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Generation Adequacy in the internal electricity market - guidance on public interventions

Accompanying the document

Communication from the Commission

Delivering the internal electricity market and making the most of public intervention

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COMMISSION STAFF WORKING DOCUMENT

Generation Adequacy in the internal electricity market - guidance on public interventions

Accompanying the document

Communication from the Commission

Delivering the internal electricity market and making the most of public intervention

On 22 May 2013 the European Council called for particular priority to be given to the Commission providing guidance on capacity mechanisms. The Commission met this call with the Communication *Delivering the internal electricity market and making the most of public intervention*. The purpose of this Staff Working Document is to elaborate on the guidance presented in the Communication.

The guidance for Member States set out in the Communication and elaborated in this Staff Working Document to aims to help ensure that public intervention in relation to generation adequacy meets the aims of the Union policy on energy and complies with the common rules on competition.

This guidance follows up on a public consultation, launched together with the Commission Communication *Making the internal energy market work* (COM(2012)663)[1]. The Consultation Document and all responses to the public consultation can be found on the Commission's website[2].

1. A COHERENT POLICY FRAMEWORK

The liberalisation of electricity markets and their increased integration in one internal electricity market create challenges for ensuring generation adequacy. As the Commission indicated in its Communication *Making the internal energy market work*, with the development of a competitive internal electricity market with multiple producers and unbundled network operators, no single entity can on its own ensure the reliability of the electricity system any longer. The role of public authorities in monitoring and ensuring security of supply, including generation adequacy, has consequently become more important. At the same time the integration of electricity markets progresses, bringing clear benefits to consumers which could amount to annual cost savings of up to

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[1] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions Making the internal energy market work (COM(2012) 663 final)

[2] http://ec.europa.eu/energy/gas_electricity/consultations/20130207_generation_adequacy_en.htm

EURO 40 billion in case of full integration[3]. However, this integration of markets also implies that security of supply, including generation adequacy, is increasingly difficult to ensure on a purely national basis. Ensuring generation adequacy is also one of the main challenges as the Union moves towards a low carbon energy system.

Article 8 of Directive 2009/72/EC[4] (the Electricity Directive) obliges Member States to implement special tendering procedures or another procedure equivalent in terms of transparency in the interests of security of supply. However these procedures may only be launched where the normal authorisation procedure is insufficient to ensure security of supply.

Public intervention to promote generation adequacy may entail public service obligations imposed on generators, suppliers and/or transmission system operators (TSOs). Such obligations have to comply with the requirements set out in Article 3(2) of the Electricity Directive. In particular, they have to be clearly defined, transparent, non-discriminatory, verifiable and guarantee equality of access for electricity undertakings. Member States have to be able to show that public service obligations are necessary, proportionate and transitional in nature.[5] Public service obligations imposed on electricity undertakings must also be notified to the Commission.[6]

In addition, where public intervention comprises State aid pursuant to Article 107 (1) TFEU, Member States have to comply with the notification and stand still obligation of Article 108 (3) TFEU. The test which the Commission applies in assessing State aid normally entails assessing if the measure pursues a well-defined objective of common interest, is targeted at a well-identified market failure, is the appropriate measure, is proportionate and limits aid to minimum necessary, changes the behaviour of the beneficiaries and has a limited distortive impact on competition and trade in the EU.

Where the Commission, in its role as guardian of the Treaties, has to assess public intervention for ensuring generation adequacy on the basis of Article 3 (2) of the Electricity Directive and Article 106 TFEU, it will include the guidance which it has provided in its assessment.

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[3] Booz & Co *Benefits of an integrated European energy market* http://ec.europa.eu/energy/infrastructure/studies/doc/20130902_energy_integration_benefits.pdf

[4] Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for internal market in electricity and repealing Directive2003/54/EC *OJ L 211, 14.8.2009, p. 55*

[5] C-265/08 *Federutility* and Others v Autorità per l'energia elettrica e il gas. The Judgement of the Court sets out " First, such an intervention must be limited in duration to what is strictly necessary in order to achieve its objective… Secondly, the method of intervention used must not go beyond what is necessary to achieve the objective which is being pursued in the general economic interest. Thirdly, the requirement of proportionality must also be assessed with regard to the scope *ratione personae* of the measure, and, more particularly, its beneficiaries.

[6] Article 3(15) of Electricity Directive

The Commission will consider the topic of capacity mechanisms and State aid in detail as it develops, in consultation with Member States, Guidelines on State aid in energy and environment. These Guidelines should then specifically address how State aid rules apply to such interventions.

Without prejudice to new guidelines on State aid in the energy and environmental fields, the guidance provided sets out how generation adequacy can be ensured in an integrated internal electricity market undergoing the shift towards decarbonisation:

- As a starting point, public authorities at Union and national level should let the market work to encourage appropriate investments. As in any other sector of the economy, price signals are pivotal to incentivize generators and consumers to balance supply and demand.

- In parallel, and as required by Directive 2005/89/EC [7] (the Electricity Security of Supply Directive) public authorities must regularly undertake an objective, facts based, assessment of the generation adequacy situation in their Member State fully taking account of developments at regional and Union level. The rules contained in the Electricity of Supply Directive and its transposition and implementation may be insufficient to tackle the challenges of the future in a fully satisfactory way. Therefore, as set out in the Communication *Delivering the internal electricity market and making the most of public intervention*, the Commission may consider taking further legislative initiatives in this regard.

- Where a concern about generation adequacy emerges, its causes should be properly identified, including policy uncertainty and failures in regulation at the national level. Where possible, such causes should be removed.

- In line with Article 34 TFEU and the Electricity Directive, Member States, when intervening to ensure generation adequacy, should choose the intervention which least distorts cross border trade and the effective functioning of the internal electricity market. Such an approach will help ensure that interventions are also cost effective.

Each of these points is addressed in more detail below providing additional guidance to Member States. That guidance, including the checklist summarising the key points, is designed to assist Member States to meet their obligations under the Union *acquis* when assessing the need for interventions to ensure generation adequacy and in choosing the appropriate method or design of intervention.

In a spirit of loyal cooperation, choices on when and how to intervene to ensure generation adequacy should be properly discussed and weighed against each other at the

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[7] Directive 2005/89/EC of the European Parliament and of the Council of 18 January 2006 concerning measures to safeguard security of electricity supply and infrastructure investment *OJ L 33, 4.2.2006, p. 22*

regional and EU level. The Commission Services are fully committed to working with Member States and regions through the Electricity Coordination Group and bilaterally with a view to effectively and efficiently addressing generation adequacy concerns.

2. ASSESSING GENERATION ADEQUACY AND INVESTMENT NEEDS OBJECTIVELY

An objective in depth generation adequacy assessment is needed to establish that the normal authorisation procedure will not be sufficient to ensure security of supply. It also helps ensure that public intervention is cost-effective. Such an assessment can in particular allow a clear identification of the gap between the capacity needed to ensure security of supply and the capacity which the market is likely to deliver absent public intervention.

2.1. Comprehensive adequacy assessment including Union policies

An objective, facts-based and comprehensive assessment of the generation adequacy situation should take account of the expected impact of the Union policy on Energy and the Union policy on the environment. In particular, the following pieces of legislation are relevant: the recently adopted Regulation (EU) no. 347/2013[8] (the Energy Infrastructure Regulation) the EU emission trading system[9], energy efficiency measures under Directive 2009/125/EC[10] (Eco-design Directive) and Directive 2010/30/EU[11] (the eco labelling Directive), and the implementation of Directive 2012/27/EU[12] (the Energy Efficiency Directive).

The potential increase in the use of electricity in other sectors such as heating and transport should be estimated. Finally, the economic and financial crisis and its impact on

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8 Regulation (EU) no. 347/2013 of the European parliament and of the Council of 17 April 2013 on guidelines for trans-European energy infrastructure *OJ L 115 25.4.2013 p 39*

9 This includes the expected ETS carbon prices over the relevant assessment period, reflecting the continuation of the ETS linear factor beyond 2020 as enshrined into law. This impacts both electricity supply and, via the transmission in electricity prices, electricity demand. The projected ETS carbon prices in the published EU energy reference scenarios may serve as an orientation. See e.g. http://ec.europa.eu/energy/observatory/trends_2030/doc/trends_to_2030_update_2009.pdf, For a partial update and extension to 2050 see: http://ec.europa.eu/energy/energy2020/roadmap/doc/sec_2011_1565_part1.pdf; A new trend scenario will become available in the course of 2013.

