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Answer to the Q&A of the European Commission

on the Capacity Remuneration Mechanisms

Can we reconcile different capacity adequacy policies with an integrated electricity market?[1]

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[1] This Policy Brief is the summary of a 2012 report to RTE which includes three parts in French under the following titles: From the capacity rights to reliability and energy rights; The contribution of external capacities to the capacity remuneration mechanism of an electricity market; The differentiation of capacity adequacy approaches in the EU: which social inefficiencies?).
The opinion expressed in this document does not in any case engage the sponsor of this study (from which this brief is extracted).

Short CV

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He manages research projects on electricity and gas market, on the efficiency of market instruments of public policies in liberalized energy industries in view of public service and sustainable development (supply security, renewables, energy efficiency, climate policy). His recent publications (academic papers, edited books) deal with electricity and gas reforms, efficiency of instruments of promotion of renewables and energy efficiency, market failures to invest in electricity and gas markets, and European energy policies.

He has written successive reports to RTE in 2011 on the decentralized obligation of capacity and in 2012 a report on the capacity mechanisms harmonisation in Europe with three parts : From the capacity rights to reliability and energy rights; The contribution of external capacities to the capacity remuneration mechanism of an electricity market; The differentiation of capacity adequacy approaches in the EU: which social inefficiencies?).

he has been invited in 2013 by ACER to be member of the expert group to advice ACER on its next report on capacity mechanisms

Recent Publications 2008- 2012 on electricity markets

1.Editing of scientific books or special issues of scientific journal

Finon D., Glachant J.M. et Hauteclocque A. de , co-editor., 2011, *Long term contracts and competition in electricity markets*, London: Edward Elgar publisher

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2. Publications in scientific journals with referee committee

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Content

Acronyms: We will use the following acronyms: for the capacity remuneration mechanism (CRM); for the mecansim of strategic reserves (RS), for the capapcity payment (CP); for the decentralized and bilateral capacity obligation (BCO), for the central auctioning of forward capacity market (FCM), for the reliability options (RO)

1. Introduction (Questions 1 to 5)

We choose to contribute to the consultation organized by the Commission on the capacity mechanisms by presenting a consistent argumentation under the form of this paper, with occasional references to the questions of the Consultation Paper.

We defend here a position different from the present conventional wisdom in the actual momentum of definition and implementation of the different elements of the Target Model and network codes, namely the usefulness of capacity remuneration mechanism (CRM) and a harmonized definition of capacity adequacy policies in time. This conventional view is based on diffferent arguments (see for instance Eurelectric report, 2011). First there is no evidence of missing money and we should wait for evidence of market failure if there is a lack of investment in capacity (CEER, ENTSO-E, etc.). In the mean time we should give up the use of capacity remuneration mechanisms after the implementation of market rules improvement in the day-ahead, intraday and reserves markets, and the integration of these different submarkets that will follow. We shall argue that, whatever the improvement of market rules for the intraday, reserve and balancing markets which will help to give an economic value to flexibility services and the back-up of the increasing intermittent generation, a capacity adequacy approach should remain a necessity. Idem for the better integration of these energy markets which will help to re-enforce solidarity between systems and the statistical contribution of each one to the reliability of the other one.

We consider that even without the large scale development of intermittent sources of energy, there will be a missing money problem for investing in peaking units and reserve capacities. It is not so much because some price cap exist on the different electricity markets for technical or political reasons: if a price cap is set at 3000€/MWh, it is not in itself the source of the missing money problem, but it could become a problem if it is set at 180€ or even at 500€/MWh as in Spain and Italy. The missing money problem comes mainly from the premature interventions of the TSO in period of scarcity and exceptional events when he anticipates a decrease of the frequency rather than to wait for it to call its contractual operating reserves. Moreover the market failure to invest in peaking units is also related to the very capital intensive nature of the investment, with a recovery of fixed costs on a very short and random period of price spikes. So, depending of the initial situation of over or tight capacity at the moment of the reform and the beliefs in the ability of the market to determine the optimal level of precaution (despite the inactive and inelastic real time demand), a member-state should have the freedom to choose a precautionary policy, because he would support the political cost of any black out or brown out. The introduction of large-scale intermittent renewables production magnifies the problem. Indeed besides the need of back up and flexibility services throughout the year which should not be confused with the next problem, it magnifies the missing money problem because the correlation between wind generation and peak load. So it erodes the price spikes and the scarcity rents most of the years. But because the risk of absence of windpower generation during some rare occurrences in winter, it increases the needs of reserve margins of the system

We do refer to the subsidiarity principle for letting Member states to act on their own in matter of adequacy which is a long term insurance for the supply reliability in due time: in particular for the choice of the level of precaution, the instrument to reach the long term insurance goal. On the one hand it is much less the market than the Member-states' policies which determine the technology mix and the different types of randoms arising from generation equipment fleets and which affect supply reliability in times of scarcity and exceptional situation. So it should be up to them in first to take precautions to control and limit these risks. On the other hand member-states

tend to consider themselves politically responsible for the supply security in their country because electricity is not an usual commodity for assuring the running of economic activities and welfare and because electricity is not storable and easily transportable as could be any normal commodity and good. The 2006 Electricity SoS directive and the 2004 and 2009 electricity market directives do not deny to Member states their right to act by their own. So, beyond the TFUE and the other electricity market directives, every MS have the right to choose between the trust in the market and the distrust the market in the "energy only" architecture, to achieve adequate reserve margins, after having taken into account the possibility of electricity exchanges during scarcity periods with neighboring systems. The communication of the commission (CE 2012) could consider that it shall be consider in the register of Public Service Obligation, and justify a control of conformity with the Treaty, the directives and the competition policy principles. [2]

Some critics are addressed to the distortive effects of the adoption of different adequacy approaches by a number of MS. These critics are based on two arguments:

- the need to minimize interference between the capacity remuneration mechanisms (CRMs) and the integrated energy market,
- the impact on long term competition because the potential effects of CRMs to alter equipment location and so production decisions within the internal market and potentially this might act as a barrier to trade on an equal foot.

The answer will be in the assessment of the real distortive effects, their comparison with other distortive effects resulting from other MS policies (section 2), in the exploration of minimal conditions of harmonization to minimize the eventual distortive effects (Section 3), and the assessment of possible contradiction with the competition policy principles (Section 4)

If CRMs are developed in different MS, another problem is raised by the opportunity to trade the "capacity rights" between systems which are created as property rights by the CRMs, in order to benefit from the exchanges. But it will need a lot of harmonization efforts in matter of designs of the different CRMs, while the social benefit of exchanges will remain quite poor (Section 5).

Beyond the need of significant alignments of principles in matter of criteria of adequacy and reliability, in matter of incentives to invest (adoption of identical high price cap), we conclude that Member States are legitimate to decide their method of action to maintain the long-term reliability insurance of their electricity system that is the capacity adequacy, in particular to choose between keeping an "energy only" market architecture or adding a capacity mechanism and also to choose the type of CRM design, provided that competition on internal energy market is not altered.

