Future Ready Networks

Empowering our customers in their energy future

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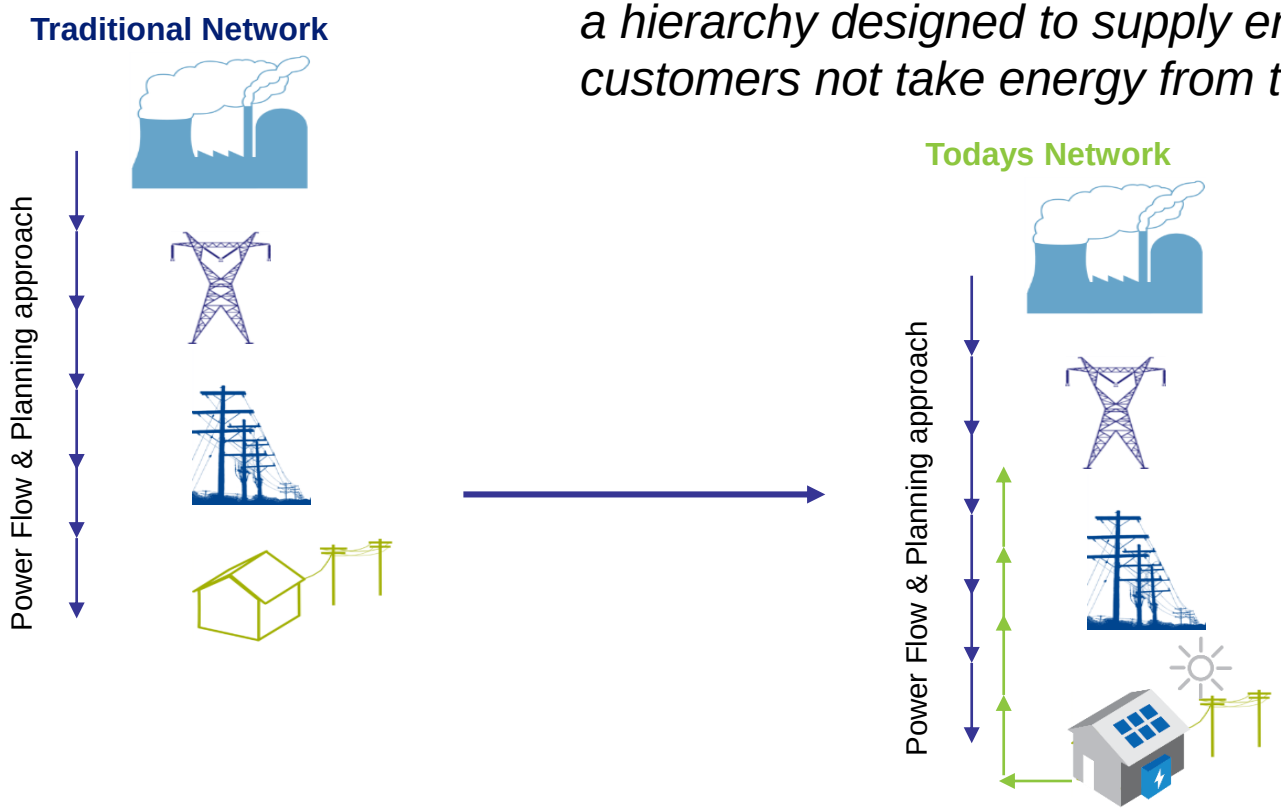
13 March 2019