10 Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products *OJ L 285, 31.10.2009, p. 10*

11 Directive 2010/30/EU of the European Parliament and of the Council of 19 May 2010 on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products *OJ L 153, 18.6.2010, p. 1*

12 Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency *OJ L 315 14.11.2012 p 1*

electricity consumption in Member States most affected shows the relevance of adjusting demand prognosis regularly to macro-economic parameters.

A generation adequacy assessment requires a judgement about likely energy market developments as well as wider economic developments, and thus a degree of uncertainty in the assessment is unavoidable. However, uncertainty is equally present when judging the likely impact of public intervention, particularly if they are complex and therefore more likely to result in unintended consequences.

The degree of uncertainty can be reduced and the reliability and objectivity of adequacy assessments increased if the principles described below are respected. Process-wise, Member States can and should continue to rely on the expertise of TSOs in carrying out generation adequacy assessments. Generation adequacy assessments should be transparent and open. In particular modelling, data sets and assumptions feeding into the assessment should be made available to all stakeholders (including system users) so that they have an opportunity to express their views and challenge the data before the assessment is finalised.

2.2. Recognize the cross-border dimension of electricity systems and markets

In the Union, the very large majority of Member States have their electricity markets coupled with at least one other Member State. In Central West Europe, electricity markets are deeply connected through price coupling, a practice expected to expand throughout the Union by 2014-2015. Coupled markets imply that power flows out of a market when prices in a neighbouring market are higher. Inversely, power will be imported when domestic prices are higher. The traded volumes can constitute a multiple of the interconnection capacity available but physical flows will be limited to the available capacity on the given interconnectors.

Market coupling is a first step towards a fully integrated market allowing short and long term trading of energy, renewable energy sources (RES), balancing services and security of supply across borders. In addition well-functioning intraday markets are critical to integration and to realising the benefits of RES and cross border connection for security of supply. Given this increasing integration of electricity markets and systems across borders it is now increasingly difficult to address the issue of generation adequacy on a purely national basis[13]. Member States' generation adequacy assessments need to take account of existing and forecast interconnector capacity as well as the generation adequacy situation in neighbouring Member States. Surplus generation in neighbouring Member States may alleviate adequacy concerns; shortages may exacerbate them. Stochastic analysis may help evaluate the risk of unfavourable weather conditions or other forms of system stress affecting generation adequacy in an entire region and the impact it may have on individual systems.

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[13] Booz & Co *Benefits of an integrated European energy market* http://ec.europa.eu/energy/infrastructure/studies/doc/20130902_energy_integration_benefits.pdf

Under the Electricity Directive and the Electricity Security of Supply Directive[14], Member States are required to monitor security of supply and produce bi-annual reports. These reports should assess the projected balance of supply and demand for the next five year period and the prospects for security of electricity supply for the following five to fifteen year period. However, not all Member States have fulfilled their obligations under Union law in the same manner. In order to improve compliance, the Commission Services will establish a streamlined reporting system to facilitate the notification of these assessments and their publication.

National generation adequacy assessments should be complemented by regional and Union-wide assessments.[15] The joint declaration that the Member States of the Pentalateral Forum recently issued is seen positively in this regard[16]. The Network of European Electricity Transmission System Operators for electricity (ENTSO-E) produces Union-wide generation adequacy assessments in accordance with Article 8 of Regulation (EC) No 714/2009[17] (the Electricity Regulation). ENTSO-E's report is currently the main Union-wide assessment of generation adequacy. However, the ENTSO-E report builds on national assessments and hence it too continues to suffer from differing methodologies being employed at Member State level. As a result, the mutual interdependence of Member States when it comes to generation adequacy and security of supply is also not yet fully or adequately recognised in its generation adequacy assessments[18].

The Commission Services, working with the Member States, the Agency for the Cooperation of Energy Regulators (ACER) and ENTSO-E in the Electricity Coordination Group, are currently examining ways in which the deficiencies in the assessment methodology at Union and national level can be remedied to ensure that generation adequacy assessment is more coordinated and that the Union-wide report produced by ENTSO-E can meet the needs of policy makers, In this regard, peer review of national generation adequacy assessments is important. Depending on the conclusions of this

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14 Article 4 of Electricity Directive and Article 7 of Secuurity of Supply Directive

15 Council conclusions of 6 June 2013 on the Commission Communication "making the internal energy market work"

16 The Pentalateral Energy Forum is an inter-governmental initiative consisting of Austria, Belgium, France, Germany, Luxembourg, the Netherlands and Switzerland to promote collaboration on cross-border exchange of electricity. The political declaration can be found at : http://www.benelux.int/pdf/pdf/201306_PoliticalDeclarationOfThePentalateralEnergyForum.pdf

17 Regulation (EC) No 714/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the network for cross-border exchanges in electricity *OJ L 211, 14.8.2009, p. 15,*

18 For example national TSOs continue to be apply different methods to calculate the required margin against peak load; variable RES is not treated in a harmonised way despite the importance of understanding the cross border impact of changes in wind and solar production. Each of these impact on the potential availability of interconnection capacity at times of system stress.

work, the Commission could propose the adoption of legally binding guidelines under Electricity Regulation or the updating of the Electricity Security of Supply Directive.

Member States can improve the quality of their assessments by integrating the ENTSO-E analysis as well as the generation adequacy assessments of their neighbours into their own adequacy assessments. Bilateral and multilateral discussions of national generation adequacy assessments between neighbouring Member States and with stakeholders can further improve the quality of the assessment. Best practices highlighted by ENTSO-E or the Electricity Coordination Group should be followed where appropriate.

2.3. Include reliable data on wind and solar

Wind and solar power generation can mean large and sometimes sudden swings in the amount of electricity fed into the system. As with any other change in electricity supply or demand, this needs to be balanced by generation capacity which can be brought into operation quickly, releasing stored electricity, or demand response. The availability of flexible generation capacity and interruptible supply contracts is therefore becoming an increasingly important consideration when assessing generation adequacy.[19]

Generation adequacy assessments should contain clear assumptions on the development of variable wind and solar power in their own system, as well as in neighbouring systems which they are interconnected with. Those assumptions should be based on applicable RES targets and/or on the expected contribution of power generation to CO2 emission reduction within relevant timeframes (e.g. a 1 year, 5 year and 20 year time horizon). Reliability factors for wind and solar may vary substantially depending on their location, but also on this point, the Commission encourages Member States to cross-check methods applied with stakeholders and to exchange best practices, e.g. with ENTSO-E.

As variable wind and solar power grows in the energy mix, generation adequacy assessments – national, regional and Union-wide – can no longer focus only on the amount of available generation capacity. They also need to consider the quality of available generation capacity, in particular how quickly it can respond.

2.4. Include the potential of demand response

Generation adequacy relates to balancing supply and demand of electricity. Both have a role to play in this. Where consumers voluntarily reduce demand, as part of their supply contract or in response to high prices, this is a sign of well-functioning markets and not a sign of a generation adequacy problem. The availability of timely price-signals for consumers could facilitate demand-response, which is being addressed by the roll out of smart meters across the Union.

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[19] Almost all responses to the consultation raised the impact of RES on the market and its impact on generation adequacy. For example the UK Government response discusses the impact that more low marginal cost pricing will have on the market, a point addressed in detail in the Clingendael paper submitted in response to the consultation.

Where a gap between generation and demand exists, it can be bridged by increasing generation or reducing demand. Both are equivalent from a system security viewpoint. The potential for demand side management in the Union is estimated to be 60 GW, i.e. the capacity of approximately 60 nuclear power reactors or 120 middle-size combined cycle gas turbines[20]. If the potential for the demand side to participate in the system is explicitly recognized in a generation adequacy assessment, assuming a realistic timeframe for it to materialize, stranded investments in generation can be avoided. The involvement of industrial users and aggregators of household demand in the preparation of generation adequacy assessment is important as other stakeholders, in particular generators and TSOs, may unconsciously be biased towards generation and/or network solutions.

2.5. Distinguish between missing money and missing capacity

Currently, there is overcapacity in many markets. This can be seen in the existing ENTSO-E system outlook and adequacy assessment[21], and national generation adequacy assessments. This is partly a result of the financial and economic crisis and the resultant drop in demand, but may in some Member States also at least in part be related to old capacities which are artificially being kept on the grid[22].

At the same time, the financial and economic crisis has stalled investments in new-built generation capacity. Low demand, in combination with increased deployment of wind and solar generation, has also been pushing wholesale electricity prices down in some Member States like Germany, Belgium or Spain, exerting pressure on utilities' returns. Moreover, the recent evolution of coal and gas prices in combination with a low price of carbon has also resulted in modern gas plants being displaced in the running order by coal plants, including those due to be withdrawn soon to comply with Directive 2001/80/EC [23] (the large combustion plant directive). Some operators of gas power stations are now expressing concerns about the financial viability of their existing plants, and discussing potential mothballing or even shutdown[24].

