Balfour Beatty

National Infrastructure Commission
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Balfour Beatty's submission to the National Infrastructure Commission (NIC) inquiry into delivering future-proof energy infrastructure

1. Introduction

Balfour Beatty is a leading international infrastructure group. With 20,000 employees across the UK, we provide innovative and efficient infrastructure that underpins our daily lives, supports communities and enables economic growth.

Our Power Transmission and Distribution teams work with regional, national and international electricity network owners and operators to provide technical engineering solutions. With experience and expertise across the full spectrum of the electricity grid, including overhead lines, cable tunnels and distribution networks, we deliver a range of proactive and reactive services which support a reliable and safe supply of power flowing to millions of homes and businesses around the world.

From scoping and feasibility, to design, construction and on-going maintenance, our in-house experts and industry-leading innovations support clients in the development of ambitious power transmission and distribution projects. We have worked on a range of high profile, complex energy projects, from installing the high voltage electricity cables for National Grid's London Power Tunnels project, ensuring London's electricity needs continue to be met; to Sellafield and soon Hinkley B nuclear facilities; and reinforcing our leading position in the growing offshore transmission market through our work on the £317 million Greater Gabbard project, the high-voltage transmission system located off the coast of Suffolk in the UK.

We recognise that the energy sector is going through a tremendous transformation and faces significant challenges over the next few years:

- coping with increasing demands for energy;
- moving to a more broader combination of energy sources and making sure the UK's power network is ready to connect to them, including the new generation of nuclear power plants;
- playing its part in helping to meet the 2050 carbon targets and the 2020 renewable energy targets whilst maintaining security of supply;
- becoming more flexible and innovative in order to keep pace with the speed at which the energy system is changing.

We are keen to use our expertise to help the country meet these challenges and opportunities and to continue to shape the future energy landscape.

2. Overarching thoughts on future energy infrastructure

Having a resilient energy system is vital for a growing economy[1]. However Britain has historically underinvested in its infrastructure[2], including its energy networks. In order to make up for this, the government estimates that it spent £45bn on electricity generation and networks between 2010 and 2013[3], investment which Balfour Beatty welcomes. However we believe that, in order to rise to the challenges outlined above, more will be needed. The government's own calculations are that up to £100 billion of further investment could still be needed to 2020[4]. We are therefore keen to see delivery of the projects in the National Infrastructure Plan, which outlines that energy projects currently account for around 60% of the UK's total infrastructure project pipeline, totalling over £200 billion[5].

As well as maintaining the existing system, developing energy infrastructure that is fit for the future is a significant challenge. Part of the challenge is ensuring that new power sources, whether from nuclear or wind and other renewables, are connected to the electricity transmission network in order to move the electricity to where it is needed. In England and Wales, much of the new electricity generation will be in remote locations such as on the coast, or offshore, where there is little existing transmission infrastructure, so additional transmission capacity will be necessary to transport the energy to towns and cities. It will also be necessary to carry out work on existing areas of the network to upgrade and reinforce it to make it fit for these new low carbon sources of electricity.

As the UK transitions to a low carbon economy, it is likely that electricity supply and demand variability will increase, driven by changes in the electricity generation mix; an increased in the proportion of variable renewable generation such as wind, solar and tidal, and a decrease in the proportion of flexible, conventional generation likely to be fuelled by gas. In terms of variable renewables, the output from wind and solar generation for example, can often be unpredictable. To ensure a reliable supply of electricity, it will be necessary to ensure that reserves can be held. There are a number of ways this could potentially be resolved, including greater exploitation of conventional generation and energy storage. Electricity storage could be revolutionary in terms of balancing electricity supply and demand if it is possible to find a way of doing it cost-effectively (more detail below).

The UK's transmission and distribution networks are limited in the investment that they can make to accommodate increasing amounts of distributed generation. As such, bottlenecks in the capacity of the networks are stifling the investment in new generation.

The funding mechanism for the network operators is partly to blame, as the funding is focused on the cost of the transmission and distribution networks rather than the cost impact on the whole electricity market. These issues are partly the cause for the current crunch in capacity and are drivers for the introduction of the Capacity Mechanism.

