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The Linear residential demand response pilot: balancing wind energy with residential flexibility

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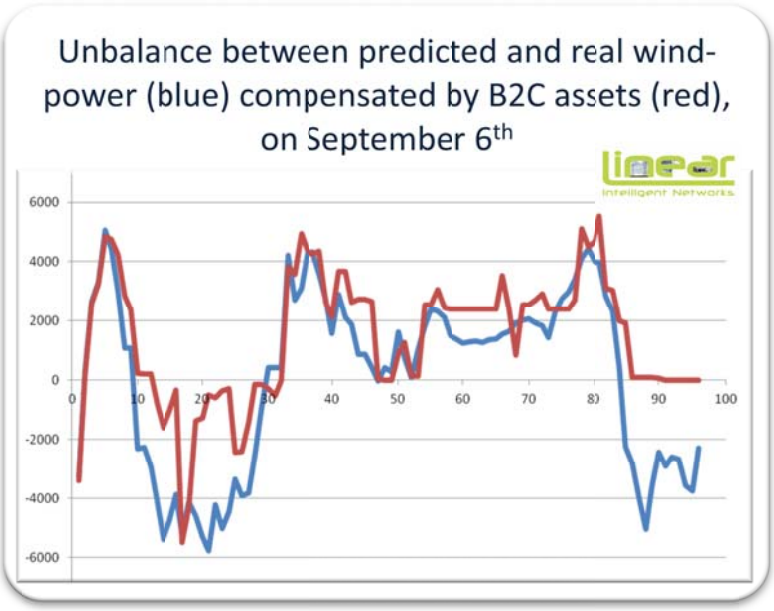
Abstract

Although demand response (DR) is increasingly deployed in the industry, the large potential in the residential sector remains hitertho unused, as other criteria than for the industry apply; comfort protection is a basic requirement to enable sustained participation of families in DR schemes, the sources for flexibility are small in power and energy, but their numbers are large, etc. As such, the technology required to unlock the residential potential is fundamentally different from the DR technology used in the industry.

The Linear residential demand response pilot, funded by the Flemish government, and based on a consortium of industrial and research partners with all stakeholders represented, has developed and validated the technology to put residential DR into practice. The pilot consists of 245 participating families, 185 of which are equipped with smart appliances, while the other 60 families participate in a variable Time Of Use tariff scheme.

Because of the comfort requirement, Linear has selected and deployed two types of smart appliances that offer a large amount of flexibility and that can be automated to minimize the comfort impact. First type are the postponable appliances, such as dishwashers, washing machines and tumble dryers, 445 of which are deployed in the Linear pilot. Second type are the buffered appliances, such as smart domestic hot water buffers (15 deployed) and electric vehicles (7 deployed). Additionally, 110 families are equipped with smart meters, appr. 2000 submetering points are installed and 94 houses are equipped with photovoltaic panels, representing a total of 400 kWp.

This highly decentralized flexibility asset is applied to several scenarii. Wind Balancing is such a scenario, consisting of balancing the difference between forecasted and actual wind energy production.



Therefore an aggregator was built, that consults 24/7 the quarterhourly status of each participating appliance. The contribution in shifted energy of all participants is scheduled with the objective to aggregate power and by doing so counterweigh the unbalance.created by the wind energy plant. The scheduling takes into account the regeneration time of the flexibility source, by selecting appliances of variable size and runtime. Results of achieved unbalance compensation are available and still improving as the pilot continues.