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[20] The project SMART-A estimated that in addition there is an energy efficiency potential to be reaped from additional energy efficiency measures.

[21] ENTSO-E (2013) Scenario Outlook & Adequacy Forecast 2013-2030

[22] See for example the recent analyses of the Commission services and of the Worldbank carried out at the request of the Bulgarian government as regards the Bulgarian energy system

[23] Directive 2001/80/EC of the European parliament and of the Council of 23 October 2001 on the limitation of emissions of certain pollutants into the air from large combustion plants *OJ L309 27.11.2001 p1*

[24] As companies could have an incentive to exaggerate intentions to shut down capacity it is particularly important that public authorities carrying out generation adequacy assessments make reasoned judgements about expected economic developments and their impact on the financial viability of existing generation capacity over time.

When faced with a structural generation overcapacity in the market, Member States may consider other measures such as facilitating exports by adding interconnection capacity or allowing for the retirement of environmentally inefficient plants, for example through the implementation of environmental legislation or by removing subsidies. Creating market wide capacity remuneration schemes may under such circumstances be counter-productive as it may (depending on the criteria set for capacity to participate in the scheme) postpone the exit of inefficient capacity from the market.

In liberalised markets, investments are not guaranteed by the State. Only where there is a real threat to generation adequacy and security of supply as a result of closure or mothballing does the financial viability of existing plant become a matter of public concern. It is very important that there should not be state support to compensate operators for lost income or bad investment decisions.

	Winter reference point					Summer reference point				
2013	Net generating Capacity	Reliable Available Capacity	Load (normal estimate)	Peak load*	Import Capacity	Net generating Capacity	Reliable Available Capacity	Load (normal estimate)	Peak load*	Import Capacity
AT	23.30	17.60	10.00	10.70	0.00	23.30	17.20	9.40	9.90	0.00
BE	19.84	12.33	13.39	13.79	3.50	21.86	14.34	10.77	11.82	3.00
BG	13.73	11.27	6.70	6.95	1.45	13.83	9.63	4.00	4.32	1.45
CY	1.62	1.27	0.85	0.90	0.00	1.62	1.22	1.12	1.17	0.00
CZ	18.20	11.65	10.10	10.30	3.00	18.20	13.65	7.90	8.10	2.80
DE	182.16	93.04	91.77	91.77	16.90	186.66	83.18	76.86	76.86	16.90
DK	11.76	5.38	5.57	6.23	5.68	11.76	4.03	3.60	5.26	5.68
EE	2.81	2.02	1.44	1.64	0.65	2.81	2.02	0.87	0.97	0.60
ES	99.60	51.80	39.40	44.60	2.90	100.60	53.20	34.70	41.50	2.60
FI	17.66	13.31	14.10	15.00	4.70	17.66	8.76	9.20	11.00	4.70
FR	128.10	96.60	82.80	83.00	8.00	127.40	76.60	56.50	57.70	8.00
GB	80.75	61.99	57.70	57.70	4.19	80.75	46.90	25.68	25.68	4.19
GR	15.88	11.04	7.04	8.83	1.50	16.48	12.32	7.07	10.20	1.50
HR	4.30	3.40	3.00	3.20	3.10	4.30	2.90	2.60	2.70	3.00
HU	9.05	5.09	5.65	5.90	2.40	9.05	4.49	5.55	5.75	2.40
IE	8.99	6.66	4.53	4.94	0.80	8.99	6.16	3.48	3.76	0.80
IT	126.30	67.30	52.50	58.60	10.50	127.80	85.30	54.40	60.40	9.50
LT	4.05	2.40	1.74	1.85	1.30	4.05	2.06	1.44	1.50	1.30
LU	1.72	1.60	1.08	1.12	4.14	1.72	1.60	1.00	1.12	4.14
LV	2.66	1.32	1.28	1.28	2.00	2.66	1.22	0.96	0.96	2.00
NI	2.79	2.22	1.57	1.72	0.45	2.79	2.22	1.06	1.37	0.45
NL	31.28	26.37	16.42	18.40	5.17	31.28	26.37	14.67	16.93	5.17
PL	35.72	26.15	23.18	24.48	0.82	36.11	20.84	19.47	20.17	0.82
PT	17.92	11.42	8.01	8.43	1.28	18.00	9.89	6.58	6.88	1.60
RO	18.54	11.60	8.44	8.93	1.50	18.96	11.14	7.33	7.51	1.90
SE	38.67	27.21	22.62	26.00	9.70	38.89	25.54	14.18	17.82	9.70
SI	3.27	2.41	1.94	2.00	2.11	3.27	2.76	1.51	1.81	2.11
SK	8.02	4.17	3.82	3.82	4.66	8.02	3.43	3.20	3.20	4.39

Source: ENTSO-E

Table 1 Net generating capacity, Load and import capacity per MS (in GW)

Justification of public intervention

Before intervening on electricity markets to enhance security of supply, Member States should carry out an objective in depth assessment of the generation adequacy, and any expected adequacy gap which should:

- Be notified to the Commission in accordance with the requirements of the electricity Security of Supply Directive;
- Take into account the cross-border dimension of electricity markets and be coordinated with neighbouring Member States.
- Be consistent with ENTSO-E's EU wide generation adequacy assessment and the methodologies used therein;
- Be based on widespread consultation with stakeholders
- Include reliable data on the development of variable wind and solar, including in neighbouring systems, and analyse the amount as well as the quality of generation capacity needed to back up those variable sources of generation in the system;
- Properly integrate the potential for demand side management and a realistic time horizon for it to materialize in order to avoid stranded investments in generation;
- Take full account of the impact of national and Union policy on energy and on the environment on electricity infrastructure, supply and demand
- Take existing overcapacity and the economic crisis into account in your assessment and avoid that inefficient plants are kept in operation through public support

3. WHAT CAUSES GENERATION ADEQUACY CONCERNS?

With liberalisation, generators and suppliers, or even consumers directly, buy and sell electricity on the market. Just as in other sectors market players should ensure that undertakings trade to ensure that they can meet their commitments to their customers. An effectively functioning market should result in generation capacity being constructed to meet the demands of consumers for electricity at all times based on expected future electricity prices and demand.

Research identifies a number of reasons why the market could fail to deliver sufficient new investment to ensure generation adequacy. These are a combination of market failures and regulatory failures. For example when consumers cannot indicate the value they place on uninterrupted electricity supply, the market may not be effective

performing its coordination function. Equally however, regulatory interventions and the fear of regulatory interventions such as price caps and bidding restrictions limit the price signal for new investments. Likewise the prices on balancing markets operated by TSOs should not undermine the price signals from wholesale markets.

Power generators and investors have argued that regulatory uncertainty and the lack of a stable regulatory framework undermine the investment climate in the Union compared to other parts of the world and to other industries. Those concerns must be taken seriously. Before deciding on public intervention to support generation adequacy, the causes of any investment gap should be objectively analysed. Where existing public intervention causes or exacerbates an investment gap, it may be more cost-efficient to review and adjust them. If remaining market failures are identified as precisely as possible, public intervention should be designed in a cost-effective manner so as to ensure effectiveness and proportionality

3.1. Regulated prices

Public authorities are concerned that electricity prices for industry are competitive and energy bills for households are affordable. In certain Member States this aim is pursued through direct public intervention on the market. However, investors calculate whether they are likely to recover their costs before they commit large sums to building new generation capacity. In the longer run, investments will only take place at a sufficient level if prices reflect the long run average cost of producing electricity, including capital costs. Wholesale prices, if unregulated, vary according to supply (driven by the costs of generating electricity) and demand. Revenues for most generators will often be above their short run production costs, allowing the recovery of their investment. In particular, generators which operate for only short periods need to be able to recover capital costs during those periods and short run prices will tend to rise well above short run marginal costs. If public authorities directly intervene to keep prices below market clearing prices, the intervention may create or exacerbate an investment gap.

