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E3G RESPONSE TO REMA CONSULTATION

About E3G

E3G is an independent climate change think tank accelerating the transition to a climate-safe world. E3G builds cross-sectoral coalitions to achieve carefully defined outcomes, chosen for their capacity to leverage change. E3G works closely with like-minded partners in government, politics, business, civil society, science, the media, public interest foundations and elsewhere.

E3G has a track record of experience and expertise on the transition to net zero energy systems including market and regulatory frameworks. More information is available at **www.e3g.org**.

This is E3G's response to the Review of Electricity Market Arrangements consultation, closing on the 10th of October 2022.

Summary

> Energy represents a key input cost to the economy – competitiveness and growth depends on low input costs. Driving down energy bills for households is also essential for ensuring social cohesion.

> Energy is itself a big sector. The UK has an edge in regulatory design, which has delivered a trade dividend. To maintain this advantage, the UK must be in the vanguard of the green and digital transition and innovation.

> Markets by themselves cannot keep electricity prices low. They must work in concert with regulations and governance to:

  - Minimise the costs of investment – both overall volume of assets and the financing costs
  - Ensure assets (generation, demand, and network) are used efficiently.

> It is also the job of markets and regulations to implement government policy on how these costs should be recovered – from which groups of consumers or society and over what time-period.

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- Energy technology is changing fast – if we are going to remain competitive, both at sector and economy-wide levels - we must take advantage of new technologies. Digital instrumentation and control technologies plus advanced predictive capabilities provide the key to creating a low-cost energy system. These will ensure we can operate the system far more efficiently than before and save huge amounts for consumers.
- But we cannot create a digitalised energy system immediately and technology will continue to advance. We, therefore, need a phased but continuous process of market reforms as the grid is digitalised and innovators find new attractive products and services that make consumer lives better – REMA is a key part of a broader regulatory reform agenda that will make sure we take advantage of the opportunities.
- The REMA process must define:
    - **The long-term objectives for markets**: Reinforcing the enduring requirement for markets to support least cost use of resources throughout the decarbonisation journey and beyond.
    - **The way the design evolves towards this vision**: Establishing a market operator function to define the reform agenda using input from system operators and system users.
    - **Changes that can be put in place now that represent steps in the right direction**: Focus now on deployment of measures to support efficient consumption and reallocate costs to protect consumers from high prices.
- Marginal pricing must sit at the heart of the long-term vision for electricity markets - it is difficult to imagine a credible alternative to manage a dynamic, decentralised system. However, it is also of paramount importance that consumers are insulated from excessive electricity costs. This should be achieved in a way that allows the market to return to clearing at marginal prices as soon as the impact of gas prices on electricity costs reduces to acceptable levels.
- In a highly decentralised electricity grid with millions of renewable generators and electrified heat and transport it will be critical to balance the power system at much more granular level in time and space. System operators can only ensure efficient use of resources by using more granular marginal prices - prioritising supply-side measures over demand-side flexibility is not sustainable. Mechanisms can be introduced alongside more

granular pricing to reduce revenue risks for investors and protect consumers from high prices. There is significant learning that can be adopted from such approaches in the USA and New Zealand.

> Reform on market mechanisms should go hand in hand with parallel workstreams in Ofgem to ensure regulated monopolies are adequately incentivised to adapt to a digitalised future, and support and embed innovative practices.

> Any future electricity market design should encourage the energy industry to adopt a more holistic and whole systems approach – e.g. realising opportunities such as storage of heat instead of electricity in district heat networks or encouraging permanent reduction of energy consumption through energy efficiency improvements in the built environment.

Context

The energy sector is critical to the success of the UK economy. Energy represents a key input cost – competitiveness and growth depend on achieving and retaining low costs relative to those in other countries. A failure to drive down energy bills will not only affect the economy but could undermine social cohesion. Recent events have illustrated that politicians cannot allow uncontrolled escalation of energy bills.

In addition to underpinning the broader economy, energy is itself an important and substantial sector. The UK has traditionally held a significant advantage at the cutting edge of energy regulatory and market design, leading to a trade dividend for technology and services industries. Retaining this advantage will continue to deliver benefits to the national economy.

The challenge for government is to ensure that energy costs are as low as possible and are recovered from society in a way that is fair and sustainable. This objective must be achieved in a context that is rapidly changing. These changes are in part driven by the need to decarbonise the energy system but also by the emergence of new digital technologies that will allow the energy system to operate more efficiently.

Electricity will play an increasingly important role in a clean and efficient energy system. The government has recognised that markets originally designed for an analogue system of large fossil-fuelled power generators and passive consumption must be reformed to take advantage of new technologies and deliver environmental, industrial, and social policy goals. The Review of

Electricity Market Arrangements is, therefore, an important process that should be viewed in this broader political context.

