DECENTRALISED RELIABILITY OPTIONS - SECURING ENERGY MARKETS

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SECURING ENERGY MARKETS

Energy markets are being challenged

Energy markets are being challenged by new uncertainties

Reliability of our electricity supply is of vital importance to modern society. In the decades since liberalisation, most European markets have relied on market incentives – to some extent – to keep the lights on, although generally starting from a situation with wide reserve margins and – at times – using out-of-market tactics to smooth the path.

The established cycle of investing in new baseload capacity and using older low-merit plants for peaking operation and reserve appeared sustainable, in a world of steadily growing demand. Prices were generally expected to return to long run marginal costs and reward investment, despite weak supporting evidence. The main commercial risk related to market price (for electricity, fuel and latterly CO_2). Price risk was hedged through forward contracts spanning a few years or vertical integration against a retail portfolio, while more risk-averse investors sought long term power purchase agreements.

Hundreds of new power plants have been built around the world under these conditions. What has changed?

The theory behind an energy-only market is straightforward. Capacity is needed until the point where its marginal cost[1] equals its marginal value[2] (i.e. of avoiding capacity shortage). Any market intervention to limit the hours of scarcity or the level of pricing in these hours will lead to 'missing money'; i.e. a situation where systematically, the market arrangements fail to reward adequate investment to meet the desired security standard.

In Europe, a sustained reduction in demand due to energy efficiency and the prolonged impact of the financial crisis has been coupled with a sharp increase in weather variable renewable generation – principally wind and solar. These new technologies make a greater contribution to energy delivery (MWh) than to peak demand (MW). Any new build generation can no longer expect to achieve baseload operation, and is heavily reliant on capturing peak (scarcity) prices. Meanwhile, the number of peak hours diminishes, as the variable renewable generation covers some (but not all) of the demand peaks. For new plants to recover investment costs from fewer peak hours, the prices in these hours would have to be far higher than previously encountered.

Increased price risk is compounded by **volume risk**. The output of most generation will depend on patterns of wind and solar generation. However, the standard market contracts – for firm patterns of delivered energy – do not give market participants appropriate tools to hedge their risk through forward contracting. Such a combination of price and volume risk is dealt with in other commodity markets by trading options, but options are not widespread in European energy markets. Irrespective of whether they face 'missing money', European energy markets appear to have 'missing contracts'.

For most European markets, Day-Ahead markets have become the predominant source of spot pricing and dispatch patterns, with intraday trading and redispatch at low levels. As variable renewable generation grows its market share, its contribution to forecast error will grow sharply. For thermal generators, this means that, in addition to lower output levels, the timing of production will become more unpredictable, based on short term weather patterns. This uncertainty continues even close to delivery time as the weather forecast changes. Such variations are expected to be met by flexible capacity,

able to respond to such fluctuations at short notice as the forecasts and market prices change within day.

Are national solutions the answer?

Market participants and the financial community across Europe are now questioning whether reliance on infrequent scarcity pricing is a credible basis for investment. Concerns about brown-out risks and a threat to security of supply are raised, and increasingly policy makers believe in a need for a separate mechanism to reward capacity. Capacity Remuneration Mechanisms ('CRMs'), once a feature only of the countries at the edges of Europe, are now in process or under serious debate in the largest European electricity markets, including GB, France, and Germany, as well as the more established capacity markets in Spain, Italy and Ireland.

There is widespread discussion on whether any 'missing money' is inevitable, or due to avoidable market distortions; e.g. limits on the formation of scarcity prices, or interventions which prevent scarcity from occurring. Such distortions exist in many markets, and are generally intended to protect consumers. Consumer protection is an essential part of a reliability options scheme.

Many CRMs under consideration in European markets are national, different in design from neighbouring countries and with no arrangements yet in place[3] for cross-border participation. Yet this outbreak of national markets takes place in the face of strong agreement by virtually all stakeholders to complete the European Internal Market for Electricity effectively.

