

CAPACITY MECHANISMS WORKING GROUP

14 APRIL 2015

DESIGNING APPROPRIATE OBLIGATIONS AND PENALTIES

This paper compiles the requirements in the Guidelines on State aid for environmental protection and energy (EEAG) related to assessing any obligations and penalties imposed on beneficiaries of generation adequacy measures. It then discusses some of the relevant design choices in this area and the kind of consideration that will be required in any assessment.

1. WHAT DO THE GUIDELINES REQUIRE?

The EEAG include the following requirements related to the obligations placed on providers of capacity in a generation adequacy measure:

(49) Environmental and energy aid can only be found compatible with the internal market if it has an incentive effect. An incentive effect occurs when the aid induces the beneficiary to change its behaviour...to improve the functioning of a secure, affordable and sustainable energy market...

(219) Measures for generation adequacy can be designed in a variety of ways, in the form of investment and operating aid (in principle only rewarding the commitment to be available to deliver electricity)...

(225) The aid should remunerate solely the service of pure availability provided by the generator, that is to say, the commitment of being available to deliver electricity and the corresponding compensation for it, for example, in terms of remuneration per MW of capacity being made available. The aid should not include any remuneration for the sale of electricity, that is to say, per MWh sold.

(233)(b) The measure should not undermine market coupling, including balancing markets.

Figure 1: Summary of EEAG requirements related to obligations and penalties

Summary	
EEAG requirement	Objective
(49)	1. The aid must have an incentive effect inducing the beneficiary to change its behaviour to improve the security of the energy market.
(219)(225)	2. The aid must remunerate solely the service of pure availability (MWs), not the sale of electricity (MWhs).
(233)(b)	3. The measure should not undermine market coupling, including balancing markets.

2. THE POTENTIAL NEED FOR OBLIGATIONS AND PENALTIES

A perfect electricity market would see high prices at times of system tightness. These high prices would provide the incentives both for longer term investment decisions (ie. do I build a power plant / do I establish a business offering demand response services? And how much do I value flexibility – the ability to alter my output quickly?) and short term operational decisions (ie. when shall I schedule maintenance? How much do I care about being able to deliver when needed to capture potential high scarcity prices?). However, the same market and regulatory failures¹ preventing the long term decisions that would result in sufficient investment in capacity to meet demand are also likely to undermine the signals for market participants to ensure their plants are sufficiently available at times of scarcity², and also for market participants to invest in the right balance of flexible capacity (though the requirement for flexibility may also be met to some extent through the provision of balancing services).

This suggests there may be a benefit in a capacity mechanism that provides additional incentives for beneficiaries to invest in the flexibility needed to ensure system adequacy. However such incentives must be carefully designed in order for the mechanism to achieve its objectives without distorting competition or trade between Member States. These incentives take the form of obligations and penalties. The obligations may be important to ensure contractual liability for the delivery of the service, while the penalties may be important to give added reassurance not just that the capacity benefitting from a capacity mechanism can and will deliver when needed, but also that there are adequate repercussions and some compensation for consumers if there are hours in which demand is not met.

2.1. Obligations and penalties in different capacity mechanism models

The design of any obligations and penalties will depend on the design of the capacity mechanism. In a strategic reserve, the beneficiaries may be instructed to run or be curtailed (if demand response) directly by the system operator at times when they are required. In this case their obligation is therefore to remain outside the market and in reserve, and to ensure they can run or be curtailed when dispatched by the system operator (probably after an agreed notice period). To ensure the reserve plants are maintained appropriately, contractual penalties may apply for failure to deliver when dispatched.³ In a volume based market wide mechanism, there are various options, including:

¹ For more on potential market failures see the previous working group paper on 'assessing generation adequacy'.

² Note though that in a market in which electricity prices rise to high levels there is also likely to be an increased risk of strategic withholding of some capacity to generate scarcity prices that can be captured by other plants within a portfolio.

