

DISTRIBUTED ENERGY

‘There is a definition issue around the concept of distributed energy’, says Steve Holliday FREng FEI, President Elect of the EI and former CEO of National Grid. ‘One of the problems I’ve observed over many years listening to those voices that have lobbied government, are the arguments for wind versus solar versus microgrids or big grids versus nuclear and everything else. In part, they are both right and wrong!’

Holliday is of the opinion that the optimal solution is going to be ‘a mix with distributed energy a growing part of the total system’.

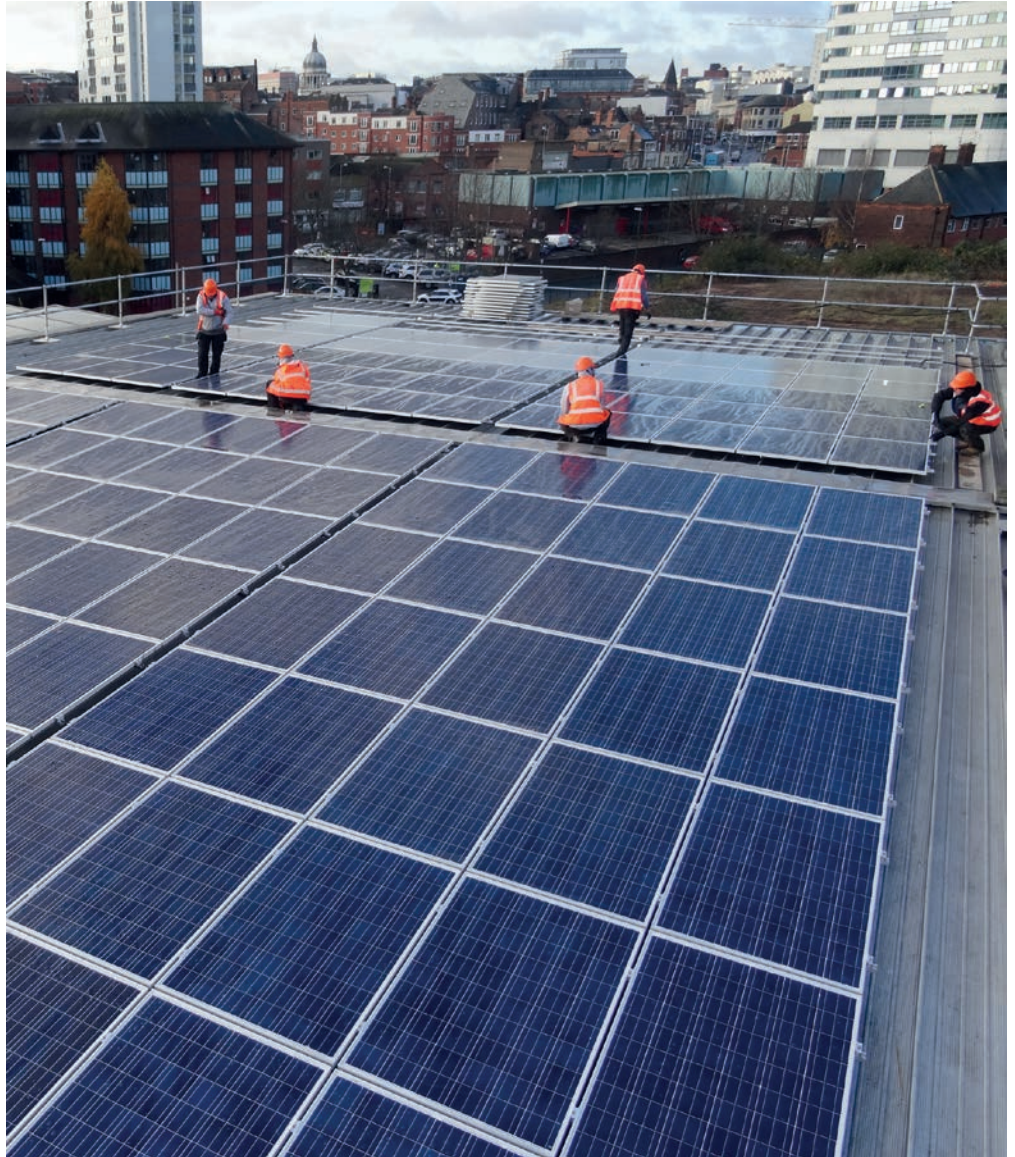
His definition of distributed energy is ‘small generation that by-and-large gets consumed locally’. And emphasises that: ‘The important words are “by-and-large” because you still need major transmission systems. If you try to design a local transmission system, then the amount of investment you need to ensure it is as reliable as the systems we have today is an inefficient use of technology and capital. The investment is needed in the distribution networks and the complexity of operating more flexibly means you now require an Energy System Operator for transmission as well as Distribution System Operators for local networks.’