Reward capacity or the right type of capacity?

Nearly all the CRM schemes under construction fail to recognise the additional value that flexible capacity brings to the system, treating all available capacity alike. Focus of CRMs has traditionally been on generation adequacy, meaning ensuring that sufficient capacity is on the system to meet peak demand.

In order to incentivise the right type of capacity markets in a world with increasing levels of weather variable generation, CRMs will need to be able to cope with emergent system performance requirements, and in particular should consider flexibility as one of the parameters of their design.

Nationally based Capacity Remuneration Mechanisms can distort their markets

The EC has designed a Target Model[4] to govern cross-border trading of electricity. It includes a coordinated process to determine price areas[5] and allocate forward capacity rights for interconnection, with any unused physical capacity being released to the day-ahead market[6] under 'use-it-or-sell-it' rules. All areas are to be coupled in a single pan-European Day-Ahead market. There will be a coordinated continuous intraday market until close to real time, with cross-border trading permitted as long as unused interconnector capacity remains. All participants should face balancing responsibility, with organised markets for energy balancing which determine imbalance prices. The heart of the concept is cross-border trading in which market prices alone determine the flow of energy.

Progress towards the Target Model is underway but key components are already in place. Day-ahead market coupling is now active in most parts of the EU[7], and intraday and balancing markets are progressing slowly.

However, national CRMs will challenge the effectiveness of the Internal Market for Electricity. The Target Model sets Day-Ahead electricity prices as the governor of trade flows, but most designs of CRM risk distorting these prices at critical times. Instead of scarcity prices, most CRMs are intended to provide a supplementary revenue stream to reward capacity. To date, cross-border participation has not been implemented in any of the national CRMs under design and there has not been an attempt to create a regional CRM.

European organisations are aware of the threat which the uncoordinated development of CRMs brings to the Internal Market for Electricity. ACER and ENTSO-E have each published their own analysis, noting the potential risk of market distortions arising from national CRMs.

The EC has produced a Staff Working Document[8] and has imposed revised State Aid Guidelines[9] to cover capacity adequacy mechanisms. These documents set out a number of criteria intended to limit the potential negative impact that a national CRM would have on the Internal Market for Electricity.

A coordinated approach to CRMs could be highly beneficial

If security of supply is threatened, national political intervention is inevitable, with the threat that existing investments are undermined. Electricity markets need to move to a sustainable model for investment with less reliance on policy and regulatory decisions. Not all European markets are considered to need a specific CRM but others are certain to proceed. The EU needs to find a blueprint for a CRM which permits national governments to take action to protect electricity reliability without counteracting the internal market or causing distortions to trade at national borders.

In this paper we consider some of the underlying of features of existing and proposed CRMs and offer a new model – **decentralised reliability options** – for consideration as a potential basis for a European RM blueprint. Decentralised reliability options would permit a wide degree of freedom to implement designs which meet national needs, without causing significant distortions between markets, while allowing a transition to a ‘smarter’ future where customers can determine their chosen level of reliability with reduced administrative input.

