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**REPORT FROM THE COMMISSION**

**Final Report of the Sector Inquiry on Capacity Mechanisms**

{SWD(2016) 385 final}

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## Final Report of the Sector Inquiry on Capacity Mechanisms

### 1. Introduction

Europe's Energy Union strategy aims to ensure secure, clean and affordable energy supplies to European consumers.<sup>1</sup> Despite important progress towards these objectives, security of electricity supply is a growing concern in an increasing number of Member States. To prevent possible electricity shortages, some Member States have, or plan to put in place, different types of capacity mechanisms. These mechanisms should remunerate electricity generators and other capacity providers, such as demand response operators, for being available in case of need.

Public support to capacity providers risks creating competitive distortions in the electricity market and in principle constitutes State aid. Capacity mechanisms often provide subsidies only for national capacity providers, ignoring the value of imports and distorting investment signals. This means many of the benefits of an open and well-connected Internal Energy Market are lost and costs for consumers increased. These mechanisms also sometimes favour certain technologies or market players without objective justification, or prevent competitive new entrants from becoming active on the electricity market. This distorts competition, risks jeopardising decarbonisation objectives and pushes up the price for security of supply. On 29 April 2015, the Commission therefore launched a State aid sector inquiry to gain insights into the need, design and market impacts of capacity mechanisms.

This Final Report presents the main findings of the inquiry, with further detail in the annexed report.<sup>2</sup> It provides insight into when capacity mechanisms involve State aid and how the Commission views capacity mechanisms in relation to State aid rules.<sup>34</sup> In applying these rules, the Commission aims to ensure that Member States introduce capacity mechanisms only when needed, and in such a way that the internal energy market is not carved up into national markets at the expense of consumers and potentially climate objectives.

During the sector inquiry, the Commission services focused on the electricity markets of eleven Member States that have already introduced, or plan to introduce, capacity mechanisms.<sup>5</sup> The Commission services gathered a large amount of information from Member States, energy regulators, associations and market operators, meetings and through two sets of questionnaires addressed to over 200 stakeholders. On 13 April 2016, the

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<sup>1</sup> Communication from the Commission, 'A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy', 25 February 2015, COM(2015)80.

<sup>2</sup> Commission Staff Working Document accompanying the Final Report of the Sector Inquiry on Capacity Mechanisms, 30 November 2016, SWD(2016)385.

<sup>3</sup> The Guidelines on State aid for environmental protection and energy 2014-2020 ('EEAG') (2014/C 200/01) include specific rules for assessing capacity mechanisms from a competition law perspective.

<sup>4</sup> Note that the conclusions of the sector inquiry are general findings that do not replace the need for a case-by-case assessment of any individual State aid measure.

<sup>5</sup> Belgium, Croatia, Denmark, France, Germany, Ireland, Italy, Poland, Portugal, Spain and Sweden.

Commission published an interim report on the sector inquiry for public consultation.<sup>6</sup> This Report takes account of the 114 replies received on the interim report.<sup>7</sup>

This Report, together with its annexes, is presented together with a package of legislative proposals, as part of the work to create an EU Energy Union with forward looking climate change policy. The package includes legislative proposals to improve the design and operation of EU electricity markets ('Market Design Initiative'), including proposals to improve national generation adequacy policies which build on the findings of the sector inquiry, which should over time reduce the need for capacity mechanisms to guarantee security of supply.<sup>8</sup>

## 2. Concerns about security of supply

### 2.1. *Is there a problem of security of electricity supply in the EU today?*

Since the beginning of the economic and financial crisis in 2008, electricity demand in the EU has decreased. The total installed generation capacity has, over the same period, continued to increase.<sup>9</sup> Capacity margins<sup>10</sup> have therefore widened<sup>11</sup>, and since 2010 price spikes in the electricity markets have become less frequent.<sup>12</sup> The sector inquiry has confirmed that capacity shortages where consumers were actually disconnected due to insufficient power generation have been extremely rare in the past five years.<sup>13</sup> In other words, the EU as a whole is currently in a situation of overcapacity.

However, the situation varies between Member States. Some Member States appear to face genuine security of supply challenges, of varying magnitudes and durations, and there are specific local security of supply issues affecting certain areas within some Member States. A considerable number of existing power plants will, moreover, be phased out in the coming years. Some power plants are approaching the end of their operational lifetimes, some cannot meet new environmental and emissions standards, while others will be phased out as a result of national energy policy choices (e.g. phasing out of nuclear energy in Germany).

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<sup>6</sup> C(2016) 2017 and SWD(2016)119.

<sup>7</sup> An overview of the responses of the public consultation is annexed to the report (Staff Working Document) accompanying this Communication.

<sup>8</sup> The package includes revisions of Regulations (EC) No. 713/2009 and 714/2009 as well as of Directive 2009/72/EC. The package furthermore includes a proposal for a new Regulation on risk-preparedness in the electricity sector repealing Directive 2005/89/EC.

<sup>9</sup> This divergence is mainly due to the implementation of investment decisions taken before the crisis started. Although total installed capacity increased to a different extent in each of the 11 Member States covered by the sector inquiry, it increased by more than 30% since 2000 in the EU as a whole.

<sup>10</sup> A capacity margin is typically calculated as the difference between installed capacity and peak (or average) demand. Installed capacity can be de-rated according to its expected availability to provide a better indication of the expected capacity margin.