In the UK we already produce a lot more renewable energy than a decade ago. ‘I expect in the future that more than 50% will come from distributed energy – using local sources and smaller sources that aren’t even connected to the transmission grid. However, both for reliability and economic considerations we will require some large power stations, including nuclear and gas with carbon capture and storage. That may be the ideal mix,’ he suggests.

Looking forward, Holliday envisages a series of investments in local energy systems, quite possibly fuel cell-based, with increasing amounts of demand-side response and battery storage, so the micro-system can be isolated. Small CHP (combined heat and power) plants may well increasingly run on hydrogen. The big question is how quickly we can pilot at scale a hydrogen/methane mix in the natural gas system in a bid to reduce carbon intensity, given the UK zero emissions target by 2050.

‘Large manufacturing plants will increasingly cover the roof of a facility with solar panels and

The chaotic revolution



Steve Holliday FREng FEI, President Elect EI and former CEO of National Grid, explains the implications of distributed energy for the UK. *Brian Davis reports.*

install battery storage for increased self-sufficiency, and interact with the grid by exporting excess power or importing power to charge the batteries when prices are cheap,’ he says.

Holliday comments on the speed of the ‘renewable revolution’. ‘No one could have forecast the speed at which renewable power generation has been constructed. This was driven by the fantastic initiative by government to put incentives in place. There were complaints that the incentives

were too generous early on. But it kickstarted the industry and since then the global costs of both wind and solar have come down enormously to our benefit.’

Big versus small

In a keynote talk at the SPARK! Energy Leader’s Club, run by edie in Birmingham last November, Holliday emphasised that: ‘Electricity has always been about megawatts and scale, scale, scale. There’s no question that big networks still supply energy to

Solar power systems installed on a range of Nottingham City Council buildings in 2018 offset the need to buy peak-time electricity from the grid

Photo: Nottingham City Council Energy Services

millions of people... and will continue to exist. But operations are changing enormously. In fact, I don't talk about "big" quite so much these days because things are moving towards the other end of the scale. Individual users of energy will have more control over their energy than ever before.'

He said the shift in power in the last decade was remarkable. 'In the past, the big players had the power. People talk about "energy transformation". For years I said: "Don't use those words as it sounds like it was well planned." This is a 'chaotic revolution' – that's not a negative but really positive, we need to act with pace and don't have the luxury of years of careful planning.'

Holliday said the EI and its fellows talk about the 4Ds – decarbonisation, decentralisation, digitalisation and democratisation of energy.

'In terms of decentralisation, we've gone from big to small in 10 years. Things are still connected into the networks, but solar and wind don't connect to the National Grid as the big generators used to. About 50% of our energy is now carbon-free. And all that generation has been pushed deeply into the network distribution systems.'

Holliday found it extraordinary that at various times of the day 40% of the power was being generated in the UK 'invisibly to the transmission system', from local wind and solar power. 'People, including me, were shocked how quickly this happened. A decade ago, there were people in the energy industry who said "That will never happen. It's impossible – not because of the economics, but because we can't handle that degree of uncertainty and intermittency on the system." But they were wrong.'