3.1.1. Wholesale

Explicit or implicit wholesale price caps can limit potential investment incentives, particularly for generators which operate only for very short periods and require very high prices to recover fixed cost. This has a detrimental effect on investment incentives for flexible generators and units covering peak load in particular. Such price caps (particularly if set substantially below reasonable estimates of the value of lost load) prevent the market from fulfilling its proper function of matching supply with demand in times of system stress. Restrictions on bidding in wholesale markets (which have an equivalent effect to a price cap) which prevent the recovery of fixed costs have an equivalent effect.[25]

[25] Price caps on organised markets vary across Europe. Not all price caps are required by regulations or legislation; some are based on commercial considerations of exchange operators. EPEX spot has a

Caps or restrictions may not be explicit, public statements by regulators or other policy makers can have the same effect. Public authorities often face significant pressures to intervene during periods of high prices. Such interventions are often called for on competitiveness grounds or consumer protection grounds. If investors fear that there will be public intervention during periods when wholesale prices rise, even if those prices are justified, that reduces the expected return on new investments. Therefore, it is important to establish the correct market framework to allow effective competition rather than relying on interventions.

Likewise, TSO actions or balancing markets can effectively set a price cap on wholesale markets. For example, where the full costs of balancing power are not passed on to those causing the imbalance, market participants can have an incentive to rely on the TSO to supply electricity rather than relying on the wholesale market.

Where an investment gap exists, it will be exacerbated if the returns that generators can make on the wholesale market are artificially capped. The gap would then have to be compensated through remuneration for reliable capacity. However, in highly concentrated markets any market for capacity could be open to the same risk of excessive pricing. In such circumstances, public authorities may be tempted to cap the remuneration for reliable capacity as well but then capacity remuneration scheme also risks failing to ensure generation adequacy.

3.1.2. Retail

Regulated retail prices act as a barrier to effective competition and make it more difficult to justify new investment which would be necessary to ensure generation adequacy. Suppliers are discouraged from building their own generation or entering medium or long term contracts with generators to develop their competitive position.

As recognized by the European Council, measures to support vulnerable consumers should not undermine energy efficiency policy or the correct functioning of the electricity market, including price signals for demand[26].

Demand (either directly or through suppliers or aggregators), which fully participates in the market contributes to the price discovery and risk management, thereby helping to trigger investment in new generation capacity. Market participants at all levels may want to hedge against the risk of rising prices.

For generators, such hedging may facilitate financing of new projects. For large industrial consumers, longer term contracting hedges against peak prices and, facilitates

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price cap of EURO 3 000 per MWh, as does GME in Italy. The SEM between Ireland and Northern Ireland has a price cap of EURO 1 000 per MWh. Certain generators in Germany are obliged to bid into markets at short run marginal cost, as are all generators in Ireland. In the OMEL market in Spain and Portugal bids must be between EURO 0 and EURO 180 per MWh

[26] European Council of 22 May 2013 Conclusions EUCO 75/1/13

better planning and more efficient management of production. This is recognised by the Recommendations of 12 February 2013 by the High-level Round Table on the future of the European Steel Industry[27] which state that long term energy contracts, especially for energy-intensive industries such as the steel sector, are an important element for ensuring their global competitiveness and can provide predictability to both buyers and sellers. At the same time, market participants, when concluding long-term contracts, need to comply with common rules on competition and State aid.

3.2. Existing support schemes

3.2.1. Renewables support

Union policy on energy promotes renewable energy. The Commission considers that it is important to ensure that RES fully participate in the market[28]. With increased RES penetration the impact of support schemes for renewable generators on incentives for investment in other types of generation capacity becomes more important.[29]

By contrast, the lack of a stable and predictable framework for investment in RES and/or poorly designed or implemented support schemes for RES may cause or exacerbate generation adequacy concerns. This may in particular be the case when (short run) market price signals are distorted causing fossil generators to exit the market and leaving a reliability gap, particularly in the absence of other flexible solutions such as demand response or storage.

3.2.2. Other support measures

Removing environmentally or economically harmful subsidies, including for fossil fuels may help correct market signals and reduce the need for further interventions. However in the electricity sector today, some Member States continue to provide financial support for generators which use inflexible and relatively inefficient technology. This displaces more flexible or efficient forms of generation as is seen for example by the impact of the support for coal in Spain on the revenues of newer gas powered stations or in Bulgaria

Artificially retaining generation capacity that is economically obsolete and should be allowed to retire can, perversely, cause security of supply and generation adequacy concerns. This will happen if efficient and flexible generation is displaced because it

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[27] http://ec.europa.eu/enterprise/sectors/metals-minerals/files/high-level-roundtable-recommendations_en.pdf

[28] See Communication Renewable Energy: a major player in the European energy market (COM (2012) 271) The benefits of reviewing RES support mechanisms regularly with the aim to limit support to what is necessary and proportionate and of ensuring that renewable generators fully participate in inter alia balancing markets has also been reflected in the annex on RES support schemes published alongside this document

[29] An issue highlighted also by respondents to the public consultation, including ENTSO-E and the Council of European Energy Regulators (CEER).

cannot cover its costs. Similarly, subsidised generators are not flexible enough to manage rapid changes in supply and demand already occurring more frequently as a result of increased penetration of variable RES. However, new flexible plant to complement variable RES would lose profitability due to the low expected running hours. These concerns will be particularly pronounced if operating support is provided through production related subsidies or obligations on suppliers to buy output. Of particular concern in this regard are subsidies for fossil fuels with high CO2 emissions.

3.3. A lack of effective intraday, balancing and ancillary services markets

It has been argued that the downward pressure on day ahead electricity prices in some markets leaves generators exposed to insufficient returns to cover their fixed costs. This could be a risk in particular for mid range and peaking plants which see their running hours go down as a result of increased proportions of wind and solar power on the system, including during the traditional lunch-time peak periods. However, where intraday, balancing and ancillary services markets operate efficiently, such plants can participate in those markets, deriving additional revenue to their day ahead operations. Prices in those markets should be allowed to rise above short run marginal cost, enabling generators to cover also part of their fixed costs.

Other flexibility providers such as large industrial users, aggregators or storage operators have the right, on the basis of Union law, to operate in in balancing markets, reserve markets and other system services markets[30].

3.4. Ensuring generation adequacy in concentrated markets

In concentrated markets, interventions to ensure generation adequacy risk rewarding dominant incumbents for withholding strategies. In particular capacity mechanisms risk replicating, or even embedding, problems of market concentration which exist in some Member States.

Justification of public intervention

In order to ensure cost effectiveness and minimise distortion of the internal electricity market, Member States are encouraged to identify and, where possible, remove regulatory or market failures which cause or may exacerbate generation adequacy concerns before intervening in the market. In particular,:

- In view of the detrimental effects of price caps on investments in power generation and on the transition towards a sustainable low cost carbon free electricity system, the removal of wholesale and retail price regulation (with the exception of social prices for vulnerable customers) has an important role ensure generation adequacy.

[30] Article 15 (8) of Energy Efficiency Directive

- The potential for modifications of renewable support mechanisms in line with the Guidance on renewable support to help ensure generation adequacy should be exploited

- The potential to help ensure generation adequacy by removing distorting support schemes for fossil fuel generation or nuclear generation should be exploited.

- The potential to help ensure generation adequacy by implementing effective intraday, balancing and ancillary services markets and removing obstacles for demand side and storage participation in those markets should be exploited.

- When addressing market manipulation or market power concerns competition rules and Regulation 1227/2001 avoid the potential market distortions caused by price caps

- Appropriate structural solutions to address problems of market concentration leading to underinvestment should be identified and implemented

4. ASSESSING THE COSTS AND BENEFITS OF CAPACITY SUPPORT MEASURES AGAINST OTHER OPTIONS

Security of supply is an objective of Union policy on energy. As indicated above, it is very difficult to assess accurately how much generation capacity and what type of generation capacity will be needed exactly to ensure generation adequacy in the medium to long term. Generation adequacy is not the only factor for ensuring security of electricity supplies. In order to deliver continuous supplies of electricity to consumers, primary energy sources for electricity generation need to be available, sufficient (firm) generation capacity needs to be available and the transmission and distribution networks must be reliable to transport the electricity generated to final consumers.

It is essential that all three components are given sufficient attention. The tendency of policy makers, regulators and TSOs may therefore be to err on the side of caution and "over-insure" the risk of a supply disruption. One element to avoid the risk of "over-insurance" is to verify whether generation adequacy standards in a Member State are comparable to the standards of adequacy required for network outages. A second instrument is to compare the generation adequacy standards applicable in neighbouring systems. Even if it might be legitimate for generation adequacy standards to be different against the background of differing circumstances in Member States, the system reliability in interconnected markets is interdependent. The Commission Services are committed to undertaking further work with the Member States, regulators, ENTSO-E and ACER in the Electricity Coordination Group on this topic.

Finally, in order to ensure cost-effectiveness, the costs invested in avoiding generation shortages or network outages should be assessed against the "value of lost load", i.e. the costs to the economy and society of unforeseen supply interruptions.