<sup>11</sup> ENTSO-E has estimated that the margin between the amount of electricity needed at peak times and the electricity that can be produced with the available generation capacity is of 13% for the EU as a whole ("ENTSO-E: 2015 Scenario Outlook & Adequacy Forecast", available at [https://www.entsoe.eu/Documents/SDC%20documents/SOAF/150630\\_SOAF\\_2015\\_publication\\_wcover.pdf](https://www.entsoe.eu/Documents/SDC%20documents/SOAF/150630_SOAF_2015_publication_wcover.pdf)).

<sup>12</sup> Figures published by ACER show a decrease in the frequency of price spikes in EU electricity markets since 2010 (ACER Annual Report on the Results of Monitoring the Internal Electricity Market in 2015, available at: [http://www.acer.europa.eu/Official\\_documents/Acts\\_of\\_the\\_Agency/Publication/ACER%20Market%20Monitoring%20Report%202015%20-%20ELECTRICITY.pdf](http://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Publication/ACER%20Market%20Monitoring%20Report%202015%20-%20ELECTRICITY.pdf)).

<sup>13</sup> The only major exception was Poland, where a heat wave in August 2015 led to forced plant outages.

More generally, Europe's electricity sector is experiencing an unprecedented transition. Market liberalisation and efforts to reduce greenhouse gas emissions have profoundly changed the way in which electricity is generated, traded and consumed. Electricity generation from renewable energy sources is growing rapidly. This has resulted in lower wholesale electricity prices, but has also reduced the use of conventional generation technologies, such as coal and gas, because renewable energy generally has lower running costs. Declining demand, lower prices and lower utilisation rates have all reduced the profitability of conventional electricity generation. At the same time, flexible conventional technologies continue to play a very important role: the growing share of renewable energy sources like wind and solar energy,<sup>14</sup> the output of which varies with weather conditions and from daytime to nighttime, requires flexible energy systems, including reliable back-up capacity, that can take the form of conventional generation, demand-response or storage, to ensure security of supply at all times.

Member States are concerned that existing electricity generation capacity, plus expected investment in new capacity, may be insufficient to maintain security of supply in the future. If current low levels of profitability of traditional generation capacity only reflect current overcapacity, there may be little reason to worry about future capacity adequacy. If, however, low profitability is also the result of market or regulatory failures, incentives to invest may prove insufficient to maintain adequate levels of capacity in the medium and long-term.

## *2.2. Why investment may be insufficient to ensure secure supplies in the future*

Economic operators decide whether to maintain current capacity, or to invest in new capacity, on the basis of expected revenues.

To verify whether the markets analysed are able to trigger sufficient investment in capacity to meet future demand, the sector inquiry looked at whether there are regulatory and/or market failures which hinder investment. The inquiry did identify several market failures that might prevent electricity markets from generating enough investment to ensure security of supply. In particular, the sector inquiry concludes that, to work effectively, electricity markets depend on prices rising sufficiently during periods when supply is tight in relation to demand. Profits generated by high prices in these 'scarcity' periods are a critical incentive to invest, especially for flexible technologies that operate rarely and therefore need to recoup their investment costs during relatively few running hours.

In practice, several factors limit the ability of electricity markets to deliver high prices at times of scarcity. First, few individual electricity customers are able to respond to price variations in real time and to reduce their consumption during peak hours when prices are high. In the absence of price-responsive demand, rules put in place by national authorities to balance supply and demand often include low regulated price caps that do not reflect

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<sup>14</sup> Wind and solar represented 11% of the EU28 electricity production in 2014 (Eurostat), but in some Member States, they are responsible, during certain hours, for almost the entire generation and in other hours do not produce at all.

customers' willingness to pay for secure supplies and that therefore result in prices which do not reflect the actual value of additional resource adequacy.<sup>15</sup>

Second, even in the absence of explicit price caps, the rules for managing balancing markets, where electricity generation and demand must be matched in real time by network operators and the ultimate electricity price for each hour is set, in practice cap the price in forward markets.<sup>16</sup>

Third, a proper delineation of bidding zones<sup>17</sup> is crucial for ensuring the right locational signals for investment in generation and transmission. Where prices are set in a large bidding zone without accounting for the limitations of the transmission system, out-of-market 'redispatching' measures are required to turn off some generation and turn it on elsewhere (at extra cost) within the large zone to balance the grid. This out-of-market redispatching undermines investment signals and distorts electricity prices – creating hidden subsidies for some consumers and surcharges for others.<sup>18</sup> This price distortion undermines cross-border trade and reduces incentives to invest in more interconnection capacity between Member States. The sector inquiry has shown that the current configuration of bidding zones in the EU is creating significant problems for the operation and development of an efficient Internal Energy Market.

Finally, even where scarcity pricing is allowed, and bidding zones are appropriately delineated, market participants may still be hesitant to invest in new capacity due to considerable uncertainty about future market developments, such as the impact on their investment of the increasing market share of renewable energy and potentially extreme price volatility.

### **3. Reforming the electricity market**

The sector inquiry has identified a number of market reforms that may reduce concerns about security of supply or even remove the need for capacity mechanisms altogether. Member States should therefore implement these reforms before or while introducing a capacity mechanism.