These issues could potentially be addressed through the use of a reopener mechanism for the distribution networks, to cover additional costs. This could be similar to the Strategic Wider Works[6] funding mechanism for the transmission network operators and could be used to develop economic solutions to accommodate increased distributed generation. Use of a reopener mechanism would

[1] OECD, Egert, Kozluk and Sutherland, 2009
[2] RSA City Growth Commission, Connected Cities – The Link to Growth, July 2014
[3] DECC, Delivering UK Energy Investment, July 2014
[4] DECC estimates based on EMR Delivery Plan modelling
[5] HM Government, National Infrastructure Plan
[6] Ofgem, Strategic Wider Works mechanism https://www.ofgem.gov.uk/electricity/transmission-networks/critical-investments/strategic-wider-works

also mean that grid connections could be more readily available, particularly if the network operator is funded only for reinforcement or refurbishment work required to accommodate the new connection and the generator is required to fund the connection, either through higher use of system charges or a lump sum up front fee.

The UK's electricity infrastructure is limited in its ability to balance the network without over-supply of generation, due to the losses in the transmission and distribution networks and the ability to quickly drop generation to respond to a drop in demand. There are a number of solutions that could improve this situation and reduce oversupply. These include the installation of more undeviating (via high-voltage direct current or alternating current) infrastructure to link generation more directly to demand for example, by linking onshore wind generation in Scotland to demand in South East England using the planned Eastern bootstraps.

Alternatively a requirement for distribution networks to take a more active role in their system's management and balancing, together with an obligation to procure a capacity of storage to support demand centres – similar to the requirement in California – could create a more efficient and balanced electricity system. These solutions could also reduce the environmental impact of developing the network to be low carbon, particularly if network operators are encouraged to upgrade existing infrastructure or utilise existing network corridors.

In addition if network operators are encouraged to take the lead on developing energy storage solutions, this could have a positive impact on the cost of electricity by reducing the price-time differentials. Increased energy storage at distribution and transmission level could also have a positive impact on the environmental impact of the electricity infrastructure through reducing the number of 'peak' power plants which are required to support demand and by ensuring that low carbon generation can be stored to meet demand.

The biggest challenge for the network operators in achieving a low carbon network is the limitation of their funding. Although schemes like the Low Carbon Network Fund (LCNF) have shown the possibilities for innovation in network design and management, in our view, the cost of implementing these schemes en masse is too high. When the cost challenge of the RIIO[7] regime is added into the mix, it is easy to see why network operators are looking to low cost contractors to support them in the maintenance of their networks. Whilst this may be cost effective in the short run, it stifles innovation within their supply chain and reduces the ability of the network operators to use more competent contractors to work together to identify opportunities for innovation as part of the development of the networks or deliver innovative solutions in construction.

Ofgem incentivises the network operators fairly well to develop innovation, but often they are forced to choose a single solution from a sole supplier to progress for funding support.

Investment in energy networks

Britain is at its highest risk of power cuts, shortages and price spikes for more than 60 years[8], with available electricity capacity in April 2016 calculated to be 52,360MW, falling short of National Grid's 2015-16 winter electricity demand forecast of 54,200MW. We need to invest in our energy networks across the UK: significant funds will be needed to ensure that the UK's electricity infrastructure is resilient and fit for the future. These will not be forthcoming without investors being confident in the policy landscape.

[7] RIIO is Ofgem's framework for setting price controls for network companies
[8] Centre for Policy Studies, The Great Green Hangover, November 2015

Investing in energy infrastructure projects is not without complexity. Energy projects take years to plan, design and build, as well as significant investment. The consenting process alone can span governments. A stable and predictable planning and investment environment is critical. A good example is electricity generation, where credible commitments over the long term to measures such as carbon pricing are required to support private investment in new, efficient low carbon generation capacity.

There are many points investors will consider before developing key energy infrastructure. These include:

- Clear political and financial commitment from government to a sector
- A clear, predictable source of income. This protects the value of an investment whilst mitigating revenue risk
- A coherent strategy that fits into wider, global goals for energy
- Cross party consensus on the direction of travel for the energy mix
- Clarity on how the government will implement and fund the plan
- A predictable and stable subsidy regime for nascent technologies

The actual funding approach is secondary to these key concerns. For example, the recent change of direction on subsidy for renewable energy (onshore wind and solar) calls into question the value in further development and investment in any renewable sector.

Other points

- The largest blockers to private sector investment are the timescales and risks associated with consenting, the lack of long term commitment to both the energy strategy and funding of that strategy and clear routes to income to recover investment costs.

- Without a clear 5 - 10 year road map with cross party support, the risks involved in investing in major energy projects may be difficult to justify. This will drive up expected returns from such an investment and add cost to the consumer. Frequent changes of direction or lack of commitment to the “greening” of our energy mix will lead to stagnation in development.

- Much of the investment in UK infrastructure is undertaken by international businesses which have a choice of markets and projects for their scarce capital. These businesses will naturally choose those jurisdictions with effective policy frameworks which provide certainty over the longer term over jurisdictions which do not.

