

449 - Influence of Grid Topology on the Operating Envelope using Relaxed Three-phase OPF

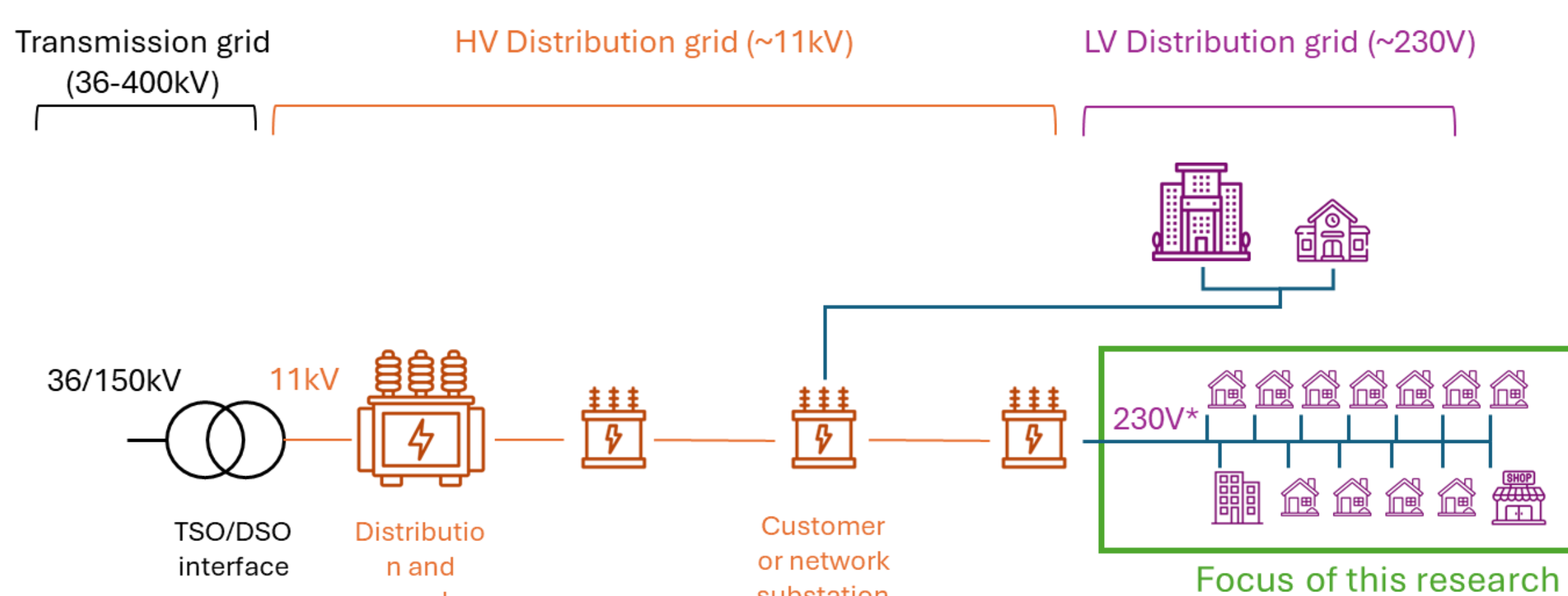
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1. Introduction