Member States may tackle raising concerns on the competitiveness of energy prices for industry and affordability of energy bills for consumers by choosing amongst different instruments the one which is the most cost-effective.

4.1. Avoiding stranded investments and lock-in effects

It is important to look at public interventions in the electricity sector holistically so as to avoid that isolated interventions undermine the effects of other interventions and may end up being counterproductive.

A particular concern as regards public interventions with the aim to ensure generation adequacy is that they may lock-in (fossil) generation based solution that end up being stranded in the medium to long term when additional CO2 free capacity, interconnection capacity or demand and storage based solutions are expected to come on stream[31]. This means that carbon prices reflecting the climate objective should be included in the relevant cost and revenue calculations.[32].

Member States are therefore encouraged, before establishing additional intervention measures, to assess holistically how such measures will impact on their RES and CO2 emission reduction targets and how they can be phased out.

In this regard, options based on increased demand side participation and increased interconnection are critical elements of any strategy to ensure generation adequacy. Therefore the impact of these measures should be explicitly considered before introducing capacity mechanisms even if alone they may not be sufficient to address a potential adequacy gap, at least not in the short term.

4.2. Demand response

The European Council of 22 May 2013 called for particular priority to be given to more determined action on the demand side as well as the development of related technologies, including the drawing up of national plans for the swift deployment of smart grids and smart meters in line with existing legislation.

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[31] Not least as the impact of already the existing ETS cap on CO2 emissions which reduces annually by a linear factor of 1.74% becomes more stringent, and overall emissions are reduced in line with the global 2 degree target and the EU's long term climate objective.

[32] An example for doing so is the investment support assessment of the European Investment Bank. Another possible proxy could be the projected carbon prices in the analysis underpinning the Energy Roadmap decarbonisation pathways See http://ec.europa.eu/energy/energy2020/roadmap/doc/sec_2011_1565_part2.pdf

Lack of participation of demand in the market is considered by most academics to be the most important reason for potential generation adequacy concerns. Member States have developed Smart meter roll out plans to assist the active participation of electricity consumers in accordance with the Electricity Directive[33]. Given the positive impact on the market that smart meters can have on market functioning and security of supply, Member States should assess feasibility of extending or accelerating this roll out before implementing a capacity mechanism.

Even before the roll out of smart technology, there are opportunities to benefit from increased demand response. As stated by *Ifiec*[34] in their response to the consultation ″voluntary demand side response could be released by adapting market structure, market products, and bidding procedures in the shorter term physical markets"[35]. Member States and national regulatory authorities should address the barriers which prevent this from happening to ensure that this potential is realised to the extent possible before implementing capacity mechanisms.

In particular where a limited capacity gap is identified for a limited period of time (i.e. during a limited number of peak hours per year), investments in additional generation capacity may turn out to be more costly than the price for which users could be found prepared to reduce or interrupt their consumption. Suppliers should be encouraged to explore the potential of interruptible supply contracts with (some of) their users to encourage demand response through variable price formula, instead of prematurely catering for additional generation capacity to be built.

4.3. More interconnection capacity

Interconnectors have historically been built to enhance security of supply in Member States which have less favourable conditions for electricity generation than in neighbouring countries. This beneficial role of interconnectors is today even more relevant with more wind and solar power on the system (being unequally spread across the Union). Member States with high proportions of variable wind and solar power will enhance security of supply by relying on interconnection capacity to export surpluses at times of high wind and/or sun and to rely on reliable capacity in neighbouring countries at times of deficit. The diverging energy mix decisions and natural conditions in our Member States offers a potential that the Union needs to harvest to enable to the transition to an affordable low carbon energy system. The alternative, namely to stay locked in to weakly interconnected national systems, will end up being much more

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33 Annex A of Electricity Directive

34 International Federation of industrial energy consumers

35 http://ec.europa.eu/energy/gas_electricity/consultations/20130207_generation_adequacy_en.htm

expensive. A recent study suggests that trying to ensure security of supply on a national basis could cost the EU EURO 3-7bn extra per year[36].

The realisation of needed new interconnection capacity is therefore an essential part of the internal electricity market, as recognised by the Energy Infrastructure Regulation. Thanks to interconnection, Member States are not reliant merely on electricity produced locally. Overall costs can therefore be brought down by an efficient siting of new generation, and the costs of system security are kept down through interconnection[37]. However, 10 Member States have less than 10% interconnection capacity compared to total consumption still today. It is notable that amongst those Member States several are contemplating or have installed capacity mechanisms.[38]

Interconnection allows generation capacity to be shared across borders, and allows peaking or flexible capacity (including demand side participation) to recover its costs from more than one national market. Storage has a particularly high potential to benefit from increased cross border trading opportunities. Overall this reduces the capacity required to ensure generation adequacy in all Member States.

For example, according to the ENTSO-E system outlook and adequacy forecast, Belgium, Germany, Czech Republic and Poland could in some scenarios simultaneously require imports in the winter period. Import from all countries directly connected to this group remains possible however, because there the possibility to import from neighbours. Not only is the required 9.6 GW of generation capacity available but there is also more than sufficient interconnection capacity available on the external borders of the group (approximately 26 GW). Likewise the cooperation between TSOs in Belgium and the Netherlands in 2012 to free up capacity across their common border, thereby helping to address security of supply concerns in Belgium, shows how improving operation of the system can help address generation adequacy concerns.

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[36] Booz and Co. B*enefits of an integrated European energy market* http://ec.europa.eu/energy/infrastructure/studies/doc/20130902_energy_integration_benefits.pdf

[37] Where there are concerns about a lack of investment signals in a particular region within a wider price zone (generally corresponding to a Member State) this is either a result of insufficient network strength, or a sign of a fundamental economic divergence between the two parts of the price zone. Once network strength and stability is ensured, the geographical location of generation does not in itself affect security of supply. Indeed this is one of the benefits of the internal electricity market. TSOs should be able to procure system support services for a limited period of time and in a regulatory approved manner while the network is being strengthened; however, a regional capacity mechanism within a single price zone would distort market functioning.

[38] Ireland, UK, France, Spain and Italy.

Justification of intervention

Before deciding to support power generators with the aim to enhance security of supply, Member States are encouraged to assess the impact of such intervention against alternatives. In particular,

- A holistic approach to climate and energy policy objectives can avoid lock-in of high carbon generation capacity and avoid stranded investments
- The Electricity Directive and the Energy Efficiency Directive Member States oblige Member States to unlock the potential of demand side, an accelerated roll out of smart meters may provide a cost effective alternative.
- Expansion of interconnection capacity, in particular towards neighbouring countries with surplus electricity generation or a complementary energy mix, may be more cost-effective

5. WHICH CAPACITY SUPPORT MEASURE TO CHOOSE UNDER WHAT CIRCUMSTANCES?

Improving market functioning, bringing the demand side increasingly into the market and improving infrastructure and integration in the internal electricity market should help minimise the need to intervene to ensure generation adequacy. However, they might not always be sufficient to avoid all generation adequacy concerns, as the benefits might not be realised in time to avoid periods of genuine security of supply concerns during a period of transition. In such cases it may be necessary to directly impose obligations on electricity undertakings in order to ensure generation adequacy.

As already noted such public service obligations must be proportionate. The intervention must be transparent and non-discriminatory. Interventions cannot undermine the effective functioning of the internal electricity market and in particular must not prevent access to national markets by electricity undertakings established elsewhere in the internal electricity market.

Interventions designed to ensure that sufficient capacity is available to ensure generation adequacy are generally termed capacity mechanisms. There are various types of capacity mechanisms possible, ranging from relatively simple one off tenders for specific capacity or strategic reserves, to much more complex market wide capacity mechanisms.

5.1. Strategic reserves

One approach to filling a generation adequacy gap is to implement a strategic reserve under which capacity is procured, but only deployed in emergency situations (or

equivalently only bid into the market at extremely high prices reflecting the value of lost load). Strategic reserves avoid the "wait for the tender" problem and do not affect the market during normal periods. They may be useful for addressing problems of exceptional peak demand, while still being easily reversible. Strategic reserves have interacted well with energy only markets where they have been used in Sweden and Finland, causing a minimum of distortion. The cost of the reserves has amounted to between EURO 0.10 and EURO 0.30 per MWh to consumers. These have successfully included demand side participation.