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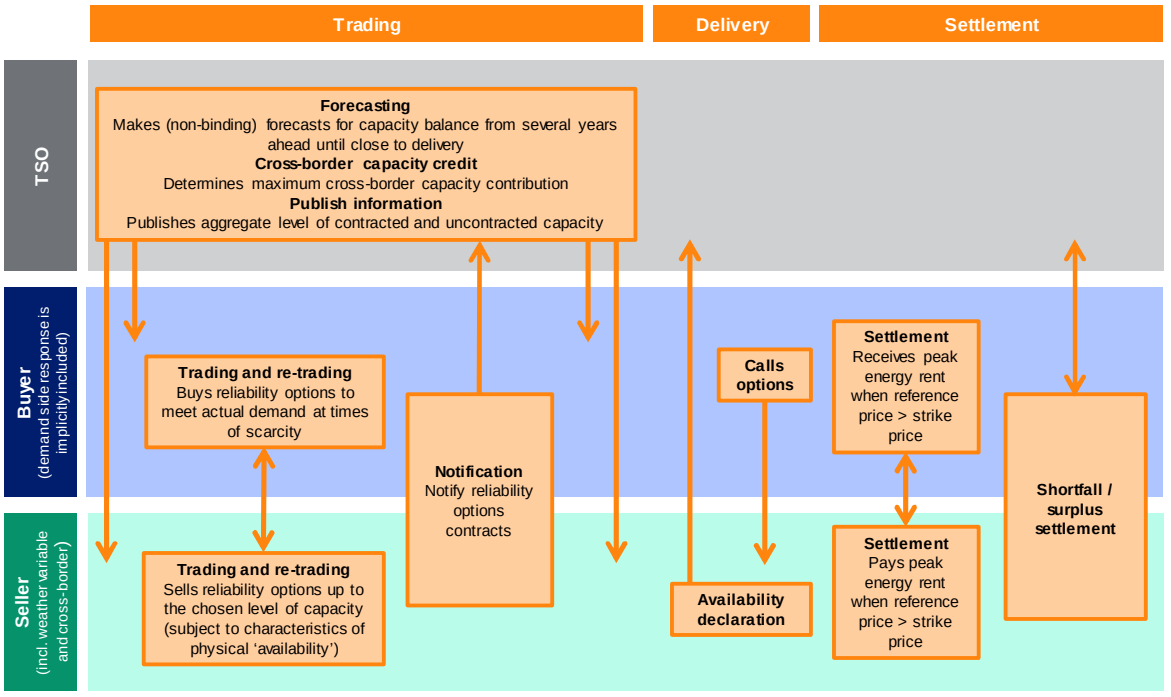
Decentralised reliability options – How do they work?

Capacity schemes take various forms, often categorised into 'targeted' (paying specific types of capacity) or 'broad' (paying market-wide); and price-based (prices are centrally determined and paid to all) or quantity-based (prices arrived at through competition between providers). A decentralised reliability option scheme is a market-wide, quantity-based scheme.

At its simplest, a decentralised reliability option scheme introduces a set of contracts between capacity providers and (indirectly) consumers. Retailers are required to buy reliability options to meet their demand at critical times. Sellers of reliability options commit their availability at critical periods and forego revenue from price spikes, in return for which they receive a stable revenue stream.

The contracts are a hybrid between a call option (which is essentially commercial) and a physical commitment to make capacity available to the system at key times. The call option introduces a financial settlement (aside from the physical commitment and penalty arrangements), whereby the seller of the option returns the difference between the reference market price and the strike price, if any, to the buyer[10]. Customers benefit from security of supply to an agreed standard, and their exposure to scarcity pricing is reduced in return for an up-front fee.

Figure 1 – Straw man design of decentralised reliability options scheme



Although many details of the scheme could be altered to suit local circumstances, a straw man design for a decentralised reliability options scheme is presented in Figure 1 and may be summarised as follows:

- The TSO makes available forecasts and information on its view of the capacity balance from several years ahead until close to delivery, in order to aid transparency and price discovery:

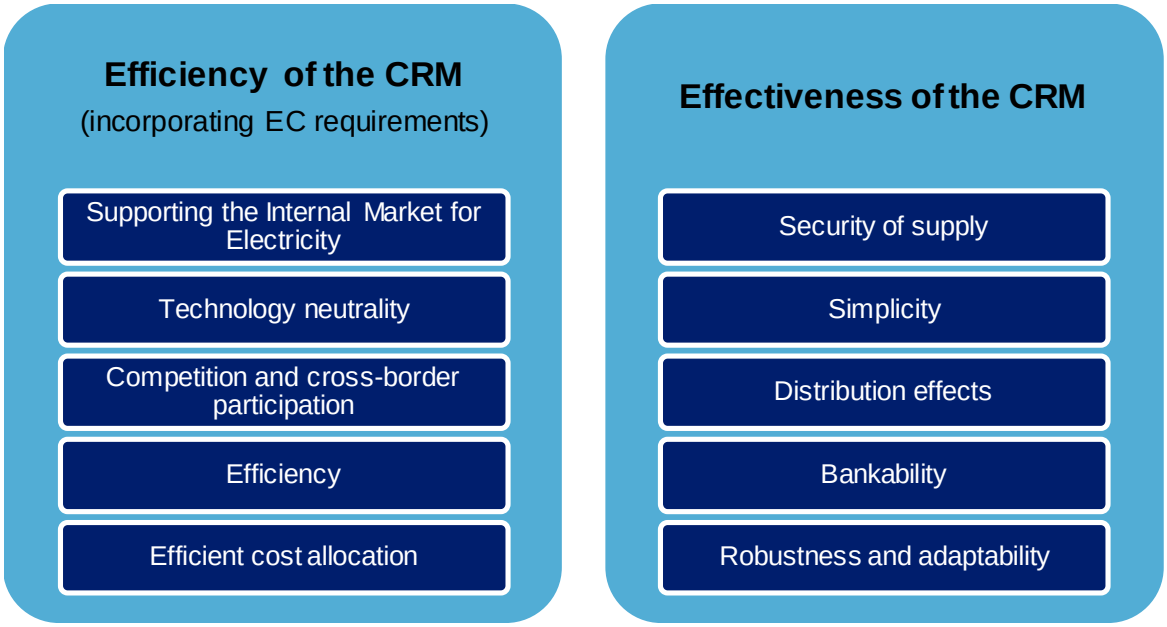
  - these are forecasts and do not define obligations for buyers or sellers of reliability options;
  - however, the maximum contribution of interconnected capacity is determined by the relevant TSOs.
- Energy retailers[11] are required to buy reliability options adequate to meet their actual demand at times of scarcity:
  - retailers may choose the level of capacity to buy, at their own risk;
  - this structure ensures that demand side response is implicitly included in the scheme, to the extent that the actual demand would be reduced at times of scarcity.
- Capacity providers[12] (including weather variable providers) may sell reliability options based on their actual contribution to system capacity at times of scarcity:
  - providers may choose the level of reliable capacity to sell, at their own risk;
  - to measure their contribution, capacity providers are committed to meet pre-agreed characteristics relating to physical 'availability' of the contracted capacity.
- Administered penalties are applied at critical periods for under-procurement by energy retailers or under-performance by capacity providers:
  - to facilitate this, reliability option contracts must be notified to a central agency;
  - contract notifications are permitted after the event, to allow capacity shortages and surpluses to be resolved by market participants.
- Aside from the physical commitment and its associated penalties, a reliability option includes a call option held by the buyer, with an agreed spot (reference) market and expiry time, an agreed strike price and other terms (e.g. contract duration). In exchange for an upfront payment (option fee):
  - option holders are hedged against price spikes (above the strike price) in the reference market; and
  - option sellers forego market revenue from such price spikes.
- A decentralised reliability option market permits buyers and sellers to agree their own contract details; notably the expiry time and reference market, as well as the contract duration, strike price and the time when they conduct the trade:
  - an upper limit would be set centrally for the option strike price;
  - due to the importance of Day-Ahead markets, we expect that many reliability options would take the form of a financial option settled against the Day-Ahead market; but options may also be struck for physical settlement intraday, or financially against a balancing or imbalance price;
  - by agreement, strike prices may either be fixed or indexed (e.g. to some fuel or price indicator or even to the Day-Ahead price);
- Cross border participation would be possible by capacity providers, subject to:
  - securing the agreement of the interconnector operator for the use of the capacity (whether through purchase of a forward transmission right or other agreement);
  - eligible capacity to be limited to the TSOs' estimates of the capacity contribution of the interconnector(s) at times of scarcity.