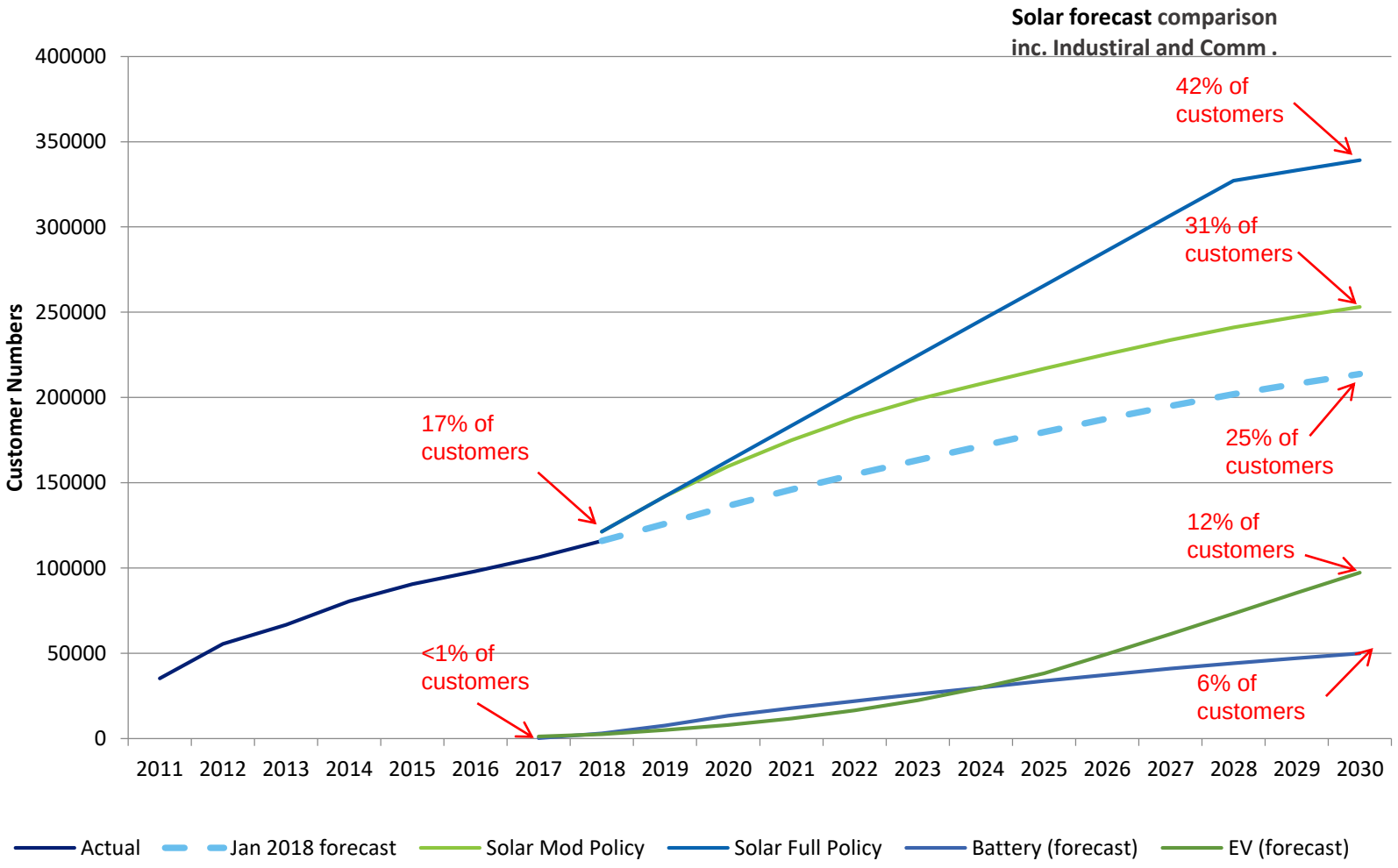
Integrating DER

Distributed Energy Resources challenge the traditional network hierarchy,

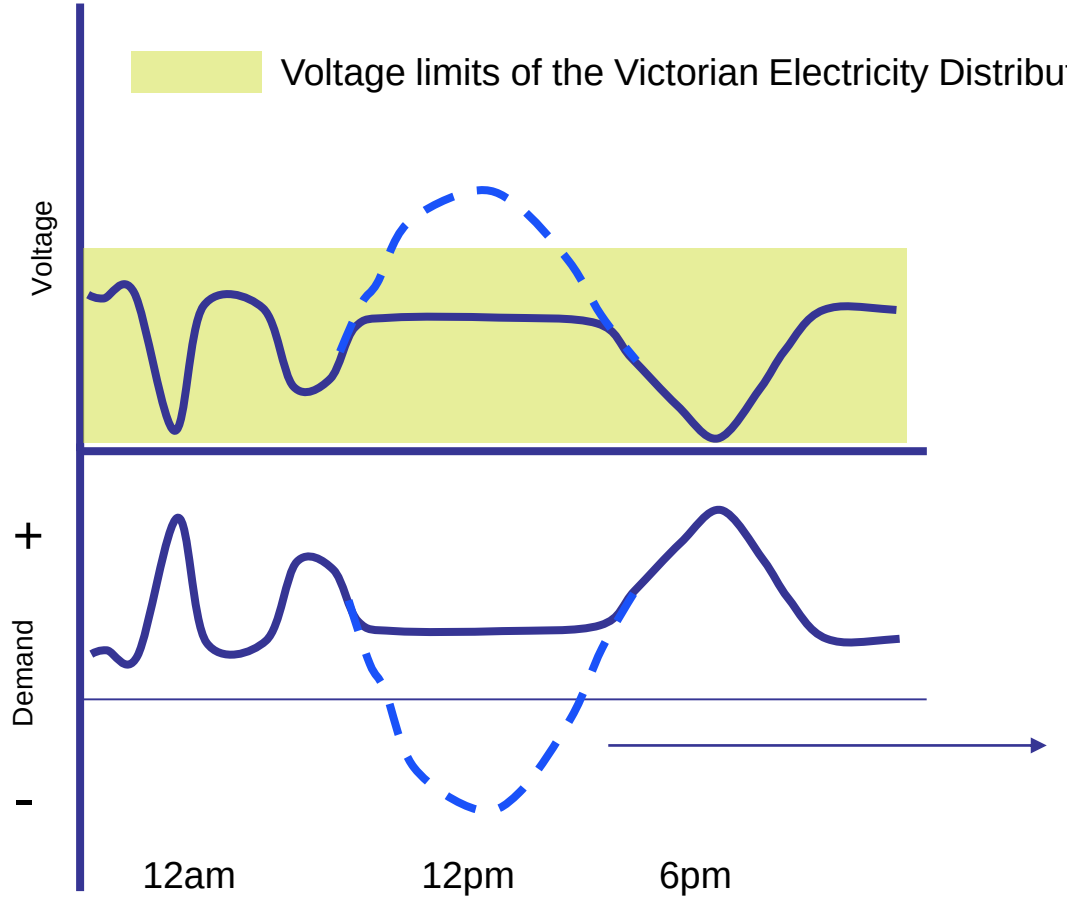
a hierarchy designed to supply energy to its customers not take energy from them.



Growth in the number of solar customers will accelerate…with EV and Battery on the rise