Prices that reflect the true value of electricity can provide signals for new investment in the reliable and flexible capacity needed to deliver secure electricity supplies. Removing excessively low price caps, and instead allowing prices to rise to reflect consumers' willingness to pay, is therefore a key market reform. Balancing market rules should be

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<sup>15</sup> Efficient price caps should in principle reflect consumers' average willingness to pay for not being disconnected when scarcity arises, the so-called value of lost load (VOLL).

<sup>16</sup> For instance, penalties for imbalance at the moment of delivery can act as an implicit price cap in day-ahead and other forward markets if they are too low, because operators may prefer paying the penalty than paying high prices.

<sup>17</sup> Bidding zones are defined as uniform price areas i.e. where all demand and supply bids are settled at the same time and at the same price.

<sup>18</sup> For example, if there is too much demand and not enough generation in one area within a large bidding zone, and insufficient transmission connecting that area to the rest of the zone, then prices in that area will be too low compared to the actual costs of generating electricity for consumption in that area. For other isolated areas in the bidding zone where generation is plentiful compared to demand, prices will be too high. So consumers in one part of the bidding zone subsidise consumers in another, and market prices remain distorted so markets fail to send signals for investment in the right locations.

improved so that costs borne by network operators to keep the system in balance are fully reflected in the imbalance prices paid by market participants that are 'out of balance'.<sup>19</sup> All market participants should have the incentives and the opportunity to support system balance by making sure their actual metered electricity generation or consumption matches the electricity they have contracted to buy or sell in forward markets.<sup>20</sup>

Member States might be concerned that removing price caps, and higher peak wholesale prices, will affect retail prices. The sector inquiry has found that such risks can be managed by the market itself, for instance by introducing hedging products which allow suppliers and end consumers to protect themselves against price peaks, including over the longer term via long term hedging contracts.<sup>21</sup> Such longer term hedging can also help support a business case for investment by generators, by converting uncertain potential scarcity prices into a certain regular income stream. A further uptake of such hedging contracts should, therefore, be seen as a useful development that could help reduce the need for capacity mechanisms in the first place.

Moreover, regulatory authorities may be reluctant to allow wholesale prices to rise either for fear of abuse of market power or due to concerns that they will result in higher retail prices for households and industry. The risk of abuse of market power linked to more volatile prices can be mitigated – by broadening market participation and increasing competition, as well as by improving transparency, data availability and market monitoring.<sup>22</sup>

A second important market reform concerns the participation of demand response providers in the market. Increasing the responsiveness of demand to prices in real time is of crucial importance because it can flatten demand peaks and thus reduce the need for additional generation capacity. However, demand response providers still face important barriers to participation in the market and the legal framework is fragmented across the EU. In some markets, demand response providers are not allowed to participate, while in other markets the network tariff regime or the absence of technical rules make it unattractive or even impossible for consumers to become active.

Finally, the sector inquiry demonstrates that delineation of bidding zones should be examined and revisited so that appropriate local prices can form to stimulate investment in capacity in those places where it is lacking as well as in the transmission infrastructure needed to move electricity from producers to consumers.

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<sup>19</sup> Generators that generate less than promised, or retailers that use more energy than promised, contribute to total system imbalance and therefore have to pay imbalance prices. The Market Design Initiative proposals include certain exemptions from this general principle (see Article 4 of the proposed Electricity Regulation).

<sup>20</sup> Where the removal of price caps does not lead to the desired appearance of scarcity prices, some electricity market operators have introduced administrative scarcity pricing. This is a regulatory intervention where a predetermined price adder is applied automatically to the market price as the probability of unmet demand increases. In this way, as capacity margins tighten, electricity prices will be automatically set to a level that reflects the risk of scarcity providing strong incentives for market participants to generate (or reduce demand) when the system most needs electricity. Examples of administrative scarcity pricing are found in Texas and the UK 'reserve scarcity pricing function'. Ireland is introducing a similar system.

<sup>21</sup> Examples of hedging products can be found in Australia and have been introduced in Germany by EEX.

<sup>22</sup> Antitrust enforcement can also prevent anticompetitive behaviour, but should not be interpreted to be a barrier for the formation of high electricity prices *per se* where such prices represent the value of electricity at times of scarcity.

The Market Design Initiative contains proposals to address all these issues: the development of short term markets that respond to the need of more variable and less predictable increasing shares of wind and solar power, harmonised rules for the participation of demand response providers, standardisation of balancing products and rules for their provision across borders – further increasing competition in the balancing market and improvements to the process for defining bidding zones.

*Member States proposing capacity mechanisms should make appropriate efforts to address their resource adequacy concerns through market reforms. In other words, no capacity mechanism should be a substitute for market reforms.*

#### **4. When to implement a capacity mechanism?**

The market reforms described above can address many of the regulatory and market failures causing capacity shortages. Market reforms may however take time to be fully implemented, or may not be sufficient to fully address the underlying problem of adequate capacity. Some Member States therefore decide to take complementary measures in the form of capacity mechanisms.

While the designs of capacity mechanisms vary, they all offer capacity providers additional revenue through payments for making electricity capacity available. This remuneration is likely to involve State aid, which must be notified to the Commission for approval under EU State aid rules. The Commission is likely to consider a measure to be a capacity mechanism subject to State aid rules if i) the measure was initiated by and/or involves the government<sup>23</sup>, ii) its primary objective is to guarantee the security of electricity supply<sup>24</sup>, and iii) it provides capacity providers with remuneration in addition to the revenues, if any, they receive from selling electricity.

