



THE UNIVERSITY OF
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Using Behind-the-Meter Reactive Power to Enhance Residential Operating Envelopes (OEs)

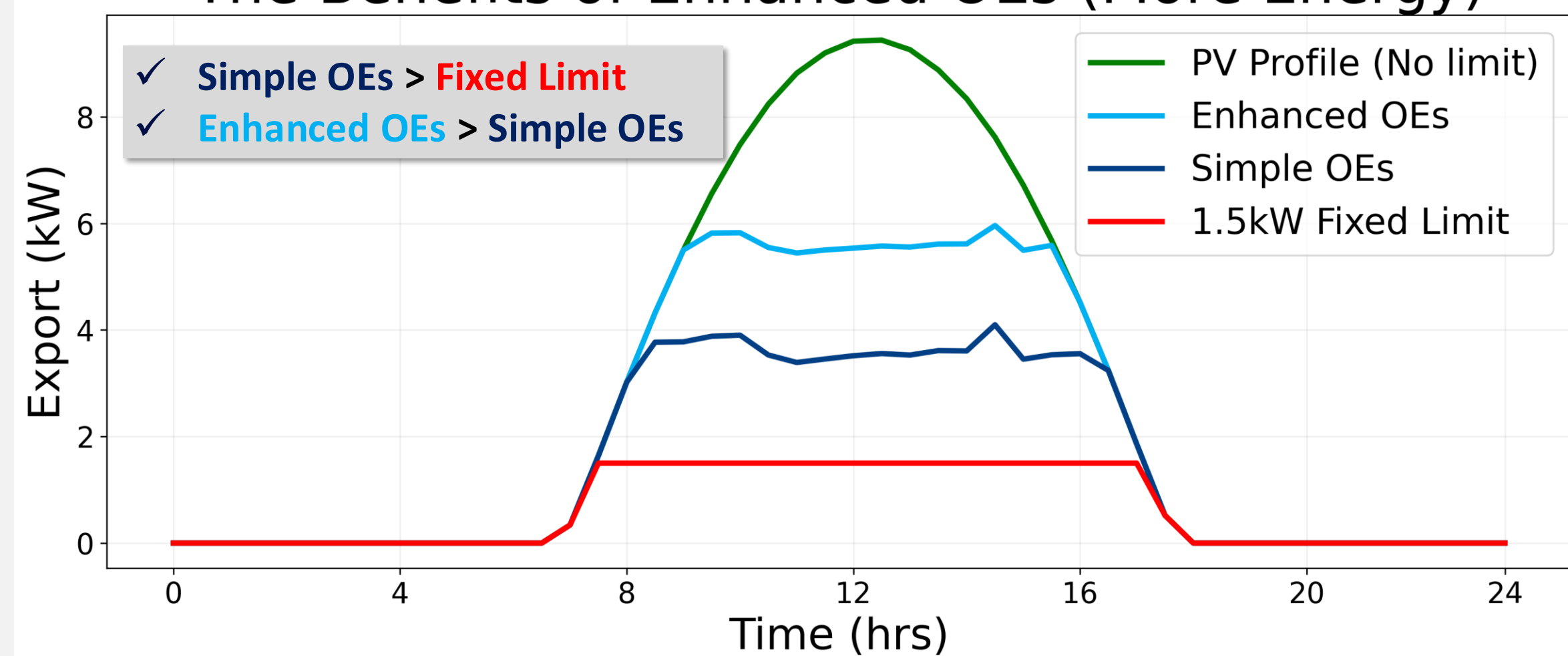
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1. Context