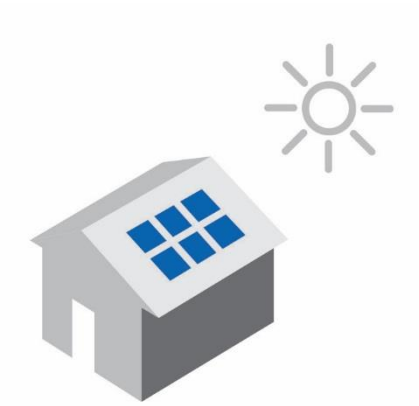


Customers voltage will now rise not just fall



Traditional customer demand profile

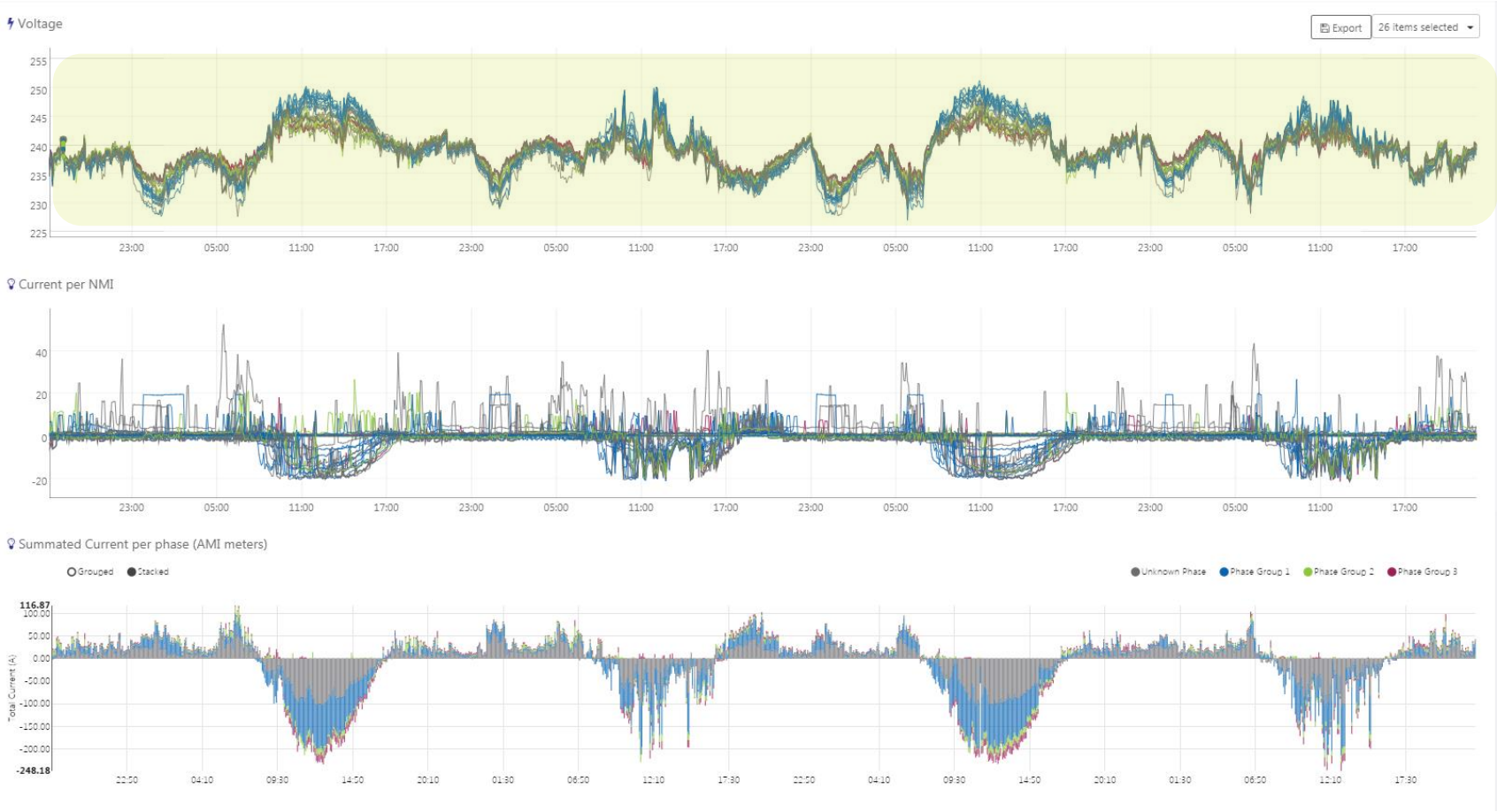
With solar



Solar Exporting