We propose the adoption of minimal criteria of adequacy and reliability in relation to the nature of randoms which could alter the system reliability and which are specific to each system. The absence of precaution in a system which gives confidence to market to reveal the level of protection wished by the set of the consumers in a system could alter the supply reliability level aimed on the neighboring energy markets integrated with. Before developing these four points, we present in the box 1 a useful conceptualization of the property rights underlying the to the

[2] As an economist, we could contest this point, considering that the directives do not consider electricity as a a composite of several goods among which long term insurance of supply reliability. Electricity is not a commodity like the other ones with storability and an active demand which reacts to price in real time. There is no expression of the consumers 'willing to pay the reliability. Electricity is a complex product which combines not only energy, ancillary services, transmission access rights, but also "long term insurance of reliability" which is a collective good non excludable, the so-called "reliable capacity" formerly theorized in the peak tariff theory (Boiteux, 1953).

reliability, the collective good managed by the system operator and the capacity adequacy, the collective good managed by the government and the regulator, knowing that each of these two collective goods interact with their homologous in the neighboring markets.

Box 1

Reliability rights and capacity rights

With the priority given to the issue of the improvement of energy markets and their integration in the present process of definition and implementation of the different elements of the Target Model, the regional markets will certainly gained in short term solidarity, as the first effects of the market coupling show in terms of social efficiency improvements on the CWE zone (mainly reduction of generation costs presently). This invites to conceptualize the second possible advantage of a better intergation of day ahead, intraday and balancing markets in term of reliability improvements.

To apprehend the advantage to build solidarity between system by exchanging different products during scarcity periods –energy, reserves- and also how it reinforce long term insurance of supply by mutual exchange, we define "reliability rights" in a system as property rights on the reliability of the supply system which is a collective good managed by the TSO in last resort. These reliability rights cover both the energy exchanged bilaterally and on the day-ahead market as well as the infraday exchanges between balancing responsible entities, and various reserves services and ancillary services bought by the TSO to assume its responsiblity in last resort during the operational window.

Reliability rights are offered by every generation unit which produce and could adjust their production, or which are in reserve, ready to produce energy, to offer the balancing services and ancillary services sold to the TSO which is in charge to guarantee the system reliability to every producer and consumer. As energy could be exchanged up to the gate closure of the infraday, The reliability rights cover not only the different types of reserve and balancing services bought by the TSO but also all the energy which is forward exchanged between producers and loads which are "balancing responsible" for a delivery hour in bilateral transactions, on the day ahead and the intraday markets just before the "real time" during which the TSO takes the complete control. So any kWh injected in the system also includes an implicit "reliability right".

We define the "capacity rights" as property rights on the long-term reliability insurance of the system. This is a collective good under the responsibility of the government and the regulator. The capacity rights associated to a generator's unit represent in fact a forward promise on the equipment reliability in times of scarcity; in other words they are forward commitments to be able to deliver power on the markets, or if they have preferred to be in reserve, to deliver operating reserve or balancing service to the TSO. The capacity rights obligation generate *de facto* reliability rights on the delivery dates.

A capacity right is related to the capacity adequacy of a system, a "collective good" which is a long term insurance of supply reliability during scarcity periods obtained by targeting a reserve margin. This helps the Transmission System Operator (TSO) who is in charge to manage the system reliability, to be sure to have sufficient reliability rights in the system. These rights come from existing units as well as new generation units installed under the incentives of the CRM, which both commit to be reliable during peaks on the delivery date by signing up their forward contract. So a capacity right is a simple promise of reliability in scarcity periods, under the incentive of a penalty. Bilateral capacity obligation (BCO) or forward capacity contracts central auctioning (FCM) create such capacity rights which in turn will contribute to generate reliability rights during scarcity periods at the delivery date.

As the TSO is in charge of the system reliability in any annual period, it should have the exclusivity of reliability rights purchases in last resort or at least it should have the total control of their use in last resort in scarcity periods in its own system. But, with the dominance of bilateral markets in the EU internal market besides some pool markets architectures, it is not possible to retain energy and reliability rights associated to a capacity mechanism in the system during scarcity periods, unless some derogation rules to free exchanges (see the section in this text where we discuss free riding).

At the end of the day the European logic would also lead to envisage the trade ot capacity rights between neighboring systems whatever they have a CRM of different types, or else whatever some of them have no CRM at all. The question is : could we exchange capacity rights of different natures between different countries with different capacity adequacy approaches, and even different level of precaution?

2. Which social inefficiency level arises from the adoption of different approaches of capacity adequacy?

In order to place the problem of interaction of adequacy approaches into perspective, it is worthwhile to underline that in the EU energy policy field, there exist specific policies or specifi implementation of common policies which could alter and distort the market functioning in the neighboring countries on short and long terms. So it is of the German nuclear phase-out policies. So, it is about the effects on RES-E priority policies implemented by some MS more largely and beyond the compulsory objectives of the RES directives. Indeed these differences result in large scale production at low variable costs and with fatal intermittent production which has large external effects on the neighboring systems in terms of new balancing needs, price variability and wholesale price decrease. It also alters the profitability of past generation investments. So we could consider that such interferences between markets coming from different policies choices are de facto admitted by the European commission, provided that it does not alter competition inside and between countries.

We shall address here the effects of the differences of adequacy approaches between member-states. Most of the issues addressed in this section are related to market architectures dominated by bilateral relations (complemented by PX), which have been adopted in most the European countries except Ireland, Iberia peninsula and Italy. In these bilateral markets in times of scarcity we must emphasize the impossibility of controlling exports of energy and reliability rights and to retain a flow of energy to another system both for legal reasons - the European Treaty guarantees the free exchange of energy - and for reasons related to the market design dominated by bilateral trade. Indeed on the opposite of a pool market architecture, a TSO is not allowed "to recall energy exports".[3]

2.1. The canonic case : the co-existence of an energy only market besides a market with a CRM[4]

We consider the case of two equivalent interconnected systems in capacity level and technology mix. The reason for which the first one has adopted a CRM is the existence of a price cap (eventually as low as 1000 €/MWh) while the second, an energy only market, is without price cap to allow investment in peaking units by the market players' anticipation of scarcity rents. We distinguish two situations:

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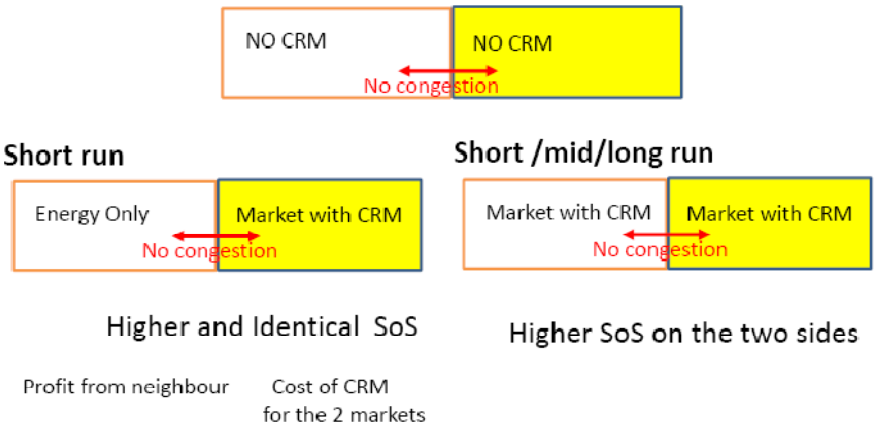
3 On mandatory pool markets managed by an Independent System Operator like in the system of PJM, New England and New York in the USA, the ISO is also the market operator and when it receives all offers day ahead, and the requests for notification to export, it has the opportunity to check the sufficient availability of energy and reliability rights in times of scarcity in order that all the electricity and reliability rights produced in the system is only used by the home retailers and by the SO' s needs for the balancing of the system.

