SMART Frequency Control
Project Fact Sheet

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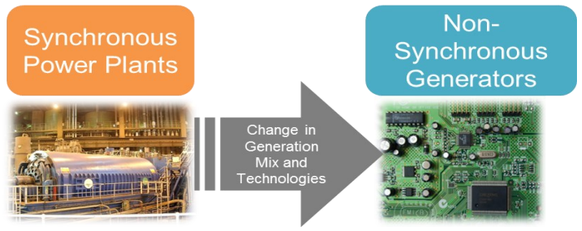
The changing energy landscape from a generation mix dominated by thermal power plants, to one with more wind, solar and interconnectors, will reduce the system inertia. System inertia is a measure of how an electrical system responds to changes in frequency and is characterised by the energy stored within the rotating mass of machines (generators and motors) connected to the network. Newer generation technologies such as wind, solar and interconnectors have no rotating shaft similar to thermal power stations so their uptake on the network will impact many system parameters and the actions needed to be undertaken to ensure continuous operability of the system. .

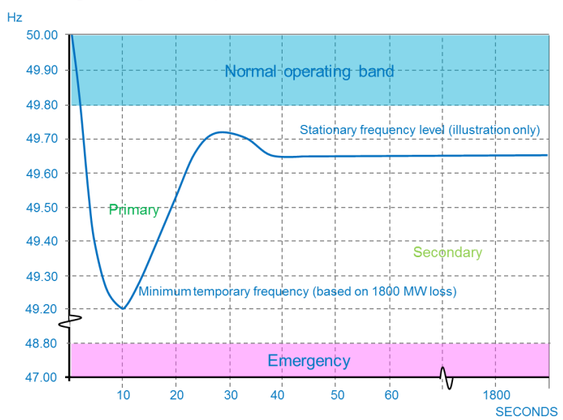


How do we control the system frequency today?

One of the affected system parameters is **system frequency** which is a measure of the balance between electrical power generated and consumed; this is nominally 50Hz in the UK

To cater for various imbalances caused by change in demand, or loss of a generator, we instruct power stations to change their output to respond to these changes through **balancing services**. Other control measures available National Grid include the use of **HVDC Interconnectors,** and a wide range of **Demand Side Management** products. We as the **System Operator (SO)** procure the volume of response needed from these products to ensure the system is remained balanced at all times, and costs are controlled. These products are classed as:

- The products needed to cater for increase in demand (**primary response**);
- The products needed to cater for decrease in demand (**high response**); and
- The products needed after an initial imbalanced and required to fully recover the system frequency (**secondary response**).



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Can we continue to use the existing products?

Yes...but it will become significantly more expensive to use a much larger volume of the existing products (e.g. increase the volume of response carried by service providers so the SO can use in case of a system incident). By 2020, the cost attributable to frequency response could be an extra £200m-£250m per annum, if we continue to use the existing measures.

Any alternative?

An alternative is to reduce the volume of response and increase the contribution new technologies make to control frequency especially as they are required to facilitate the carbon agenda. This has lead to the justification for the SMART Frequency Control Project.

Project Objective

The objective over the next 3 years (until March 2018) is to develop and demonstrate an innovative new regional monitoring and control system that will calculate the required rate and volume of very **fast response** and initiate the appropriate response to a variety of parties connected to the system. It will also demonstrate the viability of obtaining rapid response from solar PV, storage and wind farms, while coordinating fast response from demand side resources (DSR, e.g. banks, distribution centres, water treatment plants), and fast start up from conventional thermal power generators.

The output of the technology trials will be used to support the development of appropriate commercial frameworks that will eventually support the emergence of new balancing services products.

Benefits

By developing an innovative technological solution in combination with commercial frameworks, new generation technologies can effectively compete with existing technologies in the balancing services market. Ultimately this will lead to a reduction in cost to the end consumer estimated to be around £150m -£200m per annum by 2020.

The SMART Frequency Control project will generate important knowledge that can be shared amongst, and will be of benefit to, all relevant Network Licensees and service providers. Managing low system inertia will be a challenge for the SO and is not unique to National Grid so the results of the trials, and the solutions offered, will be of great interest to global Transmission System Operators.

Project Partners

National Grid is working in collaboration with companies and universities that will bring expertise in monitoring and control systems, solar PV and storage, large-scale generation and wind farms, demand side response providers as well as academic support.

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