CAPACITY MECHANISMS WORKING GROUP

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THE PARTICIPATION OF NON-GENERATION ACTIVITIES, DEMAND-SIDE, AND STORAGE IN GENERATION ADEQUACY MEASURES

This paper compiles the requirements in the Guidelines on State aid for environmental protection and energy (EEAG) related to the eligibility of all potential capacity providers in generation adequacy measures, and describes some of the main design features of capacity mechanisms that will need to be assessed in relation to these requirements.

1. WHAT DO THE GUIDELINES REQUIRE?

The EEAG include the following requirements related to eligibility for participation in generation adequacy measures:

(226) The measure should be open and provide adequate incentives to…operators using substitutable technologies, such as demand-side response or storage solutions. The aid should therefore be delivered through a mechanism which allows for potentially different lead times, corresponding to the time needed to realise new investments by new generators using different technologies.

(232) The measure should be designed…to make it possible for any capacity which can effectively contribute to addressing the generation adequacy problem to participate in the measure, in particular taking into account…:

(a) the participation of generators using different technologies and of operators offering measures with equivalent technical performance, for example demand side management, interconnectors and storage. Without prejudice to paragraph (228) [related to overcompensation], restriction on participation can only be justified on the basis of insufficient technical performance required to address the generation adequacy problem. Moreover, the generation adequacy measure should be open to potential aggregation of demand and supply;

(233)(e) The measure should give preference to low-carbon generators in case of equivalent technical and economic parameters.

Figure 1: Summary of EEAG requirements related to eligibility for participation in generation adequacy measures

Summary	
EEAG requirement	**Objective**
(226), (232)	1. Allow competition between different potential providers of capacity. 2. Provide incentives for participation of DSR, interconnectors and storage.
(232)(a)	3. No restrictions on participation except where capacity providers have insufficient technical performance, or their participation

	would result in overcompensation.
(233)(e)	4. Give preference to lower carbon capacity providers in case of equivalent technical and economic characteristics.

2. THE IMPORTANCE OF INCLUDING NON-GENERATION TECHNOLOGIES

Generation adequacy depends on a balance between supply and demand, and may be better termed 'capacity adequacy' or 'resource adequacy'. The guidelines recognise that competition is possible between different types of capacity, and can lead to the best outcome for consumers since it will help drive down costs. The inclusion of the demand side (often called demand side response or DSR[1]), storage and interconnected capacity can also provide a lower carbon alternative to generation, so should support decarbonisation objectives. This is why the guidelines specifically mention competition between generation, DSR, storage, and interconnection (which is not dealt with in this paper, but will be the subject of future discussion).

The European Council of 22 May 2013 called for particular priority to be given to more determined action on the demand side. Lack of participation of demand in the market is considered by most academics to be the most important reason for potential generation adequacy concerns. (SWD (2013) 438, Nov 2013)

The main justification for the introduction of capacity mechanisms (correcting the market failure that reliability is a public good) can only be satisfactorily corrected by developing the demand side. Once consumers can see real time prices and react to those prices, they can choose to disconnect themselves when prices reach a certain level. Once this is possible, there should no longer be a need for politicians to intervene to provide security of supply on behalf of electricity consumers.

In systems with a high proportion of intermittent and inflexible generation, there is also a significant benefit to increasing the proportion of storage in the market. The development of storage could dramatically reduce generation adequacy concerns, since if electricity could be efficiently stored on a large scale, there may no longer be significant security of supply concerns due to short term issues like a day of low wind. And storage can supply electricity at times of scarcity, so should in principle be eligible to participate in capacity mechanisms.

Capacity mechanisms that result in reduced wholesale electricity prices arguably reduce incentives to invest in DSR and storage. However, capacity mechanisms are potentially an excellent way to encourage the development of the demand side. This is because they provide a steady and reliable income, which can assist investors in DSR, for example supporting investment in metering and demand management staff and software by large industrial consumers able to directly offer DSR directly into a capacity mechanism, or supporting investment by aggregators in the development, marketing, and installation of metering technology in smaller factories, offices, shops or homes.

Capacity mechanisms could also provide incentives to invest in storage eligible to participate, though this will depend on the delivery requirements (since for example individual storage operators, like individual DSR providers, may not be able to deliver electricity over extended periods).

[1] Demand response or DSR refers to the ability of electricity consumers to supply electricity by reducing their demand at times of system scarcity. This requires establishing a baseline for those consumers consumption so that a reduction in demand can be verified.

To ensure there are efficient incentives for future innovation, capacity mechanisms should in principle be open to potential new forms of capacity, for example innovative new storage technologies.

3. DESIGN CHOICES THAT MAY IMPACT THE PARTICIPATION OF ALL POTENTIAL PROVIDERS OF CAPACITY

3.1. General eligibility

In a capacity mechanism that meets the requirements of the EEAG, all potential providers of capacity should be eligible to compete for a capacity agreement / capacity payments / capacity certification.

The most important feature, therefore, is that the fundamental eligibility rules enable all potential providers to participate in the auction / tender / allocation / certification process.

3.2. Detailed eligibility requirements

The de-minimis threshold for participation could be an important criterion for some technologies, for example small demand side response operations. To ensure small providers have opportunities to participate, the EEAG require capacity mechanisms to be open to aggregated resources.

Physical checking requirements (for example pre-qualification de-rating[2]) may be a feature of some capacity mechanisms. This checking may conclude that a particularly intermittent source of capacity cannot enter the mechanism at all, or can only enter a small fraction of its total potential capacity. So long as the technical justification is sound, this is likely to be acceptable under the EEAG, which allow limitations on participation based on technical capability. This situation is also identical to what might happen in a mechanism with no physical checking but which instead relies on high penalties to ensure the reliability of participants. In such a mechanism, operators of intermittent capacity would have an incentive to limit their exposure to these penalties, potentially by choosing not to participate at all.

Providers may be required to post collateral before entering a bidding process. This may be necessary to ensure projects requiring significant investment (for example the construction of a new power plant) do indeed go ahead if awarded a capacity payment. Without some kind of collateral requirement, there may be a risk of anti-competitive behaviour, and a risk that the capacity mechanism fails to deliver its objective. For example, with no collateral requirement, participants could bid new projects into a capacity auction to outbid and prompt the closure of existing plants, then face no consequences for building this capacity late or not building it at all (though this would depend on the rules relating to penalties for non-delivery). If these bidders also control existing plants in the market, they would then expect to benefit from high electricity prices because of the lack of expected new investment. However, the level of collateral required may present a barrier to entry.

3.3. Lead times

Another important feature, noted specifically in the EEAG, is the lead time between the allocation process and the point in time when capacity must deliver its obligation. This needs to be set so that different technologies can be constructed in time to participate. However, a long lead time can be

[2] De-rating is an adjustment to take account of the expected availability of a capacity resource, specific to each type of technology. It reflects the probable proportion of a source of electricity which is likely to be technically available to deliver electricity when needed.

problematic for new demand side response, which may be unwilling to commit to demand reductions several years ahead.

3.4. Contract / agreement lengths

The availability of different contract / agreement lengths may have an impact on the extent to which a mechanism can be considered to meet the EEAG requirements in relation to the participation of all potential capacity providers.

Where new investment is required, some access to longer agreements may be necessary to enable effective competition between new and existing capacity providers, or to enable particularly capital intensive but beneficial types of capacity to participate. However, where different agreement lengths are available the impact will need to be carefully assessed to ensure particular classes of capacity (eg. those eligible for the longer agreements) do not receive an unjustified advantage.

3.5. Delivery obligation and penalties for non-delivery

The obligation capacity providers sign up to when they choose to participate in a capacity mechanism, and the penalties they will face if they fail to deliver this obligation, will have a significant impact on the feasibility of participation by different types of capacity provider.

For example, stringent delivery requirements expose participants to higher risk of facing penalties for non-delivery. However, delivery whenever there is scarcity is the product that system operators require from capacity providers, so this is could be considered a justifiable technical performance requirement under the EEAG, and mean the capacity mechanism provides desirable signals for flexibility and reliability. Similarly, high penalties may be justifiable (and there is a sound economic rationale for high penalties given the high value consumers place on avoiding lost load).

However, features to limit participants' risk (for example a warning in advance of a scarcity event that will trigger penalties, or a cap on the maximum penalties that a participant can face) may be desirable if they can be expected to have a significant positive impact on competition.

Note the definition of the capacity product (as well as physical checking requirements) might also impact the extent to which it is possible to enable cross-border participation in capacity mechanisms, though this discussion is beyond the scope of this paper.

4. ACCEPTABLE EXCEPTIONS (AVOIDING CUMULATION AND OVERCOMPENSATION)

The general principle should be that all types of capacity able to meet any physical checking and performance requirements should be able to participate and compete to receive remuneration for their capacity.

However, it may be appropriate to limit participation in capacity mechanisms where this is necessary to prevent overcompensation, for example because there is a separate aid scheme for a particular class of capacity provider.

In general, it is desirable to maintain the principle that all forms of capacity should be eligible to participate in a capacity mechanism, therefore capacity providers should have the choice of foregoing alternative support so that they can receive a capacity payment. This complements the

principles in the EEAG relating to the fuller integration of RES into the market, whether future European electricity markets pay explicitly for capacity or not.

For example, in Great Britain, low carbon generators have the choice of whether to receive a CfD (RES operating aid) or participate in the capacity market. They cannot receive aid from both measures.

Where some forms of capacity are excluded from a capacity mechanism, the contribution this capacity makes to security of supply (and will continue to make once the mechanism is introduced) must be accounted for in generation adequacy assessments, and any calculations of the amount of capacity needed to be contracted in the capacity mechanism.