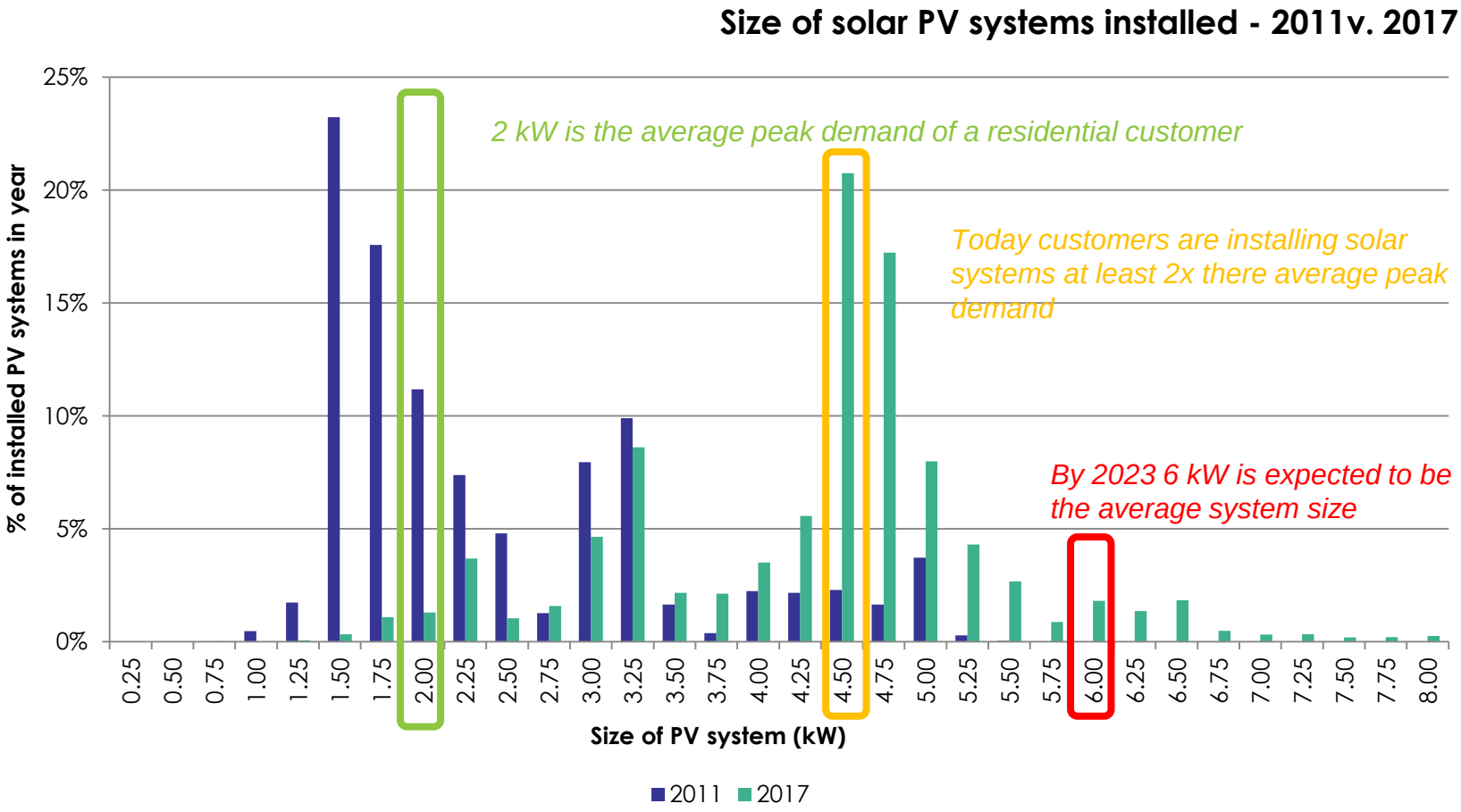
Actual customer experiences

A distribution transformer over four average (non peak) days

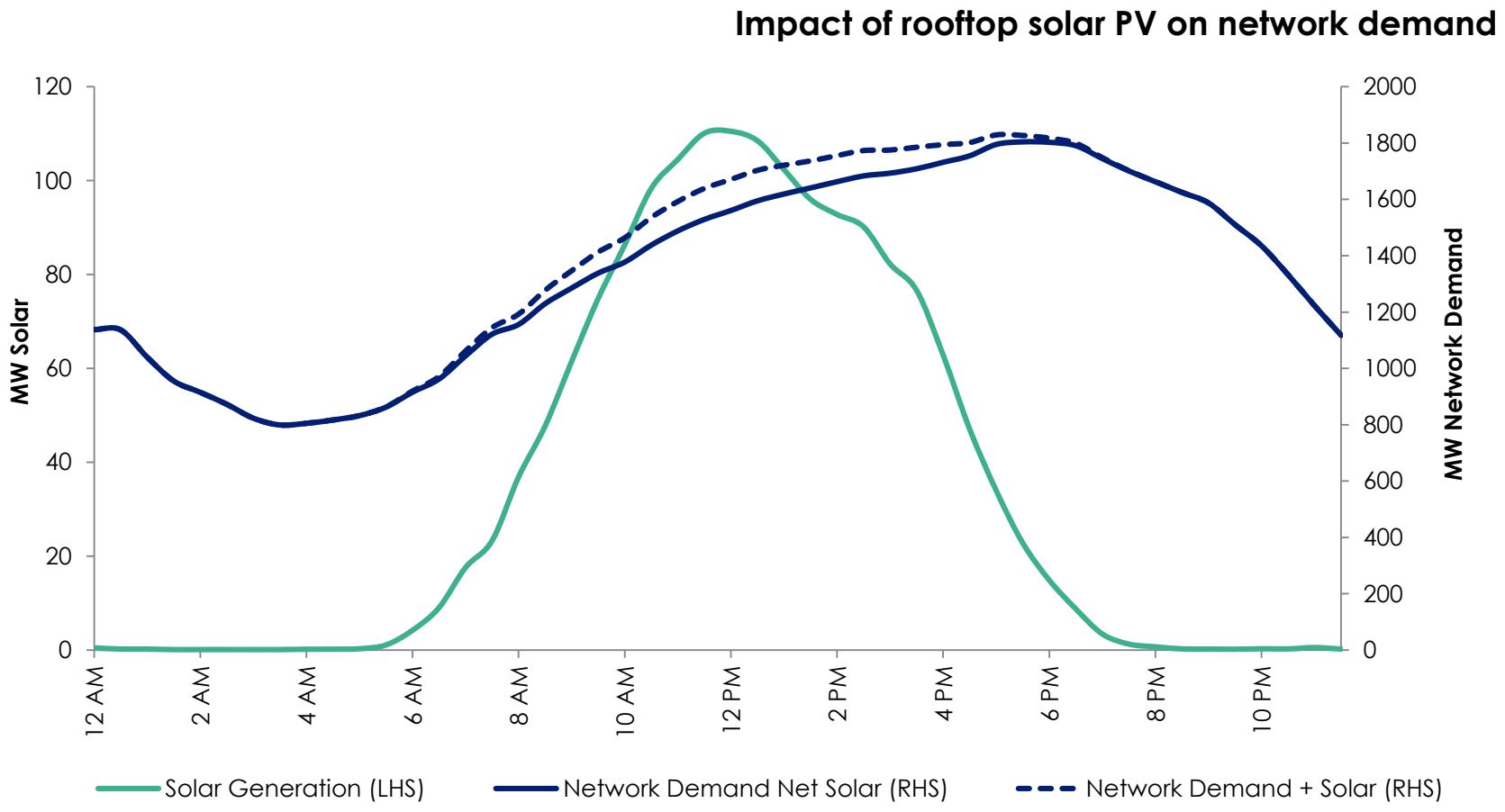


Voltage limits to meet Victorian Distribution Code