³ It is unlikely to be appropriate for reserve participants to be able to access the electricity market revenues generated from the hours in which the reserve is dispatched, since participants taking a reserve contract have forfeited the risk/reward of operating in the electricity market and relying on

- An obligation to either be available, or to deliver electricity into the market⁴, at certain times and a penalty if the obligation is not met, which could be either a fixed amount, or based on a formula (for example, linked to imbalance settlement or a near real-time market price, and/or linked to the value of lost load); or
- An obligation to pay the difference between a market reference price and a strike price in a reliability option contract, whenever the reference price goes above the strike price (so a reliability option is an obligation and penalty combined); or
- In a supplier obligation / certificate mechanism, beneficiaries have an incentive to either be available, or to deliver electricity up to the capacity of certificates they have sold, since they will have to pay for sufficient additional certificates to cover any shortfall.

Capacity mechanisms can also include penalties related to the building of new capacity on time. If the mechanism in general has strong incentives for making capacity available, and these apply to the holder of a capacity contract / certificate throughout the delivery year regardless of the status of that holder's project, these general obligations and penalties should provide incentives for the construction of new capacity on time. However, if there are any exceptions to these rules, for example to reduce the risk and therefore cost associated with new project development, additional penalties may be required (for example construction milestone checking and associated penalties for delays, or for abandoning a project). This potential form of obligations and penalties is not discussed further in this paper.

2.2. Ensuring an incentive effect

In a volume based market wide mechanism based on reliability options, an incentive effect should be ensured because capacity providers that have sold reliability options will want to ensure they are producing at times of stress (which are identified automatically by high reference prices). If they are not producing, they will have no revenues to cover potentially very high costs of sourcing electricity in the market to meet the obligation to supply electricity at the strike price at a time when market prices exceed the strike price. However, the extent to which the reliability option ensures the provision of *flexible* capacity may depend on the reference market chosen for the option (since a closer to real time market should provide greater incentives for flexibility).

In a volume based market wide mechanism including any kind of administratively defined obligation and penalty, there may be additional design challenges, for example:

- The need to define the time periods (eg. system stress period) in which obligations and penalties will apply and any advance warning of these periods (which will determine the

high scarcity prices in favour of a predictable payment for leaving the market and remaining in reserve.

⁴ Note the physical delivery of electricity can be achieved by generating electricity, releasing electricity from storage, or by reducing demand.

extent to which the mechanism has an incentive effect bringing forward flexible capacity);

- The need to determine what exactly a capacity provider must do at these times to fulfil its obligation; and
- The need to design a penalty that provides sufficient incentives to ensure capacity contributes to security of supply.

The definition of the stress period in which penalties will apply could, even without a reliability option, be based on times when prices in a reference market rise above a certain level. Or it could be based on the need for the system operator to take action to reduce demand.

Once the period is defined, there is also the need to consider whether any advance warning of such a period should be provided to beneficiaries. An advance warning will help reduce beneficiaries' risk, but it passes additional risk onto the organisation responsible for issuing the warning. Also, the warning is likely to remove incentives the measure might have provided for investment in flexibility greater than required to deliver electricity after the warning (eg. if there is a warning 5 hours ahead of real time, beneficiaries will not necessarily have incentives to invest in technology that allows them to ramp up within 3 hours). The advance warning will also tend to determine the extent to which the measure overall values flexibility. If the warning is set too close to real time, this could result in a higher proportion of very flexible capacity being constructed than is economically optimal.

In some mechanism designs, providers are not required to actually deliver electricity, they are required only to make themselves available to the market (sometimes by placing an offer in the day ahead or intraday market, or at gate closure). In other designs, beneficiaries must physically deliver electricity into the wholesale market to meet their obligations.

If the need for penalties is based on a perceived problem of insufficient short term signals to ensure sufficient plant availability, or the penalty design is considered necessary to ensure the mechanism provides sufficient longer term incentives for investment in reliable and flexible capacity, then the penalties should in theory be linked to the value of lost load. If the beneficiaries paid to deliver security of supply do not deliver their obligation, they should be penalised based on the cost to consumers that their lack of delivery causes.

Along with penalties, consideration should be given to the need for over-delivery payments. These would reward capacity providers for exceeding their obligation at times of system stress (eg. if their capacity obligation required them to deliver 100MW and they were in fact able to deliver 110MW).

A combination of penalties and over delivery payments may make sense in a system that involves the de-rating of capacity resources (ie. in which capacity providers are only certified / contracted up to a certain percentage of their total potential capacity based on their expected average contribution to security of supply). In this system, a combination of penalties and over-delivery payments can enable the system to more correctly reward beneficiaries based on their actual verifiable performance, rather than solely relying on the initial up front de-rating, which is likely to be a relatively crude and inaccurate way to determine each beneficiary's actual contribution to security of supply. A system of penalties combined with over-delivery payments

is equivalent to many forward contracts which require an agreed forward obligation (the capacity contract / certificate) to be met from either the seller's own resources (delivery), or other sources (buying in the market – equivalent to a penalty). In a capacity mechanism however, there may be no way to buy in the market at a time of scarcity, hence a pre-determined penalty / over-delivery rate may need to be set. If over-delivery payments are introduced in a design, these should in theory be set at the inverse of the penalty rate.

With or without a reliability option product, a balance may need to be struck between exposing capacity providers to the right economic incentives and the need to ensure the mechanism brings forward the necessary capacity at acceptable cost. Depending on the way new investments are financed, this may for example require a reduction in risk for participants through:

- The imposition of penalty caps (and once penalty caps are introduced, to ensure an incentive effect remains once the cap is reached, additional rules may be required – for example a system where future good performance in stress events, even after the cap has been exceeded, can reduce the overall level of penalties payable over the delivery year).
- Exemptions from the obligation (for example, allowances for force majeure or maintenance).

In the New England capacity mechanism, the model was originally based on an availability obligation with various exemptions. After it became clear that there were insufficient incentives to ensure beneficiaries made a real contribution to security of supply, however, the rules were revised and now require beneficiaries to physically deliver electricity at times of stress, with fewer exemptions⁵. The PJM system is apparently also being revised to increase penalties for non-delivery and remove /reduce previously applicable exemptions⁶.

In any design, supplementary testing may be required to ensure beneficiaries can actually meet their obligations (since in some years there may be no stress situations).

3. POTENTIAL IMPACT ON WHOLESALE MARKET FUNCTIONING (AND MARKET COUPLING)

The EEAG require the remuneration of the service of pure availability (MW) and not payments for electricity (i.e. payments per MWh). The reason for this is that the target model is based on the electricity price in each market being set by supply and demand in any given period, and market coupling determines cross-border trade flows based on a comparison of these prices (currently at the day ahead stage, but soon to be implemented closer to real-time too under the

⁵ http://www.iso-ne.com/regulatory/ferc/orders/2014/may/er14-1050-000_5-30-14_pay_for_performance_order.pdf

⁶ This is partly due to the poor performance during the crisis caused by the 'polar vortex' last winter, where 22% of the contracted capacity was not able to deliver.
<http://www.pjm.com/~media/documents/ferc/2014-filings/20141212-er15-623-000.ashx>

draft Commission Regulation establishing a Guideline on Capacity Allocation and Congestion Management).

Operating aid payments for electricity capacity paid per MWh are likely to have a far greater distortive effect on electricity prices and the short term running decisions of a generator than payments based on capacity (per MW). This is true for both renewable⁷ and conventional capacity, but with conventional capacity the damage of payments per MWh to market prices and the efficiency of cross border trade flows could be particularly severe because conventional generators still set market clearing prices for the majority of hours. If payments under a capacity mechanism are made for each MWh of energy delivered, then capacity providers would have an incentive to generate more, and more often, than otherwise. If significant capacity payments were granted based on production hours, there would be a risk that prices at times of scarcity no longer reflected even the marginal costs of electricity production.

An obligation based on the physical delivery of electricity, and associated penalties (and over delivery payments) paid per MWh could potentially mean a mechanism could not be considered compatible with EEAG point 125. In the GB Capacity Market case, the Commission accepted that a model including an obligation linked to the physical delivery of electricity was appropriate, but noted:

The Commission considers it is primarily the role of market coupling (both day-ahead and intraday) and balancing markets to ensure the efficient use of the resources available to the system, including across interconnectors. A delivered energy model has the potential to undermine this, since it may lead to capacity providers dispatching even if it was not profitable based on market prices alone, in order to avoid penalties. Sufficient conditions for a delivered energy model to have no impact on the efficient allocation of resources are that system stress events relate only to a general shortage of capacity across the system (as opposed to local circumstances) and that they apply only when the market has reached its limits in directing the efficient allocation of resources. In that regard, the Commission notes that:

- *involuntary demand disconnections by the System Operator to resolve locational issues would not be classed as system stress events;*
- *the need for the System Operator to initiate voltage reduction or involuntary demand reduction (i.e. system stress events) by definition occur when available supply is inadequate to meet demand. In an impending shortage, prices will rise, motivating owners of supply to deliver energy in response. In this manner, the UK foresees all available supply delivering its energy until exhausted by its physical capacity or, in the case of imports over interconnectors, reaching the maximum import limit. Only when all available supply sources are exhausted could an actual shortage occur, requiring the System operator to initiate rationing. As such, declaring a system stress event and requiring capacity providers to actually deliver energy merely complements the incentives in the energy market. In addition, the UK notes that in GB, the current level of interconnection is 4% of total installed capacity with the potential to rise to 6% in 2020;*
- *in certain, mainly exceptional, circumstances the System Operator may need to take actions that will involve the involuntary reduction of generation or demand before all valid offers of balancing energy have been accepted, in accordance with the Balancing Principles Statement (BPS). The circumstances are set out in the BPS and limited to unexpected emergency*

⁷ Hence EEAG point 124 relating to operating aid for renewable electricity. However, note the renewables targets mean there is a stronger rationale for MWh-based payments to renewable energy producers than exists for conventional generators.

scenarios However, the UK states that the System Operator would ordinarily instruct commercially negotiated balancing power prior to instigating involuntary voltage reduction.

The Commission notes that as a result, distortions to dispatch are highly unlikely to occur in practice, given that system stress events are defined with reference to actions that would usually be taken as a last resort by the System Operator, once the market has failed to deliver security of supply. The UK has also undertaken to review the definition of a scarcity event, with a view to basing it on a reference price in cash out markets, when the reform of cash out markets has been completed. Therefore, the Commission considers that the UK measure remunerates the service of pure availability of capacity.⁸

In a design where the obligation is for beneficiaries to be available, there is also the potential for impacts on wholesale market functioning and on market coupling. An important consideration with an availability model is whether or not to impose a bidding ceiling at which beneficiaries must be available (which may be desirable to prevent anti-competitive behaviour – for example beneficiaries offering to generate at extremely high prices that are unlikely to ever be accepted). However, once a bidding ceiling is introduced, this may become a cap on market prices, which could reduce the likelihood of imports flowing into the market with the capacity mechanism at times of scarcity, and further exacerbate the missing money problems in the market that prompted the need for the capacity mechanism in the first place.

A design with a reliability option may also pose problems, since if a single strike price is determined for reliability options allocated to a large proportion of the market, this could also become a price cap – at least for the reference market.

Note that in any model involving the de-rating of capacity resources there should be the potential for price setting above a 'price cap' imposed by a reliability option strike price or an availability obligation bidding ceiling. This is because capacity providers would only be constrained by the price cap in relation to the de-rated capacity for which they had sold certificates / contracts / options. Excess capacity (equivalent to 'over-delivery') could presumably be sold at higher prices.

Finally, note that the obligations under a strategic reserve model could also pose problems for the efficient operation of wholesale markets, particularly if the reserve dispatch price is set below the market coupling price cap (currently EUR 3,000 / MWh). The reserve dispatch price is likely to act as a cap on wholesale market prices, and the existence of the reserve may prevent prices rising as high as they should, which in turn will reduce the signals for imports to the market where the reserve is in operation.

4. QUESTIONS FOR DISCUSSION

- Are obligations and/or penalties and/or over-delivery payments required in a capacity mechanism, or do market signals provide sufficient incentive effect for efficient short term operation and investments in flexibility?

⁸ http://ec.europa.eu/competition/state_aid/cases/253240/253240_1579271_165_2.pdf points 132 - 133.

- Should obligations and penalties be set purely on the basis of ensuring optimal economic incentives, or is a balance needed to limit the risks faced by capacity providers?
- Should capacity providers receive any advance warning before a stress event?
- Which designs could pose the greatest risks to the efficient operation of the internal energy market? Which designs could be most readily compatible?