

Western University

Scholarship@Western

Inspiring Minds – Showcasing Western’s Graduate Research, Scholarship and Creative Activity

August 2021

Power Management and Control of Residential Microgrids

Syed Ahmed Raza Naqvi

Western University, srazanaq@uwo.ca

Follow this and additional works at: <https://ir.lib.uwo.ca/inspiringminds>

Citation of this paper:

Naqvi, Syed Ahmed Raza, "Power Management and Control of Residential Microgrids" (2021). *Inspiring Minds – Showcasing Western’s Graduate Research, Scholarship and Creative Activity*. 4.

<https://ir.lib.uwo.ca/inspiringminds/4>

Power Management and Control of Residential Microgrids

By: Syed Ahmed Raza Naqvi

In North America, with roof-top PV systems, storage devices and electric vehicles, the concept of central generation has transformed to local distributed generation. With this phenomenon reshaping the current distribution networks, the local generation and storage capacities with their respective controllers allow for these generation units to be grouped together to form single-phase microgrids most commonly referred to as residential microgrids. The thesis looks into the two key issues pertaining to residential microgrids i.e. accommodating multiple embedded generation and energy storage units while balancing the generation and loading in each phase to achieve overall three-phase system balance. An experimental validation of the proposed control strategies has been carried out with laboratory-scale design and development of the back-to-back converter and a control platform to mimic a typical residential microgrid. This work on power balancing single phase residential microgrids can potentially open up new areas of research in the field of microgrids.

