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Siemens plc response to National Infrastructure Commission call for evidence - Improving how electricity demand and supply are balanced

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Introduction:

This document forms part of Siemens' response to the consultation published by the National Infrastructure Commission (NIC). The response relates to the third part of the call for evidence: **Improving how electricity demand and supply are balanced.**

Siemens in the UK employs almost 14,000 people across the UK with 13 manufacturing sites and multiple other facilities. We are a major investor in the UK energy sector, both in the UK supply chain that serves the sector and in specific generation projects. We would like to do more here.

Siemens builds many types of electricity generation, electricity and gas substations and smart networks. We provide a range of energy services including meter operations and maintenance of energy infrastructure. We also invest both equity and debt into energy projects. This gives us a unique insight into the energy market as a whole.

Our UK energy businesses directly employ over 6,000 people. In the last 4 years we have created over 1,000 direct jobs and will add a similar number when our £310million joint investment with ABP in a wind turbine factory in Hull is completed in 12 months' time.

Response to Questions

1. 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?

We welcome the opportunity to respond to this call for evidence and a first chance to comment on the work and priorities of the NIC in this area, as set out in the terms of reference accompanying this consultation.

Affordable, secure and sustainable energy supply systems are a vital part of the UK's infrastructure. Energy issues are complex, interrelated and long term. Often the markets that govern them are subject to political changes. Too often government action or political announcements show evidence of lack of understanding of the industry and how things

work in real world situations. Companies that invest in this infrastructure and its supply chain can be significantly impacted by such changes, or the lack of clarity that precedes them. Decisions to invest in UK jobs and infrastructure can be too easily impacted by short term politics. It is in the interests of all stakeholders that energy policy is evidence-based and properly considered.

As the NIC approaches this subject we urge you to follow the maxim "first do no harm". Wherever possible stay silent on a subject until you know you really understand it. And before announcing something check it for sanity with a range of industry stakeholders. We also urge the NIC to work collaboratively with the expertise within all parts of government, Ofgem and industry. Otherwise your actions will only add to the political risk faced by energy investors.

The TOR asked the NIC to consider "whether an appropriate institutional framework is in place." No framework is perfect. We would caution that the way such frameworks are deployed has at least as much impact as the statutes that underpin them. We suggest the NIC focus on how investment signals are given and the clarity of policy direction, rather than unpick the institutions.

We saw, for example, a lengthy hiatus in generation investment during the EMR process. Another such period of political jeopardy would damage investor confidence in UK energy policy and make it harder and more costly to achieve the infrastructure development required.

We note that "where possible, the Commission should aim to develop market solutions to these issues." We would like to point out that energy is unique among UK infrastructure in that it is the only type of infrastructure where there is any expectation that a market will decide what gets built. We don't use markets to decide whether to build a new railway. Government decides what it wants and we use competition to deliver it efficiently. In this case market or competitive solutions are useful for delivery but do not make strategy.

Similarly there is no natural market in electricity. It is a political creation, a set of levers with government on the other end of some of them. Investors in electricity infrastructure know this. Government rarely acknowledges the fact but it is the defining fact in industry behaviour.

Since privatisation 25 years ago we have had three markets, overlaid with various subsidies, codes, standards, licences etc. The idea is that if we can design a perfect market it will simultaneously dispatch the most economic generation in the next half hour and encourage the right mix of new projects. These projects will, after a decade of development and construction, build the right mix and quantity of generation to meet the as yet unknown future needs of electricity customers, and balance the trilemma of security, sustainability and cost over all time horizons. And this is before we consider engineering issues like stability, inertia, power quality etc. Or the interaction of electricity with heat, transport, or a range of other economic factors.

What happens in practice is that government creates a market that is programmed to deliver a particular mix. When this mix starts to emerge government decides it is not what was wanted and reconfigures some of the levers in the market to deliver something else.

Investors see this political risk and refrain from investing until government makes it worth their while. The cost of capital for all kinds of energy infrastructure is higher than it need be and the resulting stop-start market inhibits investment in UK jobs and delays cost reduction. At the same time no party is responsible for adequacy of the whole system.

Energy Policy

Recognition of the myth of the market is the first step to looking at what government can actually do to create a successful electricity industry. Some fundamental decisions always come back to government. By taking decisions in a timely and well informed way government can deliver real benefit for customers. By signalling the intent of future decisions it can increase investment in the supply chain.

EMR has given a set of levers which allow government to decide broadly on the electricity mix. Up to now, government has not said what mix it wants. This leaves developers and supply chain of all types with a level of jeopardy that puts up costs and inhibits investment in the UK.

Government can use existing levers to deliver a well managed electricity system. By signalling clearly the direction of travel, government can align the efforts of the industry with policy far better than hitherto. We suggest that governments stop trying to force all types of new build generation to compete in one single electricity market and instead run technology specific competitions to find the best projects of each type.

2. What are the barriers to the deployment of energy storage capacity?

Today's infrastructure is designed to transmit electricity generated in bulk from large power stations to large load centres. Decarbonisation was not a consideration in the evolution of the country's electricity infrastructure but, driven by the transition towards a low carbon future, we will see an increasing proportion of intermittent generation from renewable sources (both bulk and decentralised) and a growth in decentralised energy systems. This will result in the balancing of electricity supply and demand becoming more complex, an issue that is only likely to accelerate in the coming years.

There is broad agreement between industry, academia and governments that energy storage has a key and increasing role to play but that the application and leading technology will change over time. However, the current market does not incentivize the deployment of storage, nor does it adequately reimburse storage operators for the benefits their technology brings to the energy network. The market needs to properly recognize the value of storage, given the role it can play in maximising utilisation of intermittent renewable energy sources and existing transmission and distribution networks. As recognised by OFGEM, the current UK market also struggles to define storage: storage can be classified as "consumption" and/or "generation and/or "supply".