Decentralised reliability options – Why?

CRMs should meet policy and commercial goals

In order to assess the merits of decentralised reliability options, we have drawn up a set of evaluation criteria. Market design assessments are by definition subjective, but we have selected a set of issues designed to test the differences between schemes. Ultimately these relate to the often repeated objectives of achieving a "secure, affordable and sustainable energy market"[13.] The EC has put in place State Aid guidelines covering capacity adequacy mechanisms[14] which have legal force from 2014 to 2020. The requirements may be summarised as dealing with the **efficiency** of any scheme (which is related to the underlying objective of affordability), within the context of the Internal Market for Electricity. As well as a scheme being efficient, it needs to be **effective** in delivering the objective of security**.** We consider that the role of a CRM is not to promote environmental sustainability directly but rather to ensure that capacity is built to to meet demand amidst a changing generation mix. From these high level principles we have created a set of evaluation criteria, as presented in Figure 2, against which to compare designs of CRM.

Figure 2 – Evaluation criteria for assessing different CRM designs



Different scheme designs fit different circumstances, but the design of decentralised reliability options is intended to be a market-wide, quantity-based scheme and in this paper we have chosen to evaluate it against similar designs. We have made two comparisons; a capacity ticket (e.g. a capacity auction or capacity obligation) against a reliability option, and a centralised against a decentralised scheme.

Reliability options deliver security of supply, protect consumers and can help avoid energy price distortions

Most market-wide CRMs are intended to supplement 'missing money' without addressing the underlying causes which limit or prevent scarcity prices. These limits – where they exist – are generally measures to protect consumers from price shocks or poor reliability.

A reliability option is a hybrid between a physical commitment and a commercial option. The physical commitment is intended to deliver security of supply. It creates a supplementary revenue stream to deliver missing money (as for other market-wide CRMs), but the inclusion of the commercial option has an important influence:

- customers are protected from scarcity prices in the spot market; and
- spot price volatility can be hedged by the seller through the sale of the option in a "fixed-for-floating" swap of revenues, lowering the risks (and cost of capital) for investment in capacity.

These two effects mean that a reliability option scheme can reduce missing money from the energy market both indirectly and directly. Reliability options put in place the customer protection which permits the regulators to remove any underlying distortions to energy price formation. If this is done, price volatility will reveal the value of demand side management, interconnection and intraday flexibility.

As a result, the reliance on the physical commitment could be made transitional, leading to an improved version of the energy-only market in which investment risks could be managed through sale of a combination of forward sales of call options and fixed volume energy contracts.

From a consumer perspective, reliability options remove any incentive for generators to exercise market power over periods of scarcity and offer a hedge to consumers through direct compensation over periods of short-term price spikes. Capacity tickets, on the other hand, present the risk of overcompensation for generators at the expense of consumers as, in the absence of regulatory measures to limit price spikes, generators may attempt to exercise market power over periods of scarcity in addition to receiving the upfront capacity payment.

On the other hand, reliability options present a more complex solution when compared to capacity tickets and may perceived as 'riskier' by investors as both a penalty and a commercial incentive for performance are in place.

Ultimately, the benefits of avoiding distortion of competition and trade, protecting consumers and better facilitating innovative technologies may outweigh the downsides of a reliability options scheme.

Table 1 shows the appraisal of capacity tickets against reliability options.

