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ENGINEERING

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Project Title: Probabilistic Dynamic Operating Envelope (DOE) Optimisation

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Summary

Dynamic Operating Envelopes (DOEs) provide time-varying import and export limits that Distribution Network Service Providers (DNSPs) issue to customers to ensure the safe operation of low-voltage (LV) feeders under high distributed energy resource (DER) penetration.

Since DNSPs have no visibility of behind-the-meter resources, DOE limits must be determined under uncertainty in PV generation, customer demand, battery operation, and tariff-driven behaviour. Furthermore, the limits must remain feasible while accounting for inverter responses driven from network condition and prescribed by the AS4777.2:2020 standard, including volt-var and volt-watt control modes.

This project develops a probabilistic optimisation framework for computing DOE import and export limits that satisfy network voltage and thermal constraints under these uncertainties while explicitly modelling AS4777.2:2020 volt-var and volt-watt inverter behaviour. The resulting DOEs are validated through time-series simulations in OpenDSS.

Objectives

Formulate a probabilistic MILP that computes Dynamic Operating Envelopes for each customer across the day.

Represent AS4777.2 volt-var and volt-watt behaviour using linearised feasible operating regions.

Model uncertainty in PV, load, and battery behaviour from AMI data.

Include tariff-driven operating conditions (e.g., Victoria's 3-hour free midday electricity window) as part of the probabilistic behaviour model.

Validate DOE limits using OpenDSS under full nonlinear LV physics and AS4777.2 controls.

Additional Information

Potential applicants are required to attend an interview. The successful applicant will be working within a group supported by PhD students and Research Fellows.