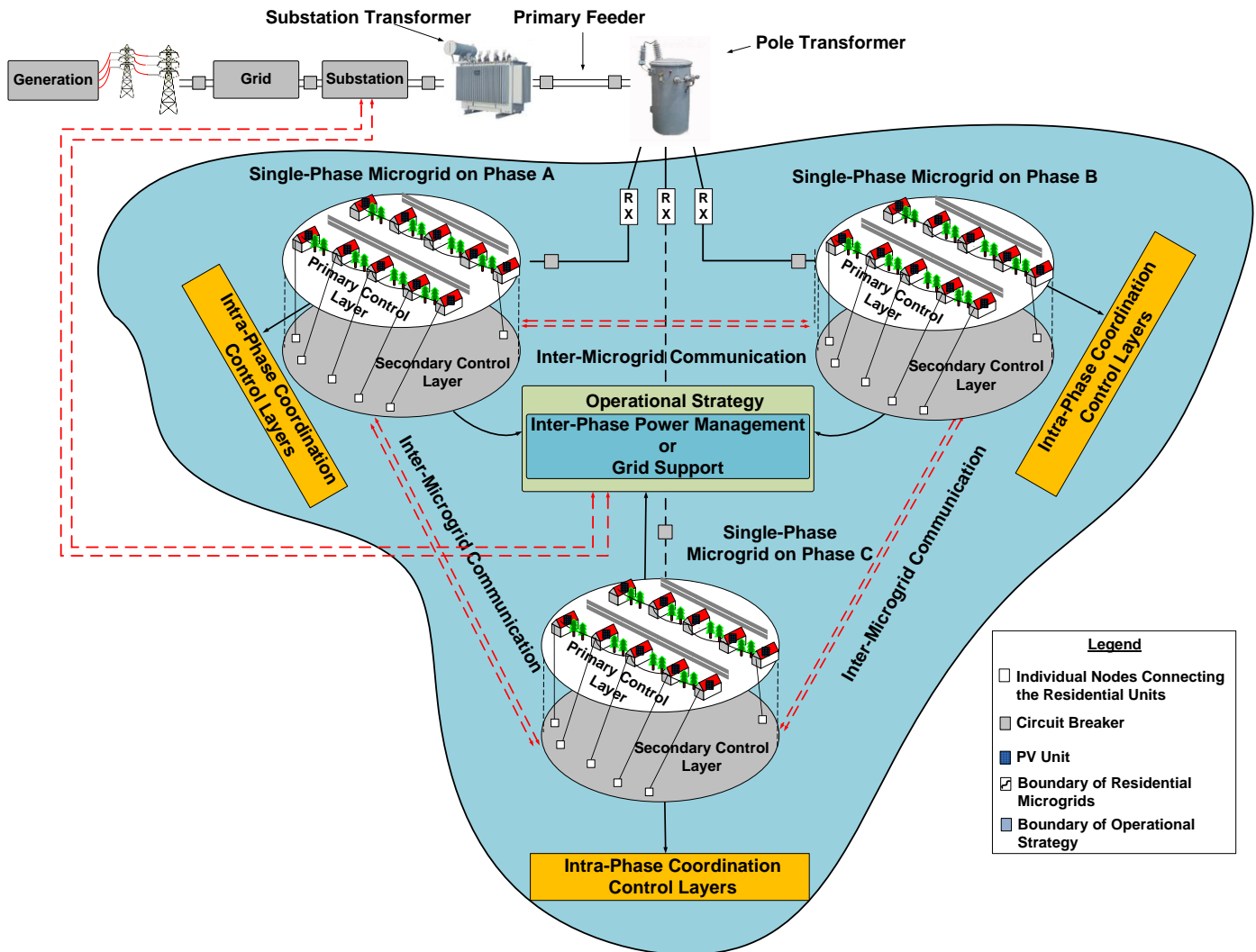


Fig. 1: An architecture of a grid interfaced single-phase residential microgrids with local load, generation and back-to-back converters for power exchanges.

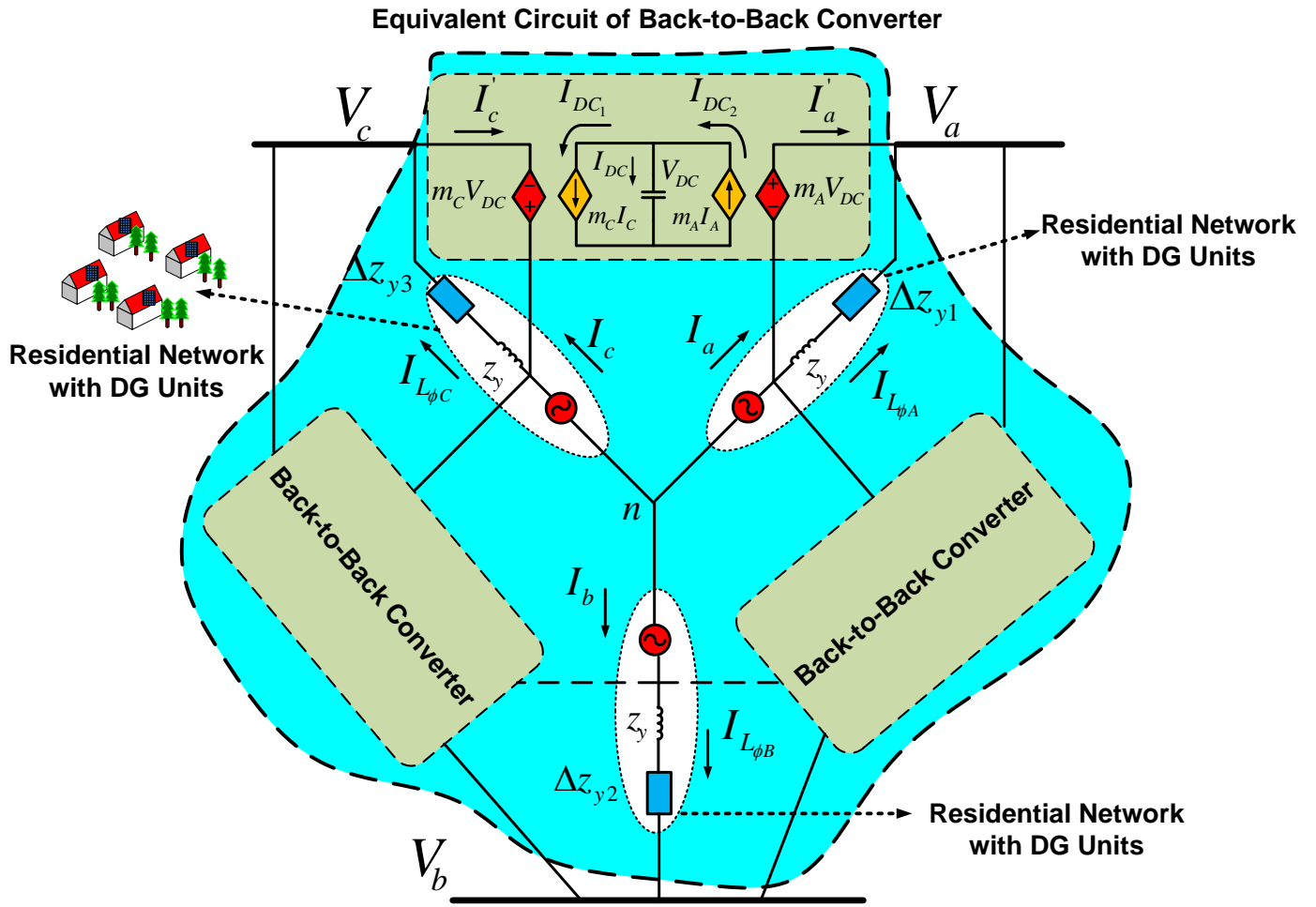


Fig.2: Power transfer between phases using a back-to-back converter and its equivalent circuit representation.