The role of market design

The 'electricity market arrangements' encompass the set of rules that determine how electricity is bought and sold. There will always be a requirement for government to administer trading arrangements in an interconnected power system given the need for a process to settle uncontracted trades. However, the range of policy objectives that must be delivered means that administered arrangements need to go beyond rules for residual system balancing.

Nonetheless, the core and enduring objective of the market arrangements should be to ensure least-cost use of system resources (efficient dispatch). The cost burden of failing to achieve this objective will mount over time and materialise in higher consumer costs. A variety of 'complementary mechanisms' will need to be introduced to ensure other objectives are achieved. These include measures to promote investment through de-risking future earnings and different approaches to allocating costs between consumers and society. Importantly, these complementary mechanisms will need to evolve over time and should achieve their objectives without undermining the core requirement to ensure efficient use of resources. This overall structure is illustrated in Figure 1.

Market arrangements by themselves cannot deliver policy objectives. They must work in concert with a broader package of legislation, regulations, and governance. This is especially true at a time of significant system change that is required to achieve net zero and take advantage of new technologies.

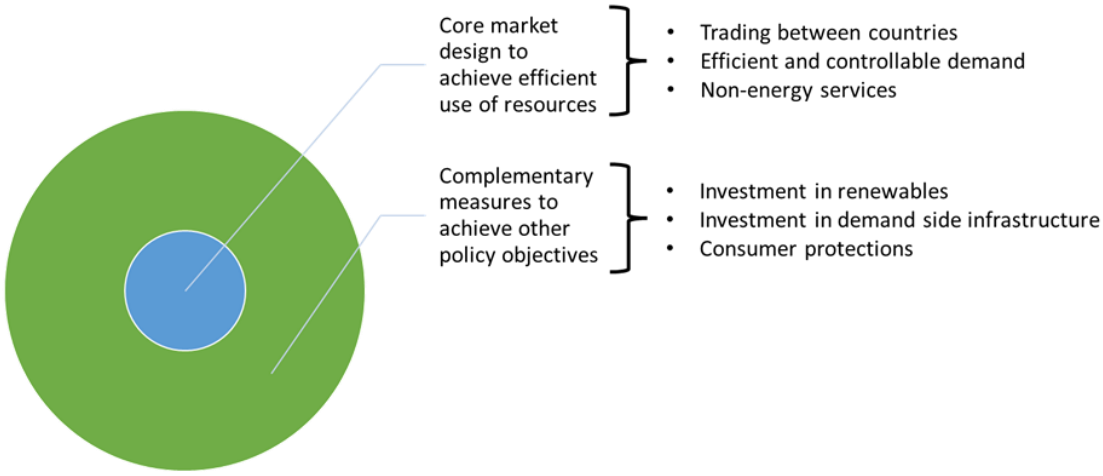

Figure 1: Market design structure

A backbone of core legislation is required to set a clear longer-term direction. This should include the allocation of delivery responsibility in areas such as efficient dispatch and network planning. It is important that these obligations recognise the emerging technological opportunities and require the delivery bodies to continually improve their approach. Other aspects of policy, including investment support and consumer protection, will need to adapt to a changing context and will give rise to the complementary mechanisms described above.

Delivery processes are required to ensure obligations are fulfilled and policy goals met. Market design is a core delivery process. It must not be viewed as static but be continually updated as technology and policy objectives evolve. When electricity markets were first designed in the late-1980's, they reflected the technical constraints and limitations on understanding and controlling system conditions that prevailed at the time. New digital technologies will sweep away many of these historic constraints giving almost infinite capacity to understand, predict and control the behaviour of connected assets. Markets define the boundary between grid operation and system assets. They must constantly evolve to embrace new operational practises and support innovators in delivering new products and services to electricity consumers.