1.1 DSO challenges due to EU regulation



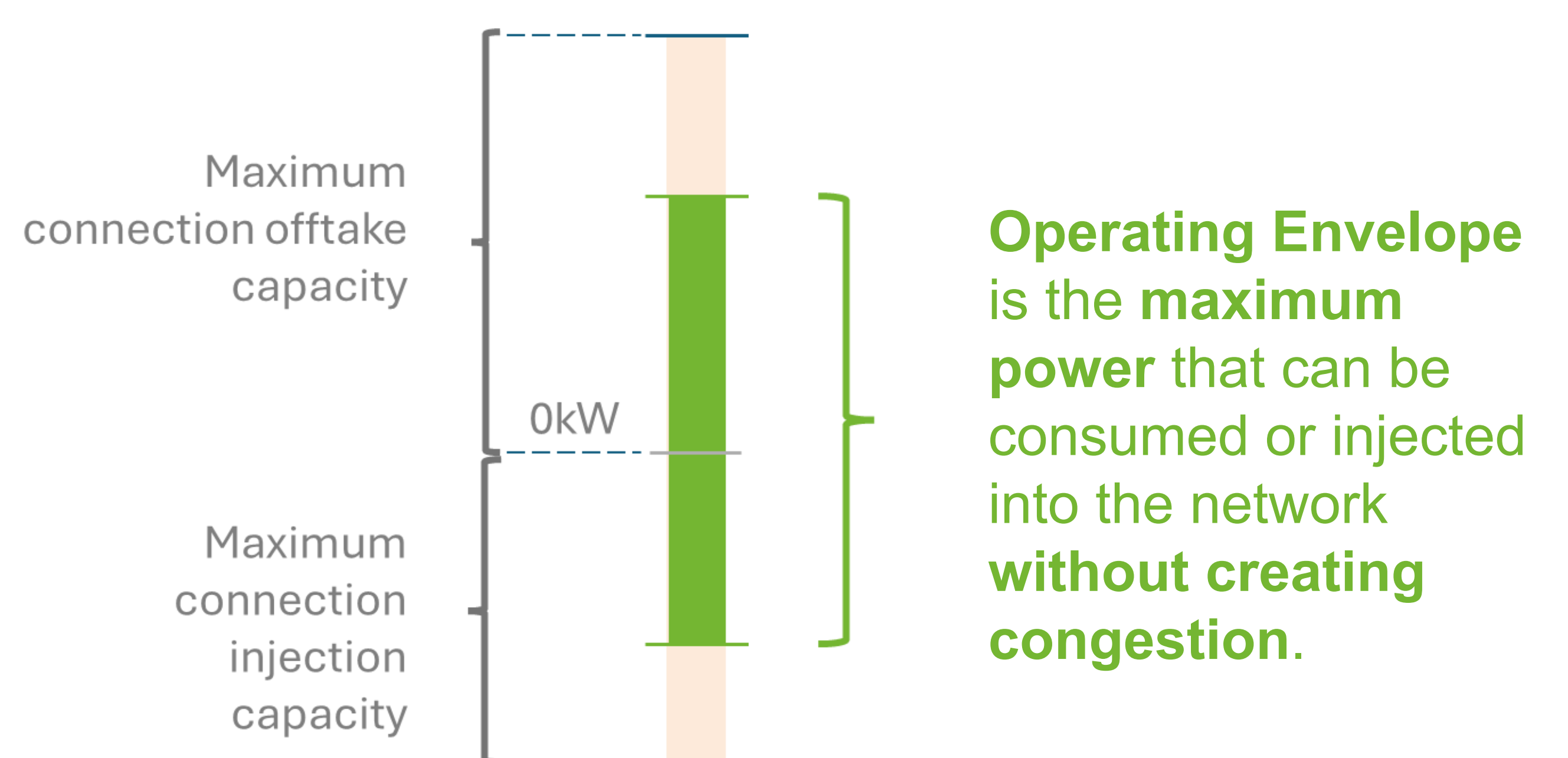
Historically

- Fit-and-forget approach (grid)
- Unidirectional flows (grid)
- Non-coincident (end-users)
- High volatility (end-users)

Challenges

- Volumes and simultaneity expected to increase
- Decentralized storage and production
- Flexibility access