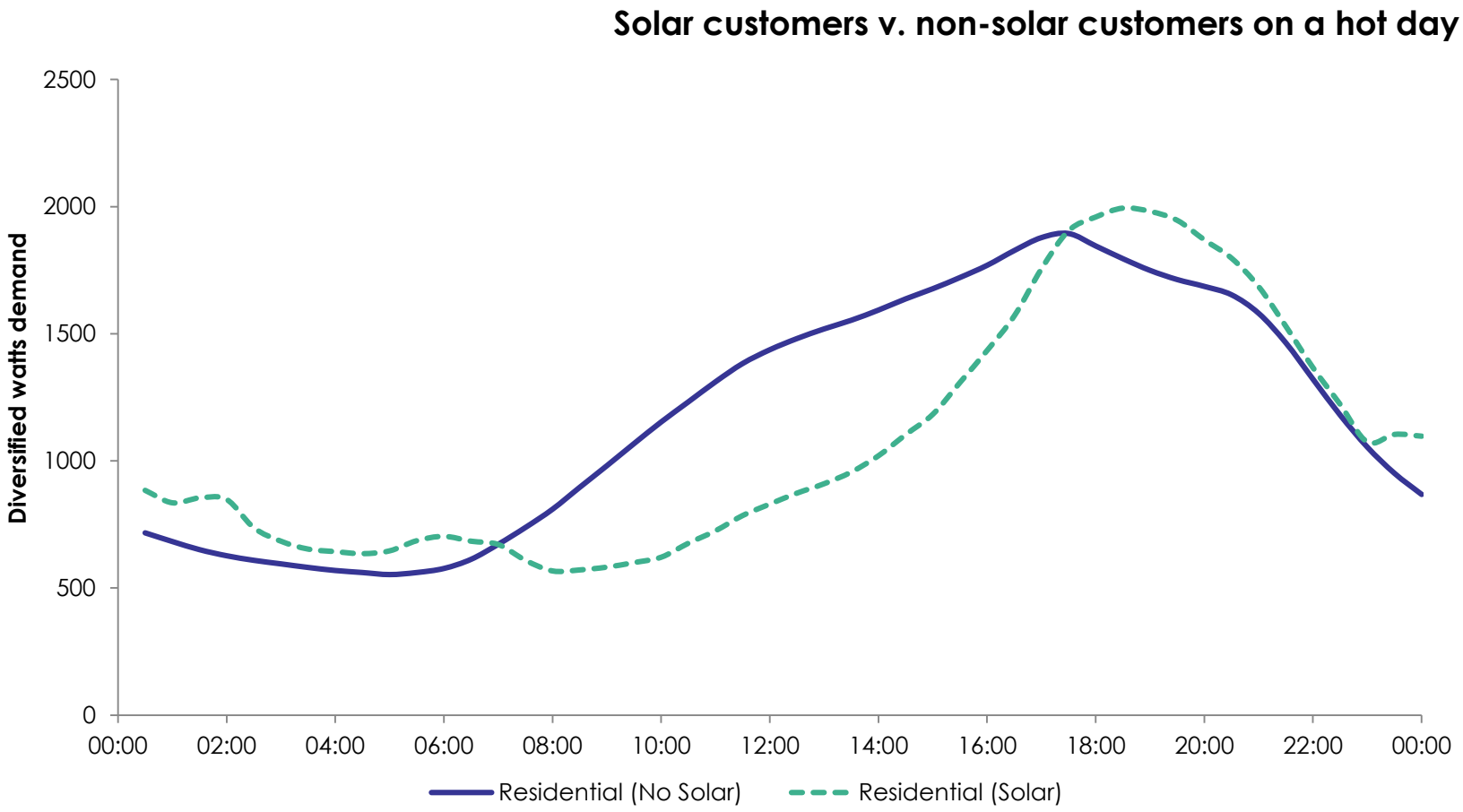
Rooftop solar PV system sizes are increasing rapidly



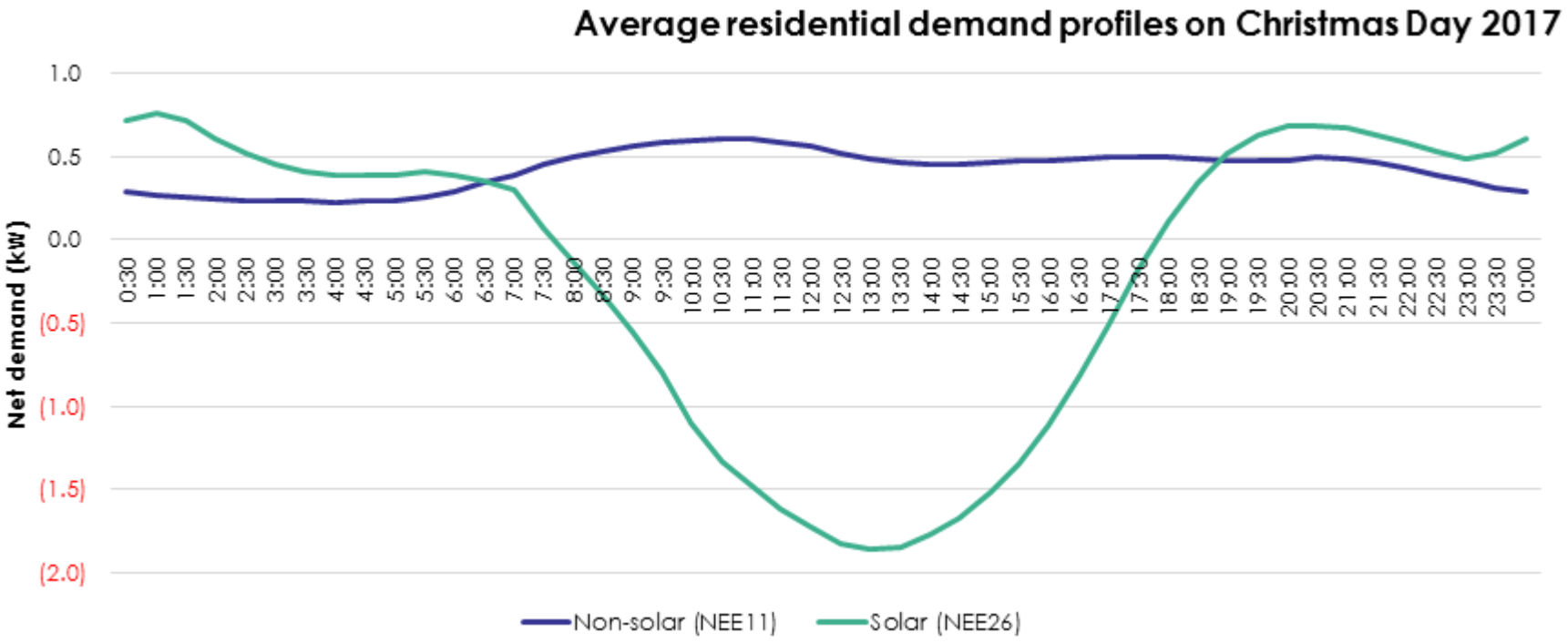
Rooftop solar generation does not materially reduce network peak