Nonetheless, it is important that they be properly implemented. Union rules on public procurement[39] must be respected and help ensure that there is no overcompensation. Where strategic reserves are used to keep prices low, this may result in high emissions from inefficient old plants and discourage the development and deployment of new and more efficient technologies, including storage and demand side response. With market coupling and the introduction of cross-border intraday trading such a failure would happen within a common price mechanism and spill over across borders. It is therefore not only not cost-effective but risks seriously distorting the internal market This problem can be avoided when strategic reserves are clearly used only in the event of the failure of the (short run) wholesale market to match supply and demand. This requires objective and transparent criteria as to when strategic reserves can be deployed. The Commission will therefore consider whether it is appropriate to develop rules on the proper implementation of strategic reserves in the context of the planned implementation of market coupling Guidelines and Network Codes developed in accordance with the Electricity Regulation

5.2. Tendering procedures

As already noted, Article 8 of the Electricity Directive provides for Member States to implement special tendering procedures to ensure security of supply. Tenders have been used with varying degrees of success in a number of Member States to ensure security of supply as part of the transition to market based investments[40].

A tendering procedure has the advantage of being relatively easy to organise and will ensure that investors actually construct the capacity tendered, and then participate in the market as normal. New capacity which benefits from the tender continues to participate on the market. Consequently, it is important that the tender not be designed in such a way as to distort normal market operation or production decisions or to distort future investment decisions.

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[39] This applies to any mechanism which involves centralised procurement, including tendering procedures or centralised capacity auctions. Relevant legislation includes Directive 2004/17/EC of the European Parliament and of the Council of 31 March 2004 coordinating the procurement procedures of entities operating in the water, energy, transport and postal services sectors *OJ L 134, 30.4.2004, p.1*

[40] E.g. Ireland, Greece, Estonia

Properly implemented, tendering constitutes a one off intervention on the market. However there is still a risk of distorting investment signals by encouraging 'a wait for the tender to be launched' approach on the part of investors to secure additional revenue. In the context of the current transition of the electricity system, and in some Member States, the decision to shut down nuclear capacity, well designed and one off tenders could have a role to play. However, only if the connection between the tender requirements and the system transition is clear, is it likely that investors would consider a commitment not to repeatedly launch more tenders, in order to be credible. Where a tender is implemented to correct for regulatory failures it is likely to undermine confidence in the willingness of public bodies to correct such failures, thereby exacerbating the underlying problems.

Tenders must be conducted by a body, which may be public or private, fully independent of generation and supply interests. TSOs may only conduct the tender if they are fully independent in ownership terms[41] [42].

5.1. Market-wide capacity mechanisms

Market wide capacity mechanisms essentially create a second product "capacity" in parallel to the wholesale market for electricity. Market wide capacity mechanisms come in different varieties, broadly either capacity payments where an administratively determined price is paid for available capacity or capacity markets based on central procurement or obligations on suppliers to buy "certified" capacity from generators.

Both centralised and decentralised capacity markets can be based on hedging products referenced to the market price, generally called reliability options, or a system of administratively determined penalties for non-availability[43]. Reliability options require a well specified reference price, generally related to intraday or balancing prices. However, if such a reference price is available then this avoids the complexity of designing a detailed penalty regime. Nonetheless, it is important that the option strike price is not set so low as to distort the operation of the balancing or intraday markets.

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41 Article 8(5).Electricity Directive

42 Where undertakings are publicly owned the test for independence should be that set out in Article 9(6) of the Electricity Directive, explained further in Commission Staff Working Paper of 22 January 2010 on the Unbundling Regime.

43 Although in theory it should be possible to rely solely on the financial incentive associated with a reliability option, usually only certified capacity are eligible to offer such options. Therefore the main difference in practice between reliability options and capacity markets based solely on certification is that in the latter the penalty for non-performance is administratively determined.

		Annual cost of capacity remuneration			
	Market design	Total cost Mill. EURO	Per gross electricity gen. EURO /MWh	Per committed capacity EURO /MW/year	Committed capacity MW
Greece	Capacity payment	451	9.18	41,030	11,008
Ireland	Capacity payment	529	14.9	78,000	6,778
Italy	Capacity payment	100 – 160	0.5	-	-
Spain	Capacity payment	758	2.7	30,506	24,847
Sweden	Strategic reserve	12	0.1	6,981	1,726
Finland	Strategic reserve	19	0.3	31,216	600
Norway	Strategic reserve	25	0.2	82,753	300
PJM	Capacity market	4,275	5.5	31,401	136,144

Table 2 Annual capacity cost of existing mechanisms[44]

The costs of capacity mechanisms can be very high - for example in the single electricity market between Ireland and Northern Ireland they are equivalent to EURO 15 per MWh, in Greece EURO 9 MWh. Outside Europe the well-established mechanisms in the PJM market in the North Eastern United States results in a capacity price equivalent to EURO 5.50 per MWh (see Table 2).

One particular concern about market wide capacity mechanisms is that they can over reward generation which was already financially viable. For example if the cause of an investment gap results from flexible generation not being adequately rewarded on balancing markets, there is little benefit from providing additional revenues to existing inflexible coal or nuclear plants. For this reason such capacity mechanisms are highly complex and difficult to implement. Professor William Hogan of Harvard University writing on capacity markets states "it is difficult to properly define the capacity product,

[44] Source: Thema, E3M, COWI, *Capacity Mechanisms in individual markets within the IEM*. All data sources provided therein. Some costs may partly reflect other market design features, for example in Ireland there is not an explicit balancing market as it is incorporated in the SEM gross mandatory pool

determine the amount and location of capacity needed many years ahead, and integrate diverse products that blend capacity and energy in a variety of configurations. The problems are fundamental. It is not easy to build a good forward capacity market model based on first principles"[45]. Other prominent academics have commented that misguided attempts to solve generation adequacy concerns cause risks, inefficiencies and regulatory responses that are far more costly than any likely mistake in the provision of adequacy, there are also concerns among academics that market imperfections will result in an underinvestment of new capacity, who have designed different capacity mechanisms to correct for these imperfections. [46] [47].

Well-designed capacity markets can be effective at identifying new potential providers as well as facilitating the minimisation of costs – this has been the experience of the PJM capacity market which has facilitated participation by aggregators and demand[48]. Likewise obligations on suppliers relying on decentralised markets should limit the compensation to capacity to fill the identified gap to the minimum necessary. Capacity markets also facilitate secondary trading, which helps to reduces costs.

By contrast, establishing the correct value for capacity payments is difficult[49] and open to accusations of political interference. Neither can it be assured that required capacity will be delivered (particularly given regulatory uncertainty associated with the setting of the payment) or alternatively that excess capacity will not result from the scheme resulting in overcompensation. These concerns were reflected by the vast majority of respondents to our consultation.

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[45] Hogan, WW Electricity Scarcity Pricing Through Operating reserves: An ERCOT window of Opportunity. November 2012 Working paper available at http://www.hks.harvard.edu/fs/whogan/Hogan_ORDC_110112r.pdf

[46] Cramton P & Steven Stoft S 2008, Forward reliability markets: less risk, less market power, more efficiency. Utilities Policy 194-201

[47] Paul L. Joskow, Capacity payments in imperfect electricity markets: need and design. Utilities Policy, 16:1590170, 2008

[48] PJM is a regional transmission organization in the USA that coordinates the movement of wholesale electricity in all or parts of 13 states and the District of Columbia.

[49] The additional payment can be set in advance (then reset periodically) or an automatically updated formula applied as was the case in the pool market in England and Wales in the 90s.

Recommendations on choice of instrument

A strategic reserve or a credibly one-off tendering procedure is normally less distortionary and easier to implement than market wide capacity mechanisms unless there is clear evidence that they are unsuited to filling the identified adequacy gap.

Mechanisms based on capacity payments do not ensure that the identified adequacy gap is filled and create significant risks of overcompensation.

6. DESIGN FEATURES OF CAPACITY MECHANISMS

Incompatible or poorly designed capacity mechanisms risk distorting trading, production and investment decisions in the internal electricity market. They also risk discouraging innovative solutions, for example energy services providers that control demand based on wholesale market prices and instead locking in (possibly high CO2 emitting) generation based solutions. If capacity mechanisms become more common in the internal electricity market, the potentially distortionary effects will become greater.

It is important that those risks are mitigated by careful design.

6.1. Technological neutrality and decarbonisation

Member States have signed up to the Union's climate objectives and the resulting need to decarbonise the power sector.. Therefore, they are encouraged to ensure that low carbon technologies can compete on a level playing field. The implementation of a capacity mechanism should not increase carbon intensity footprints for capacities to avoid lock-in of high carbon generation[50].