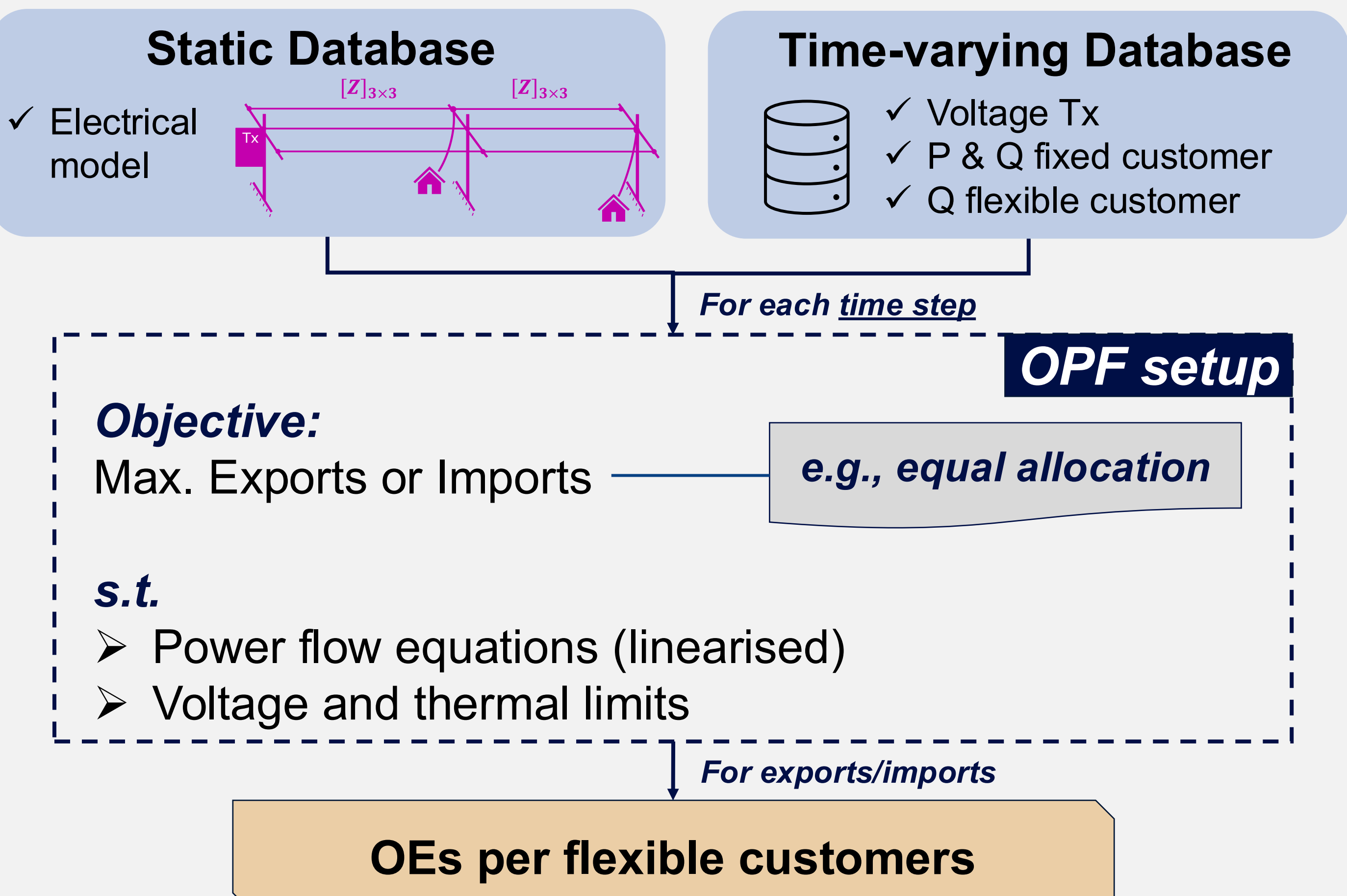
- High penetration of residential distributed energy resources (DER) can create **voltage and thermal issues** in low voltage (LV) distribution networks.
- Operating Envelopes (OEs)**, i.e., time-varying export/import limits at the **flexible customer** connection point, are an **effective solution** to preserve network integrity.
- Behind-the-meter reactive power (Q)** can counteract voltage deviations, enabling **enhanced OEs**.

$$\Delta V = \frac{P \cdot R + Q \cdot X}{V}$$

The Benefits of Enhanced OEs (More Energy)