5. CASE STUDY: COMMISSION ASSESSMENT OF UK (GB) CAPACITY MARKET (SA.35980)

Note: subheadings relate to summary EEAG requirements in Figure 1.

The UK's capacity mechanism for Great Britain is a market-wide design. It involves central auctions four years and one year ahead of the year in which capacity must be delivered. The auctions are open to all providers and a single GBP/MW capacity price is determined (clearing price).

Successful auction participants commit to deliver energy whenever needed in the delivery year (after a four hour warning), or face financial penalties.

The costs of the mechanism are allocated between electricity suppliers according to their market share.

5.1. Allow competition between different potential providers of capacity

The GB Capacity Market is open to all forms of existing and new capacity: generation, storage, demand side response and (from 2015) interconnected capacity. Once pre-qualified, they compete in transparent auctions on the basis of price alone.

The assessment concluded that this should provide a clear route to market for all capacity providers.

The assessment also appreciated that lead times and contract lengths were designed to cater the different nature of each category of capacity provider. However the availability of different agreement lengths for participants undertaking different levels of capital expenditure was a controversial design feature:

- most existing capacity providers will have access only to one year capacity agreements;
- capacity providers undertaking capital expenditure above GBP 125/kW (refurbishing plants) will be eligible for capacity agreements of up to 3 years; and
- capacity providers undertaking capital expenditure above GBP 250/kW (new plants) will be eligible for capacity agreements of up to 15 years.

The assessment concluded that differentiation between new and existing plants may be justified because of their need to secure financing for higher capital expenditure.

The assessment considered two complaints against the different agreement lengths:

- claims from some DSR participants that they required access to longer agreements too; and
- claims from some existing plant operators that denying existing plants access to long agreements could force them to close and lead to more new plants being constructed than necessary.

The assessment concluded that there was insufficient evidence that DSR required long agreements, and that competitive and efficient existing plants were likely to bid lower prices than new plants and therefore competitive bidding would lead to the minimum necessary new generation capacity.

5.2. Provide incentives for participation of DSR, interconnectors and storage

The GB Capacity Market included plans for two years of transitional arrangements specific for DSR and small scale storage. These involve year-ahead auctions specifically for these providers, with certain requirements will be relaxed to limit risks, encourage enterprise and build confidence in the

sector. The supportive features include a lower collateral requirement, and the availability of time banded products which, rather than requiring DSR to deliver whenever needed throughout the delivery year, will only require delivery at specified times (e.g. between 3pm and 7pm).

The Capacity Market enduring regime also included features to encourage and support DSR participation:

- A low de-minimis threshold of 2MW.
- DSR with reduction savings under 2MW able to aggregate.
- Possibility to participate in either the four years ahead or one year ahead capacity auction. provides flexibility for different business arrangements.
- Metering and baselining approaches developed with DSR community.
- Guarantee to procure 50% of the capacity initially reserved for each one year ahead capacity auction. The one year ahead auction will support DSR applicants who may find it difficult to commit to delivering capacity four years ahead.

The UK committed to include new interconnectors in the mechanism from the second capacity auction in 2015.

5.3. No restrictions on participation except where capacity providers have insufficient technical performance, or their participation would result in overcompensation

The GB Capacity Market is open to all potential providers of capacity, but includes the following exceptions:

- Generating plants receiving support through the Contracts for Difference or small scale Feed-In-Tariff.
- Providers receiving support through the Renewables Obligation (RO), unless they choose to forego receiving RO payments (they will be allowed to participate once their RO contracts expire).
- Plants in receipt of the Renewable Heat Incentive (RHI) – this is because the RHI has been designed to complement the RO and, in future, the CfD for renewables.
- Plants in receipt of funding from the UK Carbon Capture and Storage (CCS) Commercialisation Competition – because the CfD for CCS has been designed to provide them with the additional support needed to be commercially viable.
- Technologies in receipt of funding from the EU New Entrants Reserve 300, which aims to support emerging low carbon technologies such as CCS and tidal energy as they will also be eligible to receive support under the CfD.
- Plants which were awarded 15 year contracts by National Grid to form part of the Short-Term Operating Reserve (STOR) immediately prior to the initial EMR policy proposals in 2010, unless they forego their long-term STOR contract.

The general principle was that all potential capacity providers could have been eligible for the Capacity Market if they chose not to receive alternative support.

The assessment implied that this policy would avoid cumulation and overcompensation.

5.4. Give preference to lower carbon capacity providers in case of equivalent technical and economic parameters

The assessment considered that the UK's carbon price floor (which supplements the carbon cost already faced by generators under the EU Emissions Trading System) acted as a secondary selection criterion giving sufficient preference to low carbon generators (since a lower carbon capacity provider would have lower carbon costs and therefore be able to bid more competitively in the capacity auction than a rival with higher emissions).

The assessment noted that the EU ETS price alone was considered to be an economic parameter for the purposes of (233)(e), and therefore insufficient as a determining criterion in favour of lower carbon capacity providers.