In order to be cost-effective and in line with Union policy on the environment, capacity mechanism should be open to all technologies able to solve the problem of an identified gap in generation adequacy. While it is sometimes suggested that the capacity need can only be addressed by a specific technology (for example combined cycle or open cycle gas turbines) the choice of technology should not be established by the public authority.

It is more cost-effective and less distortionary to the internal market to base any restrictions on participation in the mechanism on performance specifications, for example the ability to deliver electricity at short notice or within certain time periods where generation adequacy concerns are highest. Reliability options require capacity providers to reflect these factors in the price they charge, as the risk faced by less flexible plants will be higher.

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[50] http://ec.europa.eu/energy/energy2020/roadmap/doc/sec_2011_1565_part2.pdf, Annex 1 provides information on projected EU average carbon intensities of electricity and steam production of different decarbonisation scenarios in line with the EU climate objective.

In certain situations, it can be more cost-effective to retrofit or retain existing generation capacity, which would otherwise shut down, to keep it operational. This can also help potentially to avoid the lock-in effects of constructing new (fossil fuel) generation capacity.

Therefore, capacity mechanisms open to capacity retention as well as new investments, without discrimination between the two categories ensure cost-effectiveness and minimise distortion. Avoiding windfall profits for already amortized plants requires that the selection process is competitive If the capacity mechanism provides longer term commitments to particular generators, the costs of giving such commitments must be appropriately valued and included in the assessment.

Another possibility to ensure cost-effectiveness is the inclusion of new and innovative approaches, in particular the potential contribution from demand side participating in the mechanism. To ensure non- discrimination any mechanism implemented must be open to aggregation of demand and supply. Capacity mechanisms should be designed fully taking into account the particular characteristics of demand response rather than defining products on the assumption that it will be filled by new generation.

As already noted the Energy Efficiency Directive promotes demand side participation in balancing markets, reserve markets and other system services markets. These provisions, in particular those relating to the treatment of aggregation apply equally to any mechanisms which are introduced to ensure generation adequacy.

Technological neutrality and decarbonisation

Open capacity mechanisms to demand side participation and fully take account of their particular characteristics

Ensure consistency with decarbonisation objectives to avoid the lock in effect of new high carbon generation capacity.

Open capacity mechanisms to new and existing generation capacity

Base restrictions on participation in a mechanism to ensure generation adequacy on the technical performance required to fill the identified adequacy gap and not on predefined technology types

6.2. Time bound intervention

There are two dimensions of time that are relevant for the length of interventions – the time during which support is given to individual capacity and time for which the mechanism is retained.

Cost-effective capacity mechanisms which minimise market distortion allow the price of capacity to fall to zero as market failures are addressed, allowing smooth exit from the

mechanism. Regarding the time for which the mechanism is retained - any mechanism implemented should also be subject to regular review; this review should include an assessment of progress towards addressing the underlying market and regulatory failures and include a roadmap explaining the expected duration of the need for the mechanism of the capacity mechanism in the context of addressing the underlying market failures.

Mechanisms based on decentralised supplier obligations mean that all "certified" capacity (that is new and old) will receive the same price. If the price falls to zero, indicating that the mechanism is no longer required, this will also apply equally to old and new capacity.

Capacity markets based on central procurement allow for the duration of payments to be differentiated between new and old capacity. This requires careful design of auctions or tendering mechanism to avoid overcompensation. Best practice in the application of auction design and procurement rules in this regard should be followed. In any case commitments should be significantly shorter than the expected economic life of the capacity, in order to avoid distortion of the market in the longer run and locking in of fossil fuel based generation.

The timing of auctions or the fulfilling of supplier obligations is of critical importance; this is an important factor to take into account when designing a capacity mechanisms. In practice, this means that lead times should be just enough to commit to building a new generation plant, or implementing a programme of demand side response. Generally this can be done in around four years or less (depending on availability of existing sites etc.). Retrofitting can normally be achieved well within this timeframe. Lead times which are longer than this mean that the inevitable uncertainty in markets, for example regarding medium term economic developments, is transferred to consumers. Very short lead times by contrast are likely to result in investors not being able respond to the incentive in practice.

Time-bound intervention

Capacity mechanisms should be designed to deliver a price of zero when there is sufficient capacity available

Capacity mechanisms should subject to regular review in line with a roadmap for addressing underlying market and regulatory failures.

The lead time for a capacity mechanism should correspond to the time needed to realise new investments, that is 2-4 years

6.3. Cross border participation

In the internal electricity market, both domestic and non-domestic capacity contribute to delivering security of supply; with further integration the already high degree of interdependence between Member States will deepen. Member States are obliged to respect commitments to export electricity even during

periods of locally high demand. In this regard the Commission Services recall that Article 4 of the Electricity Security of Supply Directive specifically requires Member States not to discriminate between cross border contracts and national contracts[51].

Any mechanism which is only open to domestic capacity is likely to distort investment signals, steering new investments away from neighbouring markets. A mechanism which excludes cross border participants could result in new generation capacity displacing imports. This would undermine the financial viability of generation in other Member State and could have a negative impact on regional security of supply. At worst this could cause a spiral effect, with both Member States intervening to protect generation adequacy and thereby undermining the benefits of the shared security of supply which the internal electricity market brings. Any territorial restriction may be incompatible with the Union *acquis*

Therefore, mechanisms should be open to any capacity, including capacity located in other Member States, which can effectively contribute to meeting the required generation adequacy standard and security of supply. Just as the possibility should also exist for capacity located elsewhere to participate in a mechanism, it should also be possible for capacity to "opt out" of its national scheme, in order to instead participate in a mechanism established elsewhere.

It should be possible to allow capacity equal to the maximum import capacity of the Member State to participate in a national mechanism. This would create a demand for the use of the interconnection which could be marketed by TSOs separately from the normal allocation of cross border capacity. Alternatively, long term allocation capacity on interconnectors could allow for cross-border participation in capacity mechanisms by allowing generators to demonstrate their ability to deliver electricity to the Member State in question. This is compatible with Market coupling and could even work across several borders. With reliability options the incentive effect of the option should ensure that generators located in other Member States would anyway ensure they had sufficient interconnection capacity rights. Both these approaches ensure that while revenues are created for new interconnector operators (who are by definition TSOs) they do not bid directly into capacity mechanisms, preserving the unbundling of network operators and electricity supply and generation functions.

Obviously generation abroad or interconnector capacity should not be double-counted or double remunerated, but not remunerating anything implies favouring local generation over imports and slowing down new interconnection. Regional cooperation would facilitate addressing this problem and should be pursued where possible[52]. The Commission Services recognise there may be practical difficulties of implementing a framework for cross border certification

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[51] In the network codes implementing market coupling planned to be adopted under Article 8(6)(g) and Article 6 of Regulation 714/2009 the Commission intends to include procedures for the allocation of cross border capacity in coupled markets when they reach technical price limits or are unable to clear.

[52] The example of Ireland and Northern Ireland shows that regional cooperation is possible.

of capacity and accounting for "capacity" import and export[53]. As a result, it may be necessary, as an interim step, for Member States to calculate the contribution of imports to meeting the generation adequacy standards, and the implicit value of this in any capacity mechanisms implemented. This sum should then be used to develop of additional interconnection capacity for as long as it is not possible for external capacity to directly participate in the scheme.

The Commission Services will continue to work with Member States, ACER and National Regulatory Authorities, and ENTSO-E and TSOs to examine how cross border trading can be facilitated in capacity mechanisms.

Cross-border participation

Mechanisms to ensure generation adequacy should be open to all capacity which can effectively contribute to meeting the required generation adequacy standard, including from other Member States.

Member states should allow the participation of cross border capacity based on holding of (financial or physical) interconnection capacity rights, or alternatively implement reliability options which ensure that participants are incentivised to hold capacity rights.

If the security of supply benefit of electricity imports can only be accounted for implicitly, this benefit should be calculated and these funds used to for the development of additional interconnection capacity

Member States considering interventions to ensure generation adequacy should cooperate with Member States in their region at an early stage, to examine the potential of implementing cross border mechanisms

6.4. Avoiding distortions of competition and trade

The introduction of a capacity mechanism should not jeopardise the benefits of efficient market functioning, a particular concern of respondents to the consultation paper. This is why it is important that the mechanism does not interfere with the operation of market rules.

Generation adequacy means the availability of sufficient capacity to avoid involuntary disconnection; wholesale energy markets continue to provide the best signals for the efficient use of the capacity which is actually available. The development of market coupling across the EU is an integral part of the full integration of the energy markets. Aligning market rules and expanding coupling across the EU will bring additional benefits of up to EURO 1bn per annum on top of the EURO 1-2 bn from the market coupling already

[53] These difficulties apply equally to the holders of interconnector capacity and to interconnector operators, by definition TSOs

implemented. Interventions which jeopardise these developments would be clearly detrimental to the functioning of the internal electricity market.

