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Exploring a live residential mini grid ecosystem of the future

Marinda de Villiers¹

¹ *University of Pretoria, Pretoria, South Africa; marinda.devilliers@ausnetservices.com.au*

In view of the high uptake of rooftop solar in Australia, AusNet Services is pioneering innovative solutions that deliver benefits for customers through deeper integration and optimisation of customer distributed energy resources (DERs) on the grid. AusNet Services established a Community Mini Grid in a street in Mooroolbark as a live model of the future network. The aim was to explore a wide range of technical, commercial and social facets in collaboration with local energy services suppliers.

The mini grid comprises a residential network section of 17 homes, where 14 (82%) of the homes have been equipped with solar and smart batteries systems. The trial supports grid-connected and stand-alone mini grid scenarios through a low voltage grid switch combined with an innovative, intelligent and economic battery based stabiliser device. The homes also have the ability to operate off-grid.

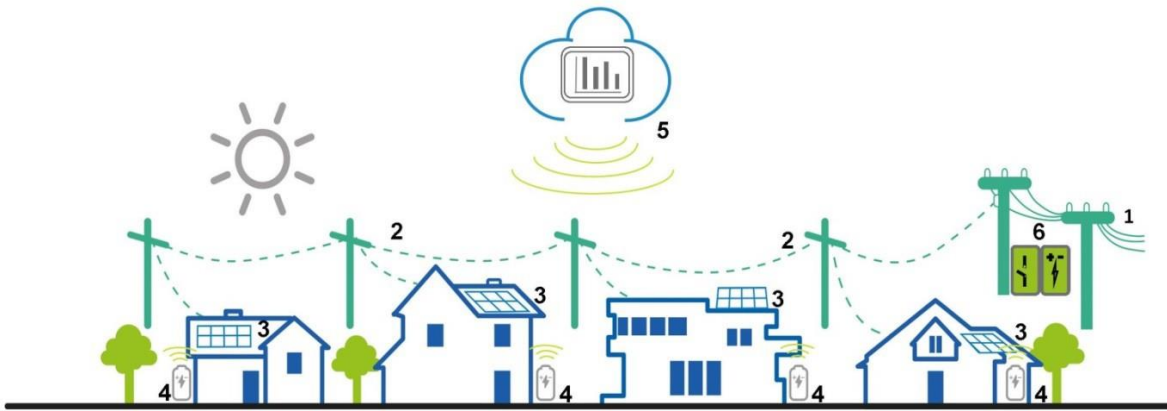
Innovations include:

- intensive engagement with and education of customers;
- household access to real time energy flow data;
- an in-depth protection study proving the viability of safe operation of an “all-inverter” grid section;
- operation of the mini grid as a 3-phase island, with 100% renewable energy resources and a distributed architecture, compared to traditional mini grids that rely on synchronous supply from devices such as diesel generators;
- using an economic stabiliser with a very small power rating to drive a stand-alone network with a much larger sum rating of residential solar and battery systems;

Key outcomes demonstrate the value of individual customer installations, as well as the potential aggregated value of a customer asset or community owned asset fleet to

- enable customer choice and neighbourhood energy sharing,
- reduce electricity cost directly on customer bills,
- emissions reductions,
- improve security and reliability of supply,
- optimise network efficiency through strategies such as demand response, peak demand management, voltage management.

This paper presents the project as a case study of the creation of a live, innovative mini grid on our network, and will share the innovations and key trial outcomes. It will also highlight potential collaboration with universities to exploit the host of analytical and modelling opportunities enabled by the comprehensive data collection.



1. AusNet Services main power grid. 2. Mini Grid powerlines and poles. (Existing infrastructure). 3. Solar panels.
4. Storage batteries with control, communications and safety systems. 5. Cloud-based mini grid control system.
6. Mini grid stabiliser and switching equipment.

Key words: Inverter-based, mini grid, solar, battery, control

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References: not applicable, as research is based on expected future energy scenarios