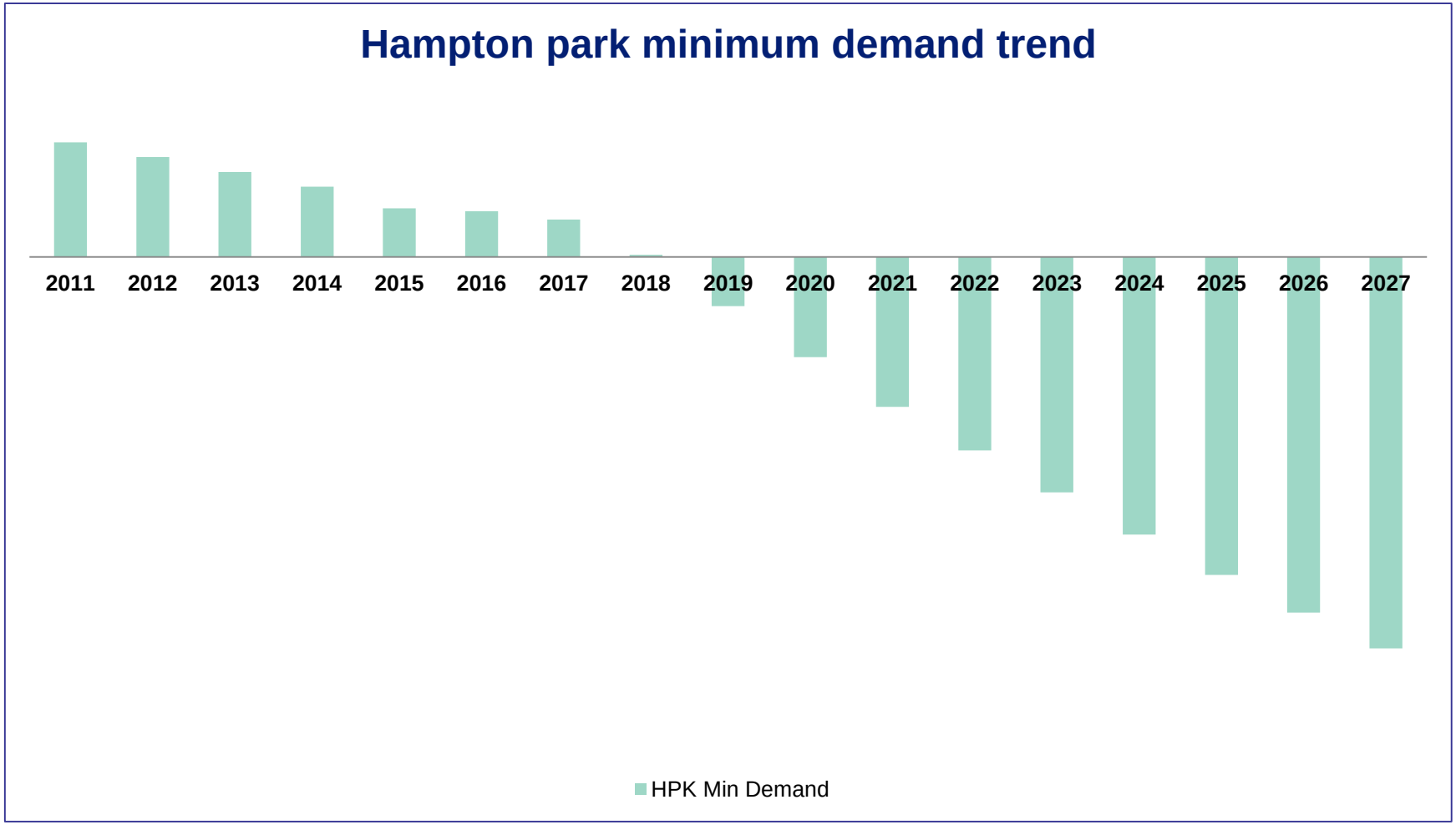
Solar customers (as a group) have a higher peak demand than non-solar



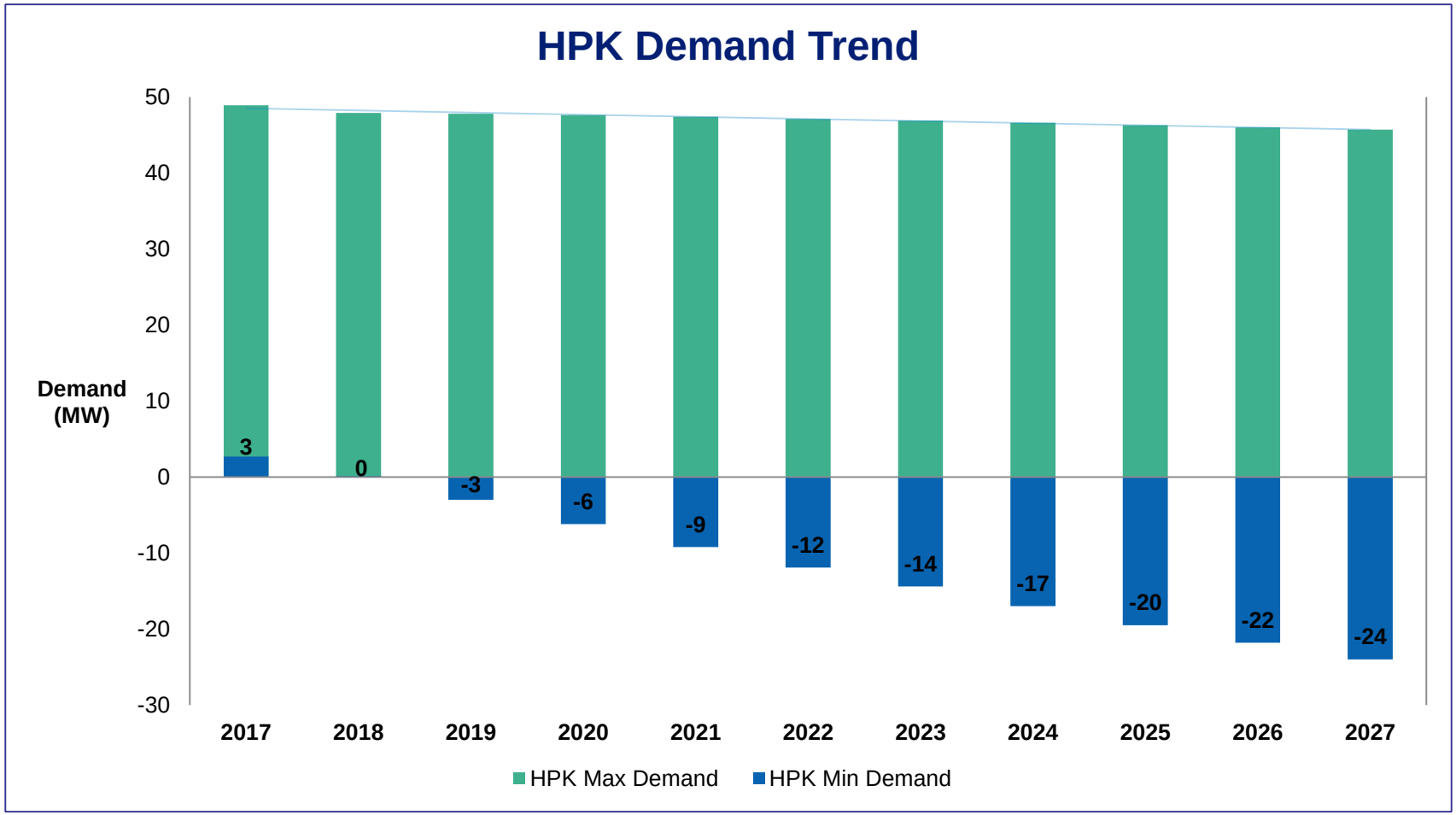
Solar customers (as a group) typically export during the day



