IEA response to the European Commission's consultation on "Generation adequacy, capacity mechanisms and the internal market in electricity"

The answers to the European Commission's consultation are directly derived from the IEA Insights Paper "Securing Power during the Transition" released in November 2012. This publication assesses the challenges and identifies options for competitive electricity markets embarking on the transition towards a low-carbon generation, as well as an analysis of power generation systems and investment issues in liberalised electricity markets, within the framework of the IEA Electricity Security Action Plan (ESAP).[1]

Introduction

Electricity security has been a priority of energy policy for decades, due to the dependence of modern society on reliable electricity supply. Only a few years ago there was confidence that liberalised electricity markets in IEA member countries could also deliver sufficient and timely generation investments needed to ensure security of supply. Most of the liberalised power markets have experienced significant investments in new efficient combined cycle gas power plants on a merchant basis. *Lessons Learned from Liberalized Electricity Markets* (IEA, 2005) concluded that "electricity market liberalisation has delivered considerable economic benefits" and that *"minimising regulatory uncertainty is key to creating a framework for timely and adequate investment"*.

Ensuring security of electricity supply is not just about avoiding blackouts at any cost; it is also about the functioning of electricity markets. Clearly, a basic requirement of any effective market and regulatory framework is to ensure a reliable and secure supply of electricity. An efficient regulatory and market framework would also seek to deliver reliable electricity services that meet end-use requirements at least cost. Ultimately this can only be achieved over time if the market stimulates adequate investment in new generation capacity at the right time, in the right place, and using the most cost-effective technologies.

[1] *The views expressed in this document and the IEA Insights paper do not necessarily reflect the views or policy of the International Energy Agency (IEA) Secretariat or of its individual member countries.*

1. **Do you consider that the current market prices prevent investments in needed generation capacity?**

Currently most of European electricity markets, with the notable exception of UK, are experiencing comfortable reserve margins, excess capacity and generation adequacy and should stay for the next 10 years (Entso-E 2012). Economics conclude that functioning electricity markets don't trigger new investments in situations of excess capacity.

Even if competitive electricity markets are still relatively recent, there is clear empirical evidence that well-designed competitive markets do work and can bring economic benefits. That has not been an easy conclusion; given the unique features of electricity in terms of real time balancing needs and lack of demand response to prices, market rules must be well designed to ensure reliable supply. The experience of several IEA member countries over more than ten years demonstrates how it has worked in practice.

IEA Insights Paper "Securing Power during the Transition" : Pgs 57 – 58 "Energy policy and regulatory risks"

2. **Do you consider that support (e.g. direct financial support, priority dispatch or special network fees) for specific energy sources (renewables, coal, nuclear) undermines investments needed to ensure generation adequacy? If yes, how and to what extent?**

Investments to ensure generation adequacy could be undermined as the result of a mix of industrial reality and policy interventions, including non adequate support mechanisms to specific energy sources.

Policies to decarbonise electricity systems have served to magnify investment risk and uncertainty at a time when the capital stock is ageing and slowing demand growth is discouraging investment in many IEA power markets. Some new low-carbon sources (mainly wind and solar photovoltaics) have unique technical characteristics that accentuate real-time power system volatility, creating additional challenges for system operations. The combination of these developments is increasingly perceived to pose a challenge to maintaining electricity security in many IEA power systems.

In several OECD countries most incremental power production is driven by government policies rather than markets – based on feed-in tariffs or quota systems. New nuclear investment also extensively relies on public policy support. This has led to a situation where some pioneers in electricity market reform are beginning to express concern about the capacity of energy-only wholesale markets to provide sufficient incentives to deliver the investment needed to facilitate decarbonisation while continuing to deliver reliable supply of electricity.

IEA Insights Paper "Securing Power during the Transition" : 10 " The growing challenges of designing a stable regulatory framework and well-functioning markets"

3. **Do you consider that work on the establishment of cross-border day ahead, intraday and balancing markets will contribute to ensuring security of supply? Within what timeframe do you see this happening?**

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4. **What additional steps, if any, should be taken at European level to ensure that internal market rules fully contribute to ensuring generation adequacy and security of supply?**

Stable and predictable climate and low-carbon policies which have the potential to mitigate some of the problems associated with investment incentives. Examples of such policies include providing more certainty for carbon pricing, defining attainable policy goals, developing predictable policies for renewables and energy efficiency, and avoiding sudden decisions that can erode certainty and confidence among market participants. Governments should aim to provide as much certainty and predictability as possible, recognizing that the uncertain economic environment and technological developments will demand a degree of flexibility.

