Smart grids (Part 3 (IV))

Virtual power plants (VPPs)

To understand virtual power plants (or 'VPPs', for short), you need to first know what a distributed energy resource (or 'DER') is. A DER can be small-scale distributed generation (DG), a power storage facility or a flexible, controllable load. A *VPP* is an aggregation of DERs that can be remotely monitored and collectively controlled in a similar way to a conventional large-scale power plant. DGs that do their own thing are a problem for a distributor due to their unpredictability. However, herd them together and take control of them via a VPP and they become a powerful tool for managing the distribution network. You can think of a VPP as a means by which lots of little players can gain the market visibility they need to play with the big boys – it's good for the VPP members and it's also good for the system. DER with no exposure to market signals tends to behave inefficiently, whereas, a VPP integrates DER into the market place. VPPs come in two flavours:

✓ Commercial VPPs (or 'CVPPs'): The prime objective of a CVPP is to maximise the financial outcome for the participating DERs.

✓ Technical VPPs (or 'TVPPs'): The prime objective of a TVPP is to help optimise management of the distribution grid.

Put crudely, CVPPs serve the suppliers whereas TVPPs serve the distributor. Given that a VPP can take on either guise, the big question is: Who should have control? In an unbundled energy market, control of demand-side flexibility is likely to fall to suppliers. Research such as Project FENIX (see the sidebar 'Threat to opportunity') suggests that suppliers can make more money through commercial aggregations of DER in the form of CVPPs than offering distribution optimization services via TVPPs. VPPs are a major component of any smart grid. However, there are significant challenges in balancing the needs of distributors and suppliers, these challenges being more commercial than technological.

Threat to opportunity

In even moderately deregulated energy markets, large distributed energy resources (DERs) are able to sell their energy on the open market even though their production still flows through the distribution network. In some instances, the transmission system operator (TSO) may be aware of their intended production schedule, but this is rarely the case for the distributor. The lack of visibility and controllability of DER makes DNOs reluctant to include DER in their networks. FENIX, a €14.7m European collaborative project partly funded by the European Commission, set out to demonstrate how DERs could be 'tamed' by distributors and harnessed to help manage the distribution network. The 4-year project, which kicked off in 2005, involved 8 countries and a consortium of 20 companies. Focusing on CVPP (Commercial Virtual Power Plant) applications, FENIX attempted to quantify the value of DER under conditions prevailing in the UK (the 'northern scenario') and Spain (the 'southern scenario'). The project found that DER, aggregated and controlled in the form of a CVPP, could offer substantial benefit to suppliers, distributors and TSOs alike. However, equitable access to these benefits will require substantial changes to current regulatory frameworks.