4 This example has been developed in detail in Cepeda M. et Finon D, 2011, Generation capacity adequacy in interdependent electricity markets , *Energy Policy*, Volume 39, Issue 6, June 2011, p. 3128-3143

- one in which the systems are perfectly integrated in times of scarcity,
- one in which congestions on the interconnections separate the two systems during such periods.

In the first context, the two collective goods that are each system reliability are pooled in one collective good. Accordingly, if different approaches of capacity adequacy are adopted between the two systems, it does not affect this pooled collective good. Similarly, the capacity adequacy which is also a collective good proper to each system is pooled as a long term forward insurance for reliability in the next future.

That said, this situation produces asymmetrical effects as a consequence of the different structures of income between producers in each market: the producers in the energy only markets gain the energy prices as revenues while those in the market with a CRM gain both the energy price and the capacity revenue. If there is no congestion in scarcity times, the difference in policy choices will inevitably affect the functioning of the integrated energy markets, not in terms of reliability performances, but in terms of costs to be paid by the second market's consumers.



In the following situation, we consider now two situations:

- a system with a capacity payment which pays all the reliable capacities of the system [5]
- a system with a CRM which act as a quantity instrument (decentralized obligation, centralized auctioning).

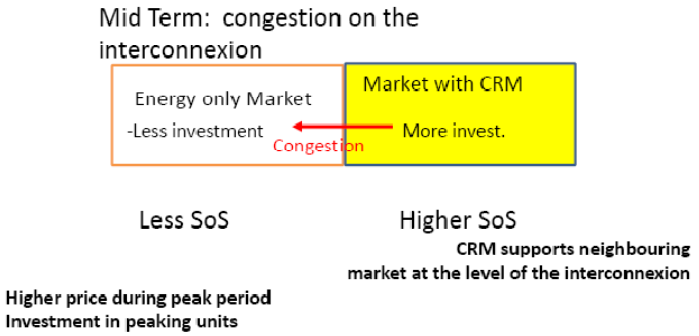
- **2.1.1. A system with a capacity payment**

We note that in a first step there is no short-term impact of the installation of a CRM in one of the market on the pricing on the integrated energy market. In a former period, the price on the integrated market is only altered during the short periods of scarcity, because additional generation investments, in particular in peaking units have been made in the market with a CRM as a consequence of the supplement of revenues it allows. Prices are therefore lower in extreme peak in the energy only market, triggering less investment mainly in peaking units in this system, but this leads consumers to benefit from cheaper electrical energy coming from the nearby

[5] Let us underline that, in theory, it is not so far from the effects of a CRM acting by the quantity, because in a perfect situation of information of the TSO on the cost curves, the theory says that the result is the same. But in fact we shall discuss this point further).

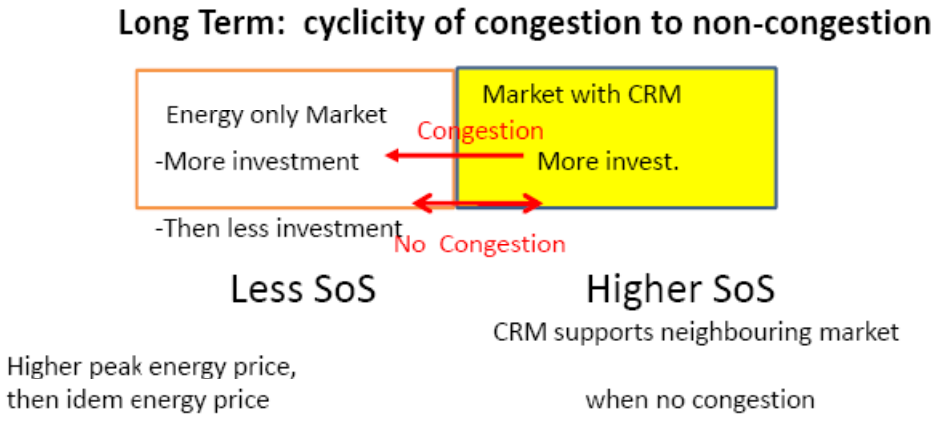
market that has a CRM.

These differences do not affect the social efficiency of the whole of the two markets, because the reliability performance of the two systems remains the same. There is not, strictly speaking, some "capacity leaks". There is just a redistributive problem. Indeed, consumers in the system with a CRM pay more than those of the neighboring energy only market. In the same time, the producers profit both of the capacity remuneration and the potential spillage of excess electricity with peak units built beyond the needs of the reserve margin of this system with CRM to supply the other market during scarcity periods.



However there is a dynamic effect in a third period: the flows from the market with CRM to the other without increased installations of peaking units because price spikes have been erased on their integrated market and it does not allow scarcity rents during peak load. After having been physically integrated in any period, the markets will be separate during some hours of the extreme peak within few years. In each one during this period there will be a consistency between the revenue structures of the producers and the need for investment in different technologies to meet energy and capacity needs.

It should be noted however that in the post-separation years, the reliability performances on the energy-only market will fall during a couple of years during which price spikes occur more frequently, the time to have sufficient “scarcity rents” during these current price spikes to trigger investment decision in peaking units for reserve margin. It is noteworthy in parallel that the neighboring system with MC continues to contribute to the reliability of the energy only market during scarcity periods of the latter with energy flows at the level of the interconnection capacity.



2.1.2. A situation with a CRM based on a quantity instrument (obligation, centralized

auctioning)

In a context of uncertainty on the cost curve with a flat benefit curve, the theory shows that an instrument based on an obligation will never bring to the same quantitative result than an instrument by price which aims to guarantee revenues (M. Weizmann, 1974)[6].

In our case a centralized or decentralized obligation the difference of nature of the instrument in comparison to a capacity payment will have a further effect. Indeed with the obligation, the TSO defines a maximum probability of shortages in peak to be reached by targeting a total capacity covering the total system load, plus a reserve margin, less the statistical contribution of the other systems (calculated by the concerned TSO or by ENTSO-E for the delivery year). So the TSO has a possibility to limit over-installation of semi-base load and peaking units which would be supposed to supply the neighboring markets without CRM. This could avoid what fears numerous experts about the adoption heterogeneous adequacy approaches: an unfair competition between countries and markets in the installation of new equipment.