After notification of a measure, the Commission, on the basis of the Energy and Environmental Aid Guidelines, first assesses whether it is necessary to address a well-defined problem of security of supply that the market cannot solve by itself. Member States can demonstrate this by providing factual evidence that the market is unlikely to bring about the level of security of supply they deem appropriate – defined in relation to an economic reliability standard based on consumers' willingness to pay. This includes identifying the market failures that cause the problem, quantifying their likely impact on investment and system reliability, and estimating the size of the gap between the expected and the desired level of security of supply.

The adequacy assessments the Commission has reviewed so far generally provide a quantified analysis, but the sector inquiry shows that a lot of work remains to be done to ensure that the introduction of capacity mechanisms is based on an objective and thorough assessment of the

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<sup>23</sup> A pure ancillary service developed and operated autonomously by a TSO does not qualify as a capacity mechanism that is relevant from a State aid perspective.

<sup>24</sup> Where a government develops a renewable support scheme and grants subsidies to a wind farm operator, it is likely that the primary objective of the measure is the decarbonisation of the power sector. In this case, while the measure adds to available capacity in the market, it is not considered as a capacity mechanism and therefore will be assessed against the rules for support to renewables.

adequacy of the electricity system. In the case of insufficiently reliable adequacy assessments authorities may need to remedy adequacy problems in the short term which bears the risk of interventions that expensive, distortive and increase market uncertainty.

First, the approaches and practices to calculate resource adequacy vary widely between Member States. Since Member States use different methodologies, metrics and assumptions, and since these are not clearly communicated, it is difficult to ensure that the results are reliable and comparable. Respondents to the sector inquiry have made a strong case for making adequacy assessments more comparable, verifiable and objective. To address these concerns, the Commission's Market Design Initiative proposes to introduce a coordinated European resource adequacy assessment based on a harmonised method.

Second, there is substantial room for improvement as regards Member States' approaches towards reliability standards, i.e. the declared level of security of supply desired by the government. An economically efficient reliability standard is based on the value that electricity consumers place on security of supply. In other words, Member States should carry out a cost-benefit analysis to determine the extent to which it is useful to give incentives to market players to achieve a particular reliability standard. Many Member States do not, however, carry out such a cost-benefit analysis and do not measure the value that consumers attach to having uninterrupted electricity supplies. Several Member States that have introduced capacity mechanisms have not even defined a reliability standard. Where reliability standards do exist, they are often not taken into account when designing the capacity mechanism or setting its size.

At EU level, the European Network for Transmission System Operators ('ENTSO-E') is developing a probability-based methodology to assess the capacity adequacy situation throughout Europe. The Commission's Market Design Initiative proposes further improvements to the assessment and development of EU-wide methodologies for calculating economically coherent reliability standards which should form the basis of any decision to implement a capacity mechanism.<sup>25</sup> It also envisages that Member States applying capacity mechanisms introduce a reliability standard that is based on the value that consumers place on security of supply.

*A rigorous adequacy assessment, taking into account the regional adequacy situation and based on a well-defined economic reliability standard, is crucial for identifying risks to security of supply and determining the necessary size of any capacity mechanism.*

## **5. Fitting the solution to the problem**

Where appropriate market reforms have been implemented or are already planned, and a proper adequacy assessment has identified a residual regulatory or market failure, a capacity

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<sup>25</sup> It for example includes the obligation to take into account an economic assessment of the future profitability of the generation fleet (which could include assessing the impact of expected price development of the different fuels and the carbon price) the contribution of planned market reforms and the potential impact of increasing demand response and network investments.

mechanism may be appropriate to ensure secure electricity supplies for consumers. There are different types of capacity mechanisms, and some are more suitable than others to address different types of adequacy concerns.

### *5.1 Which types of capacity mechanism exist in Europe?*

The sector inquiry identified 35 capacity mechanisms in the eleven Member States it covered. These can be divided into 'targeted' and 'market-wide' mechanisms, both of which aim to ensure sufficient capacity to meet a reliability standard. Targeted mechanisms give support only to the extra capacity required on top of that provided by the market without subsidies, whereas market-wide mechanisms give support to all market participants required to meet the reliability standard. Such schemes can further be divided into 'volume-based' and 'price-based'. In the volume-based schemes, the total amount of capacity required is determined in advance and a market-based process is then used to establish the price to be paid. In the price-based schemes, a price is set administratively at a level calculated to achieve investment in the amount of capacity required.

The sector inquiry has identified three types of targeted mechanisms: strategic reserves, where a certain amount of capacity is held outside the market to be called upon in emergency situations; tenders for new capacity, where support is granted to new investment projects often located in a specific area; and price-based capacity payments, where administrative payments are made to a subset of capacity in the market.

The sector inquiry has also identified three types of market-wide mechanisms: central buyer models, where a central buyer purchases the capacity required on behalf of suppliers/consumers; decentral obligation schemes, where an obligation is placed on suppliers to make their own arrangements to contract the capacity they require; and price-based capacity payments, where an administrative payment is available to all market participants.

