The Proposal

Active development of Virtual Power Plants (VPP) should be strongly encouraged in the UK market to maximise the exploitation of readily accessible renewable energy resources from existing infrastructure, improving UK economic productivity, at the same time reducing fossil carbon emissions.

Introduction

The community energy sector faces a series of obstacles in its growth in this country, most of which have already been well documented by others. This NTBM submission calls for active encouragement of Virtual Power Plants (VPPs) as a significantly more efficient use of economic, financial and engineering assets by energy service companies, especially community energy companies (CESCO's). This will be a material benefit, both to local economies and to meeting national renewable energy targets, ensuring maximum use of solar energy and other assets. Combined with a good locally-based demand response system with or without local energy storage, VPPs will represent a much more effective exploitation of the available natural resources.

This submission concentrates on efficient use of solar resources as a good example, but all local natural and fossil energy resources can be combined, in effect creating smaller scale virtual replications of the Grid, to which they would interface. Major deployment of local biomass-based communal CHP units is another effective means of reducing overall fossil carbon emissions, as are other energy recovery technologies for existing industrial plant, all crucially dependent on available demand for their economic viability. VPPs open up the possibility of much more creative local marketing schemes, for instance allowing a CESCO to concentrate on reduction of fuel poverty, a major problem in off-gas areas, not only locally in Sussex but all over the UK. VPPs are also an economic means of tackling pinch points on the existing grid, providing better load and frequency stability at the local level represented by a CESCO-based VPP.

The Problem

All over the UK there exists large natural energy resources which are uneconomic to develop because there is insufficient demand available attached to a given metering point (MPAN) to absorb the generated output of that resource. The usual option is to sell any output through a local Power Purchase Agreement, the revenue from which is completely determined by the on-site demand and price, regardless of the generation potential of that site. This is becoming very apparent in the artificial manner in which local solar projects using existing buildings are being developed.

The problem is most acute where there are large roof areas available in warehouses but little demand within those buildings. The equivalent demand may well be available locally but not near enough to install private wire access economically, although spare capacity is available in the local 11/33kV grid connection. The local community energy company (CESCO) is in a unique position - aware of local demand that can be filled but unable to take advantage of the potential revenue stream, essentially because the only revenue currently available is that from the Export FIT.

This will also skew the potential specification and installation of local energy storage systems where engineering logic and security may dictate optimum solutions for their sizing and location but are again limited by the present structure.

The result is that potential generating capacity is going to waste, for instance with social housing providers on their houses, farm buildings, warehouses, offices (at weekends) and schools (particularly during the Easter & summer holidays).

Engineering

The Distribution Network Operator (DNO) may contend that local grid capacity and stability may be compromised; available experience in other parts of Europe and USA shows that this can be catered for by good design and improved SCADA and supervisory systems without compromising capacity, stability or security. Several mature packages have been developed over the last few years which will need adaptation to UK conditions and regulations. They will also encourage the adoption of closely related technologies such as demand response and distributed energy storage to give optimum solutions both locally and on a larger scale. At the same time these will allow a wider variety of solutions to existing grid limitations of load and stability. The DNO's have still a crucial role in voltage control and reactive compensation.

System Security is, of course, a major factor in deployment of any new systems; VPP systems rely critically on the rapid and secure transmission of data, the provision of which to acceptable standards would be an integral part of new VPP installations.

Reverse current flows were never envisaged in the classic grid system layout; again, where economic benefits outweigh the cost of modification, then it is worthwhile to modify and upgrade switchgear and transformers.

All these factors contribute to grid stability, especially voltage and frequency, which are the central core of existing methods of control. It is well recognised that all new systems must take grid stability into account, but these considerations must not represent, in principle, a permanent bar to the deployment of VPP systems.

Solar array and energy storage output can be controlled by use of active inverters and control equipment; it would be prudent therefore to actively encourage development of interface data protocol standards for control systems to allow for a mixed fleet of such equipment, while encouraging technical innovation.

Economics

The VPP approach will certainly lead to a more rapid installation of economically viable solar installations, as well as encourage the adoption other new technologies, locally increasing the energy productivity of existing assets such as roofs, contaminated land, and under-loaded grid connections.

Further, VPPs can exist at more than one level; a CESCO can operate, and be responsible for, the supply and demand balancing locally. In turn, the CESCO may be part of a wide area VPP agreement

with one or more energy brokers who may be independent, part of the DNO, or another energy supply company. The control hierarchy should at all times be absolutely clear – and not only from the safety viewpoint. Such an agreement would be essential to support the demand load if the local solar or other renewable energy source goes offline, e.g. no sun, wind, etc. There must also be agreement on a tariff structure to compensate the DNOs for provision of access to their wires, handling of losses, voltage control and reactive compensation. Equitable access to available wire capacity and the development of new capacity must also be considered.

There are several vivid examples of under-exploited resources in East Sussex alone, for instance large warehouse, hospital and school assets with very skewed or no on site demand, physically situated around the outskirts of villages and towns with significant continuous demand from supermarkets, freezer stores, sports centres and swimming pools, process and infrastructure plant, etc. With the rapidly changing cost and system maturity of energy storage, a strong economic case will develop over the next few years for their deployment. The main target will be the daily domestic peak in the evening being serviced by energy storage charged up during the solar energy afternoon peak between 12 and 3 PM. The energy storage can be either side of the meter, right down to individual house level. The provision and management of that new capacity is another real market opportunity both for CESCO's and private companies. A CESCO-led local VPP structure can for instance be a major tool in supporting a community's efforts to eliminate fuel poverty among its residents.

Well proven irradiance performance of solar arrays up to 1040kWh/kWp per annum along the South Coast will reinforce the economic performance of VPP and energy storage installations in the area. At present it is estimated that up to 80% of the local solar potential in some cases is uneconomic because of the absence of demand on the available MPANs, a loss of productive economic capacity if nothing else.

Regulatory

An important regulatory factor is to provide a good basis for VPPs to interface properly with the Half Hourly Market, in particular with distributed solar and energy storage. This will have a direct impact on how a revised BETTA agreement would be structured.

More generally, the active encouragement of VPP installations and novel market structures is very much in the spirit of the NTBM call for submissions by Ofgem. The detail regulatory content to permit this development is beyond the scope of this submission, except that community energy representatives nationally should be involved in the development of that regulatory regime, if only to help us catch up with the progress already made in other countries.

In the tenor of the NTBM consultation paper, the proposed regulatory regime must indeed be a facilitator rather than a block for development of suitable VPP structures and market liberalisation, key factors in the future success of community energy in the UK.

Contact

RX Power Rye Ltd – c/o Mike Slavin – M 07785 362201, E mikes@pobox.com