  The UK has recently lost its place in the top ten markets for clean energy according to the Renewable Energy Country Attractiveness Index[9], as investors have taken up opportunities in markets overseas. We therefore urge an end to the recent sudden changes in direction in energy policy in favour of a financial and regulatory regime that is stable and predicatble, in order to maintain investor confidence.

- There are currently a number of agencies involved in decision making and enabling development:

  - DECC controls the subsidies required for new technology
  - The Crown Estate controls critical development space for marine energy

[9] EY, RECAI Issue 45, *Renewable energy country attractiveness index*, September 2015

- The Treasury controls (and changes at short notice) budgets, local government control planning and consenting on land
- Various agencies control marine consents and environmental consenting etc.

It would be helpful if these gatekeepers were coordinated and perhaps the planning and consenting pathways were simplified and related timescales accelerated. One example is marine consents. If there were a precedent for a given area, then perhaps the next consent should only have to deal with the incremental differences rather than repeat the entire consent process.

Procurement models

More broadly, it is Balfour Beatty's view that the model of procurement should fit to the type of project being considered. Where there is a critical need with a limited opportunity to develop such a project, we believe that PFI/PF2 should be considered.

For example, the development of Tidal Lagoons should be centrally planned and procured. Such projects lend themselves to a PFI/PF2 type model due to the resource limitations required and scarcity of sites for implementation.

In our view, it makes little sense having numerous parties "reserving" areas of the country for the development as they do at the moment, by publicising plans and consulting publicly when there is no guarantee they can implement the plans. The current approach also leads to the risk of multiple consents on the same site or within the same region and no clarity as to who will eventually be able to implement their plans. This leads to confusion and potential failure of all plans.

There are also resource and capacity limitations relating to the build of major infrastructure in the UK market. For economically viable Tidal Lagoons, the quantity of material required would be enormous. This would need a "one at a time" approach so as not to cause material shortages and drive cost upwards.

Open competition with clear, committed funding would reduce the costs, risks and invite competitors into the market.

3. Responses to specific questions outlined in the inquiry

Questions 1. and 2. What changes may need to be made to the electricity market to ensure that supply and demand are balanced, whilst minimising cost to consumers, over the long-term, and what are the barriers to the deployment of energy storage capacity?

In our view, in order to ensure supply and demand is balanced at the lowest cost, the regulation around energy storage needs to be addressed. The current definition of energy storage is not robust in that it varies from country to country across the EU. In Italy, the regulator has interpreted the definition in such a way that the system operator (SO) is able to own and operate storage, whereas the current UK interpretation prevents this.

If the definition of energy storage could be clarified – preferably to enable the SO to own and operate storage – as well as defining regulation for energy storage for generators, suppliers, Transmission Network Operators/Distribution Network Operators and the private sector in order to prevent double charging for generation/transmission/distribution, it would be possible to create a

market for energy storage which will help renewables integrate into the network. This could reduce the level of network investment required and ultimately drive down costs for consumers.

Importantly, the market should not be subsidised or subject to any price mechanisms which could prevent the market from developing organically.

Balfour Beatty believes that any support for energy storage should focus on the development of technologies, in order to support UK industry. Different storage technologies also have different benefits, from the speed with which they can be dispatched, through to the duration of supply. No single technology is a 'silver bullet': they should all be considered as complementary and viewed based on their individual merits.

Any regulation needs to consider the speed of dispatch, storage capacity and the duration of supply for technology, rather than focusing on a single variable – size is not the be all and end all of storage. Storage should also be considered under the capacity market, as it has the potential to provide electricity during peak demand (peak shaving) which could reduce the need for (fossil fuel powered) peaking plants.

In our view, the most appropriate scale for energy storage is a mixture of transmission, distribution and domestic level, as well as storage at the point of generation. Storage across the network could provide much greater demand reduction and, through coordination of the transmission and distribution storage, provide balancing services for all parts of the network. Enabling storage at the point of generation would enable intermittent renewable generators to limit their generation when required, without losing revenue or requiring curtailment payments to compensate them.

Finally, we believe that the regulatory regime for Distribution Network Operator funding should be reviewed in order to consider how the regime can be an enabler for connecting renewable generation, rather than a barrier. At present, the regulation prevents the network operators from being able to connect some distributed renewable generation to their network as there is limited capacity in their network and the cost of the wider works required to facilitate the connection is considered too high.