As explained, the big driver for change was government subsidies. 'The government gets a bad rap at times for putting too much subsidy in there. But I say, you can't ever get it perfectly right. It worked and really ignited a new plan and industry which has transformed the UK energy system in a matter of a few years.'

While pundits talk about huge spreads of storage from 2,000 MW to 12,000 MW by 2035, Holliday anticipates a lot more battery storage than today. 'It's all about finding the right economics and supportive regulatory environment to make sure that really takes place,' he said.

In particular, he is excited about the 'flip' from thinking about the

system to a supply-side view rather than the demand-side. And noted that in 2015, the National Grid launched a campaign called 'Power responsive' to encourage people to take much more active use of their own consumption of energy and play a part in helping to flex demand.

'When the power industry first started talking about flexible demand, the older generation envisaged the 1970s, black-outs, coal strikes and three-day weeks. But we are not talking about switching off power,' said Holliday. 'We are talking about flexible consumption reducing energy costs and saving billions of pounds of unnecessary investment.'

'The move has been slower than I would have liked. But it's gaining huge momentum,' he remarked. Well over 800 organisations have signed up to flexible supply contracts, including industrial companies, government organisations, university campuses and hospitals. 'This combination of optimising the use of intermittent supply, through smarter and more flexible demand, married with the traditional grid, will keep energy costs down in the future along with decarbonisation.'

Furthermore, it is encouraging lots of start-ups and innovators. 'People who are really challenging the old ways of doing business and are also challenging incumbents to a great extent. They realise that energy flows are two-way, as opposed to the way we built the big systems that start in the middle and flow out to the edges. It's a revolution with commercial energy users really setting the pace and direction for the future.'

Talking about a revolution

Holliday says he's not afraid of using the words 'chaotic revolution' in this context because the system is working well. 'There's a professionalism in all the organisations involved in the energy networks today. We have been able to handle unpredictability, which continues to happen. I don't think this is putting security of supply at risk as we edge towards the ideal energy mix over time.'

He insists: 'When it comes to judging "chaos" versus essentially a "planned economy" where you suggest this is what it will look like in 2030, the latter is the wrong approach. It will constrain technology innovation and will not take us to the right place in the most affordable way. Having said that, I applaud brave targets for decarbonisation as we need to act

with increasing urgency and continue to believe that there will be areas where incentives can again be used to provide stimulus at early stages of various development.'

The main imperative is to continue to decarbonise the energy system. 'Therefore, we need renewables for zero carbon, along with nuclear, carbon capture and gas. A lot of renewable technology by definition is "small and local". The economics will always lie potentially with scale as we've seen in the falling costs of producing offshore wind. But if you can get the right wind conditions for a small onshore field, for example, then the economics are very attractive.'

He continues: 'In the UK, we've got great networks and fantastic reliability. But as we start to electrify all our transportation, and progressively more of our heat, looking at the National Grid scenarios the gross electricity demand, which is currently about 60 GW, is forecast to increase to 140 GW in the extreme scenario where everything is electrified. Fortunately, this will not all be carried via the transmission system as smaller, local systems grow while still using the grid to shift big power requirements around.'

Finally, has the EI got a role in terms of distributed energy development? 'The EI has a role as a centre of excellence, professionalism and technical expertise,' Holliday enthuses. 'It does a fantastic job bringing people together to explore and develop understanding across the energy system. As this changes, professional standards, our training, our industry good practice and our contribution to the quality of the evidence base adjusts to ensure we can be relevant and useful to energy practitioners and those who make decisions to shape our future energy system. Our ambition is that we want people to understand the critical role energy plays in our world so that it is better understood, managed and valued. We've done this for over a century and arguably fulfilling our purpose has never been so important as it is today given the revolution taking place.' ●



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**Steve Holliday
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Elect EI and former
CEO of National Grid**