

## New opportunities for the LV grid of Tomorrow

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Nowadays the integration of renewables on the grid already reached a certain “common sense”. However challenges increases with increasing congestion and stability problems on the grid. Besides the new players, i.e. “prosumers”, other actors in the grid, such as aggregators and energy agents becomes more important, there role should be clarified.

As a consequence, the combination of new technologies, storage and DSM are highly important aspects to fulfil the requirements of modern electrical grids. The interaction of all those parameters will determine optimal solutions, including improved grid autonomy during rolling black outs.

In order to have a good combination of renewable technologies, analysis of reliability of LV distribution networks using battery backed up PV invertors in combination with  $\mu$ CHP and PEHV (plug-in hybrid electrical vehicle) is needed. These renewable technologies are to be combined with electrical (e.g. battery packs coupled to PV) and thermal storage, including the dimensioning of these elements. Also the expected performance in terms of grid stability, energy efficiency, reliability, safety and economic rent ability must be considered .

- Determination of best techno/economic feasibility for local storage using PV and  $\mu$ CHP @ residential, office buildings and SME, with respect to load profile.
- Develop guidelines for centralized or decentralized storage on LV distribution networks with respect to grid requirements including voltage quality, overvoltage and unbalance and congestion.
- Create flexible solutions for SME and office buildings for DSM applications and become players in the VPP network, including techno/economic feasibility.
- Development op control strategies with respect to both load profile and combination of renewables (including different types) is order to find the optimal solutions including the energy market and economically driven parameters.

The acceptance capacity of the distribution grid must be considered in order to make theoretical models of injection and storage points, including their minimum/maximum capacity. Unbalance and overvoltage problems due to uncontrolled load management and the non-determinable behaviour of local renewables such as photovoltaics and small wind also must be included in the model

Next to that, a comparative study for determination the best technological, energetically and economical combination of renewable and storage combinations, including storage capacities and feasibility is performed.

A test platform of a LV distribution grid of 637m distribution cable, and including all renewable sources, such as PV invertors,  $\mu$ CHP, Heat pump and wind turbine is available to validate the proposed research under real power conditions (up to 240kVA).