Table 1 – Comparison between capacity tickets and reliability options

EC key CRM features	Criteria	Capacity tickets	Reliability options	Comment
	Security of supply	✓	✓	ROs provide for stronger incentives for capacity providers to perform as both a penalty and a commercial incentive exist
Competition and trade / Cross-border participation	Internal Market for Electricity	✓	✓✓	Capacity tickets risk damaging the underlying energy price signals at times of scarcity, limiting effectiveness of demand side and interconnection. ROs allow for the removal of regulatory interventions, which could result in energy market price distortions, while protecting consumers. Both options could provide for cross-border participation
Technology neutrality and decarbonisation	Technology neutrality	✓	✓✓	ROs protect the underlying energy price signals and avoid price distortions, better facilitating DSR. ROs are more easily adapted to appropriately reward flexible capacity
Competition and trade	Competition	✓	✓	Both schemes allow for competition within the scheme. ROs, however, better facilitate competition in the energy market through limiting energy price distortions over scarcity periods
Competition and trade / Time-bound intervention	Efficiency	✓	✓✓	ROs have the potential to deliver a more efficient outcome in terms of capacity on the system by allowing option contracts with different parameters (strike price, duration and expiry time). ROs protect consumers, making explicit regulatory set price caps redundant
Allocation of costs	Efficient cost allocation	✓	✓	Both schemes aim at targeting costs associated with funding capacity contracts over periods of scarcity and in proportion to the consumers contribution to demand over peak periods
	Simplicity	✓	✗	ROs are more complex than tickets as option settlement has to be considered
	Distributional effects	✗	✓	With capacity tickets there is a risk of overcompensation towards generators (paid by consumers), limited in the RO scheme as there is direct compensation for short-term price spikes
	Bankability	✓✓	✓	In both schemes, penalties should be strong enough to incentivise performance but should also be manageable. The presence of both a penalty and a commercial incentive under ROs may present additional risk for investors
	Robustness and adaptability	✓	✓✓	Both schemes require regulatory intervention and centrally determined parameterisation. ROs provide for flexibility to be adapted to reward capability more appropriately and can more easily be adapted to meet national needs.

Decentralising reliability options promotes 'active' role for market participants and allow for the value of different types of capacity to be revealed

The underlying intent of a decentralised CRM (whether for capacity tickets or reliability options) is to minimise the importance of central decisions and design parameters, and thereby reduce regulatory risk. Gains can potentially be realised from a decentralised approach in setting the capacity requirement and the terms of procurement.

A centralised approach can accommodate the introduction of long-term contracts for new generating units, providing for greater investment certainty and resulting in a lower cost of capital. However, a central agency is more likely to over-procure capacity when compared to market participants, meaning that security of supply is better guaranteed, but that the outcome may be less efficient (with the associated cost borne by customers).

In terms of competition, a centralised platform for selling capacity means there is a common route to the market for all capacity providers, and a simpler product design promotes liquidity. A decentralised approach, on the other hand, adds complexity, and challenges liquidity as the number of products traded increases.

The decentralised model places greater responsibility on market participants and allows them to better optimise their own portfolios. Demand side response is implicitly included whether it participates directly in the scheme or not.

Decentralised reliability options have further advantages over a centralised reliability option scheme. The use of reliability options tends to fit with centralised energy markets, with a 'spot' price which represents the value of energy.

However, under the European Target Model, with Day-Ahead, continuous intraday trading and balancing energy markets, there is no single 'spot' price. The most convenient reference market for a centralised reliability option would be the Day-Ahead market, which will generally have good liquidity. However, the Day-Ahead market is too early for real scarcity to be revealed, and the use of Day-Ahead as the sole choice of reference price would mean that the reliability option does not distinguish between flexible and less flexible capacity. This seems to lose one of the advantages of trading capacity in the form of an option.

The principal advantage of decentralised reliability options is that the options can be struck against different markets, including intraday and imbalance. Therefore, investments in flexibility will also benefit from being able to lock in fixed revenue streams, as well as investments in capacity. Participants may also choose the timing and duration of their contracts and the level of the strike prices contracted, making the trading of reliability options a part of the portfolio of traded products. This freedom will allow value to be revealed for different types of capacity, while allowing the value to adapt to changing system requirements.