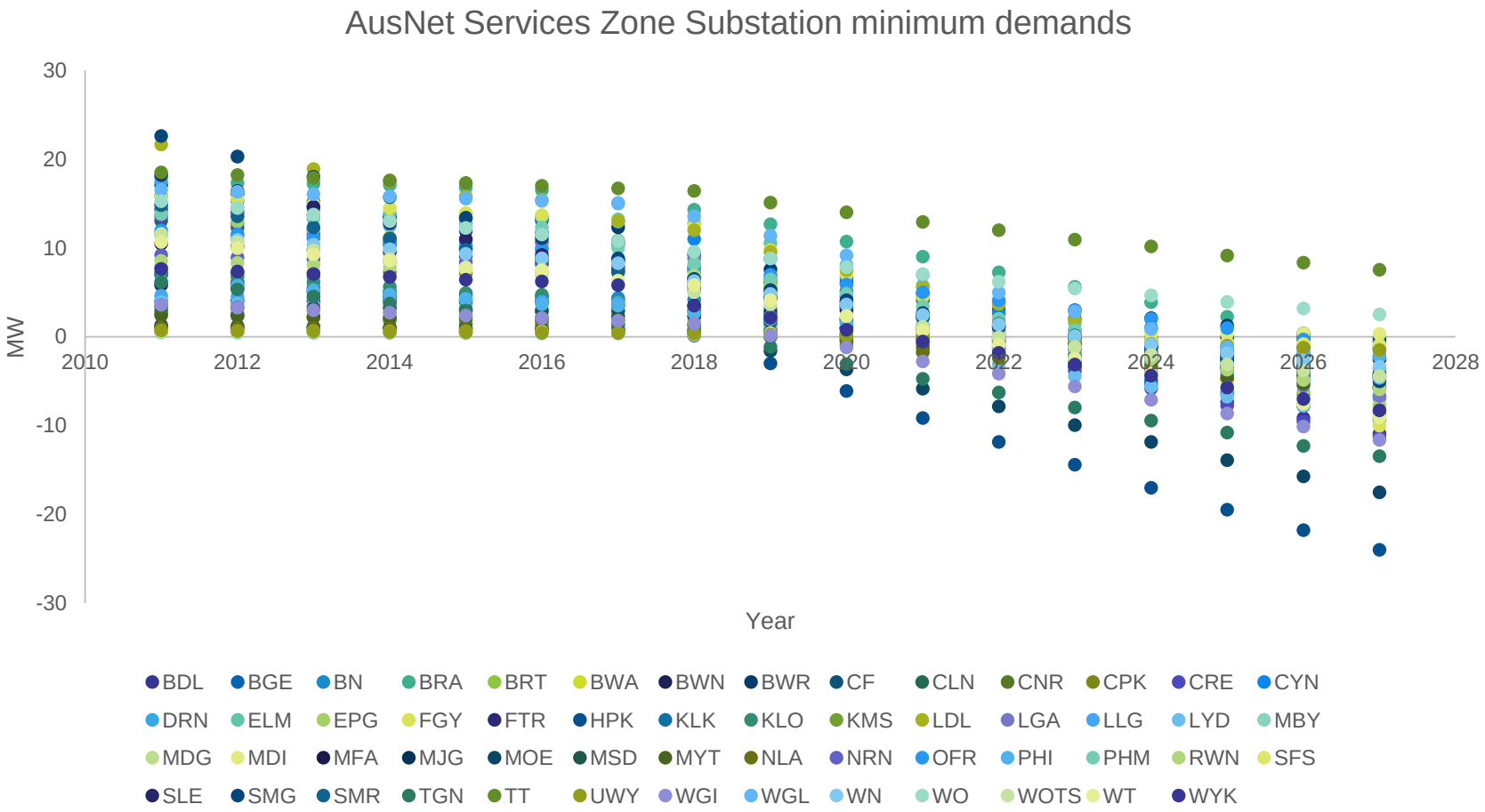
and we are at the cross roads for reverse flows..