Finally, the sector inquiry has identified demand-response schemes, also known as interruptibility schemes, in six of the eleven Member States. These are targeted schemes that only remunerate demand response operators.

### *5.2 Which capacity mechanism for which problem?*

Depending on the type of capacity adequacy problem identified, different types of capacity mechanisms are likely to be appropriate. The main adequacy problems encountered in the sector inquiry can be categorised in four groups:

1. concerns about the long-term ability of the market to trigger sufficient investment
2. concerns of a temporary nature where the current market design fails to provide adequate investment signals, but where the market is expected to be effective in the longer term
3. concerns of a local nature (i.e. in a specific location within a Member State) that cannot be resolved quickly enough by investing in transmission or by better delineation of electricity bidding zones and
4. concerns that, without additional support, energy consumers will not play a sufficient role in managing electricity demand and security of supply.

### *Long-term adequacy concern*

Where long-term adequacy concerns are identified, the most appropriate capacity mechanism to address the problem, while limiting distortions to competition and trade, is likely to be a volume-based, market-wide scheme. Such a mechanism can exchange the potential revenues from uncertain periods of high prices at times of scarcity for a regular, guaranteed income stream. It can therefore increase investment certainty.

To ensure coherence between the market reforms necessary to ensure imports at the right times and the introduction of a capacity mechanism, a scheme based on 'reliability options' may be the best choice. In such a scheme, participants receive a certain, regular capacity revenue but forego the opportunity to make profits from high electricity scarcity prices.

### *Temporary adequacy concern*

Where adequacy assessments show and policy makers are convinced that in the long run the market can be reformed to ensure sufficient investment incentives and provided that there is sufficient capacity available to ensure security of supply until the markets deliver investments, long-term interventions are not necessary.<sup>26</sup> However, there might be a need to ensure that existing capacity is not closing prematurely.

In such circumstances a strategic reserve is likely to be the most appropriate response because it can help to control the amount of existing capacity leaving the market. Moreover, market distortions can be kept at a minimum if the reserve is kept as small as possible, is designed not to promote new generation capacity<sup>27</sup>, and is itself held outside the market to preserve market price signals and incentives for capacity to remain in the market. In order to ensure their temporary nature, strategic reserves should not require long term commitments (for instance one-year renewable contracts) or lead times. They should also build in, from the outset, a clear end date linked to planned market reforms which helps to preserve future investment signals.

### *Local adequacy concern*

Adequacy concerns of a local nature are in most cases best addressed by better connecting the local area with other areas with sufficient capacity. Where better connection is not possible (e.g. on remote islands) or too costly, the local shortage should be reflected in local electricity prices, as this gives an incentive to both investment in new capacity and energy savings by consumers. This requires a separate bidding zone for the local area.

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<sup>26</sup> Though a strategic reserve may also be used as a tool to fill a gap if necessary while a volume-based market wide capacity mechanism is introduced, and can be valuable to avoid a transitional period in the market-wide scheme where auction lead times are too short to ensure competition from new entrants.

<sup>27</sup> New generation capacity generally needs long term commitments in order to be able to compete with existing capacities. These long term commitments are unlikely to be compatible with the necessary temporary nature of a strategic reserve.

Where introducing a separate bidding zone is not possible either, for example because the deficit area is so small that there would be no competition and all capacity in the zone would need to be fully regulated, the introduction of a capacity mechanism may be appropriate. Where longer term adequacy concerns have been identified and a market-wide mechanism is being introduced, a market-wide mechanism can sometimes be tailored also to solve a local adequacy problem. For example, Italy is planning, and Ireland is considering, to create capacity price zones within a market-wide capacity mechanism to provide signals for local investment.

A more targeted measure may also be suitable to address a local adequacy concern. Certain forms of strategic reserve can be limited to a specific region only, as can a tender for new capacity. The size of these targeted mechanisms can be tailored to the identified capacity gap. The particular risk with tenders is, however, that the new capacity pushes existing capacity out of the market, and creates a situation where market players in future rely on tenders to invest in new capacity rather than reacting to market signals.

In conclusion, other than for very isolated systems where transmission is prohibitively expensive, new transmission infrastructure or structural reforms of the electricity markets reflecting locational constraints are likely to be the most suitable long-term solutions to local capacity concerns. Local capacity mechanisms may however be necessary tools while the required reforms are made.

#### *Concerns about the role of energy consumers*

The fourth concern is that demand from energy consumers will remain inflexible, although flexible demand is essential to cost-effectively balance an electricity market with increasingly volatile wholesale prices due to variable renewable energy production and the potential for high scarcity prices. This concern may lead a Member State to introduce an interruptibility scheme or to introduce specific rules to stimulate demand response within a volume-based market-wide scheme.

The Commission's initial assessment of the eight interruptibility schemes in operation in the 11 Member States suggests that these may be justified given their contribution to both short-term and long-term security of supply<sup>28</sup>. Demand response can provide useful tools for balancing the system in the short run, and in the long run a fully responsive demand side has the potential to eliminate the need for capacity mechanisms since it would enable consumers to pay for different levels of reliability. However, the appropriateness of interruptibility schemes – and therefore their compliance with EU State aid rules – depends crucially on how they are designed and how they actually function.