Reserving capacity for the national market would result in systematic distortions in the functioning of the internal electricity market, as would rules which restrict generators participation in Market Coupling (day ahead or intraday) or balancing markets[54]. Such reservation is not confined to explicit prohibitions on exports – export charges would have the same effect. Likewise the effective operation of market coupling requires that market participants be able to freely participate in the market.

With reliability options, generators no longer benefit from prices above the reference price, this means that the reference price could end up setting an implicit price cap in the market. Moreover, they could also displace normal trading between generators and suppliers, supplanting the normal wholesale market. Therefore the reference price needs to be set at a sufficiently high level that normal market functioning is not affected. This means that scarcity conditions can still be signalled from normal market operation.

Relatedly care should be taken that penalties for non-availability, or the formulation of capacity certification obligations, do not lead to inefficient production by operators. Otherwise the penalty could end up setting a "shadow price" for the energy market, as generators become more concerned with avoiding the penalty than actually delivering electricity when it is required.

[54] This does not apply to strategic reserves, where the system is designed to ensure the availability of a reserve which does not operate in the normal market.

Avoiding distortion of competition and trade

There should be no procedures to reserve electricity for the domestic market where a capacity mechanism is in place.

There should be no export restrictions or surcharges from the operation of capacity mechanisms

Price caps or bidding restrictions should not be implemented to offset impact of mechanisms on prices

Penalties for non-availability should not lead to inefficient production decisions by operators, reliability strike price options should be significantly above expected market prices

Capacity mechanisms should not adversely affect the operation of market coupling, including intra-day and balancing markets.

7. HOW TO FINANCE SUPPORT FOR CAPACITY

Interventions to ensure generation adequacy come with a cost, including direct as well as indirect costs. As indicated above, it is important that Member States undertake a detailed cost benefit analysis, including against other alternatives, before deciding upon public interventions to support generation adequacy. The impact of such costs on energy bills for industrial and household users should also be assessed. In this, administrative costs associated with operating the systems (e.g. certifying capacity, running auctions) should be explicitly included.

International experience shows that capacity mechanisms can cost up to 10% - 20% of wholesale electricity (i.e. energy only) prices. This is a significant sum and while it is imperative to keep energy costs low, it is reasonable that electricity consumers benefiting from the increased security of supply should bear the associated cost. Exempting industry or other classes of consumer from the costs of ensuring generation adequacy will push bills for all other consumers up even further.

The most effective way of passing costs to the beneficiaries of enhanced security of supply will normally be through their electricity suppliers, either directly in the case of capacity obligations or indirectly where surcharges are included on bills for the cost of centralised procurement. However, it is necessary that the costs passed on to suppliers reflect the actions of those customers; otherwise there is a risk that mechanism will lead to additional burdens falling only on some undertakings.

In practice this will normally be a function of their consumption at peak load, which requires that customer profiles are accurate and detailed. This also allows suppliers to pass on costs to the appropriate consumption groups. Consumers, and in particular

industry, who are able to manage their demand flexibly should therefore end up paying less towards the capacity mechanism.

Allocation of costs

The costs of capacity mechanisms should be should be allocated in a transparent and non-discriminatory manner

The costs of capacity mechanisms should be allocated to consumers in proportion to their contribution to demand during periods of scarcity or system stress.

8. CONCLUSIONS

The guidance set out in this document is summarised below as a checklist for Member States to use when considering the implementation of capacity mechanisms. The Commission Services welcome the opportunity to discuss with Member States how this guidance can be applied so that the benefits of an integrated and competitive internal electricity market in electricity can be fully realised. Nonetheless, the Commission will also take the necessary action to fulfil its obligation to ensure that national measures are in line with the EU acquis.

The Commission Services will also continue to work with Member States and national regulatory authorities, in particular through the Electricity Coordination Group, on addressing the challenges to ensuring security of electricity supply and generation adequacy during the transformation of the electricity system.

Finally, the Commission Services will also continue to progress the work underway through the Electricity Coordination Group on ensuring consistent European generation assessments are available to policy makers which allow them to assess the national situations, and also understand the impact of their decisions on the internal electricity market.

CHECKLIST FOR INTERVENTIONS TO ENSURE GENERATION ADEQUACY

Justification of intervention

Assessment of generation gap

(1) Is the capacity gap clearly identified and does this distinguish between need for flexible capacity at all times of year and requirements at seasonal peaks? Has a clearly justified value of lost load been used to estimate the cost of supply interruptions?

(2) Has the assessment appropriately included the expected impact of EU energy and climate policies on electricity infrastructure, supply and demand?

(3) Does the security of supply and generation adequacy assessment take the internal electricity market into account; is it consistent with the ENTSO-E methodology and the existing and forecasted interconnector capacity?

(4) Does the assessment explain interactions with assessments in neighbouring Member States and has it been coordinated with them?

(5) Does the assessment include reliable data on wind and solar, including in neighbouring systems, and analyse the amount as well as the quality of generation capacity needed to back up those variable sources of generation in the system?

(6) Is the potential for demand side management and a realistic time horizon for it to materialize integrated into the analysis?

(7) Does the assessment base the assessment of generation plant retirements on projected economic conditions, electricity market outcomes and the operating costs of that generation plant?

(8) Has the assessment been consulted on widely with all stakeholders, including system users?

Causes of generation adequacy concerns

(9) Has retail price regulation (with the exception of social prices for vulnerable customers) been removed?

(10) Have wholesale price regulation and bidding restrictions been removed?

(11) Have renewable support mechanisms been reviewed in line with the Guidance on renewable support before intervening on generation adequacy grounds.

(12) Has the impact of existing support schemes for fossil and nuclear generation on incentives for investments in additional generation capacity or maintenance/refurbishment of existing generation capacity been assessed?

(13) Are effective intraday, balancing and ancillary service's markets put in place and are any remaining obstacles, in those markets removed? Have any implicit price caps from the operation of balancing markets been removed?

(14) Have structural solutions been undertaken to address problems of market concentration?

Options other than support for capacity

(15) Have the necessary steps been taken to unlock the potential of demand side response, in particular has Article 15(8) of Directive 2012/27/EU on Energy Efficiency been implemented and do smart meter roll out plans include the full benefit of demand side participation in terms of generation adequacy,?

(16) Have the benefits of expanded interconnection capacity been expanded, in particular towards neighbouring countries with surplus electricity generation or a complementary energy mix been fully taken into account.

(17) Have the impacts of the intervention on the achievement of adopted climate and energy targets been assessed holistically, and is lock-in of high carbon generation capacity and stranded investments avoided?

Choice of Mechanism

Choice and design of intervention

(1) Has the effectiveness of a strategic reserve been examined?

(2) Has the potential for a credibly one-off tendering procedure to address the identified capacity gap been examined?

(3) Does the chosen mechanism ensure that identified adequacy gap will be filled while avoiding risks of overcompensation (unlikely with payments payments)?.

Recommendations to avoid distortion of internal electricity market

(4) Is the chosen mechanism open to demand side participation?

(5) Is the mechanism to ensure generation adequacy consistent with the long term decarbonisation of the power sector?

(6) Is the chosen mechanism (other than a tendering scheme) open to existing and new generation?

(7) Are conditions for participation in the mechanism based on technical performance and not technology type?

(8) Does the chosen mechanism deliver a price of zero when there is already sufficient capacity available?

(9) Has a framework for the phase out of the mechanism in line with a roadmap for addressing underlying market and regulatory failures been developed

(10) Does the lead time for a capacity mechanism correspond to the time needed to realise new investments, that is 2-4 years?

(11) Is the mechanism open to all capacity which can effectively contribute to meeting the required generation adequacy standard, including from other Member States? Insofar as imports are accounted only on an implicit basis, is a mechanism established to calculate this benefit and allocate funds to this value for the development of additional interconnection capacity?

(12) Is it ensured that there are no export charges or procedures to reserve electricity for the domestic market?

(13) Have all barriers to the equal treatment of national and cross border contracts been removed?

(14) Are there no price caps or bidding restrictions as a result of the chosen mechanisms?

(15) Is it ensured that the operation of the chosen mechanism does not lead to inefficient production by operators?

(16) Is it ensured that the capacity mechanism does not adversely affect the operation of market coupling or cross border intraday trading?

(17) Does the chosen mechanism allocate the costs to consumers on a non-discriminatory basis, taking into account their consumption patterns and without reductions for particular customer segments