

FUTURE POWER SYSTEM ARCHITECTURE

MEETING BRITAIN'S
FUTURE POWER
SYSTEM CHALLENGES



The Future Power System Architecture (FPSA) Programme: Perspectives for Industrial Customers & Communities

Including: Large Industrial & Commercial Customers, Aggregators, Energy Community Enterprises, Smart Cities, Distributed Generation Operators, Storage Operators, Virtual Power Plant Operators and Virtual Communities.

The power system in Britain is undergoing radical transformation. The Future Power System Architecture (FPSA) programme is taking a holistic and whole-system approach to the evolution of its architecture - considering technical, governance, commercial and societal factors. FPSA is a multi-stakeholder collaboration led by the Institution of Engineering and Technology and the Energy Systems Catapult, sponsored by Innovate UK. Updating the architecture of the power system will enable this group to take advantage of new opportunities that reduce their electricity costs through energy efficiency and active management of demand, generation and storage, and/or derive income from provision of system services.

Drivers:

The decarbonised GB power system must accommodate increasing levels of weather-dependent generation and remain secure at lower levels of system strength. This will place a high value on supporting reserve and ancillary services, and on demand flexibility to optimise system operation at national, regional and local levels. Managed portfolios of energy resources help reduce electricity charges and/or derive revenues from provision of services.

Opportunities and consequences:

Large customers with Building Energy Management Systems and smart technologies linked to communications systems will help unlock demand flexibility. Larger consumers could provide a baseline of flexible demand around which virtual networks could draw in smaller consumers and generators across communities, forming the basis of more localised or virtual energy markets.

Failure to harness opportunities around demand flexibility would result in higher overall electricity consumption and suboptimal electricity demand profiles leading to higher system peak demands requiring additional generation,

transmission and distribution system capacity, higher GHG (Greenhouse Gas) emissions due to greater need for peaking plant.

Failure to exploit the capability to provide system reserve and ancillary services would result in a higher cost of system balancing, including frequency management, and lead to inefficient investment in conventional balancing and reserve measures such as central generation.

Energy community enterprises will offer local control and/or local accountability. However, failure to make provision for cost-reflective inter and intra-community trading could undermine the business case for community energy action and smart city schemes.

Management and co-ordination will be required to ensure conflicts are avoided - such as provision of balancing services creating a local network constraint, or delivery of network constraint management services creating a technical or commercial system imbalance.

How can the FPSA functions help?

New power system functions that are core to exploiting the above opportunities include:

- *Enable and execute necessary operator interventions:* providing the means for system operators to exploit flexible demand, storage and generation at all levels within the system.
- *Provide a process that facilitates active engagement of customers within local energy markets, e.g. aggregators, smart city schemes:* markets and settlements provisions to maximise opportunities and manage conflicts.
- *Implement smart grid to maximise system capacity:* securing the scale and speed of response required for system operability at national, regional and local level.
- *Form and share best view of state of system in each time scale:* monitoring impacts of interventions at all levels to assess system operability, security and stability.

Delivering these and other functions in a timely manner will require a new agile stakeholder-inclusive process, which FPSA has described as 'Enabling Frameworks'.

The commercial customer perspective: what does this mean for me?

This stakeholder group has a mutual interest with the energy sector in jointly exploiting inherent opportunities arising from flexible demand, generation and energy storage and will create the infrastructure necessary for the delivery of more localised energy markets. However, co-ordination will be key to maximising opportunities; for example:

- Smart City and Energy Community Enterprises will need to co-ordinate the use of energy resources within their communities to minimise energy costs and maximise value from provision of system services.
- Aggregators and Virtual Power Plant (VPP) operators will need to do likewise - exploiting system services from their customers and virtual communities.
- Large customers will need to take advantage of tariff price signals and contracting through service co-ordinators to provide system services.

Call to action:

The FPSA programme has identified the new functions necessary to deliver the above opportunities, and the current barriers to delivering this functionality. This stakeholder group is encouraged to consider how it might best engage in the next phase of the programme which will explore enabling actions to overcome these barriers.

For more information and to get involved please visit: es.catapult.org.uk/fpsa and www.theiet.org/fpsa