

Operating the system beyond 2020

- We face new challenges in operating an electricity transmission system with variable wind generation and new larger nuclear power stations
- We expect that day to day operation of the transmission networks will become more complex; the way we operate and the way the electricity market operates is likely to change; the way that consumers, large and small may interact with the market may also change considerably
- New technology, from smart meters to innovative forms of electricity storage, could offer new opportunities for large and small consumers to sell services to help us balance the system



National Grid working with other energy companies, Government and Ofgem within the Electricity Networks Strategy Group (ENSG) recently published a vision of the network investments required to meet the 2020 renewable energy target.

This vision is based on a scenario which would meet the 2020 UK climate change and renewable energy targets and sets out the requirement to:

- connect c.32GW of wind by 2020;
- account for an unprecedented churn in the generation fleet due to the closure of old fossil fuel and nuclear generation; and
- the expected connection of 12 GW of new gas-fired generation in the same timescales.

Here we outline our initial views on the key issues we will face in our role as System Operator and an indication of the services we are likely to require in balancing the system.

Renewable energy, new large nuclear plant and carbon emission

reduction targets mean that the type and size of generation connected to the electricity transmission systems in Great Britain will change. Patterns in electricity demand will also change due to energy efficiency measures the possible introduction of active and passive demand management.

Energy markets have been designed such that the bulk of the task of matching electricity generation and demand is performed by generators and suppliers as driven by market forces. As System Operator we need to have tools in place to ensure supply and demand balance precisely, minute by minute.

Under a scenario with much more wind and larger nuclear generating units than is currently connected to the transmission system, our Short Term Operating Reserve Requirement could increase from today's levels of approximately 4GW to possibly 8GW in 2020. We anticipate that with more experience and improved tools, we will be able to improve our forecasting abilities and have factored this into our assessment.

Our day to day job will change as we learn to deal with the fluctuations in

electricity generated from renewable sources as well as the fluctuations in electricity demand we are used dealing with. We will have to deploy more sophisticated control solutions which make our networks even more 'smart' than they are today.

The rest of the energy industry will become more 'smart' as well:

- Energy suppliers will be using tariffs to optimise energy use and possibly to accommodate electric cars.
- Distribution network operators may want to maximise their network capacity by controlling the small scale generation connected to their systems. Our scenario relies on a significant growth in this type of generation in order to meet targets and we expect it to make a large positive contribution if implemented with resilience in mind.

Both of these developments will change the electricity demand we see and give us more work to do in operating the transmission networks

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New Technology and New Opportunities

We believe that the generation technologies which are new to Great Britain (wind, supercritical coal and the latest generation of nuclear power) can be made capable of meeting our requirement for flexibility in operating the transmission networks.

There will also be new opportunities for large and small electricity consumers to provide Balancing Services to us. Energy storage, electric cars, smart metering and smart metering enabled control systems can all play a part. Fridges, washing machines and dishwashers could all contribute through co-ordinated demand management in the same way that generators do today.

We estimate that there are some 8GW of additional services that could be available by 2020 to help meet our operating reserve requirements. Significant effort is required to realise the benefits available from these demand side measures. We recognise that other parts of the energy industry will be interested in them too.

Managing Intermittency

In the recent past we have seen periods where the electricity generated from wind within the UK, Ireland and parts of Northern Europe has been very low; this can coincide with days of peak electricity demand when cold and still conditions persist.

Electricity generated from wind will displace the use of scarce fossil fuels, reducing carbon emissions in the process. It is important to remember that the wind is blowing somewhere across Great Britain most of the time.

However, as System Operator we need to balance supply and demand minute by minute and think it is prudent to plan for periods where the amount of electricity generated from wind is low at times of peak demand. This does mean that other sources of generation are required, but we think that demand side measures have a big role to play too.

Interconnection between Great Britain and Northern Europe can also help. This has the effect of sharing intermittency across a wider area and reducing its impact. It is therefore important that we understand how European network operators and energy markets will act as this will affect the amount of electricity we can import if we need it. We have already engaged with our European counterparts to start this process.

Operating Margin

There is a great deal of uncertainty over how electricity operating margins (the difference between forecast demand and the available generation, an important measure of security of supply) will develop over the next decade.

This is due to uncertainty in underlying energy demand linked to economic activity, uncertainty over the growth rate of small scale generation and uncertainty over the introduction and impact of energy efficiency measures. There is further uncertainty over the rate at which new generation can be constructed and how this can contribute once in operation.

We have presented a view of future operating margins in a form which is familiar to the industry and is based on an energy scenario which is consistent with renewable energy and emissions targets.

Our analysis highlights that in order for stakeholders to assess future operating margins they will need to come to a view on the contribution of renewable generation, flows across interconnectors, the required operating reserve and consumers' reaction to price signals.

Interaction with Energy Markets

We have based our thinking on an assumption that electricity market participants continue to take actions to minimise their exposure to 'imbalance' (the difference between the energy they have contracted to produce and/or consume and the energy actually produced or consumed, whether due to forecast error or plant 'failure').

We will continue to be reliant on this market participant action to operate the transmission networks efficiently, increasingly so as installed wind capacity increases. It is important though that market participants give us their views on whether the necessary operational capacity and flexibility will be available to us.

We expect there to be further debate over this assumption and the mechanisms and obligations which allow security of supply objectives to be met.

To read the System Operation in 2020 Consultation in full please visit our website at www.nationalgrid.com

Responses to the consultation can be sent to Operating.2020@uk.ngrid.com

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