National Grid Response to ERGEG consultation

Introduction

National Grid supports the European Union and UK Government in addressing climate change. We welcome the commitment to sustainability and setting a greenhouse gas reduction trajectory towards meeting the 2050 target. The electricity transmission network of the future must connect a large number of renewable and low carbon generation to the country's demand centres whilst providing security of energy supply at an affordable cost.

Smart Grids have the potential to create benefits across the energy supply chain – supporting more efficient network investment on both the gas and electricity networks, optimising real time energy management and balancing supply and demand. Through integrating the actions of generators, networks, gas shippers, energy suppliers and consumers, smart networks can facilitate low carbon, sustainable economic and secure energy supplies at a more affordable cost than would otherwise be the case.

Section 1 – Introduction

1. Do you consider that networks, transmission and distribution, are facing new challenges that will require significant innovation in the near future?

Yes, we agree with this view. As a result of the European Unions 2020 targets an unprecedented change in the type and size of generation connected to the UK transmission and distribution systems will take place over the coming decade to meet the current electricity needs of end customers.

As electricity generation becomes increasingly decarbonised, we expect that opportunities will arise to electrify more of our transport and heating needs in pursuit of the carbon reduction targets. This will present further challenges particularly within distribution networks.

Networks must therefore connect more generation including those with intermittent output at new sites and new forms of demand (e.g. Heat pumps and EV's) whilst providing user choice and system security; all at an affordable price.

Smart meters will help with this challenge by incentivising the efficient and timely use of energy. Smart Grids provides the opportunity to integrate more price sensitive demand with increasingly inflexible generation and seeks to optimise the efficient network investment and operation that will be required to underpin this new environment.

2. Do you agree with the ERGEG's understanding of smart grid? If not, please specify why not.

Yes, National Grid agrees with ERGEG's understanding of smart grids.

Smart Grids are often thought of as primarily concerning distribution networks. Whilst the changes within distribution network and supply businesses may be more pronounced, the Transmission perspective is equally important and is key in ensuring that renewables and low carbon technologies are enabled in a secure and affordable way.

The principle Smart Grid topics for TSO's in support of their role in helping to deliver environmental targets in a secure and affordable way are the:

- Integrated and co-ordinated operation of active distribution networks (e.g. the development of distribution system operators);
- Efficient and secure management of intermittent, distribution embedded and inflexible generation in operational timescales;
- Efficient integration of more active demand (e.g. through price signals and automatic instructions by parties all along the supply chain); and
- Integrated operation of Flexible AC Transmission devices and more interconnection.

3. Do you agree that objectives of reducing energy consumption impose the need for decoupling regulated companies' profit from the volume of energy supplied? How can this be implemented?

We agree that this is a sensible approach. In the UK, the energy supply businesses are separate from the regulated networks so this should not be a primary concern.

However, in general it is important that market arrangements for Supply businesses and Energy Service Companies facilitate efficient provision and use of energy. In the UK, the implementation of smart meters and billing arrangements (perhaps ½ hourly but certainly within day segmentation) should promote Suppliers, Energy Service Companies and consumers to use electricity in an efficient way. There will also be scope for Demand Side Management to contribute to the efficient real time balancing of the system in operational timescales of less than ½ hour.

Any efficient incentives should recognise that, as we progress towards 2020 and beyond, the general improvement in efficiency and decarbonisation of electricity is very likely to result in increased electrical energy consumption as electricity plays an increasing role in heating and transport.

Section 2 – Drivers for smart grids

4. Do you agree with the drivers that have been identified in the consultation document? If not, please offer your comments on the drivers including additional ones.

Yes, National Grid agrees with the principle drivers of sustainability, security of supply and competitiveness. In our view, competitiveness is the vehicle to help ensure this is affordable. Ultimately, the depth and pace of smart grids and the pursuit of environmental targets will be dependent on our ability to fund such initiatives.

From a technology perspective, we agree with the drivers identified in section 2.4.

It is worth noting that improved operational security is more likely to be applied to distribution networks, however for TSO's, smart grids should allow operational security to be achieved more efficiently than would otherwise be the case.