A recent exercise, realised in Netherlands[7] could contradict our position in an alarmist way. Indeed this exercise show that a small system without CRM will be de-optimized by the installation of a CRM in the much larger neighboring system who choose a 15% reserve margin, because the latter will attract investment in CCGTs and peaking units which will compete unfairly with the old equipment of the small system. But the TSO in the large system with CRM who defines the reserve margin for the auctioning of capacity contracts (in the FCM instrument) or for the bilateral obligation of the suppliers (in the BCO instrument) will not encourage capacity surplus for its own system. In other words the results of such exercise are too dependent of representation of the CRM which could be based on a quantity instrument, on the recalculation of the optimized non-RES system after the RES-E massive deployment and the role of interconnection capacity

2.2. If markets are separated in scarcity times by congestion on interconnections…..

If there is congestion on interconnections between the two systems in times of scarcity, both "reliability" and "adequacy" collective goods of each system are separated. The issue of social inefficiency which could result from the divergence of capacity adequacy approaches in their respective market architecture only arises in relation to the market integration during peak load. If there is a congestion on interconnections capacities, it should be noted that the divergence of adequacy approaches does not affect the functioning of energy markets because the markets are structurally separated in times of scarcity. Marginalist hourly price is set during these periods in a way which is specific to each of these markets, depending from different marginal equipment to clear each market.

It is noteworthy that, if in this case we imagine the establishment of a single capacity market on these two energy markets in this type of situation, it would completely be inefficient. It is a classical counter example of unicity of the price of a public good which is related to two private goods which have separate markets in Public Economics. It could be the case between the regional markets as the CWE one and the peninsula (Iberic, UK-Ireland, etc) if the same capacity

[6] Weitzman, M.L, Prices vs Quantities, *The Review of Economic Studies* , 41 (4), pp. 477-491, October 1974.

[7] Ozge Ozdemir, 2012, *"Financing investment in electricity generation capacity A quantitative analysis for the NL of the adoption of a CRM by the German market*", ECN working paper (PPT). The results depend upon the hypothesis of the COMPETES model which should be controlled and the way the two systems are recomposed up to 2020 which is the reference year of this recomposition

mechanism would cover these different markets

The answer is more complex and less clear when it happens between systems which are initally integrated with large interconnections between them, but which present some risks to be separated by a congestion during some hours during peak periods. Specifically, it is the case between systems that have different marginal costs in extreme peak, as between France and Germany, or the Netherlands and Germany, although interconnection capacities are quite large enough to respective peak loads. But it could be also for exceptional reasons as between France and Germany (very cold weather which makes the first system to call for great quantity of energy from the other ones, effect of German political decisions plants closures in the other sense, effect of exceptional wind generation production in the sense Germany to France etc.).

2.3. The problem of free riding raised by arbitrages between markets with different adequacy approaches

When the two markets are perfectly integrated in times of scarcity, there is no problem of "capacity leakage" from the market A with CRM and the market B without CRM [8], because the reliability of both systems is made up in common. However, if the regulator of the system A has decided to establish a CRM, it is in order to only allow his system to reach a target of reserve margin which is only related to the needs of the system A and its peak load. So the TSO of this system A should be strictly focused onto the requirements for the reliability of its system, even though both markets are perfectly integrated and implicitly share a long term insurance of reliability, despite their differences of efforts. The TSO of the system A *de facto* ignore the pooling of the capacity adequacy (long term insurances) of the two systems and will find himself in a deadlock in a situation of synchronous scarcities. When there are arbitrages on energy and reliability rights in this period of scarcity between A and B, it will be at the advantage of B where the price will be higher. This could be viewed as a "capacity leakage" from A to B. In this case this TSO should be worried about the way to counter the arbitrages logics between the two systems in scarcity periods. In fact the market players' arbitrages should be limited only to situations in which the system with CRM has some surplus, when the system without CRM is in a period of scarcity.

2.3.1. Ways to limit arbitrages between markets with different capacity approaches or CRMs in times of scarcity?

The subsidiarity principle (in favor of which we argue here) invites us to analyze this issue of capacity leakages and the possibility to restrict arbitrages on energy and reliability rights in the day-ahead and in the infra-day markets, from the country who have preferred to install a CRM besides a country who prefers not to have such a precautionary approach and which stays with an energy only market.[9]

A first and simple method between markets coordinated by a market coupling arrangement could consist in an agreement between the members of ENTSO-E to adapt the market coupling rules. Indeed in the software of the market coupling, there are rules of curtailment in time of scarcity, which tends to equalize the level of curtailment between the markets in scarcity situations, whatever the precautionary approach in matter of reserve margin (See Vassilopoulos, 2013). So the first solution could be to adapt the criterion of curtailment in relation to the severity of efforts

[8] This problem of the so-called "capacity leakages" simply results from market players' arbitrages between markets with different adequacy approaches in times of scarcity.

[9] The case would be clearer if this country has chosen to impose a quite price cap;

made in matter of reserve margin and adequacy target.

A second method is already used by some TSOs under the name of "freezing", even if it turns its back to the free trading. In period of scarcity, a TSO could adjust its day-ahead calculation of Available Transmission Capacity (ATC) when a scarcity is anticipated in its system. It turns back to the free trading principle but it is tolerated. The method could be legalized in an ENTSO-E agreement: countries with a CRM will be allowed to calculate ATC along with more restrictive criteria (which should be clearly defined by the comitology of ENTSO-E).

A third method, more market-oriented**,** is to increase the demand of reliability rights of the market players of the system with CRM (see box 1 about reliability rights). This could be done by imposing an operating reserve obligation (1-2%) to producers and retailers, besides their balancing responsibility, as well as for all other market players (importers, exporters, traders) able to make arbitrage with other countries during the intraday period before the gate closure[10]. This obligation could concern pure windpower and PV producers above a certain size, or after a mandatory aggregation of them in a cooperative.
By this way reliability rights generated in the market with CRM should tend to stay in this system under the pressures of the obliged buyers' demand as well as the own TSO's requirements. Indeed in times of scarcity, this new obligation (combined with a significant penalty aligned on the VoLL for instance) increases the demand of reliability rights and can discourage arbitrage on energy and reserve services between systems that have adopted a CRM (and tend to have suitable capacity for their own needs) to those with an energy only market (without price cap) whose prices can rise to higher levels. Arbitrages with the other systems (and therefore capacity leaks) will correspond to the surplus of reliability rights existing in it. By the same way the limitations of number of arbitrages will limit the influence of systems with CRM on the price of neighboring systems with energy only markets. [11] But this approach will impose a control on the activities of each obliged player during peak periods and the notification of producers and traders on the market could a priori appear impossible to be developed if we consider only the day ahead transactions because the anonymous character of the exchanges in the market coupling.