Energy storage can provide production, consumption and therefore balancing services. Siemens believes this lack of classification/recognition, combined with regulatory restrictions (e.g. a Distribution Network Operator cannot own generation assets) has a detrimental effect on potential solution providers' abilities to tender for storage solutions

and services, as they will require revenue certainty over sensible contracted durations to guarantee returns, gain investor confidence and in time reduce costs.

Storage will become prevalent in a range of different forms. Types, scale and technology behaviour will vary according to local needs: there will be no single technology winner. Early winners may be network connected Li-ion bulk energy storage to alleviate short term network constraints; however, this could transition to sizeable grid scale storage solutions such as Compressed Air Energy Storage (CAES) and a much greater penetration of storage 'behind the meter' as EV rollout and levels of domestic distributed generation. Later, power to gas will become more prevalent as electrolyser technology improves or there are new developments in small scale combustion to support microgrids.

In the longer term, significant deployment of behind the meter storage could be a significant threat to distribution networks due to the issue of "Load Defection". Essentially, as prices of solar and storage technologies decrease, it could become more beneficial for end customers to install such technologies behind the meter. This could result in decreased revenues for the utilities as use of system charges are challenged, with the net result potentially being reduced investment in distribution networks. Due consideration should be given to these long term eventualities.

Siemens itself has a comprehensive research and development program focused on energy storage across a broad technology landscape and multiple use cases. Due to the long term potential for energy storage to maximise the utilisation of renewable generation capacity and address the complex balancing issues of low carbon networks, we would urge continuation of and consistent, innovation-focused financial support within the UK for storage projects to speed up the development, deployment and cost-effectiveness of storage technologies.

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

Others including Ofgem, DECC and the EU have identified that the UK and other countries would benefit from interconnection of at least 10% of national capacity, for both gas and electricity. Siemens has no expert view on an optimum level for the UK. We note that if all the proposed UK interconnectors were to be built they would add up to around 10%. It would be sensible to get on and deliver them all in the most cost effective way.

Siemens is a technology provider for interconnectors and we may provide some finance for projects but we do not regard ourselves as a developer. We have limited insight into the business models of projects but we do see how long they take to develop and how difficult they are to financially close.

The challenge for merchant interconnection (as for storage) is that project economics depend on a price differential between the systems to be connected. The nature of the connection, once built, is to remove the price differential. There are significant benefits to

the country but not necessarily to the asset owner. If we finance interconnectors on a merchant basis this exposes the owner to market risks which they cannot control; pushing up the cost of capital. Most other countries choose to build interconnectors as strategic infrastructure assets. Indeed some of the existing UK interconnectors are merchant at one end and not the other.

The Cap and Floor approach aims to reduce the merchant market risk, whilst leaving the discipline of being exposed to some of it. In Siemens' assessment this is helping encourage projects to a more advanced state of development. However the system is new and as yet unproven and we believe further encouragement may be needed to deliver projects.

Cable supply for interconnectors is constrained and competes globally and with projects such as offshore wind and oil and gas platform connections. A single large interconnector, such as to Norway, can tie up European cable production for a long periods. The existing market approach leaves projects unable to commit to cable suppliers until final investment decision. There is a risk that this will result in a long period with no projects and then a number reaching this stage together, creating a bottleneck and pushing up the cost.

If the National Infrastructure commission were to propose a more planned approach to infrastructure delivery the supply chain could plan with greater confidence and both the delivery of cable and the cost could be smoothed. And even consider capital investment in additional manufacturing capacity.

The Cap and Floor approach gives a strong disincentive to anything that looks like a stranded asset. The linear nature of interconnectors and potential congestion at a limited number of landing sites make it sensible to plan for future capacity. In our experience the Cap and Floor approach discourages our customers from considering future expansion by making provision during one project for a future one. This may be as simple as designs that sterilise a future corridor, building ducts for future cables or even laying future cable sections that could be used as backup for the first project until incorporated into a future link.

We note the recent research on public attitudes to infrastructure by Copper Consulting et al which suggests public frustration at the lack of forward planning in infrastructure and a willingness to accept greater cost and disturbance once in order to avoid multiple and less efficient works.

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?

Infrastructure investment is more straightforward where there is a clear long-term strategy and a relatively simple regulatory regime (or a state-backed utility.) Competitive processes

work well when the goal is clear and companies compete on a like for like basis. All the efforts of competitors are focussed on the goal, not on second guessing what arbitrary weighting may be given to other technologies in some artificial single market.

We suggest that the National Infrastructure Commission should advise government on the broad mix of energy assets required and government should use competitive processes to deliver this mix in a cost effective way.

Further information:

If the Commission would like to discuss any of these subjects further with Siemens, please contact:

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Or

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Siemens plc, 8 January 2016

About Siemens

Siemens AG (Berlin and Munich) is a global technology powerhouse that has stood for engineering excellence, innovation, quality, reliability and internationality for more than 165 years. The company is active in more than 200 countries, focusing on the areas of electrification, automation and digitalization. One of the world's largest producers of energy-efficient, resource-saving technologies, Siemens is No. 1 in offshore wind turbine construction, a leading supplier of combined cycle turbines for power generation, a major provider of power transmission solutions and a pioneer in infrastructure solutions as well as automation, drive and software solutions for industry. The company is also a leading provider of medical imaging equipment – such as computed tomography and magnetic resonance imaging systems – and a leader in laboratory diagnostics as well as clinical IT.

In fiscal 2014, which ended on September 30, 2014, Siemens generated revenue from continuing operations of €71.9 billion and net income of €5.5 billion. At the end of September 2014, the company had around 357,000 employees worldwide. Further information is available on the Internet at www.siemens.com. October 2015