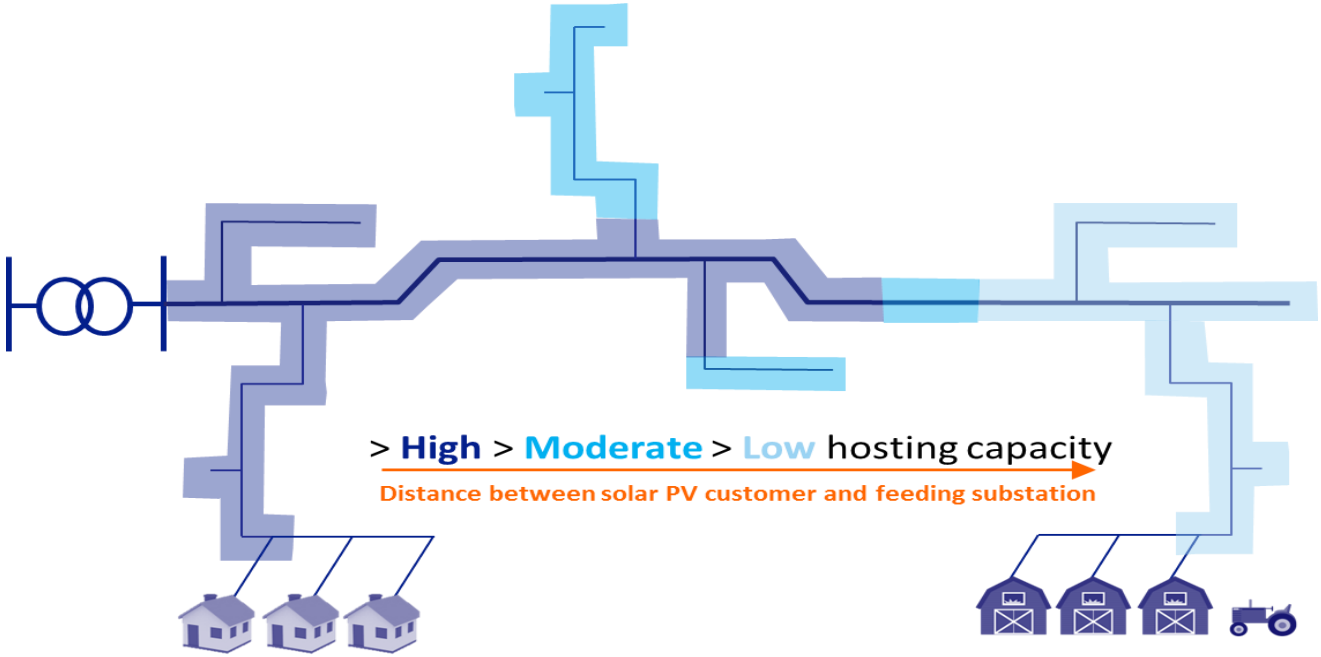
we expect large reverse flows of 20 MW by 2025



we expect reverse flows across our network



Customers in rural areas will be the most effected



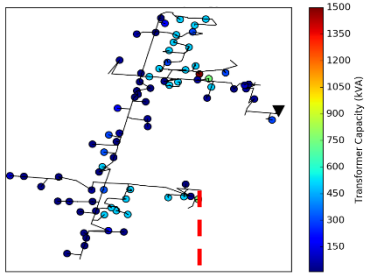
Integrated HV-LV Analysis of PV-rich Distribution Networks: An AusNet Case Study

Kyriacos Petrou, Luis Ochoa (The University of Melbourne), John Theunissen, Jacqueline Bridge, Justin Harding, Tom Langstaff (AusNet Services)

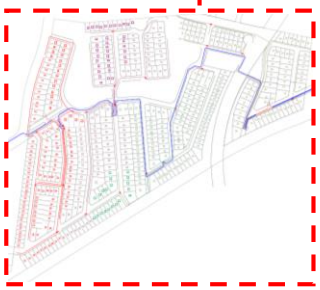
1. Introduction

The "HV-LV Analysis of Mini Grid Clusters" project was carried out to investigate the impacts of clusters of new PV-ready LV networks (100% PV) on an existing HV feeder.

2. HV – LV Network Modelling



- 22kV Feeder
- 79 Dist. Tx.
- 6.5MW Peak Demand



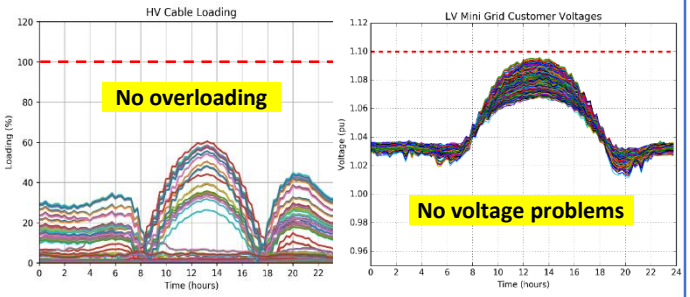
- 12 x 500kVA Tx. (22kV / 0.412kV)
- 4c / 240 sq.mm cables
- ~1400 Houses
- 100% PV – 4 kWp

Integrated HV-LV analysis, smart demand and generation data, time-series three-phase analysis.

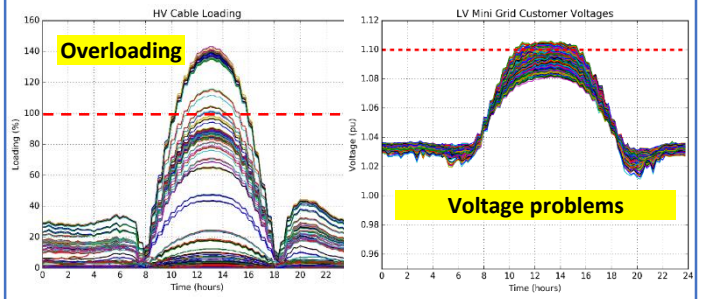
3. Impact Assessment

Impact assessment carried out for two cases, using data of a summer day with minimum midday demand.

Current (Minimal PV Penetration) HV Feeder State:



Future (50% PV Penetration) HV Feeder State:



4. Potential Solutions

Solutions Assessed	Line Utilization	Voltage Problems	Curtailment
No Solution	142%	9.3%	1.3%
Change OLTC Settings	147%	0%	0.2%
Change Volt-Watt Settings	98.4%	0%	55.9%
Enable Volt-Var Function	143%	1.15%	0.6%
PV Export Limit	99.5%	0%	57.3%
Grid-scale Storage	86.3%	0%	0%

4. Conclusions on Successful Solutions

- **Change Volt-Watt Settings**: High curtailment, requires extensive tuning, unfair curtailment depending on location in the network, uses existing assets.
- **PV export limit**: High curtailment, requires minimal tuning, uses existing assets.
- **Grid-scale Storage**: No curtailment, requires new assets (expensive).

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Thanks for your time

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