If the regulatory regime allowed network operators to apply to Ofgem for funding for the wider works – on the basis that in the long term it will provide a greater socio-economic benefit and help drive down costs – then it would be possible to recover a proportion of the funding for these works from the saving made on capacity market contracts or short term supply agreements made by National Grid. Particularly if the network operators deployed storage.

Skills and training

Designing, constructing, operating and maintaining the transmission and distribution infrastructure which supports the electricity market requires specialist skills and experience. In order to support the balancing of supply and demand it is important to ensure the UK develops and retains the required level of skilled resource.

Balfour Beatty welcomes and supports the government's ambitious plans to create 3 million more apprenticeships by 2020. We invest in apprenticeship programmes across a broad range of disciplines, employing over 150 apprentices each year in the UK in addition to the 320 currently under training in a diverse range of roles across the business[10]. We employ around 700 more young people on graduate and part-time higher education / degree schemes. We are also members of the

[10] http://www.balfourbeatty.com/index.asp?pageid=364

5% Club, and are committed to the aim of ensuring that 5% of our UK workforce are apprentices, graduates or sponsored students on structured education programmes within the next five years. We recognise the valuable contribution our apprentices make to our business and as the pipeline of future talent. By investing in growing numbers of apprenticeships, we believe that we are not just helping young people build productive careers and successful lives, but also making a sound investment in our own future.

However, we do not believe that the apprenticeship levy alone will be enough to meet the shortfall in skilled workers the infrastructure industry needs.

- Business needs confidence in the quality of the pipeline in order to ensure it has the skilled staff for some of the specialist roles in energy projects. This is especially the case where new skills are required, for example in new nuclear build. It can take a decade from starting an apprenticeship for someone to gain all the skills they need to work in this area. Early, firm decisions are needed to enable us to invest in the people we need.

- The NIC could help drive investment in skills across the industry, in both contractors and network operators (transmission and distribution), by promoting a requirement to include minimum training requirements within OJEU tenders.

- The NIC could also work with the regulator (Ofgem) and network operators to look at how they can manage workflow across the sector. Recognising the specialist nature of the skills required in the industry, it is possible for the skilled operatives from the industry to find work abroad when the workload drops in the UK. This 'brain drain' means that when work increases, it is often challenging to find the number of skilled staff needed. This results in higher costs that are subsequently passed on to consumers.

- To ensure that costs are kept low for consumers, training requirements across the industry need to be clearly shared, and network operators should (where possible) ensure that they provide a steady flow of work for contractors and the industry needs to be encouraged to and supported in developing the skills needed to support the networks.

Question 3. What level of electricity interconnection is likely to be in the best interests of consumers?

Interconnection has significant benefits for balancing supply and demand in both the UK and across Europe. Greater interconnection from the UK to Europe will have significant long term benefits in terms of balancing the networks and reducing carbon emissions across Europe. In our view, capacity should be developed in line with the current cap and floor regime as a minimum.

There may be a case for developing interconnection at a higher rate beyond 2020 if projects in North Africa (Morocco/Egypt) and parts of Europe (Spain/Portugal/Ireland) provide low cost, reliable generating capacity, but bottlenecks in the existing (onshore) system prohibit the UK from accessing this generation. In this case the current regime may be prohibitive to the development of these projects, as the window for applications is not frequent enough. A continuously open window for applying to the cap and floor regime would allow projects to be brought forward for assessment sooner than the current programme.

Question 4. What can the UK learn from international best practice in terms of dealing with changes in energy technology when planning to balance supply and demand?

Balfour Beatty highlights the following international examples:

- California – encouraging storage.

  The Californian energy market regulator has set a requirement for the distribution network operators to each develop 1325MW of storage capacity by 2020 in order to provide network balancing services as they integrate renewable generation into the system.

- Uruguay – decarbonising without subsidies.

  In Uruguay the country has managed to shift electricity generation to 94.5% renewable sources without the use of subsidies. Renewables now make up 55% of the country's overall energy mix (including transport fuel) compared to the global average of 12%[11].This has been facilitated by a supportive regulatory environment and strong partnership between the public and private sector.

- India – developing solar without subsidies.

  In India, the government has set out an ambition to develop 100GW of solar by 2022 – which is half of the world's current installed capacity. The government is not providing any subsidies for solar, instead they are relying upon the fact that the cost of the technology has fallen sufficiently to make it competitive with coal. In the UK, the subsidies for solar have hidden the true cost of solar, so as the cost has fallen, the benefit of having the subsidies increased. But once the subsidy was removed it created a false fall in the returns from investing in solar.

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[11] http://www.theguardian.com/environment/2015/dec/03/uruguay-makes-dramatic-shift-to-nearly-95-clean-energy