Section 3 – Smart grid opportunities and regulatory challenges

5. Do you agree that a user-centric approach should be adopted when considering the deployment of smart grids?

We believe that smart grids, and indeed any technology, should be designed and applied recognising the needs of users and the possible benefits that could be offered. In the context of smart grids, we see that smart grids can offer benefits to users across the whole supply chain to deliver a low carbon energy solution at a more affordable cost than would have otherwise been the case. A user-centric approach is therefore a prudent way to assess the value of smart grids.

In addition to user benefits that may be identified by applying a user-centric approach, there may also be benefits that straddle several parties (users) in the supply chain which could result in reduced costs to the consumer. (E.g. avoiding building peaking generation by reducing demand over high demand periods) To ensure this happens, it is important that the commercial frameworks incentivise the right behaviour and we see the role of Suppliers and Energy Service Companies as an important part of translating these potential benefits into meaningful products for consumers.

6. How should energy suppliers and energy service companies act in the process of deploying smart grids solution?

Suppliers and Energy Service Companies have a pivotal role in building trust with consumers and engaging them in the efficient and responsible use of energy. This requires effort at several levels including:

- Education – developing consumer's understanding and sophistication in energy use;
- Translating potential supply chain efficiencies into understandable and useable energy tariffs and bridging the gap between consumers and the supply chain;
- Enabling home automation and interaction with the energy industry by supporting the integration of smart appliances within the home;
- Aggregation of demand services to the supply chain; and
- Promotion and use open standards for data communication and control.

Supplier and Energy Service Company behaviour should be commensurate with these focus areas.

7. Do you think that the current and future needs of network users have been properly identified in Section 3.3?

Yes, with the exception of security of supply, this section identifies the main current and future needs of the network. We think it would be useful to provide an additional section

that describes the 'efficient provision of security of supply' role that networks and the System Operator perform for all their users to enable the market to operate.

8. Do you think that the main future network challenges and possible solutions have been identified in Section 3.4 and 3.5 respectively? If not, please provide details of additional challenges/solutions.

From a technology perspective, we believe that the majority of network challenges have been identified within these sections however, planning consent and public acceptability to build new infrastructure to harness new forms of generation will continue to be a major challenge.

The ability of the System Operator to efficiently maintain security of supply is also influenced by the ability to forecast wind generation output and develop a better understanding of the factors that will influence net demand at a distribution level. For example, as distribution embedded and micro generation volumes increase, visibility of volumes and behaviour will become increasingly important.

Finally, to support the industry transition required, the whole supply chain will need to attract, recruit and develop new, skilled resources to and industry that has previously been reasonably stable.

9. Do you expect smarter grid solutions to be essential and/or lower cost than conventional solutions in the next few years? Do you have any evidence that they already are? If so, please provide details.

Given what we understand about the future generation mix and behaviour and the potential increase in demand, it is difficult to envisage transmission and distribution networks and market arrangements without the capability that smart grid solutions offer. In many ways, labelling aspects of networks and supply chain activity as 'Smart' is irrelevant. In our view, providing the framework to incentivise behaviour and provide appropriate investment signals should drive networks and the supply chain to employ the most efficient and cost effective solution, whether this is smart or more conventional in nature. Of course, some developments will require policy decisions to underpin their development, but these should be done with an expectation of a lower cost than would otherwise be the case.

There are a number of phases to smart meter and smart grid roll out that will develop over the next decade. For distribution networks and suppliers, the roll out of smart meters and improved condition monitoring and distribution network control will be a key element to engage consumers in efficient energy use and distribution network utilisation i.e. time of use and volume of energy consumed.

For Transmission, it is more concerned with connecting new generation and building transmission capacity efficiently and within planning permission requirements. These two drivers inevitably drive for solutions that are 'Smart' in nature. Here in the UK, under the Electricity Networks Strategy Group (ENSG) co-chaired by Ofgem and DECC, we have developed proposals for asset investment, to connect new generation which includes smart grid assets such as Transmission system embedded DC links (offshore). These have been justified in preference to traditional solutions on their merits and recognising the planning permission challenges of introducing new transmission lines onshore.