At significant penetration levels, generation using variable renewable energy magnifies the volatility of real-time electricity balancing, increasing the challenge to maintain reliable and secure power system operations. Variable renewable resources themselves will also have to contribute to the balancing of the system. The variable renewable output must be controlled during periods of exceptionally high output in order to ensure secure and reliable system operations. This means that in practice, some wind turbines or solar power plants must be curtailed, as is already the case in Spain, Texas and Ireland. Investment in other flexibility options helps mitigate curtailment for security reasonsEfficient participation of renewables in the markets requires both renewable support and adaptation of the design of markets.

IEA Insights Paper "Securing Power during the Transition" : Pages 11-12 "Variable renewables will need to provide flexibility services in order to secure system operations"

5. **What additional steps could Member States take to support the effectiveness of the internal market in delivering generation adequacy?**

Energy markets have the potential to ensure electricity of supply provided that a number of policy measures are pursued. These measures constitute a basic package that will bring benefits, not only in terms of security of supply, but also in terms of overall efficiency during the transition to a low carbon economy. They include:

- providing more certainty concerning climate policies;
- enhancing low carbon support instruments in order to ensure more effective integration of variable renewable generation into electricity markets, in particular, the participation of variable renewables to ensure system security;
- incrementally improving wholesale energy market design in order to accommodate increasing shares of variable renewables at least cost; and
- enhancing technical standards and procedures, to more clearly define and enforce reliability criteria, adequacy forecasts and controllability requirements of renewable generators.

Removing restrictions on wholesale peak prices during scarcity conditions is important to ensure well-functioning electricity markets. Wholesale peak prices during scarcity conditions are not intrinsically bad, since in periods of scarcity, high prices act to incentivise demand response. More sophisticated structural and behavioral remedies should be pursued to address concerns about market power, rather than poorly targeted price controls. Ultimately a more flexible demand side would contribute to mitigating market power and price volatility, and ought to be pursued to enhance market efficiency and flexibility.

IEA Insights Paper "Securing Power during the Transition"

6. **How should public authorities reflect the preferences of consumers in relation to security of supply? How can they reflect preferences for lower standards on the part of some consumers?**

In principle, a price level should exist above which a limited outage becomes an acceptable alternative to the average user. However, this price level is likely to vary as a function of many variables, such as the duration and timing of interruption, whether customers are generally prepared for interruptions, whether customers are notified in advance notice, and the type of customer.

A number of different indicators are used by governments or regulators to define an acceptable level of reliability in energy markets. These include measures that target a number of hours in a year where demand will not be fully met, and a threshold volume of unserved energy that should not be breached. These mechanisms all relate in some way to the cost of marginal supply, and indirectly to the value that customers place on reliability. In this way, considerations about the value of lost load are inherent in features of market design such as market price caps.

Technical standard and procedures will continue to play a role to ensure electricity security. Even where operations and investment decisions are market-based, governments and system operators will continue to define, in one way or another, the reliability criteria, some dispatching capabilities and requirements for new generation capacity and electrical appliances connected to the grid.

IEA Insights Paper "Securing Power during the Transition" : Page 18 "Reliability, carbon emissions and technology spillovers"

7. **Do you consider that there is a need for review of how generation adequacy assessments are carried out in the internal market? In particular, is there a need for more in depth generation adequacy reviews at:**
   - **National level**
   - **Regional Level**
   - **European Level**

An important procedure at the disposal of governments is to periodically publish adequacy forecasts, projecting the supply/demand balance and forecasted reserve margins during peak hours. Legislation mandating such projections is already in place in most OECD member countries. This simple tool brings transparency on market forecasts and also helps inform market-based investment decision making. Such adequacy forecasts remain subject to macroeconomic uncertainty but are becoming even more important in the context of uncertainty over renewable policies.

IEA Insights Paper "Securing Power during the Transition" : Page 18 "Reliability, carbon emissions and technology spillovers"

8. **Looking forward, is the generation adequacy outlook produced by ENTSO-E sufficiently detailed? In particular:**
   - **Is there a need for a regional or European assessment of the availability of flexible capacity?**
   - **Are there other areas where this generation adequacy assessment should be made more detailed?**

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9. **Do you consider the Electricity Security of Supply Directive to be adequate? If it should be revised, on which points?**

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10. **Would you support the introduction of mandatory risk assessments or generation adequacy plans at national and regional level similar to those required under the Gas Security of Supply Regulation?**

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11. **Should generation adequacy standards be harmonised across the EU? What should be that standard or how could it be developed taking into account potentially diverging preference regarding security of supply?**

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12. **Do you consider that capacity mechanisms should be introduced only if and when steps to improve market functioning are clearly insufficient?**

A basic package of policy measures include improved climate policies, better energy only markets and standard and procedures. If these policies were to be implemented successfully, they would lay the foundation of well-functioning, energy only markets.