But a factor play in favor of a possibility of control: *on the intraday market coupling*, injector and receptor are identified, what could be a way to overcome the issue if the obligation is defined as an intraday one. This change could be combined with the change in *the rules of curtailment of the day ahead market coupling*, which has just been underlined. (Those which are supposed to insure equity in curtailment in the market coupling software between the different markets should in any case allow to restrict flows from one market to the one in which long term precautionary rules are the most laxist even if scarcity is the most developed).

3. Could we correct interferences between different capacity adequacy approaches and integrated energy markets?

Differences in adequacy approaches create interferences in first by the choice of the adequacy criterion and by the influence of these differences of criteria on the functioning of energy markets, and not only by the choice to whether or not create a CRM (or else by the different CRM designs). We should seek in first the alignment of the adequacy criteria before considering the difference of adequacy approaches. It is only after this prerequisite in a relevant political agenda that we could

[10] Producers support already some obligation on secondary reserves in some countries as Spain.
[11] By the way we should note that potentially the mechanism of reliability options would allow to limit arbitrages. We prefer to focus on this simple tool based on a physical obligation on operating reserves.

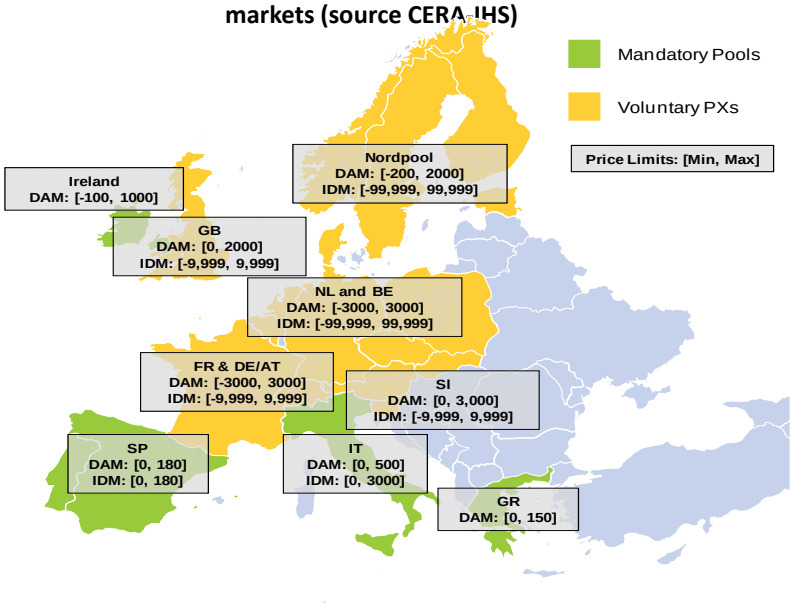
cope with the issue of interactions between markets A with CRM and markets B without CRM (or between markets with different CRMs with more or less stable capacity revenues).

- **3.1. Priority to the harmonization of price caps and adequacy criteria**

In an integrated set of energy markets in which each system's collective goods of adequacy and reliability could interact, the main challenge of harmonization should be to make self-responsible each system in matter of long term security insurance in relation to two drivers: first the incentives to invest in peaking units (because they could be limited by different levels of price caps which determine the possibilities to extract scarcity rents during peaks) and second the adequacy criteria defined by the TSO in agreement with his government.

First the following figure shows the difference of price cap on the day ahead and the intraday markets between countries. It lead to point the fact that mandatory pools have low price cap (respectively 180 €/MWh in Spain, 500 in Italy and 1000 in Ireland) because they are designed to integrate a capacity payment with modulated value but during each hourly market. Nevertheless the other markets based on bilateral contracts and show some divergences (2000 to 3000 here and there on the day ahead, 10,000 to 100,000 on the infraday).

Différence of price caps on day-ahead and intraday markets between markets (source CERA, IHS)



Comment: Traditionally the pool design has a lower price cap because a capacity payment is added

- **Necessity of alignment of adequacy criteria**

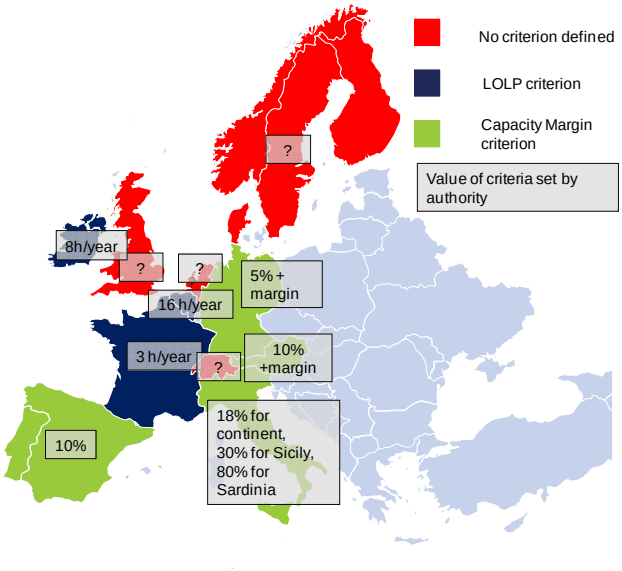
Second the adequacy criteria is also quite different (see the next figure and the table in annex). They differ in nature (deterministic or probabilistic) and in level (for instance those who choose the probabilistic criteria of LOLE (loss of load expectation) shows a difference of 3h/y for France to 16h/y in Belgium with the Ireland in the middle with 10 h/y). The harmonization should concern the choice of the nature of the criteria, and this choice should aim to make countries responsible of their negative externalities on the other systems.

Each system bears specific hazards which result from resources, types of technologies (seasonal

hydro-reservoir, thermal equipment, intermittent windpower, etc.) but also the types of uses (as for instance the long lasting promotion of direct electrical heating in France with the example of a very important thermal gradient of peak load of 23 GW per -10°C). When countries succeed in windpower and PV generation development, they should take the associated random into account. If not they spill their problem of need reserves on neighboring systems and handling the need of additional reserves of their system. A country as presently Germany is with 50 GW of RES6E intermittent has to develop the corresponding reserve margin. Thus there would be long-term negative externalities between systems if they do not adopt the same nature of criteria of adequacy. These negative externalities of the difference of price caps and adequacy criteria are more important than those which result from the different choice of adequacy approach or different CRMs. It is also noteworthy that as another side of the medal, if there is consistency of the approaches, equivalent efforts in matter of reliability and adequacy of each country will play a positive role to decrease the efforts of the other countries because of the mutual statistical contribution of each one to the adequacy of the other ones.

Figure : Differences of criteria of reliability between some European countries

Source : CERA-IHS and table in annex



Whatever a market chooses to install a CRM or to stay an energy only market, it is a necessity that each one adopts criteria for both adequacy (long term) and reliability (very short term) that lead each system to carry its own long-term and short term responsibility vis-à-vis the long term supply security of the systems with which they are integrated. It should be done in relation to the nature of randoms and the extent of risks which are specific to each of them. **The idea that market integration could justify differences of precaution because the day-ahead and intraday energy trades will solve the respective reliability problem is highly open to criticism because they would justify any Member-State free-riding on the long term.** In this respect the probabilistic criteria under the form of LoLP (loss of load probability) or LoLE (loss of load expectation) appears to be the most relevant for this empowerment than the deterministic criteria which will arbitrarily impose a reserve margin of 5% here, 10 % here, or else 15% if there is much windpower and PV generation.