1.2 Operating Envelope concept

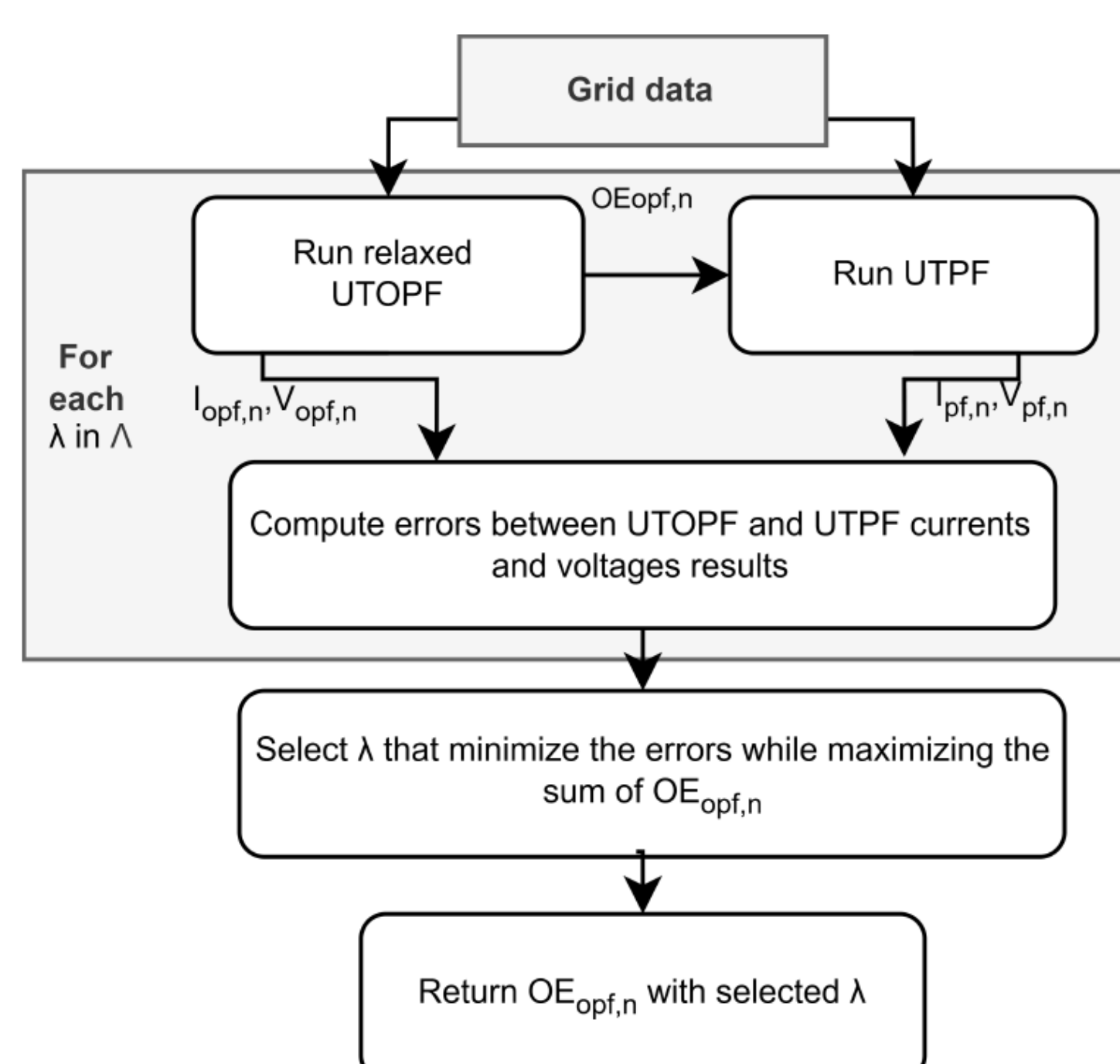


2. Methodology

Relaxed Unbalanced Three-Phases OPF

In the objective function, maximizing the active power **leads to an inexact solution**. A term must be added in the objective function.