10. Would you add to or change the regulatory challenges set out in Section 3.6? Section 4 – Priorities for Regulation

We believe that the regulatory regime of the future needs to blend the continued drive for efficiency and response to user investment signals (e.g. new generation connection) with the need to innovate and anticipate capacity requirements, in order to meet the environmental and technology challenges that have been identified within the Position Paper.
The regulatory regime also needs to recognise that network flexibility will become increasingly valuable to facilitate a range of possible outcomes to meet our environmental goals within the prescribed timescales. There is therefore a careful balance to be made between network flexibility, which keeps options open, and assets that in hindsight appear to be stranded (In the UK, Ofgem have already recognised this issue in their RPI-X @ 20 emerging thinking consultation – Paragraph 6 of the Executive Summary and elsewhere[1]). We believe it is important to develop a regulatory regime that enables efficient anticipatory investment and appropriately values network flexibility / 'optionality'.

We also agree that a model in which energy suppliers are incentivised to sell more in order to generate increased profits will inherently struggle to meet challenges to reduce energy consumption. As already noted in question 3, regulators therefore need to seek to develop regimes which remove the incentives for energy companies to simply "sell more" to customers and which incentivise them to deliver additional services (such as demand management responding to network congestion, frequency responsive demand etc).

Finally, for widespread penetration of distributed generation (wind, solar PV, CHP etc applied in domestic and small business situations) it will be important that there are common standards agreed by network companies and manufacturers of generating equipment, domestic appliances, and e.g. electric vehicles. These standards will need to address both the network compatibility issues (e.g. Distribution embedded generation Rate of Change of Frequency (ROCOF) relays could pose a major threat to transmission system integrity) as well as communication and interoperability with smart meters and network SCADA systems. The regulatory authorities will have a key role in ensuring the various industries work together to develop appropriate standards in a timely manner and that these developments are not blocked by vested interests.

11. Do you agree that regulators should focus on outputs (i.e. the benefits of smart grids) rather than inputs (i.e. the technical details)?

Yes, the regulator should focus on the benefits (outputs) to end users whether they are direct or indirect. These should include societal benefits including facilitation of low carbon technology, decarbonisation of electricity and efficient delivery of security of supply. As noted in question 10, regulators should also focus on appropriate incentives on market players to offer energy efficient solutions to consumers
[Might be worth cross referring to the point about incentivising energy service companies and dis-incentivising suppliers that just want to sell more]

[1] Link to RPI- X @ 20 doc

12. Which effects and benefits of smartness could be added to the list (1) - (7) presented in Section 4.1, Table 1? Which effects in this list are more significant to achieving EU targets? How can medium and long-term benefits (e.g. generation diversification and sustainability) be taken into account and measured in a future regulation?

We broadly agree with the effects and benefits that have been identified in Section 4.1 Table 1. We also agree that the order in which they appear reflects their relative significance. In general, it is important to focus on the required benefits rather than the features or particular technologies that smart grid offers.

It is important to recognise that carbon dioxide and other greenhouse gas targets are imposed on all forms of pollution, most notably heat and transport in addition to electricity. Many scenarios suggest that as we start to decarbonise electricity there are more opportunities to electrify heat and transport. It may be more appropriate to consider carbon emissions within the context of the overall environmental goals rather than solely electricity generation.

Such an outcome would result in electricity demand rising which will increase the pressure on existing distribution and transmission networks. One of the key benefits of smart networks will be (in combination with smart meters) to maximise the use of existing network assets by demand shifting and responding to network (distribution or transmission) congestion – thereby delaying the need for traditional asset intensive solutions to meet the rising demand. One of the likely consequences of this would be to see an increased load factor on the network and this implies that network losses would increase and so we would have concerns regarding a simple network losses output measure. Therefore item 5 would need a reasonably sophisticated losses output measure to be of value.

Sustainability measures could also use already proposed performance indicators for higher security and quality of supply; i.e. share of electrical energy produced by renewable sources or as an alternative, tonnes of carbon per MW of electricity produced.

Item 6 is probably not appropriate. There is no justification for an arbitrary level of interconnection. The cost of interconnection will vary widely due to geographic considerations – e.g. for the UK or Ireland they will be substantially higher than for systems that can use AC interconnectors and so the economically efficient level of interconnection will be likely to be different. The value for interconnection will depend on the different power system economics (plant types and mix, fuel sources etc) in different member states and the economically efficient level of interconnection will be determined by the market.

Some of these benefits may not be complementary and any measurement should recognise that compromise may be needed to achieve an optimum balance of benefit. In this regard, benefit 4 should perhaps say ‘appropriate’ security and quality of supply. For example, in some instances, a lower security of supply may be appropriate for certain classes of consumer or appliances provided it is agreed and accompanied by a corresponding reduction in cost. This is particularly relevant where demand side management could play a bigger role in managing intermittent generation as an alternate to peaking generation.