State aid rules normally require capacity mechanisms to be open to all technologies.<sup>29</sup> In the case of demand-response mechanisms however, the absence of competition between different

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<sup>28</sup> Note that such assessment within the sector inquiry cannot replace the need for individual assessment of any State aid measures, and this statement should not be interpreted to mean that schemes that have not yet been assessed and subject to a Decision of the Commission will be found compatible.

<sup>29</sup> Within the limits of climate change objectives as recognised in by the Energy and Environmental Aid Guidelines in paragraphs (220) and (233)(e).

resources may be justified. Where a demand response scheme allows for broad participation from large and small industries and from demand response aggregators, does not procure excessive capacity, is based on a competitive procurement, and is designed not to influence the formation of appropriate electricity scarcity prices, it can be an appropriate form of intervention. On the other hand, demand response schemes in which too much capacity is procured from only a subset of large industrial beneficiaries are unlikely to be approved under State aid rules. They risk subsidising energy intensive industries without providing corresponding value in terms of increased security of supply to other electricity consumers.

Best practice identified in the sector inquiry also shows that where specific support is available for demand response, the support should not be available indefinitely. The aim should be to support the development of demand response so that in the longer term it can compete in the market (or in a market wide capacity mechanism).

#### *Capacity payments generally unsuitable*

Finally, with respect to 'capacity payments', the sector inquiry shows that these mechanisms are unlikely to set the right price for capacity since they do not allow the market to competitively set the right capacity price, but rather depend on an “administrative” price. They are therefore unlikely to correctly reflect the actual scarcity situation. They imply a high risk of under- or over-procurement of capacity – especially as such schemes tend to react slowly to changing market circumstances. The general presumption is therefore that price-based mechanisms are unlikely to be an appropriate measure regardless of the specific concern identified.

#### *Choosing the type of capacity mechanism that suits the identified problem:*

- *For long-term risks, market wide capacity mechanisms are the most appropriate instruments – alongside market reforms to limit the role of the capacity mechanism.*
- *For temporary risks, a strategic reserve is likely to be a more appropriate solution while the market is reformed to deliver security of supply in the longer term. The reserve must be held outside the market.*
- *For a local adequacy issue, the problem should be solved by better grid connections or more appropriate bidding zones but various mechanisms may be appropriate transitional tools.*
- *To develop a flexible demand side, an interruptibility scheme may be an appropriate solution.*
- *Administrative capacity payments are not likely to be appropriate because the lack of competitive process means a high risk of failing to achieve the objective, or of over-compensating.*

## 6. Getting the design right

Regardless of the type of scheme chosen, all Member States need to make detailed design choices about three basic features of capacity mechanisms:

- eligibility: who can participate in the capacity mechanism?
- allocation: how to set the price of capacity and select capacity providers?
- product design: what are the obligations and penalties on capacity providers?

Decisions on all of these areas determine the effectiveness of the capacity mechanism in achieving security of supply at the lowest possible cost and the extent to which it affects competition and trade among capacity providers competing for subsidy in the mechanism, through distortions to the electricity market and between Member States.

### 6.1 Eligibility – who can participate?

In terms of eligibility, many existing capacity mechanisms are open only to a limited number of capacity providers. In some cases, certain capacity providers are explicitly excluded from participating. In other cases, requirements such as size, environmental requirements, or short lead times<sup>30</sup> implicitly reduce the number of potential capacity providers.

New and existing capacities are often procured separately rather than encouraged to compete within the same capacity mechanism – missing an opportunity to increase competitive pressure on all participants. Capacity from other countries is usually excluded, and some Member States do not even take into account the contribution of imports when assessing how much domestic capacity they need, which leads to a collection of national overcapacities.

The inquiry has also shown that overly selective capacity mechanisms risk over-compensating their participants because the competitive pressure is weaker when the allocation process has only limited participation. The payments to capacity providers resulting from this limited competition are typically at a higher level than the funding they actually require to provide the availability service.

Where eligibility is restricted, Member States have also tended to introduce additional mechanisms over time so that, in the end, almost all capacity has an opportunity to claim support. This helps explain why 35 mechanisms were found in only eleven Member States.<sup>31</sup> Such a piece-meal approach to capacity adequacy risks creating inefficiencies, and multiple capacity mechanisms will usually not be appropriate except where an additional mechanism is used to support demand response. For example, where a market-wide capacity mechanism is in place, the introduction of an additional capacity mechanism would need to be justified by demonstrating an additional market failure that cannot be solved with the market-wide mechanism.

This situation is however changing. There is a growing and welcome tendency towards mechanisms open to a wider group of potential capacity providers, and the new mechanisms being developed in France, Ireland, Italy and Poland are all designed to enable different

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<sup>30</sup> 'Lead time' is the time between the allocation of a capacity bid and the moment of delivery.

<sup>31</sup> Though some are past or planned mechanisms and not all of these are in simultaneous operation.

capacity technologies and new and existing resources to compete. France and Ireland are also developing plans to allow direct cross-border participation in their capacity mechanisms. This is essential to remove investment signal distortions that favour domestic investment and benefit incumbents. It also creates incentives for continued investment in interconnection where this is the most cost-effective way to increase security of supply. In the interim sector inquiry report, the Commission put forward ideas on how to implement cross-border participation in practice. In the Market Design initiative, the Commission proposes binding common rules on cross-border participation to reduce complexity, inefficiency and ultimately costs to consumers, as well as respecting Member States' decarbonisation objectives.