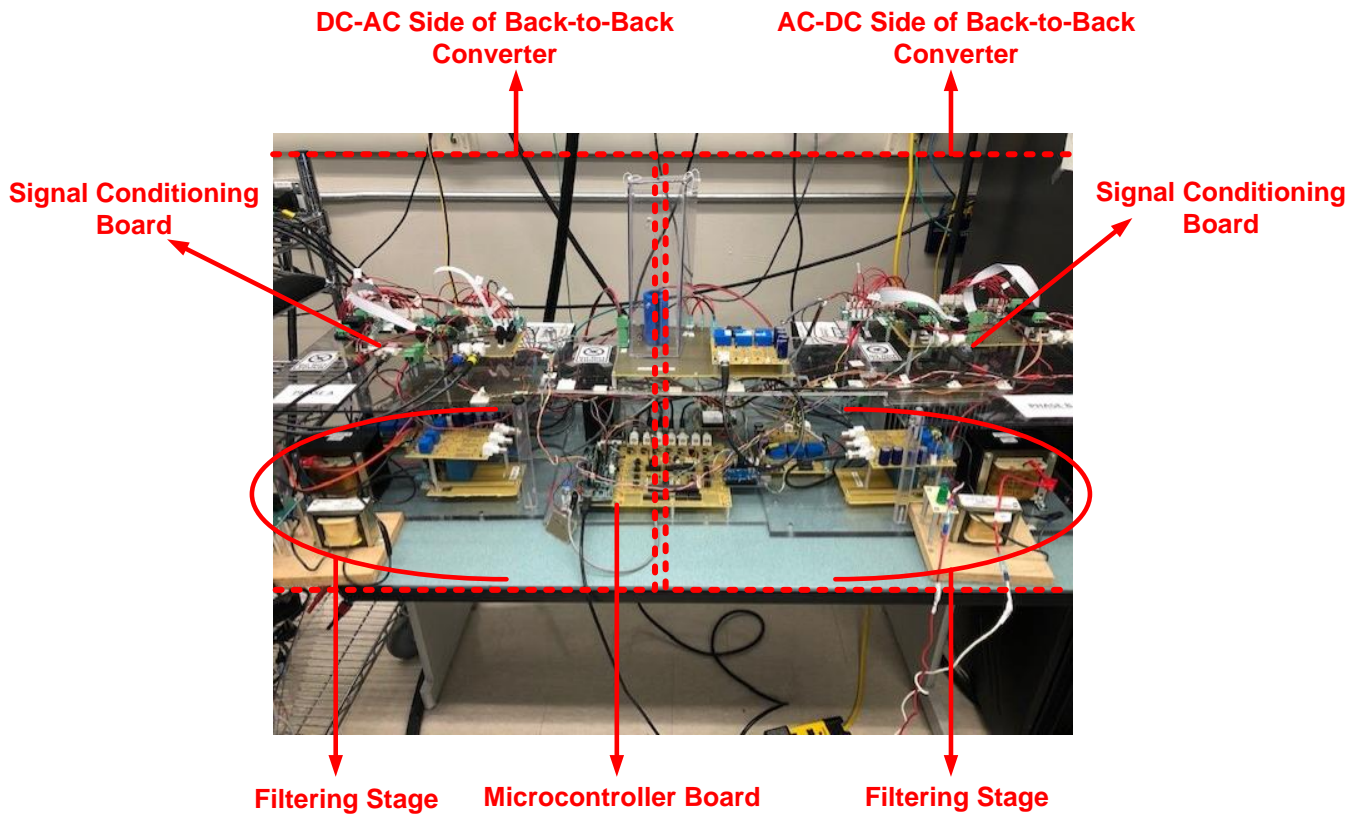


Fig.3: The developed laboratory-scale back-to-back converter