However, some reforms may be difficult to implement successfully and may take time. This is the case, for example, of stable renewable policies and of building credibility of governments to let electricity prices rise high enough during periods of scarcity. In addition, even if implemented successfully, they have only an indirect effect on incentives to maintain or build adequate capacity to meet demand, and there is no absolute certainty that they will be effective in ensuring the right level of security of electricity supply in all circumstances. Furthermore, they may not address all the investment issues. In particular, variability and volatility of revenues for peak power plants, the load factor risk and peak prices may remain a concern.

The practical considerations also matter, and implementing the measures of the basic package takes time-- several years -- a lead time not compatible with urgent security of supply concerns. In this respect, IEA countries face different situations. Most states have already developed or improved energy markets and will continue to do so. While some regions face urgent generation adequacy constraints (the United Kingdom and Japan, for instance), most of other countries have enough excess-capacity, as a result of sluggish demand growth. In the latter case, reforming electricity market design is not seen as a pressing concern.

IEA Insights Paper "Securing Power during the Transition"

13. **Under what circumstances would you consider market functioning to be insufficient:**
    a. **to ensure that new flexible resources are delivered?**
    b. **to ensure sufficient capacity is available to meet demand on the system at times of highest system stress?**

a.
In some jurisdictions, there is no market platform for some specific products needed by the system operator in the short run. This may be the case for products to solve network congestion (counter trading), products to ramp-up or ramp-down capacity to follow demand and renewable output variations, or products for voltage control during certain hours. Some countries such as Spain are considering the creation of new short-term, flexible products markets, using existing electronic market platforms as the tertiary reserves market.

In the absence of such markets, system operators tend to rely on bilateral contracts with specific power plants that have the technical capability to supply the specific service. However, the financial settlement of these operations often lacks transparency. Defining open market platforms for new products would contribute to increasing the revenues of flexibility services. Such markets should be opened to power plants or demand response. They can provide a price signal to decide to mothball an old power plant, to invest in demand response capabilities or a new flexible plant. One caveat must be mentioned here: as products are defined more precisely, market liquidity and market power quickly become issues. Cutting the definition of flexibility products into too many small slices could reduce too much liquidity. Therefore, the number of products may have to remain limited. In addition, system operators are often the natural counterparty of such flexibility products and are the only ones that can create a forward demand curve.

b.
While in theory, well designed, energy-only electricity markets could ensure adequate investments, this is becoming increasingly challenging under policies that promote rapid and large-scale decarbonisation. Our analysis also indicates that current policy and regulatory risks may act as a deterrent for the investments in generation needed to ensure security of supply. Existing or foreseen restrictions on power peak prices, lack of credibility of carbon policy, the uncertain pace of development of renewable and nuclear policies, as well as energy efficiency policy targets, all induce a degree of policy risk. Private investors are not in the best position to handle these kinds of risk.

Improved climate, energy and renewable policies and better energy markets are needed to address these challenges. Following the economic crisis, many OECD countries are currently experiencing a situation of excess capacity, and thus have a window of opportunity in which to address these issues before considering other more interventionist arrangements. This should be a priority as they will deliver economic benefits in terms of lower dispatching costs and better price signals and have the potential to substantially reduce the transitional costs associated with decarbonisation. This includes improving renewable policies, removing restrictions on peak prices, creating more transparent and efficient market platforms for flexibility services, developing efficient locational pricing and integration of the day ahead, intra-day, balancing and reserve markets. Obviously, this is easier said than done and in particular improving climate policy depends on a range of wider issues including progress with international negotiations and will take time. If a situation of excessive uncertainty persists, there may be a material risk that competitive electricity markets may not provide timely and sufficient investment to maintain security of supply.

Capacity mechanisms, including targeted contracts and market wide capacity arrangements, are a second-best solution to ensure security of supply and generation adequacy. The objective of such mechanisms should be not to increase the profitability of existing assets hit by the economic crisis, but rather to provide certainty that there will be enough capacity available, either with existing old

plants or new assets if needed.

Nonetheless, several reasons may explain why governments have introduced or are considering the introduction of capacity mechanisms. First the degree of uncertainty concerning climate policies and the pace of deployment of renewables may magnify risk to such an extent that markets alone are unlikely to deliver efficient and timely investment responses. Second, regulations that restrict efficient electricity price formation, such as unduly low prices caps, can undermine market-based signals for efficiently timed and located investment responses. Third, the reduction in spot prices and lower and less predictable periods of operation resulting from increasing volumes of variable renewable generation, increases cash flow uncertainty for conventional generation, with the potential to encourage the closure of existing conventional capacity and discourage timely investment in new capacity. Where these risks are material, there may be a case for, capacity arrangements that can create a safety net in order to ensure sufficient and timely investments.