Overall, it can be argued that centralised reliability options naturally fit better with more centralised energy trading arrangements, whereas decentralised reliability options are more in line with most European electricity markets, which value bilateral trading and place greater responsibility on market participants.

Table 2 shows our appraisal of centralised against decentralised reliability options.

Table 2 – Comparison between centralised and decentralised reliability options

EC key CRM features	Criteria	Centralised	Decentralised	Comment
	Security of supply	✓✓	✓	A central agency is more likely to over-procure capacity, thus providing for greater security of supply, which may however mean overcapacity and a less efficient outcome, in contrast to a decentralised approach.
Competition and trade / Cross-border participation	Internal Market for Electricity	✓	✓✓	A decentralised approach is more in line with the thinking of the EU Target Model of placing increased responsibility on market participants, whilst allowing them to hedge their position through traded instruments
Technology neutrality and decarbonisation	Technology neutrality	✓	✓✓	A decentralised approach may prove better at facilitating demand side response as retailers have better information regarding their customers' demand elasticity
Competition and trade	Competition	✓✓	✓✓	Centralised procurement provides common route to market for all capacity providers and a simpler product design promotes liquidity. Demand side response is implicitly included (and better facilitated) with a decentralised approach
Competition and trade / Time-bound intervention	Efficiency	✓	✓✓	Decentralised procurement allowing different strike prices, contract duration and expiry of options should allocate resources more efficiently and more appropriately reward capacity for its value to the system
Allocation of costs	Efficient cost allocation	✓	✓	Both options aim at targeting costs associated with funding capacity contracts over periods of scarcity and in proportion to the consumers contribution to demand over peak periods
	Simplicity	✓	✗	(Potential) additional complexity in decentralised option as there may be a variety of contract types
	Distributional effects	✓	✓✓	In a decentralised environment, assuming the development of more than one product, capacity will be rewarded for its real value to market participants and by extension to the system
	Bankability	✓✓	✓	Longer term signals to investors with centralised procurement. More difficult to impose long term obligations on retailers in a decentralised option. However, regulatory risk increases in a centralised scheme due to the importance of centrally determined parameters
	Robustness and adaptability	✗	✓	Decentralised procurement provides for a more flexible framework, able to adapt to evolving market conditions

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Decentralised reliability options – Way forward

We have outlined a straw man design for decentralised reliability options, building on the centralised schemes which have been implemented elsewhere. We have adapted the design to the circumstances in EU electricity markets; with continuous traded markets, growing needs for flexibility, and increasing shares of non-conventional capacity. Crucially, **decentralised reliability options meet the EC's stated requirements** under the State Aid guidelines (which ultimately require efficient operation in the context of the Internal Market for Electricity), while also delivering capacity effectively.

By decentralising the design, the arrangements place less reliance on administrative and policy decisions (with the regulatory risk that this brings), and greater reliance on the decisions of market actors, more in line with the spirit of the EU's Target Model for electricity trading.

Capacity gives an option to deliver energy. By basing the scheme around the pricing of options, the scheme reflects the underlying economics of different types of capacity. As markets change, the value of flexibility inherent in the options will change without the need for clumsy regulatory intervention.

Reliability options are a hybrid, containing commercial and physical (administered) obligations. This hybrid nature is a strength. It makes the scheme suitable for markets with different degrees of sophistication, and allows a transition towards more market based arrangements; moving away from reliance on the physical commitments and penalties, towards reliance on the commercial incentives which are more consistent with the operation of the underlying energy markets.

The underlying principle of decentralisation is that market actors will use innovative means to deliver the necessary level of system reliability, whereas a centralised system will tend to act conservatively and underwrite overcapacity at the expense of consumers. Demand-side response is fully facilitated (both implicitly and explicitly) – a crucial step towards a mature energy market with a fully active demand-side.