While generally there are strong benefits of open eligibility, the sector inquiry identified two exceptions to that rule. First, the long term importance of demand response as a remedy for market failures can justify interruptibility schemes limited only to demand response. Second, since strategic reserves are only appropriate to address temporary problems and because they need to be designed so that their interference with the market is minimal, they should not promote new capacity requiring long term commitments.

#### *6.2 Allocation – setting the price of capacity and selecting capacity providers*

The sector inquiry has found both administrative and competitive allocation processes. In an administrative allocation process all eligible capacity providers are selected without competition and the level of capacity remuneration is set in advance by public authorities or negotiated bilaterally between the authorities and capacity providers. A competitive allocation process allows potential capacity providers to compete to provide the required level of capacity, setting the level of capacity remuneration through market forces.

Administrative allocation processes are unlikely to reveal the true capacity value and are therefore unlikely to be cost-effective since they risk providing too much or too little capacity. The lack of a competitive process also misses an opportunity to deliver better value for consumers. In Spain, for example, the cost of an interruptibility service almost halved after a competitive auction was introduced. Competitive allocation processes are in principle a better tool, combined with eligibility rules that ensure competition between all possible providers capable of delivering the required capacity.

Until now, administrative and competitive processes have been equally common in the 11 Member States covered by the inquiry, but new or revised mechanisms planned by Member States increasingly involve competitive bidding processes. Ireland and Italy, for example, plan to replace administrative allocation processes by competitive auctions.

#### *6.3 Capacity product – what do capacity providers have to do?*

All capacity mechanisms include certain obligations that capacity providers must fulfil, ranging from an obligation to build and operate a power station, through obligations linked to fulfilling instructions from the network operator (e.g. generate electricity), to obligations that are more complex (e.g. reliability options requiring financial paybacks when a strike price is exceeded by a reference price).

There are also many different rules for what happens if capacity providers fail to meet their obligations (penalties). Some mechanisms simply exclude capacity providers from receiving future payments, but most require them to return the payments earned or to pay an additional penalty.

The sector inquiry has found that where obligations are limited and penalties for non-compliance are low, there is insufficient incentive for plants to be reliable. Both capacity mechanism penalties and electricity scarcity prices provide signals for generation or demand reduction in scarcity situations. However, only electricity prices provide a signal for imports within the Internal Energy Market. To avoid distorting cross-border trade Member States should therefore take care not to replace electricity price signals with capacity mechanism penalties.

A further finding is that mechanisms which include demand response usually impose different obligations on demand response providers than on electricity generators. Some differentiation in obligations and penalties between generation and demand response may be justifiable, at least in the short term, to enable the development of demand response, which in the longer term will be a better response to underlying market failures than capacity mechanisms.

#### *6.4 Minimising competition and trade distortions through appropriate design*

Capacity mechanisms have the potential to distort competition in the electricity market, both within the Member State setting-up the mechanism and cross-border. However, the sector inquiry found that these distortions can largely be addressed by ensuring a high degree of competition within the capacity mechanism itself.

Firstly, in concentrated electricity markets, capacity mechanisms may distort competition in the electricity market of the member State setting-up the mechanism. This is the case where the revenues from the capacity mechanism essentially accrue to existing capacity in the hands of incumbents. This increases barriers to entry for competitors and cements the concentration of the electricity market. An open and competitive process for selecting the capacity providers where new entrants of all technologies can compete against existing capacity providers, will go a long way to reducing these competition distortions. Additional safeguards (e.g. transparent and organised trading of certificates) may be needed to create a level playing field for new entrants, in particular in decentralised schemes. Conversely, in some circumstances it may be possible to use the capacity mechanisms to help new entry, e.g. by offering long-term contracts to new capacity or having a premium for competition in tenders.

Secondly, capacity mechanisms create distortions across borders both by altering signals for electricity trading, and by affecting incentives for investment in domestic and foreign capacity, and in interconnection.

Given the importance of electricity prices as a signal for efficient electricity imports and exports within the Internal Energy Market, capacity mechanisms should be designed to coexist with high electricity scarcity prices. A Member State that chooses to rely on electricity prices can attract imports at the right times and at the same time provide strong incentives for

reliability. Reforms to allow electricity scarcity prices and a capacity product design that coexists with electricity scarcity prices are therefore crucial to avoid trade distortions.<sup>32</sup>

As well as the potential impact on trade at times of scarcity, market-wide capacity mechanisms will generally have a dampening impact on electricity prices because capacity providers now earn part of their income from the capacity mechanism instead of the electricity market. If capacity revenue is only available to domestic capacity providers this dampening effect creates a distortion in favour of domestic capacity investments rather than capacity in other countries or interconnection, which also provide security of supply. To ensure efficient signals and avoid barriers in the Internal Energy Market, full cross-border participation in market wide mechanisms is therefore essential.