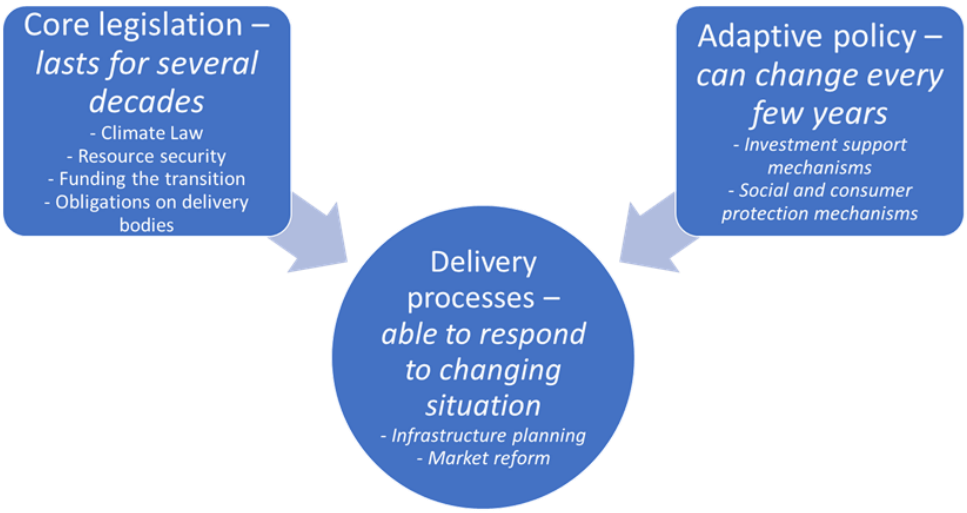

Figure 2: High-level framework for delivering system change

A related and equally important process involves whole-system infrastructure planning. It is vital that required investments are made in time and that money is not wasted on building infrastructure that is not required given developments elsewhere on the energy system. Whilst this planning process is outside the scope of market design, infrastructure requirements will be informed by understanding the value of energy and associated services at different locations on the energy system. Also, complementary mechanisms will be needed to ensure many of the required infrastructures are delivered in a timely and cost-effective manner.

Figure 2 illustrates this high-level framework for delivering system change and the role played by market design. It is explained in more detail in a recent E3G publication[1].

Implications for REMA

Low energy costs delivered by a system that makes the most of new technologies and adopts leading-edge regulatory approaches will be essential to create a competitive and growing national economy on the journey to net zero. REMA is the opportunity to ensure that market design processes are implemented that can support this objective.

[1] **Power System Change: Delivering a Net Zero Power Sector in the G7**; E3G Briefing; October 2022

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The appropriate market design will change in line with the evolving context. It is impossible to identify the optimal market arrangements for a future we do not yet understand. Instead, REMA should seek to define the long-term objectives for markets, the process for evolving the design, and changes that can be put in place now that represent steps towards the longer-term objectives.

Long-term objectives

The market design must support efficient dispatch of a system with millions of small assets such as storage devices, electric heating, electric vehicle chargers, and small-scale generation. The vast majority of these are connected to local electricity networks. It must also provide a mechanism that enables innovators to offer consumers the energy products and services they want, easily and cheaply. Efficient dispatch of a highly decentralised energy system requires a knowledge of marginal costs at every point in space and time. Markets must reveal this information and allow system users to increase/decrease production/consumption accordingly.

The nature of the products and services that best meet consumer needs will continue to evolve over time. However, it is likely that consumers (or, more usually, those providing energy services to consumers) would prefer the interface with the electricity system to be very simple - ideally involving a single price for production and consumption at each location. System operators would need to move away from a complex array of explicit markets to provide system services and use advanced predictive capabilities to manage a system based on a simple interface with users.

Investment support mechanisms will continue to be required if system change is driven by policies to take advantage of emerging technologies and deliver other political objectives. It is likely that this situation will prevail for the foreseeable future. This support should be targeted towards new and innovative technologies and ensure incentives for efficient operation are retained.

In a decarbonised power system, prices will largely be determined by competition between demand response, storage, and other providers of system flexibility[2]. This will create prices that are inherently more stable that those produced in a system dependent on volatile fossil costs. High prices will arise

[2] It is often argued that prices will collapse in a system dominated by renewable generation with very low marginal costs. This will only happen if insufficient flexibility is available to maximise usage of cheap renewable electricity.

because of constraints on the grid network. It is, therefore, reasonable that network companies should issue system users with access rights which include protection against high prices or other adverse consequences.

For small-scale users it is likely that those access rights will be intermediated. It is also likely that consumer protection would need to change significantly and to play an increasingly important role to respond to the changing nature of vulnerability. For example, users with less access to smart technologies may be more exposed to spikes in prices if no protections or investment support for them is put in place and cybersecurity and personal data protection will also increase in priority.

This long-term vision for market design is necessarily high-level and could not be implemented for many years. It illustrates why it is inappropriate for the REMA project to attempt to identify and implement an enduring market design solution, and why instead it should focus on kicking-off a process of ongoing change.

Process for change

Markets embody the interface between system users and system operators. They must meet the needs of both – making it easy for users to get the products and services they need whilst allowing system operators to leverage the power of digital technologies to ensure a more efficient dispatch of resources in an increasingly decentralised context.

A degree of arbitration will be required between these stakeholder groups. System users and their agents will not be able to have their ideal solution immediately and system operators will be required to change operational practises, a process they may resist. A 'market operator' will be required to undertake this arbitration role and decide what changes should be implemented. This market operator must have clear obligations to support delivery of decarbonisation targets and to act in the interests of consumers, current and future. It must also be technically fluent in digital system architecture and opportunities[3]. The market operator will provide a platform for system operators and users to engage and inform the need for market reforms.