In the initial design, an appropriate set of penalties is required to ensure that the market actors meet their obligations, but there is scope to vary the design to strengthen the physical commitment if it is deemed necessary. In time the penalties may be lifted and the commercial incentives, which are inherently part of the option contracts, may suffice for delivering the required amount of reliable capacity.

To underpin these proposals, it is essential that any other distorting features of the electricity markets are removed, in particular balance responsibility for all participants, marginal pricing for balancing energy and imbalance, effective intraday markets and the relaxation of controls or TSO policies which constrain the ability of the market to reveal scarcity. In a further phase of development, the markets would be strengthened by the use of shorter settlement periods and gate closure, by moving the 'main' traded market closer to real-time and by improving the performance of intraday markets.

Ultimately, this blueprint can be applied to all European countries (or regional markets) or just a subset of these. It creates a framework where different countries (or regional markets) can adopt this blueprint or continue with an energy-only market without distorting trade and competition in the underlying energy markets.

Endnotes

1 In principle, under an 'energy-only' market, prices are expected to follow short-run marginal production costs at most times, but when the capacity margin becomes tight, the prices should also reflect the possibility of scarcity. In the short term, these scarcity prices provide incentives for imports from neighbouring areas and for reduction in price-sensitive demand. Over the long term the returns should balance the marginal cost of capacity with its marginal value. In this context, the marginal cost of capacity includes amortised investment cost (net of other revenue), converted to a cost per MWh of delivered energy. The key unknown is the number of hours in which the marginal capacity is needed.

2 Ideally, the marginal value would be defined by price-responsive customers, but in practice most demand does not face spot prices, and electricity markets generally use a deemed 'value of lost load' and an administrative process for disconnections at times of scarcity.

3 DECC has confirmed that in the next GB capacity auction to be held later in 2015, interconnectors will be eligible for one year contracts.

4 The Target Model is a combination of (to be) legally binding Codes on Forward markets, Capacity Allocation Congestion Management and Balancing. In addition to the Target Model, the vision of the Internal Market for Electricity is being built through the creation of ACER and ENTSO-E, with their specific obligations on cross-border network coordination, planning and pricing; and a series of additional Codes (under development) which improve coordination in planning and operational timescales.

5 Price areas are intended to reflect network congestion (subject to national approval) and the areas may join or subdivide countries. For convenience we will use the terms "cross-border" and "interconnector" to denote the price areas and the network capacity between them.

6 Physical forward capacity rights give the holder an option to nominate a physical flow between the two price areas. If the right is not exercised, the capacity is allocated to the day-ahead market and the holder receives payment for the use of the capacity based on the price differential (if any) between the two areas.

7 At the time of writing (January 2015), day-ahead electricity market coupling is in place across 17 countries, with Italy and Slovenia expected to join shortly. There is a separate Czech-Slovak-Hungarian-Romania market coupling process and another for Italy-Slovenia, with plans for continued integration.

8 Generation Adequacy in the internal electricity market – guidance on public interventions; Commission Staff Working Document; 2013

9 Guidelines on State Aid For Environmental Protection And Energy 2014-2020; European Commission; 286.2014

10 Decentralised reliability options may also be settled physically, in which case the holder of the option may choose to exercise the option in the form of a notified energy trade.

11 Also, the obligation may extend to potentially large customers and distribution companies if they have to buy losses.

12 Capacity providers may potentially include generation, storage demand side providers and interconnected capacity.

13 These objectives are often repeated, and were set out (for example) in EC Communication 'Energy 2020 – A strategy for competitive, sustainable and secure energy' – ref COM(2010) 639, 10 November 2010.

14 The State Aid Guidelines are part of an initiative which "aims to create a framework for policies to support the shift towards a resource-efficient and low-carbon economy which helps to: (a) boost economic performance while reducing use of resources; (b) identify and create new opportunities for economic growth and greater innovation and boost the Union's competitiveness; (c) ensure security of supply of essential resources; (d) fight against climate change and limit the environmental impacts of the use resources.

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