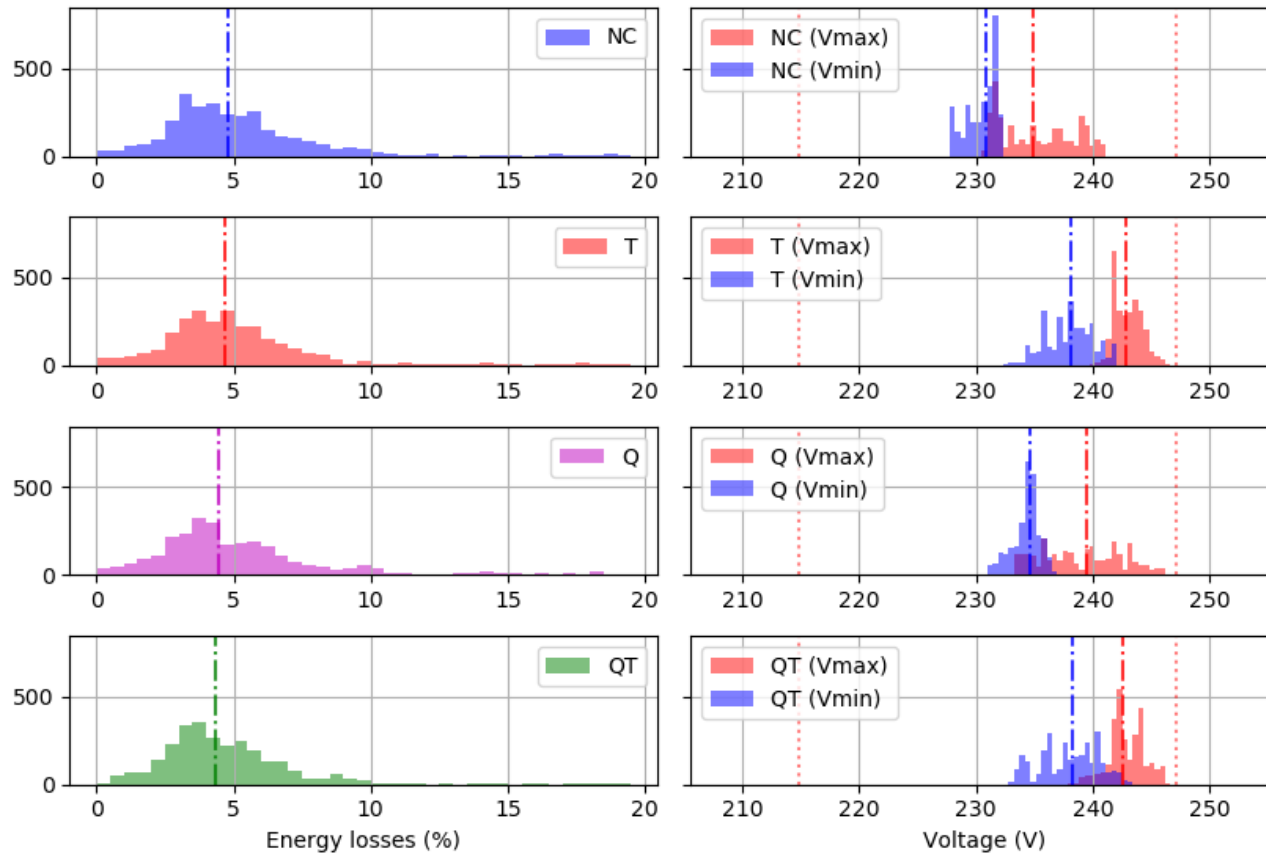




# Validation test: real-time measurements



# Results of validation test



Control strategy	HC (%)	Losses reduction (%)
NC	0.00	0.00
T	61.65	2.56
Q	63.27	6.31
QT	61.07	9.35

- The **efficiency** of the electrical grid can be **improved by 9.35 %**.
- By an application of the OLTC transformer the **Hosting Capacity** can be **increased up to 61.65%**.
- Decrease of voltage excursions.

# Benefits from the exchange/lessons learned

TA provided us with a great the **opportunity to speed-up the time-to-market of the innovative equipment and solutions** by testing new developments in the field:

- The **technical viability of smart distribution transformer with OLTC with implemented advanced control algorithms** was **successfully assessed** in close-to-real environment.
- The proposed solution contributes to **increase grid flexibility and reliability**, particularly when integrating high share of renewables
- An insightful information about unexpected **secondary benefits for DSOs** that it can provide.

# Thank you for attention!

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