There may be scope for some form of measure that addresses the ease by which customers can connect e.g. renewable generation to domestic property and small business supplies might prove useful. Similarly, the ability for consumers to provide system services through demand side management via smart meters should be considered.

13. Which output measures should be in place to incentivise the performance of network companies? Which performance indicators can easily be assessed and cleansed of grid external effects? Which are suitable for European-level benchmarking and which others could suffer significant differences due to peculiar features of national/regional networks?

We do not believe that there should be specific output measures for smart grids and, as you have already noted within the Position Paper, we believe any measures should be focussed on benefits rather than technology. Where possible, it would be better to integrate any additional measures into existing measures to reflect the outputs of networks in totality.

There are many differences to the networks across Europe, the customers they serve, their geographic disposition and the level of integration with neighbouring networks and the different level of natural resources (such as hydro) available. Given this variation it makes it difficult to make any meaningful comparison. We think this is worth exploring the practicality and value; however simple metrics may not necessarily demonstrate the ingenuity and effectiveness of the supply chains in member states.

14. Do you think that network companies need to be incentivised to pursue innovative solutions? How and what output measures could be set to ensure that the network companies pursue innovative solutions/technologies?

Meeting the challenges of moving towards a low carbon economy will require extensive innovation right across the spectrum of research, development and demonstration (RD&D) activities. However, this is not the only challenge facing Transmission and Distribution companies in the UK. Companies are also faced with challenges presented by an aging asset fleet and a shortage of experienced engineers. This means that manpower resources are constantly stretched ever thinner addressing a wide range of issues. The result of this is that unless incentivised correctly it will be very difficult for companies to carry out R&D.

In the UK Ofgem's Innovation Funding Incentive (IFI) for Transmission and Distribution companies has been successful in incentivising and stimulating RD&D over the last three years. This has allowed National Grid to develop a modest RD&D programme.

However as the challenges mount it becomes more and more apparent that the current incentive is not enough. DNOs now have access to a further incentivised fund (the Low Carbon Network Fund) while TOs still only have access to IFI. It is felt that either the funding cap set by IFI should be increased or a further fund for research into low carbon technology should be made available for TOs.

It has recently been agreed with Ofgem that National Grid may now use IFI funds for System Operator (SO) related research and development. We anticipate that this will lead to an increasing use of IFI in the future to develop and demonstrate SO smart grid tools. While we welcome this decision it will inevitably mean that the already over subscribed IFI fund will be stretched thinner. This reinforces the point made above for an increase in funding.

National Grid's current practice concerning project output measures is the production of an R&D annual report that is supplied to stakeholders and made available to the public. It is envisaged that this would continue.

15. Do you consider that existing standards or lack of standards represent a barrier to the deployment of smart grids?

National Grid supports the use of standards to promote interoperability, competition between equipment suppliers and choice for users along the supply chain. It also facilitates a migration path to harness new innovations. In this regards, we see the definition of and adherence to communication and smart meter standards as particularly important.

We also believe there are opportunities to improve operational standards for distribution embedded generation and appliances which should result in containment of avoidable costs with only modest increases in unit costs. For example, as the population of embedded generation grows, it will be increasingly important that their behaviour is understood and sympathetic to wider system considerations such as frequency control.

There are also opportunities to stimulate consumer demand side management by enhancing appliance standards. For example, high energy use appliances such as washing machines, tumble driers and heat pumps could have a smart capability requirement to respond to time of use pricing or external signals.

16. Do you think that other barriers to deployment than those mentioned in this paper can be already identified?

Consumer participation in delivering a sustainable, secure and affordable supply of electricity is uncertain. Smart meters, home automation and smart grids should facilitate the desired consumer participation, but it is the availability of smart appliances and a willingness and ability to respond to external signals (e.g. Time of use prices) that will determine a change in behaviour. A range of incentives may therefore need to be considered to stimulate a behavioural change. Some incentives could be in the form of standards for new appliances which could the transition to smart homes easier or limit the impact on wider system and market implications.

Data protection may also be a challenge. Aggregated smart meter data will be valuable to many parties along the supply chain. Concerns over the use and availability of data may inhibit the efficient development of Smart Grids.