$$\max \sum_{c \in C} OE_c^{Re} - \lambda \sum_{n \in N} diag(r_n L_n^{Re})$$

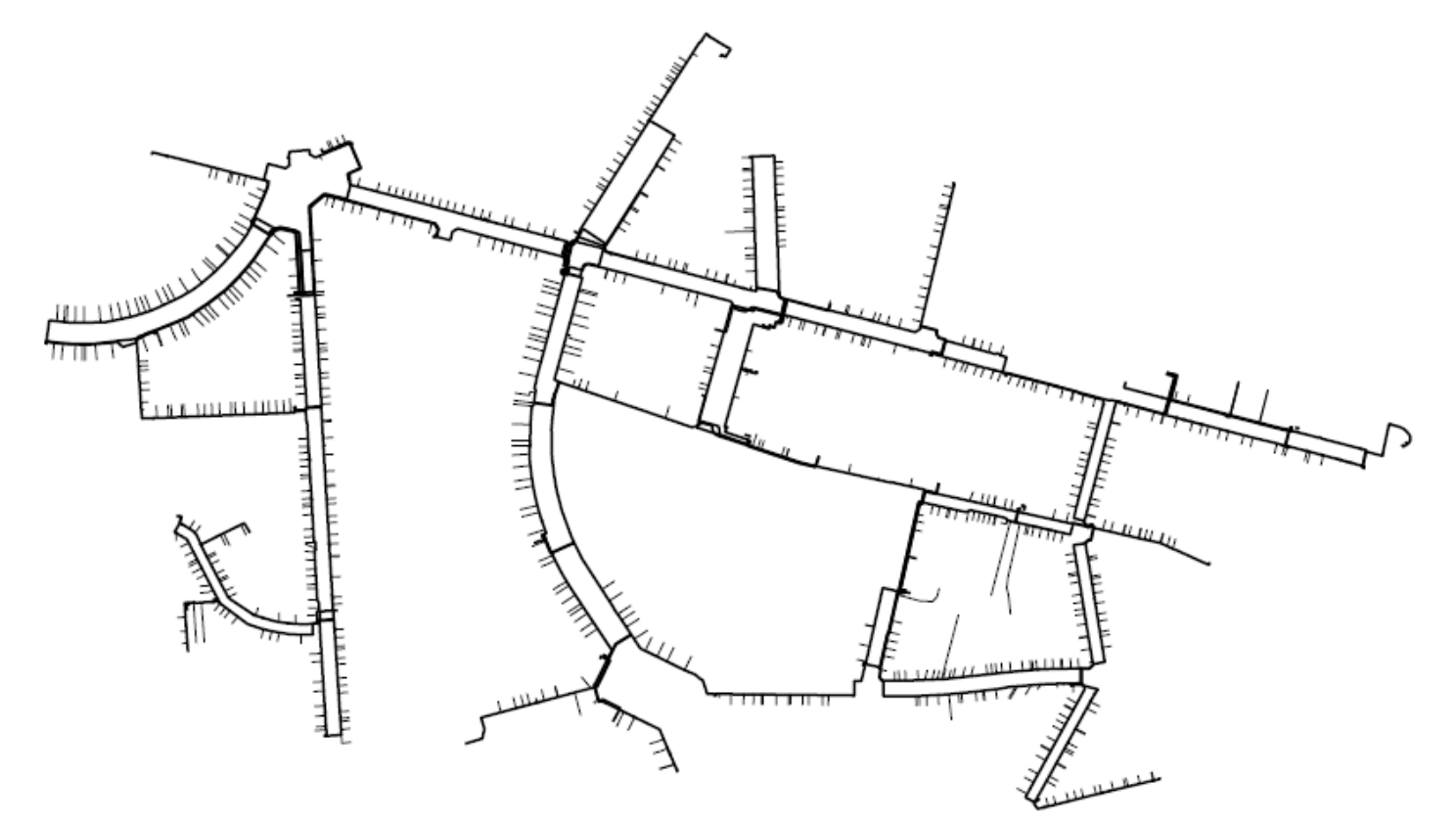


3. Results

3.1 Case study

49 Sibelga LV feeders (Brussels DSO)

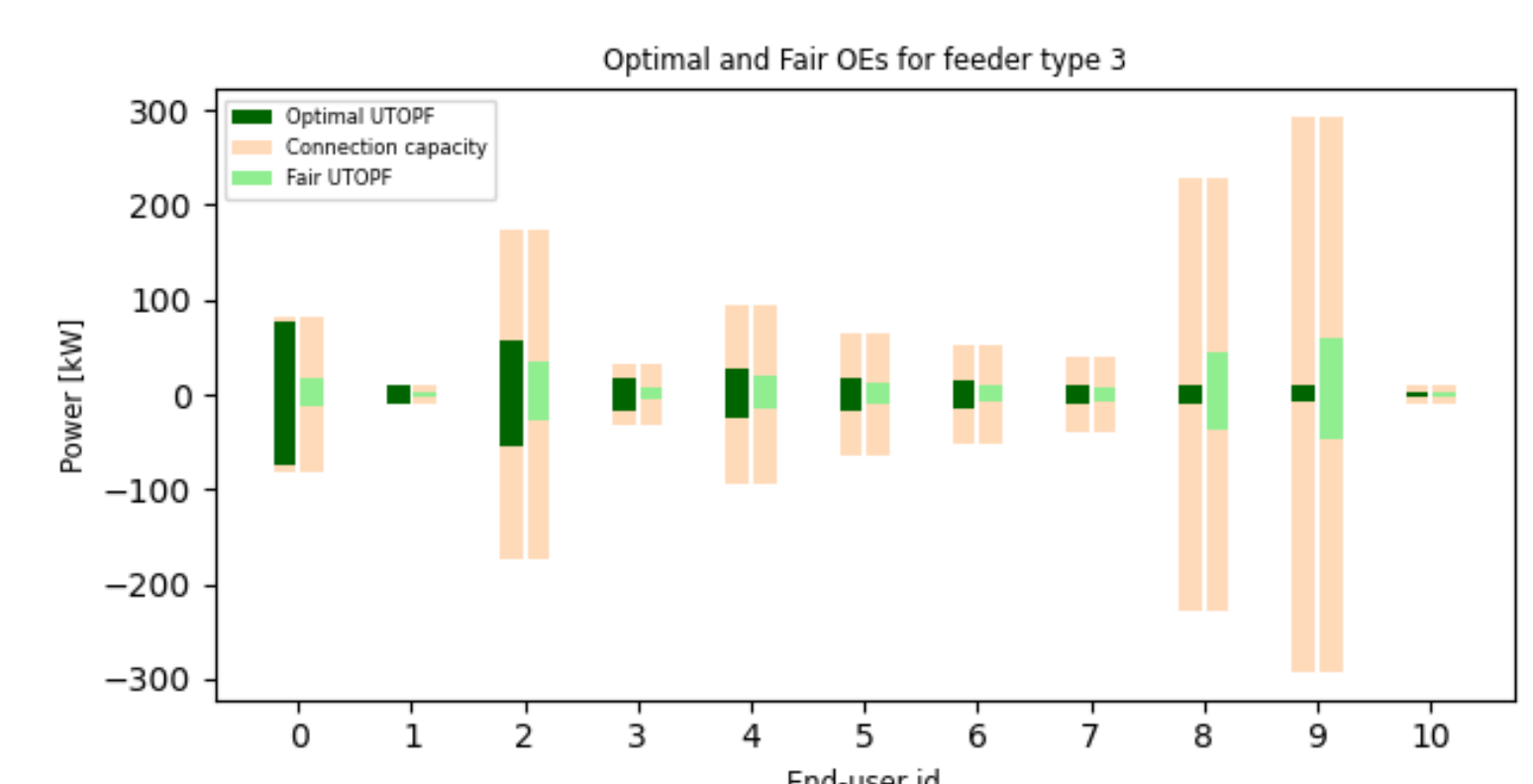
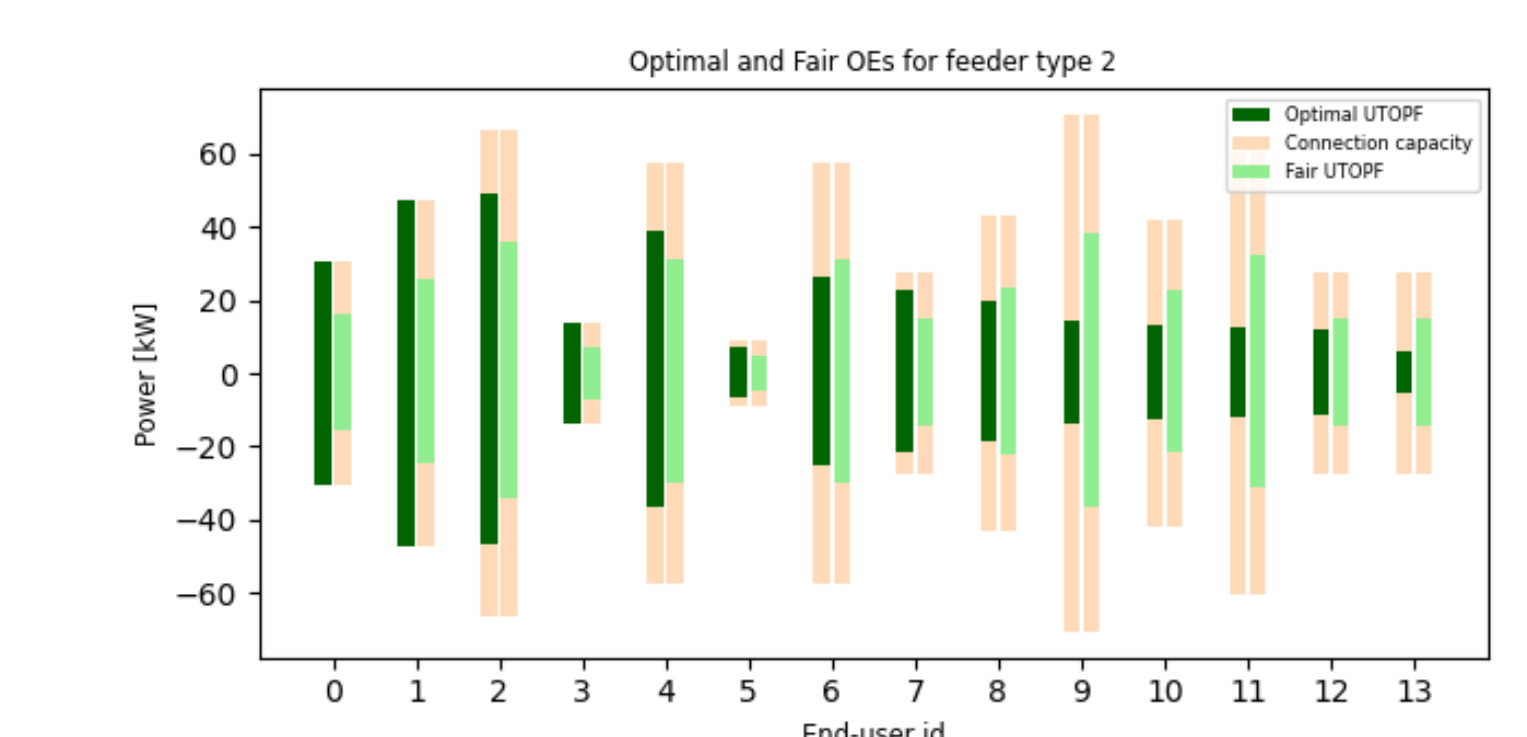