2. Methodology

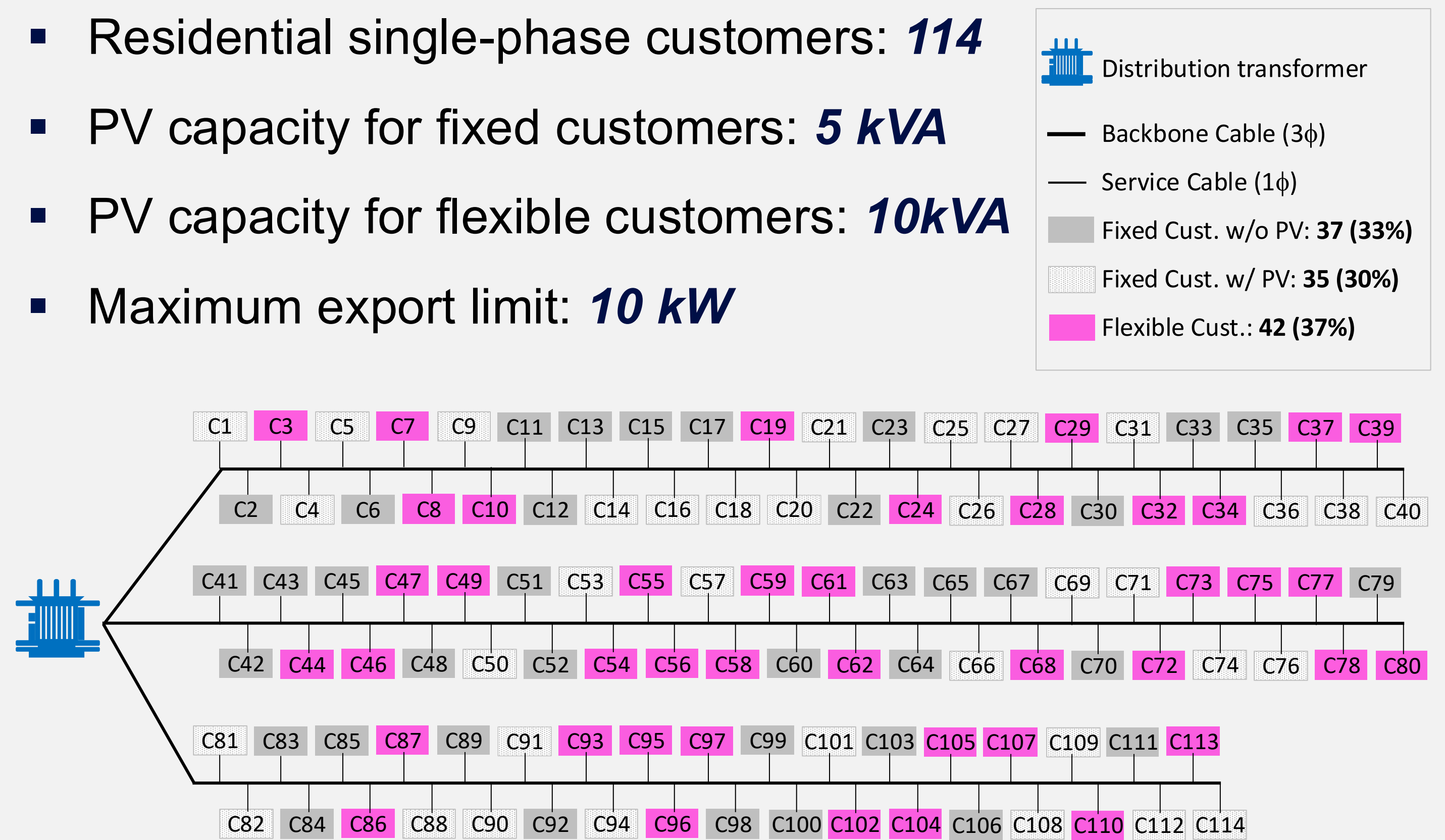


5. Key Remarks

- ✓ Leveraging behind-the-meter Q leads to enhanced OEs → Exporting more P 🚀
- ✓ The benefits of enhanced OEs are proportional to the available behind-the-meter Q
- ✓ OE enhancements become more impactful as the penetration of flexible customers increases
- ✓ Quantifying the value of behind-the-meter Q is essential to support future implementations of enhanced OEs

3. Case Study

LV Network with 3 feeders



4. Results