The methods of ENSTO-E (for instance in the so-called scenario of adequacy forecast to 2030 (ENTSO-E, 2012)) tend to be dominated by the deterministic approach. In this approach,

generation margins is equal to a fixed percentage of the peak demand and operating margins sufficient to cope with the most likely contingencies. One of the drawbacks of this method is that they do not take into account the stochastic nature of supply and demand. Indeed, random events as uncertainty in customer demand, forced outages of generating units, intermittent production have an impact on the adequacy assessment. On the other hand, probabilistic methods provide a more meaningful and realistic information about the random events that affect supply and demand (Prada and Ilic, 1999).

- **The mutual statistical contributions to the adequacy of each system**

There should be also a relation between the choice of the method and the way the mutual statistical contribution of each system to the other ones are taken into account. Probabilistic methods which take into account the uncertain nature of the generation margins between countries should not assume independence between these margins, and thus should not neglect correlations between the generation margins of the countries interconnected and anti-correlation between intermittent productions in different systems.

Interdependencies between systems which are characterized by the interconnections' statistical contributions that fall within the calculation of the system's reserve margin target by each TSO, but which needs to be uniformly assessed with the same method (which should be the role of ENTSO-E, the European organization of TSOs). We shall underline the relation between this approach and the theoretical argument developed further to do not recommend at all that we could exchange capacity credits between systems on a bilateral basis: Adequacy and reliability are collective goods inherently related to each system which interacts with the others on a stochastic basis and these goods cannot be regarded as being affordable by bilateral relations on energy and capacity rights between private agents.

The harmonization of these criteria around a probabilistic approach is more important than a harmonization of adequacy approaches and the choice of CRM designs because this approach is able to responsibilize each member state. Note in passing that the imposition of a criterion which makes each TSO empowered on an equal basis (as the probabilistic criterion does) could incite a Member State originally in favor of the energy only architecture, to choose to install a CRM, as might be the case of Germany. Indeed the probabilistic criterion should bring to define a reserve margin much higher due to the development of intermittent generation sources on a large scale. It should also be noted that throughout it begins to be admitted that alone the "market" will not be able to reach a high reserve margin to cope with the problem created by large-scale intermittent productions on the system.

- **The need of adaptation of the SoS directive: which methods and which possible alignment of criteria?** (question 10 and 11 of the questionary)

These considerations lead to positively answer to the question 10 of the Consultation Paper **(Would you support the introduction of mandatory risk assessments or generation adequacy plans at national levels to those required under the Gas security of supply regulations?).** The methodology of assessment as well as the analysis of the statistical contributions of the interconnections should be standardized under the coordination of the working group of ENTSOE. A crucial aspect of the assessments is that the interdependence between the systems could be very evolutionnary, depending upon the introduction of RES-E, the success of the interconnectors reinforcement policy and the macroeconomic situations.

Idem for the question 11 : "**Should generation adequacy standards be harmonized across the EU? What should be that standard or how could it be developed taking into account potentially diverging preferences regarding security of supply?".** We need to adopt the probabilistic criteria but it is politically difficult to adopt the principle of a strict harmonization of probabilistic criteria. **The main option which seems to be the most in line with the "Community modus operandi" would be that a probabilistic criteria floor should be adopted, but each Member State might choose to go further in the precaution.** They could be so, despite the fact that their effort could be as useful for their neighboring systems as for them if there is no congestion, because more dispatchable equipment could be built in their system because more prudential criteria or else the most securing capacity mechanism. But we have seen above that some measures could be taken in order to avoid "capacity leakages" towards less precautionary systems and the *de facto* free riding of the consumers of these systems.

About reliability criteria, it concerns the loss of load of one of the major equipment in a system (rule N-1). But development of large-scale wind power capacity changes the issue and makes necessary a rule taking into account the fading-out of all the windpower or RES-E capacity of a system. This issue of management of reliability rights for the need of a system is even made more complex by the heterogeneity of the curtailment rules in the market coupling and also the price caps in the same market coupling. It is important to underline that, in a market coupling mechanism, if a market A has a price cap of 1000€/MWh while the neighboring system has a much higher price cap of 3000€/MWh, it is possible for the generators of the market A to bid on the market coupling at 1500 or 1800 with the chance to be called by the market of the market B, even if the market A is in a situation of scarcity. The main question becomes: at which level the less precautionary TSO should decide to curtail some loads when the most precautionary ones have to take the same type of decision along the rules of the market coupling ?

A metaphor can be done with the Monetary Union inside the Eurozone. The creation of the Euro has been accompanied by the definition of criteria of convergence in terms of budgetary deficit, even if each MS budget relies on the national sovereignty. So nothing has impeded some MS to be more virtuous than the rule of 3%. But in the same time, the compliance of the rule was fictitious for most of the Eurozone members, in particular after the financial crisis when the MS have tried to save their banks. But at the end of the day, the virtuous countries have felt themselves slighted when they consider they have to participate to the deficit of the others via some new Common funds managed by the European Central bank. If we transpose that to the issue of adequacy and reliability, that means that it should have a minimum adequacy rule establish on the same basis and a stringent survey of the national plans to respect this criteria. And in the calculation of the rule, the evolving statistical contribution of each system to the others should have to be taken into account, but with common rules of calculation.

- **3.2. How far could we accept the differences between adequacy approaches?**

How far can we accept difference in rules between systems, for reliability remuneration and capacity mechanisms if this leads to a major tension with the principles of market integration? Before considering this issue, two remarks should be done.

A first remark is simply related to the differences of rules of TSO's contracting for the operating reserves, ancillary services, because this interacts with the role of CRM to give a complementary remuneration to reliable capacities, as these services do in relation to reliability rights. The current process of improving the integration of day-ahead and infra-day markets, balancing mechanisms

as well as network codes will certainly result to a homogenization of reliability rights.

A second remark concerns the relative adequacy of energy market design and CRM design. The majority of EU energy markets are bilateral markets complemented with exchanges. Their integration proceeds of the same principles : coordination of facultative exchanges via the market coupling, cross border bilateral transactions. We could intuitively consider that the bilateral and de centralised obligation *à la française* could be the most compatible with this energy market design and, by extension, we could deduce that, if this type of decentralised energy market could be integrated, why not the capacity markets associated to the bilateral obligations. In fact there is no need of such a concordance. Decentralised energy markets could be compatible also with central auctioning of forward capacity contracts or reliability options.