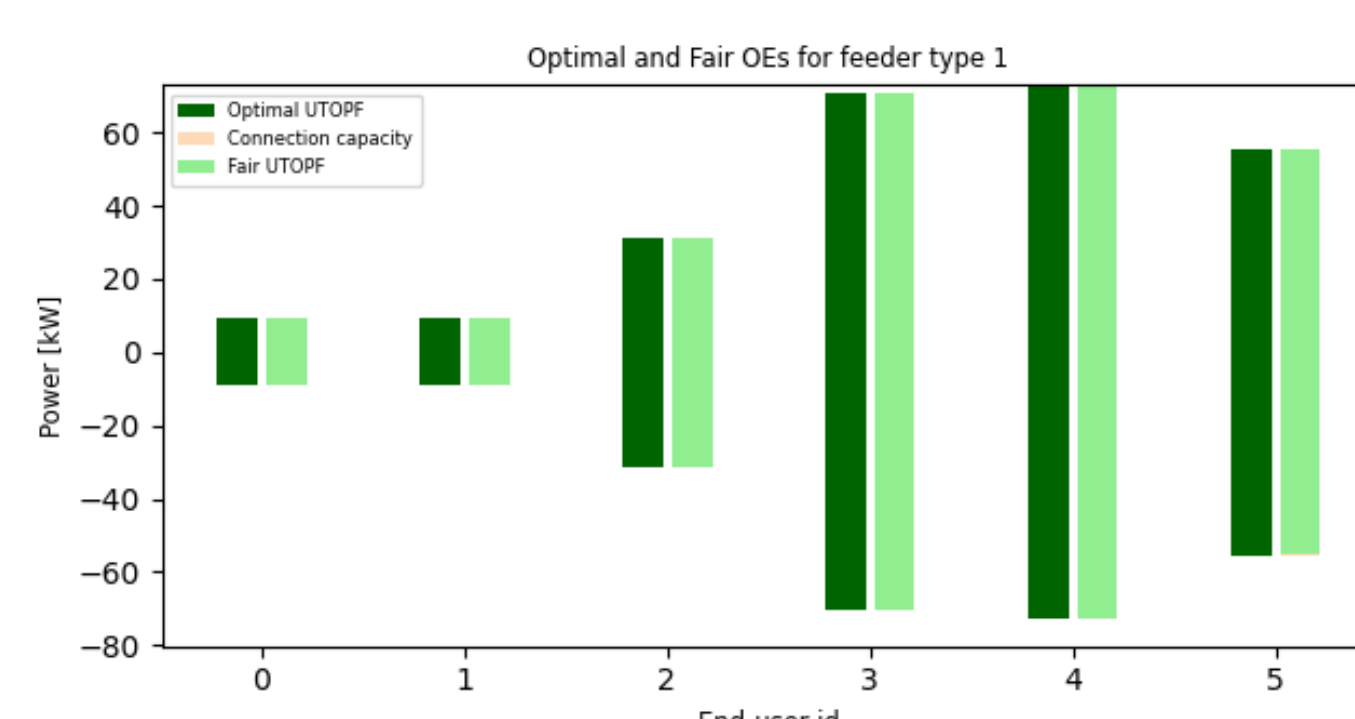
- 712 connection with 2,267 end-users
- 1-phase or 3-phase delta-connected
- Maximum connection capacities from 3.7 to 25.1 kVA



3.2 Feeders types

Three categories:

1. Cat 1 - Flexibility limited by connection capacity and not OE ;
2. Cat 2 - Aggregated fair OE and optimal OE identical ;
3. Cat 3 - Other feeders.



4. Conclusions

1. Investigates **Operating Envelope** computation in LV distribution networks with a focus on maximizing flexibility
2. Use of **UTOPF with SOCP relaxation** and a loss-minimization term for accurate and optimal OE calculation
3. Case study with **49 real LV feeders** from Brussels DSO

Acknowledgements

Alexander
ACCELERATING LOW VOLTAGE FLEXIBILITY
PARTICIPATION IN A GRID SAFE MANNER

In collaboration with:

