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Long-term Forecasting of Reactive Power Demand in Distribution Networks

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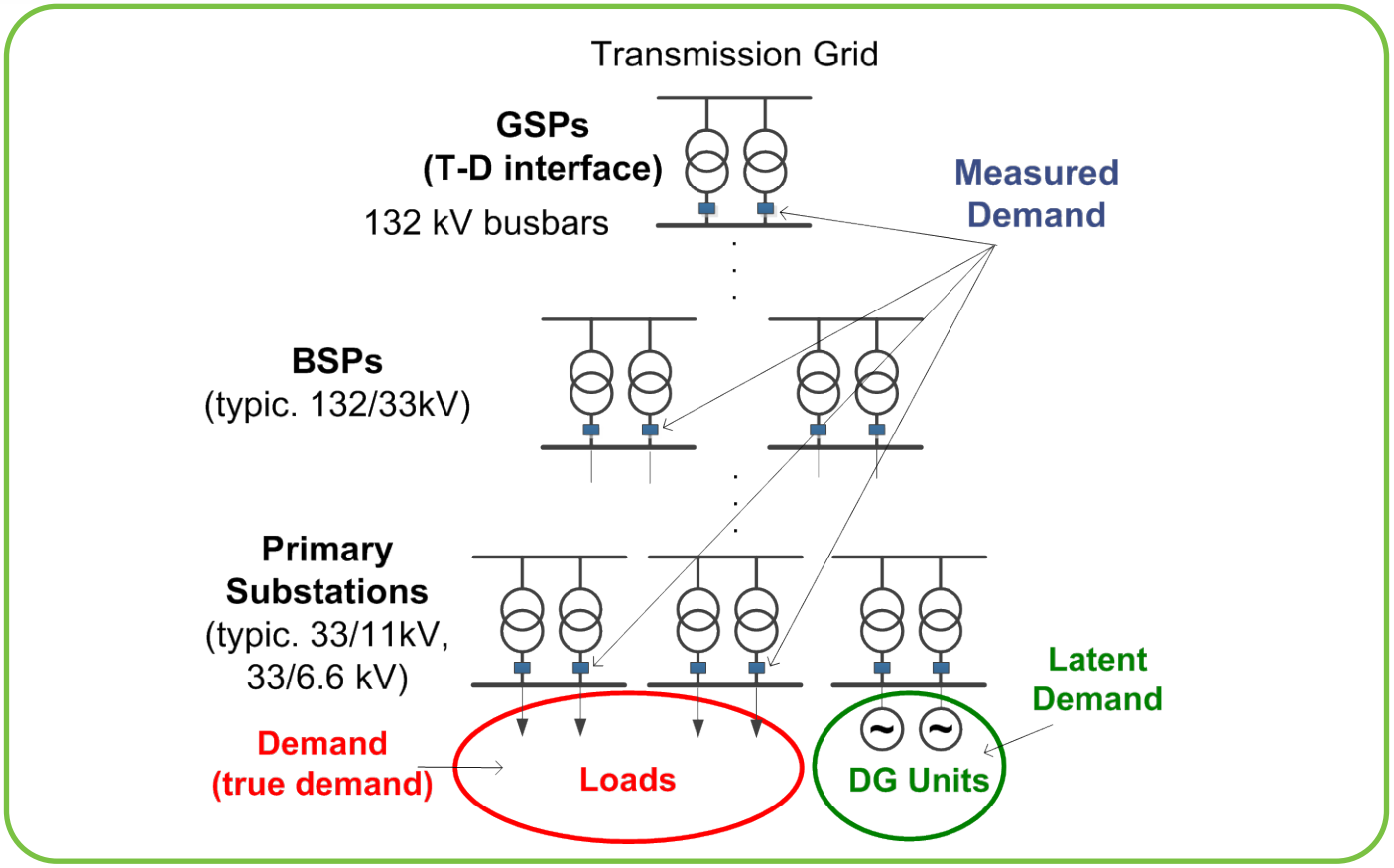
Introduction

Reactive power (Q) demand in UK	Long-term forecasting of Q demand
Critical at transmission-distribution (T-D) interfaces	Limited works
Acute Q decline during minimum load (P)	REACT project (2013-2015) First approach using network and demand data
Challenges to maintain transmission voltages	ATLAS project (2015-2018) Enhanced approach, more extensive network modelling

Distribution Networks in UK

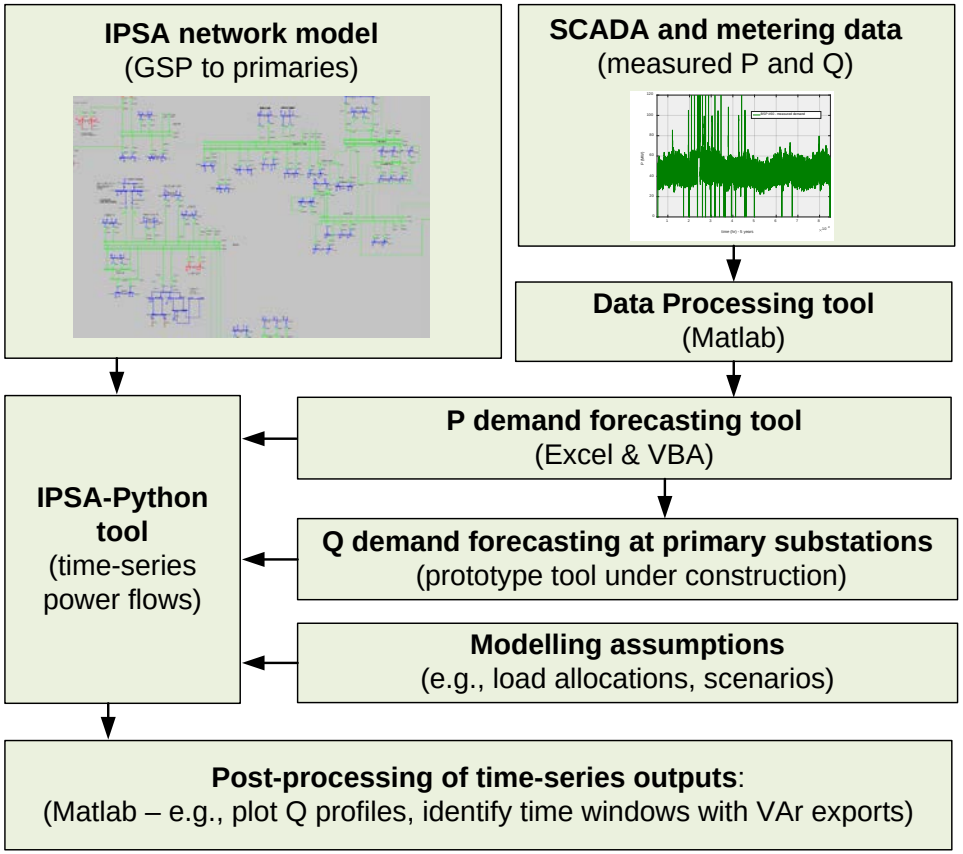


Proposed Methodology

Scenario based

Time-series network modelling T-D interface to primary substations Half-hourly resolution in analyses	Focus on periods of peak & min P demand	Use of forecasted P demand and generation Effects of low carbon technologies (LCTs), econometrics, demographics, renewables

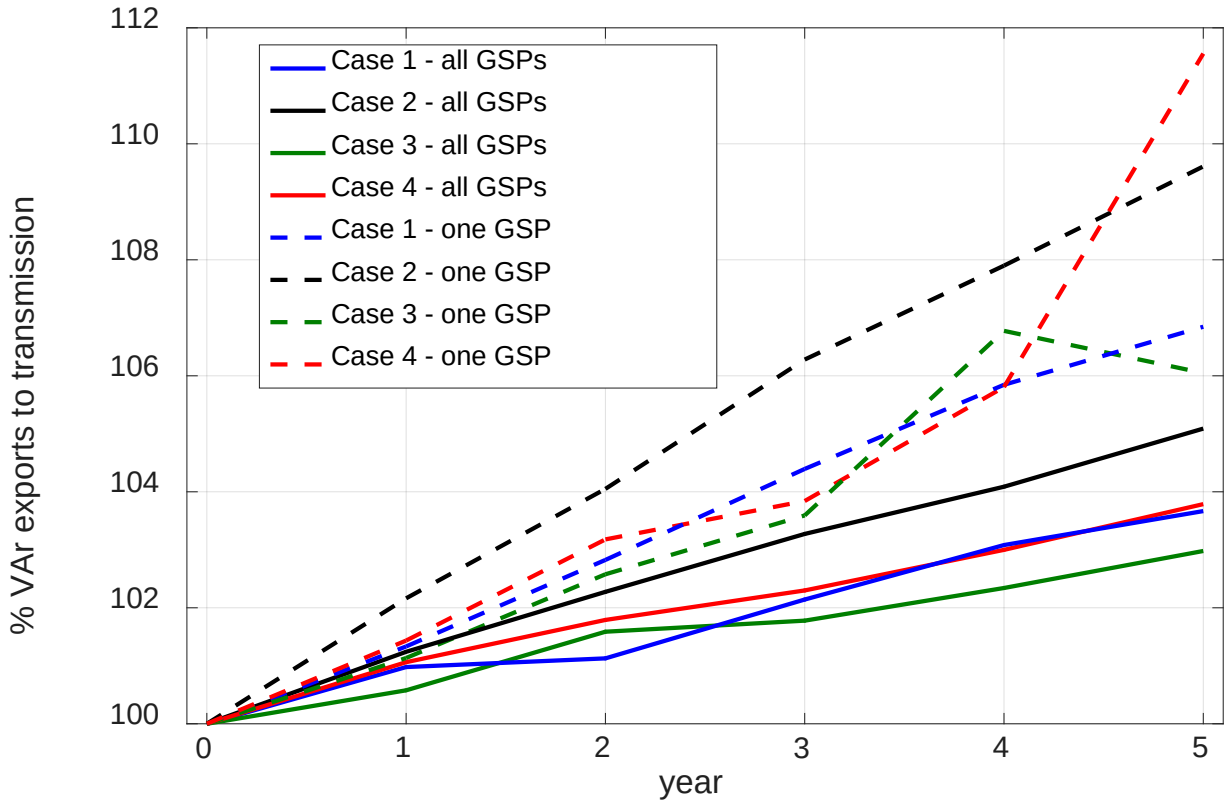
Implementation of Proposed Methodology



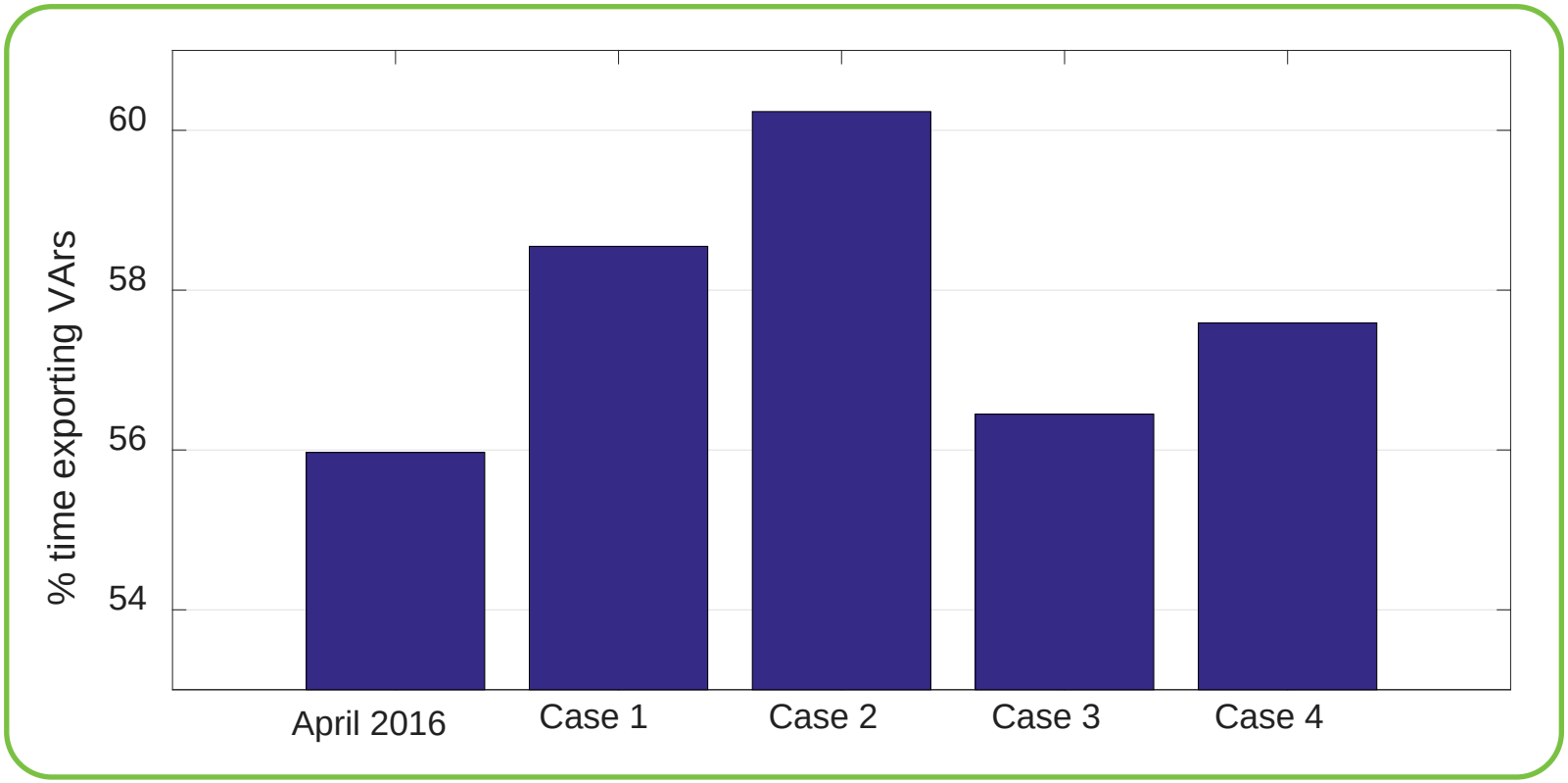
Future Scenarios

Case 1	Case 2	Case 3	Case 4
per year reduction of both P and Q at primary substations by 1 %	per year reduction of P by 1% and Q by 2%	per year reduction of only Q by 2%	per year reduction of only P by 2%

Future trends in Q demand



Duration of VAr exports to transmission



Conclusions

Proposed methodology for long-term forecasting of Q demand using network modelling

Implementation for the whole 132 to 33kV network in North West of England

Practical benefits from time-series network modelling

Time windows of VAr exports to transmission

Future trends in individual and groups of substations