- **The difference between the market architectures**

A third and more important remark concerns the problems raised by the differences between capacity remunerations. Some of these differences are inherent to a general difference in market architectures between pool-type mandatory markets as in Iberic market or Irish market, versus bilateral markets with facultative exchanges), and the problems resulting from the differences between CRM in neighboring markets dominated by bilateral relations and facultative power exchanges. The price caps are much lower in this market architecture, and the pool could be easily complemented by a capacity payment because all the equipment have to sell on the market and their reliability which conditions the capacity payment to them could be easily controlled by this way.

The co-existence of instrinsically different market architectures could *de facto* result in different products that we wrongly suppose to be exchangeable on an integrated market of energy. Considering the difference between a mandatory pool market with capacity payment and an energy-only market like between Ireland and the UK (Lawlord, 2013) : in the trading from the first to the second, it is "pure" energy, without reliability rights, which is traded while in the other sense the British market players sells energy with implicit reliability rights. It must be underlined that these differences already impede integration of mandatory pool market in the regional perimeter of a market coupling which could only integrate systems based on bilateral relations and facultative exchanges.

A corollary of this late remark concerns the differences in price cap regulation between market architectures. Energy and capacity products in the market rules of a mandatory pool are more designed in a logic of long run marginal cost pricing (indeed the bids should be aligned on the variable costs even in scarcity periods with a bid cap near to 130-150€/MWh). It is the opposite of bilateral markets architecture which is running in a logic of short run marginal costs with constant bet on the scarcity revenues in the future to trigger investment in peak plants. On the EPEX market the price cap could be quite high (3000€/MWh), letting open some opportunities to extract scarcity rents during peak periods.

- **The effects of difference of capacity adequacy approaches between neighboring bilateral markets**

Concerning now the case of a market with a CRM and an energy only market, the export of energy from a market with a bilateral capacity obligation (BCO) or with a forward capacity market (FCM) to an energy only market during scarcity periods concerns energy that already benefits from the capacity remuneration, while this energy seeks to take advantage of high price reflecting the capacity scarcity in extreme peak on the neighboring energy-only market. This implies that in this

market there is a much higher scarcity rent in the absence of explicit capacity remuneration. So this rises the problem of double payment of the energy exporters from the first market with CRM to this energy only market in period of scarcity.

A quite similar problem could also arise between two bilateral markets with two too different CRMs which could introduce different incentives to invest in generation equipment on the two sides of the interconnections by influencing their net present value.

4. Does the difference in adequacy approaches tend to oppose to competition policy principles?

In a context of perfectly integrated energy markets with the same price cap, if a government decides to install a capacity mechanism in its electricity system in the name of subsidiarity principle for supply security reason while the neighboring systems do not benefit from the same measure, does this CRM introduce a competition distortion? Indeed there is a difference of revenues for the same type of equipment between the two systems, and we could argue that the competition is altered for the competitors belonging to the different systems. In the simplest case of two inter-related identical systems without congestion, generation investment in one country will be favored in particular in peaking units in comparison to the other country, and it could come in particular. By the fact that one CRM creates specific incentives to invest in one of the two geographical parts of the integrated market and suppress the level playing field in a long term competition perspective. However we could argue that, after taking into account transmission costs, there is no distortion to competition for three reasons.

First, inside the system with the CRM, all the competitors received the same revenues, the energy price and the capacity remuneration. It is the same as for the differences between RES-E support policies: no difference inside a member state, but difference of revenue and guarantee between MS. It is on such a basis that the DG Comp reports on June 2012 on the French law NOME and the price calculation of the nuclear drawing rights attributed to the EDF's competitors, considering that it allows competition inside France (cf. European Commission, 2012a) while NOME has two adverse effects: first it creates barriers to arbitrage on wholesale nuclear electricity exchanges between the different MS markets; second it deters to invest in new capital intensive equipment in the French market by suppressing their potential infra marginal rents that they could extract if the retail prices might be aligned in France on the wholesale market price.

Second it is true that the difference of revenues between the two systems incite to more easily invest in new capacities in one of the two integrated energy markets, the one with CRM. But the energy markets being completely integrated and the circulation of capital totally free, the market players of the "energy only market CRM" (or the market with a less favorable CRM) could invest in the market with CRM, either to make more money by selling capacity on the latter, and to export towards their "energy only system" during price spikes by making their own arbitrages.

Third as said before, we have to distinguish between the CRMs based on quantity and the CRMs base on a price instrument. With a CRM based on quantity the TSO has the possibility to limit over-installation of semi-base load and peaking units which would aim to supply the neighboring markets without CRM and profit form a sort of double payment in scarcity periods in the latter ones. CRM based on obligation or centralized auctioning could avoid what fears numerous members of the experts community about heterogeneous CRM approach: unfair competition in the installation of equipment between countries and systems. Central auctioning could be the

most transparent in this respect.

Fourth in the case of a system with capacity payment, (that is, without the possibility to control opportunistic installations in the system with CP, the type of industrial structures would also play a role. If the system is very "verticalised" as the French or the British ones are, there could be some investment in surplus by local producers and by producers from the other systems already present in this market but, it would not be in an excessive order of magnitude. The reason is that it would be a risky investment because the exports would be at a certain moment exposed to the congestion risk on the interconnections in period of synchronicity of the scarcities. With the extension of market coupling and anonymous transactions, there will be no guarantee that generators could succeed in their arbitrage with the other systems.

Moreover if we contemplate the relative share of capacity revenues in the total revenues for each type of equipment, the problem concerns mainly peaking units and much less mid-merit and base-load units, in particular in the systems where the price cap is quite high as it is in the European facultative CWE markets (3000€, instead of 1000 $ in the US East Coast markets and respectively 180-500-1000 €/MWh in the Spanish Italian and Irish pools).[12] Even if it means repeating, when the energy markets are completely integrated, capacity adequacy as well as system reliability are strictly the same collective goods and they are not made heterogeneous by the difference of adequacy approaches, provided that each regulator and TSO refer to the same probabilistic criteria of adequacy and reliability.

Another perspective in considering this issue is the TSO's perspective in a system with a CRM when neighboring system has not a CRM. For the first TSO, the logic of definition of the adequacy objective to be reached by the CRM incentive drives him to only take into account the national need of reserve margin related to anticipated national load and installed capacities able to guarantee availability during extreme peak (and exceptional events). This TSO subtracts the statistical contribution of neighboring systems (with ou w/o CRM) to the system adequacy target in the future. In other words the TSO is in a position to ignore the speculative investment in his system in peaking units to supply the neighboring systems w/o CRM during synchronous scarcity periods.

So to sum up we could argue that inside countries with a CRM the competition is not altered by the installation of the CRM, that any entrant could come and invest in, in particular operators coming from neighboring "energy only" markets. We could also argue that it is not opposed to competition on the integrated energy market between the different systems. In particular when a CRM is a quantity instrument (decentralized obligation or centralized auctioning) , the TSO is in a position to control the installed capacity surplus in relation to the need of its system, after having taking into account the statistical contribution of the other systems.