Planning permission: As already noted, the networks and generation needed to meet renewable and carbon reduction targets may be inhibited by the granting or otherwise of

planning permission. This will increasingly drive innovative solutions however there will be a need for new assets that will be faced with planning and consenting issues.

Technology specific subsidies: We recognise that in many cases, new technologies need to be supported to stimulate the necessary investment required to drive innovation, research, development and implementation. We also recognise that renewable and carbon targets with associated timescales mean that specific interventions are required to provide the impetus to meet the targets within the timescales. Where specific interventions are made, we believe that it is important to consider how these incentives interact with the wider market and how they may transition from specific incentives to competition on an equal footing. This becomes more important where interventions could apply to a significant volume of the market, but it is not so critical where the incentives apply to a smaller segment. For example, in the UK the electricity market is incentivised to match supply with demand for each half hour, whereas the Feed in Tariff (< 5 MW generation) and Renewable Obligations incentives are provided for each MWhr generated within a year. There may be occasions where a significant volume of [renewable] generation may be incentivised to behave counter to the half hourly supply and demand imperative or are inappropriately incentivised to withhold flexibility that will be required in a smart grid world. This may however be moderated if demand becomes more responsive to time of use price signals.

17. Do you believe new smart grid technologies could create cross subsidies between DSO and TSO network activities and other non-network activities?

We do not believe this is a significant risk in cross subsidies in the UK because of the regulatory regime and the commercial framework that exists between the Transmission Owners, System Operator, Distribution Network Owners and Suppliers. We do not envisage the development of Smart Grids as affecting this position.

18. What do you consider to be the regulatory priorities for electricity networks in relation to meeting the 2020 targets?

There are a number of documents that are considering regulatory priorities in the UK, including Ofgem's Project Discovery, RPI-X @ 20 and Ofgem's business plan 2010 – 2015. We are actively involved in responding to these documents and therefore do not propose to respond to this question in detail. In the context of this Position Paper we offer the following thoughts.

As already noted in our response to question 10, we believe that it is important to develop a regulatory regime that enables efficient anticipatory investment and appropriately values network flexibility / 'optionality'. The regulatory priorities and approach should also recognise the lead times required to recruit appropriate skilled resource to make the transition to a low carbon network and then retain them to continue with driving innovation and efficiency.

We also believe that regulatory certainty is critical in providing the investment background for long term assets. The regulatory regime and any changes that are deemed necessary to achieve 2020 targets need to be mindful of the potential to disrupt the regulatory certainty.

Consumer engagement and education will be paramount in improving more efficient energy use and demand side participation. It will also be important to establish effective ways of uncovering the value that consumers place on networks in order that appropriate investment may be made; whether this is Smart orientated or otherwise.

As part of consumer engagement, it will be important to ensure market frameworks allow efficient use of networks and energy to be encouraged. More cost reflective arrangements, charging and tariffs should promote this behaviour across the supply chain.

For Smart meters in particular we consider the following to be regulatory priorities:

- Develop a robust yet flexible commercial and regulatory framework for smart meter deployment. This will need to accommodate future changes due to technology developments[2] and, at the same time, give investors confidence that they can invest with a reasonable expectation that they will make a return and that assets will not be stranded.

- Common standards (particularly communication protocols and smart meter standards) will provide the key to realising benefits through economies of scale by giving the supply side clear sight of the volume and timing of the roll-out. However this needs to be balanced since overly restrictive standards could limit the scope for future innovation.

- Coordinated roll-out will be key to minimising costs as well as consumer disruption. It will be important to provide clarity regarding the scope, volume, and timing of installation.

- The above will be best achieved by a central agency (in the UK perhaps regulated by Ofgem) responsible for placing contracts for regional meter installation and national communication infrastructure.

- From a regulatory perspective it will be important to protect the interests of consumers in terms of:
    a. Continuing ability to switch energy supplier at reasonable notice
    b. Protection of customer personal data / information
    c. Open software architecture to facilitate future software upgrades

- Focus on consumer education and engagement to promote consumer participation in delivering a secure, affordable and sustainable electricity supply. This will principally be around efficient use of energy and response to time of use or external signals.

[2] Given that these devices will be installed for a target lifetime of perhaps 25 years and considering the developments that have taken place in information technology and communication systems over the last 25 years it will be essential for the design standards to facilitate e.g. software upgrades as technology evolves and matures.