[3] It is this latter requirement that means that Ofgem might not be ideally positioned to fulfil this role.

The change required is substantial. The change process must be far more rapid and flexible than the one we have today if it is to support the speedy entry and roll-out of innovative propositions and technologies.

Initial steps

It is difficult to deliver more efficient system operation and improved services for consumers through changes to market design alone. The two key initial priorities should be:

> Digitalise the grid and electrical devices.

> Create the right institutional framework, including clear responsibilities for system operation and planning at transmission and distribution level, and a market operator function with governance arrangements to drive market reforms that supports innovation and the roll-out of new business models.

This assumes that everything possible is being done to improve the underlying efficiency of electrical consumption which should always be the highest priority action. It is critical to support large-scale improvement of the energy efficiency of the building stock alongside continuous improvement is standards for electrical appliances.

The market design priorities are:

> Design efficient investment support mechanisms to drive the significant infrastructure deployments that will be required, including those required to improve efficient and flexible consumption such as the roll-out of digital infrastructure and associated data and interoperability requirements.

> Ensure electricity costs are allocated fairly and sustainably given high gas prices.

The first of these issues highlights the secondary importance of market design compared to institutional and governance arrangements. There is now significant evidence to show that investment costs can be considerably reduced through well-designed support mechanisms. Much of the benefit arises through allocating the support via competitive mechanisms. It is also important to retain a degree of exposure to market prices to ensure incentives for operational efficiency. However, these 'market design benefits' will be dwarfed by wasted costs if the assets supported are not those that are needed to ensure a least-cost pathway to a decarbonised energy system. This requires a robust, independent, science-based process to identify infrastructure needs coupled with a system

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architecture that ensures this infrastructure is deployed at least overall system cost. The second issue is addressed in the next section.

Focus on marginal pricing

The issue of marginal pricing has recently been the subject of much debate. Gas power stations are required to meet demand for most of the time and, therefore, high gas prices have resulted in correspondingly higher electricity prices. This is despite the large volumes of electricity provided by cheap renewables and nuclear whose costs have not changed. Many commentators have argued that this does not make sense and consumers should not have to pay for all electricity as if it had been produced by gas. In other words, they have argued that markets should not be based on the principle of marginal pricing.

Marginal pricing delivers two outcomes that are vital for the efficient operation of the electricity system. The first is that it ensures the cheapest assets operate and the second is that consumers do not have to consume at prices higher than they are prepared to pay. Any deviation from these will create costs that will ultimately manifest in higher consumer bills. Indeed, it is difficult to imagine how else a system depending on significant demand flexibility (as will soon be the case in the UK) could function[4]. Therefore, marginal pricing should remain as a central tenant of the long-term market design.

However, it is of paramount importance that electricity bills are fair and sustainable. At current gas prices this is not the case and consumers should be insulated from high electricity costs. There are many ways that this can be achieved. However, it is important that the solution adopted achieves two outcomes:

> The market should return to clearing at marginal prices as soon as the impact of gas prices on electricity costs reduces to acceptable levels, either due to a reduction in gas volumes or prices.

> Consumers must be helped to consume efficiently through accelerated deployment measures to improve the building 'envelop' and provide the capability for smart energy usage.

[4] It is possible to envisage a situation when demand is disconnected based on a pre-determined set of rules, but such an administered approach does not sit well with a vision of a dynamic, digitally enabled market economy.

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Focus on locational pricing

National Grid ESO has identified that dispatching assets based on national prices has become far removed from the actual dispatch required to physically match supply and demand. The costs involved in 're-dispatching' are already significant and are likely to increase. It has therefore recommended moving to a situation in which prices are set at each point on the system – so-called 'nodal pricing'. Many system users have expressed concern at this proposal, worried about increased price volatility affecting investment incentives and creating a 'postcode lottery' for energy consumers.

It is important to consider three separate issues.

> System operators at both transmission and distribution levels must seek to ensure efficient use of resources. This cannot be delivered in a decentralised and digitalised energy system without understanding marginal prices at a much more granular level – ultimately at every point in space and time. The market should, therefore, move to more geographically specific pricing.

> Investments in energy infrastructure, especially networks, should be located to minimise overall system costs. An improved understanding of prices at different locations will help inform the system value of investments. However, this does not mean that investment returns should be exposed to increased volatility. Well-designed support mechanisms should be applied that take account of any moves towards locational prices.

> Consumers should be protected from excessive prices regardless of whether this arises from high gas prices or an inability to access cheap renewable electricity due to network constraints. Ultimately, costs will only escalate in a decarbonised power system where there are tight grid constraints. Therefore, it may be appropriate at this stage for network companies to provide protection for consumers against high prices through the terms of their connection agreements. In the meantime, measures introduced to protect consumers from high gas price impacts can continue to be applied to locationally derived prices.