Capacity mechanisms would constitute a shift toward heavy-handed regulatory intervention, in which a central entity – not the market – has to plan how much generation capacity is needed. Added to the policy-driven deployment of renewables, such mechanisms have the potential to jeopardise the competition benefits from electricity market liberalisation.

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14. In relation to strategic reserves:

a. Do you consider that the introduction of a strategic reserve can support the transition from a fossil fuel based electricity system or during a nuclear phase out?

b. What risks, if any, to effective competition and the functioning of the internal market do you consider being associated with the introduction of strategic reserves?

Targeted contracting of capacity can provide a temporary fix but may introduce distortions between technologies.

Targeted contracts can help countries facing short-term and transitory adequacy or reliability issues during the transition period. Such contracts are quick to implement and unwind once policy and regulatory uncertainty has been reduced and market design improved. Therefore, targeted contracts have the potential to promote security of supply without necessarily jeopardizing the economic benefits from well-functioning energy-only markets in the longer run. However, expectations of such contracts can distort market prices and might lead to strategic behavior as companies withhold investment and wait for their introduction. Moreover, experience in certain countries indicates that it could be difficult to stop them.

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15. In relation to capacity markets and/or payments:

a. Which models of capacity market and /or payments do you consider to be most and least distortionary and most compatible with the effective competition and the functioning of the internal market, and why?

b. Which models of capacity market and /or payments do you consider to be most compatible with ensuring flexibility in a low carbon electricity system?

c. Are there any models of capacity mechanism the introduction of which would be irreversible, or reversible only with great difficulty?

Market-wide capacity mechanisms can be effective **to ensure generation adequacy and** to create a safety net if well-designed but tend to be costly and complex and can introduce other forms of market distortion, such as the risk of over-investment or under-investment and market manipulation.

They can be used to promote flexibility, investment in capacity and in particular, demand response. They also have the potential to address the growing discrepancy between the ongoing need for flexible conventional generation capacity and its declining utilisation, which is a salient feature of systems with high variable renewable shares. They have the potential to encourage competition between different technologies, while reducing the risk of over-investing in particular technologies associated with targeted contracts.

IEA Insights Paper "Securing Power during the Transition" : Page 78 "Market-wide capacity mechanism: a safety net"

16. Which models of capacity mechanisms do you consider to have the have the least impact on costs for final consumers?

Model of capacity mechanism to be chosen by a government should be carefully considered based on the timing of its introduction, its impact on existing incentives and be aligned with common rules for regional markets spanning multiple jurisdictions. Capacity markets tend to have high transaction costs and put a burden on regulatory institutions. They might have unintended consequences in introducing secondary incentives and, depending on their design, may create excess capacity and lower demand response during scarcity conditions. In addition, while regional integration of electricity markets is an important source of flexibility and efficiency gains, national capacity markets tend to reinforce national rather than market-wide assessments of generation adequacy, thereby introducing distortions between different countries or jurisdictions.

17. To what extent do you consider capacity mechanisms could build on balancing market regimes to encourage flexibility in all its forms?

It has been proposed that capacity markets can also play a role in ensuring that sufficient flexibility services will be available to accommodate increasing shares of variable renewables. Based on the experience of some existing capacity markets, there is a concern that the power plants triggered by capacity markets may not flexible enough. This could lead to restrict the dispatch of variable renewables in the future or require further investments to upgrade plants. Indeed, adding flexibility features to the definition of capacity obligation can contribute to ensuring that the ramp-up or minimum load requirements will be met.

However, restricting capacity markets to flexible products would not solve the generation adequacy issue, as all the capacity would not be factored in. In practice, flexible capacity markets would thus lead the regulator to define quantitative flexibility forward objectives in terms of ramp-up, ramp-down or minimum load. This would go a step further than the definition of flexibility products already discussed before and would constitute an additional market intervention.

For practical example, please see IEA Insights Paper "Securing Power during the Transition" : Page 84

18. Should the Commission set out to provide the blueprint for an EU-wide capacity mechanism?

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19. Do you consider that the European Commission should develop detailed criteria to assess the compatibility of capacity mechanisms with the internal energy market?

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20. Do you consider the detailed criteria set out above to be appropriate?

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Reference

IEA (2012) " Securing Power during the Transition. Generation Investment and Operation Issues in Electricity Markets with Low-Carbon Policies", Insights Paper, IEA, Paris. http://www.iea.org/publications/freepublications/publication/SecuringPowerTransition_Secondeedition_WEB.pdf

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