*The sector inquiry demonstrates that capacity mechanisms should be open to all types of potential capacity providers and feature a competitive price-setting process to ensure that competition minimises the price paid for capacity. Competition between capacity providers should be as large as possible and special attention should be given to new entry.*

*Capacity mechanisms should ensure incentives for reliability and be designed to coexist with electricity scarcity prices to avoid unacceptable trade distortions and avoid domestic overcapacity.*

*Market-wide capacity mechanisms should be open to explicit cross-border participation to ensure incentives for continued investment in interconnection and to reduce the long-term costs of EU security of supply.*

## **7. Conclusions and next steps**

Given the on-going developments in and reforms of EU electricity markets, the Commission will continue to carefully monitor the evolution of capacity mechanisms and to refine the guidance set out in this Final Report and its annexes in the light of its evolving case practice. Based on the sector inquiry, eight overall conclusions can be drawn.<sup>33</sup>

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<sup>32</sup> The reliability option capacity product can be particularly valuable for achieving this because it leaves market signals intact and once scarcity pricing is implemented does not require an additional penalty for non-delivery to be provided through the capacity mechanism.

<sup>33</sup> These conclusions focus primarily on the ability of various types of capacity mechanisms to address problems of security of electricity supply in the most cost effective and least market distortive way. Capacity mechanisms can however affect the generation mix and therefore interact with policy instruments aimed at fostering decarbonisation. As recognised by the Energy and Environmental Aid Guidelines in paragraphs (220) and (233)(e), the design of capacity mechanisms should take into account these impacts in order to contribute to the overall coherence of EU energy policy in electricity markets.

First, it has become clear that despite current overcapacity in the EU as a whole, there are widespread concerns that in the future insufficient generation capacity will remain in the market or come forward in time to ensure adequate security of supply.

Second, electricity market reforms are indispensable since they help to address concerns about inadequate security of supply. However, most Member States have yet to implement appropriate reforms. The Commission's Market Design Initiative therefore proposes a number of reforms to improve the functioning of EU electricity markets and the Commission will require Member States to implement reforms to accompany the planned introduction of any capacity mechanism.

Third, even if a reformed market in principle has the potential to deliver secure supplies, uncertainty may persist about whether an increasingly volatile market price and rare scarcity situations can drive long-term investment decisions. Some Member States have therefore decided to introduce capacity mechanisms to ensure security of electricity supply. These mechanisms involve State aid and must be notified to the European Commission under State aid rules. These mechanisms will be approved if Member States demonstrate their necessity and if the distortions of competition that they generate are minimised in line with internal market and State aid rules, taking account the outcome of the sector enquiry as summarised in this Communication.

Fourth, a rigorous adequacy assessment against a well-defined economic reliability standard is crucial for identifying risks to the security of supply and for determining the necessary size of any capacity mechanism. Such a rigorous assessment will significantly reduce the risk of over-procurement and help to limit the distortions of competition that capacity mechanisms create. Further EU harmonisation of adequacy assessments will help to increase transparency and build confidence in the results of these assessments. The Commission's Market Design Initiative therefore proposes to develop an enhanced EU-wide adequacy assessment methodology, and annual adequacy assessments to be conducted by the European Network of Transmission System Operators for Electricity.

Fifth, the type of capacity mechanism chosen should address the problem identified:

- Where a Member State identifies a long-term risk that there will be insufficient investment, market-wide capacity mechanisms (like those introduced in the UK and France, and planned in Ireland and Italy) are likely to be the most appropriate form of intervention. Market reforms should also be made to limit the State aid needed through the capacity mechanism
- Where a Member State identifies a temporary risk, a strategic reserve is likely to be the most appropriate form of intervention, as it is designed to deal with situations where the market will deliver security of supply in the longer term, but concerns exist about capacity in the short to medium term. Strategic reserves should only be deployed in emergency situations. They should be held outside the market to minimise distortions to its day to day functioning. Strategic reserves must be transitional measures, which accompany market reforms and are phased out as soon as the reforms take effect.
- Where a Member State identifies a local generation adequacy issue, the choice of mechanism will depend on the specific market conditions. In the long run however, the

local problem should be solved by better grid connections or by more appropriate bidding zones that introduce local electricity prices reflecting the balance of local supply and demand.

- Where a Member State is concerned about insufficient development of a flexible demand side, an interruptibility scheme may be an appropriate solution, though attention must be paid to avoid the scheme developing into a subsidy for energy-intensive industries.
- Irrespective of the mechanism chosen, it should be regularly reviewed to check the continued need for the capacity mechanism.
- Administrative capacity payments are unlikely to be appropriate, regardless of the specific issues facing a Member State, because the lack of a competitive process means a high risk of failing to achieve the capacity objective or of over-compensating.

Sixth, capacity mechanisms should be open to all types of potential capacity providers. This, combined with a competitive price-setting process, ensures that competition minimises the price paid for capacity. The only exceptions are mechanisms for demand response, given their particular ability to address underlying market failures, and strategic reserves, which should not promote new generation capacity, to minimise market distortions.

Seventh, market wide capacity mechanisms must be open to explicit cross-border participation in order to minimise distortions to cross-border competition and trade, ensure incentives for continued investment in interconnection and reduce the long-term costs of European security of supply.

Finally, the sector inquiry has shown that a number of existing capacity mechanisms are designed in a way that does not address all competition concerns. The Commission will work with Member States to bring all existing capacity mechanisms gradually into line with State aid rules, bearing in mind the conclusions of the sector inquiry. This will help to give certainty to capacity providers and other economic actors, as well as ensure that the right signals are provided to investors.