Grid stabilization united kingdom

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As renewable energy generation increases, new ways to maintain system stability are required. This vital transition from large fossil-fuel plants to renewable energy presents a need for solutions that can deliver grid stability, increase the amount of renewable energy delivered on the grid network and reduce costs for consumers.

We are already seeing the need for grid stability projects. On 20th April 2020, National Grid Electricity System Operator (NGESO) had to turn on 17 gas fired power plants simply for their stability services, increasing carbon emissions and consumer costs.

Different countries have different types of technologies for producing electricity and ensuring a stable power supply. Norway, which gets almost all its electricity from hydropower, generally has no problem with inertia and frequency drops. Other countries, such as France, have a lot of nuclear power, where large steam turbines provide stabilising kinetic energy to the grid.

Most other countries – including the United Kingdom– do not have access to large amounts of hydropower or nuclear power and until now needed to operate coal or gas-fired power plants to ensure a steady frequency in the power grid. In practice this means that, on an increasingly regular basis, these power plants are run only to stabilise the grid, even though there is more than enough power from solar and wind to cover electricity needs.

The result is that we often don’t get to utilise all of the renewable generation we have. The system operators are forced to run gas or coal power plants and turn off wind turbines that could supply electricity. The UK aims to cut emissions by at least 68% by 2030 on 1990 levels and reach net zero by 2050. If we are to achieve this goal, we must have solutions that can ensure stability in the grid without emitting large amounts of CO2.

This is where the rotating stabiliser, or synchronous compensator, comes in. These machines are designed to deliver the inertia needed to stabilise the grid and thus eliminate the need to run fossil-fired power plants. With the help of flywheels, the stabilisers can "store" kinetic energy in the same way as turbines.

"The rotating stabilisers are large machines weighing over 200 tonnes. While the turbines in traditional power plants convert motion into electricity, the rotating stabiliser uses a small amount of electrical energy to balance the friction losses and maintain the rotational speed. The units are designed with a large mass to create as much inertia as possible. The greater the inertia, the slower the system frequency will change during major power outages or disruptions," explains Guy Nicholson, Head of Greener Grid Parks in Statkraft UK.

In the UK, Statkraft uses rotating stabilisers in itsGreener Grid Parks. Keith Greener Grid Park in Moray,

Scotland, went into operation in December 2021, and in Liverpool, England the Lister Drive Greener Grid Park is nearing completion.

The success of Keith Greener Grid Park since it went into operation has been encouraging and opened up the possibility of a number of Greener Grid Parks being built in the UK and in other countries. Located at strategic points along the power grid, they will be able to help ensure stable energy supply in and, crucially, reduce greenhouse gas emissions from energy production.

"In the UK, we have a goal of an emission-free power grid that can simultaneously deliver a stable and secure energy supply to households, business and industry. Statkraft"s Greener Grid Parks with rotating stabilisers can be an important contribution to achieving that goal," says Nicholson.

"This solution means not only that we can use more self-produced renewable energy, but also that we can import more renewable energy via subsea cables from the continent. In 2021, the world’s longest subsea electricity interconnector went into operation, connecting the UK and Norway. This gives the UK access to renewable Norwegian hydropower and gives Norway electricity from British wind power when needed."

Like rotating stabilisers or turbine-powered plants, batteries can be used to stabilise the frequency of the power grid, and they can be used in combination. Battery Energy Storage Systems (BESS) are actually the fastest solution for delivering large amounts of power to the grid in an emergency. This is known as “grid-forming BESS”.

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