5. The exchanges of capacity rights between systems: Which economic advantages? Which organizational conditions?

To promote capacity rights trading between systems is questionable. We argue that such exchanges involve property rights which are extremely difficult to define and then these exchanges do not bring forward clear economic gains. Moreover, the ongoing improvement in

[12] It would be convenient to add here a comparison of the structure of revenues in two contexts of market architectures (with or w/o CRM) and for different levels of price cap.

reliability rights markets (intraday, reserves, balancing, systems service) and their markets integration is an issue far more important than exchange of capacity rights. If there is a real improved efficiency in exchange of energy and reliability rights between countries up to the real time between markets, we must identify the benefits that the trade on "promises" to trade guaranteed reliability rights at a delivery rights would brings to the system. So we have to identify the relative importance of each issue in relation to each other one, to identify the minimum relevant measures of harmonization, and to point out the difficulties in trading capacity rights between systems that are inherent to the nature of these products

5.1. Low stake of inter-system capacity rights exchanges

The stake of making liquid and much more integrated energy and reliability rights markets is much more important than the capacity rights trading which would partly justify harmonization at any cost. It should be noted in first that the need for additional “flexibility services” and back up due to the rise of intermittent production should not be confused with the need for additional reserve margins in extreme peak. Answers to the first need, including the better integration of day ahead and infra-day markets, partly reduces the stake of harmonization of capacity adequacy approaches at any cost. The achievement of the Target Model on energy (and reliability rights) markets and network codes under the "Market integration Agenda 2014" will enable the sharing of flexibility services resource to cope with the intermittency randoms. This pooling of resources will lead to cope with the production and demand randoms in extreme peak of the different systems within the limits of interconnection capacity between countries.

By comparison the economic stake of capacity rights trading is limited compared to the stake of reliability rights trading. Assuming a situation where countries have the same adequacy approach and that there is no congestion in times of scarcity between the two systems, economic gains to trade capacity rights will emerge in two types of situations. First we find advantages in situations of transitory overcapacity in one or more systems resulting from an overestimation of investment prospects of profitability or unanticipated growth trend reversal. Such an exchange of capacity rights would postpone the construction of reserve units in neighboring systems which are close to capacity scarcity during peak or exceptional situation. It is the reason for which these short term reasons could be a basic belief in market virtues for searching harmonization of capacity adequacy approaches. But we should not forget that temporary overcapacity situations could be shortened by private decisions of equipment closure (as we presently observe in Spain and Germany) or by resumption of growth.

Second situation, in a longer run perspective of market equilibrium (the only one that really matters when capacity creation is at stake), there would only be gains from trade in a situation where the industry in one country would be much more efficient in building new capacity in peaking units. So firms would decide to build such units to sell energy to the other systems with a capacity mechanism in scarcity periods for making money. But this hypothesis of comparative advantages on peaking unit costs is not realistic because these techniques (gas turbines, combustion turbines) are standardized technologies with the same cost from one system to another.[13] There is therefore no comparative advantage in the trading of capacity rights, in terms of social benefit of market integration in comparison of the improvement of day-ahead, intraday and real time energy markets and their better integration. Such better integration mutually reinforces the reliability in each system. Pooling the flexibility resources via the extension of balancing zones should moderate the compensation expense of variability of large scale wind and

[13] We do not consider the particular case with hydro-dominant countries with seasonal or weekly storage capacities (Austria, Switzerland and now Norway for The Netherlands and Germany).

solar productions. The more the area of reliability rights is important, the least the own balancing need of each system will need internal adjustment and operating reserves services and – as an effect on capacity adequacy – the least reserve margins for the long term will be necessary, provided that interconnection capacities are there.

Nevertheless, even if developments in “flexibility services/reliability rights” markets solve short term and real time adaptation problem created by the large scale introduction of windpower, they do not suppress the need for a capacity mechanism for the attribution of a complementary economic value to guaranteed capacity in extreme peak with possible weak windpower generation.

5.2. The possibilities of capacity rights trading[14]

If a priori the principle of trading capacity rights between systems stems from the principles of the European treaty and the SoS Directive of 2006, the likely heterogeneity of adequacy approaches requires to question the feasibility of such exchanges. We need indeed a set of stringent conditions most of which are unattainable to reach exchangeability of capacity rights.

The first set of conditions is related to the homogeneity of property rights. In first we should ensure the existence of explicit capacity rights in each market, and when they exist in the different markets, they should be homogeneous.
To respect these two conditions we need:

- 1 / That TSOs have adopted an uniform criterion of adequacy (probabilistic nature, level of precaution), as well as the same method to assess the statistical contribution of other systems to their need of reserve margins;
- 2 / That each market has a capacity mechanism so that there is an explicit capacity right which have an economic value in its home market to be compared to the value of similar rights in the other markets;
- 3 / That the mechanism designs have the same nature (acting by the quantity rather than by price for instance) in order to give an economic value of equivalent nature on both sides of interconnections.

However, if we assume that one of the systems stays in an “energy only” architecture, a capacity right could be sold from this system to a system with a CRM, but this trading would need a strong intervention of the two TSOs, for the capacity certification and the checking of the compliance of the exporter unit with his commitment to be reliable during scarcity periods. But this close collaboration presents a flaw: the TSO of the system exporter is forced to give up its total control over the use in last resort of the reliability rights generated by the local capacities in period of scarcity. This could be a reason for which a rule opening the possibility of bilateral capacity rights exchange does not respect the condition of institutional acceptability. A TSO should have the right to refuse capacity rights bilateral trading in tight situation.

The second set of conditions is related to the temporal intrication of "reliability rights" which are short term or real time products, in “capacity rights", which are forward promises to be reliable at the delivery date. As said, a TSO should have the exclusivity of purchasing reliability rights in last resort for guaranteeing the stability of its system, given its legal responsibility to ensure the reliability of supply. If there is a legal possibility of exporting capacity rights, he must give up this

[14] We present extensive development on the topic of trading of capacity rights in the Annex 2 in which we the legal conformity of the non eligibility of foreign units in a national CRM

exclusivity because these sales by a local player relied on the commitment to export the associated reliability rights (under the form of energy deliveries) in times of scarcity. If it could be acceptable in period of overcapacity, it could certainly be not in period of scarcity.

A third set of conditions concerns the "transferability" of the capacity right from a system to another system. This transferability is submitted to the possibility of firm reservation of access rights to interconnection capacities in advance to allow the transfer of the corresponding reliability rights because of the possibility of congestion in times of scarcity. The commitment of the capacity rights export is only valid with this firm reservation: the reliability rights of the external capacity may have to be mobilized by the other system during scarcity periods. But, the market coupling cancels the firm booking of access rights. This will be also the case with the forthcoming adoption of the "Financial transmission rights" on interconnections presently governed by physical transmission rights auctioning. And we should underline to conclude that the priority given by the Target Model realization to the increasing liquidity of the energy markets and their integration, especially through market coupling, and in the future, through extension of financial access rights, are contributing to hinder the development of credible commitments of capacity rights exchange. Indeed between two systems the market coupling makes impossible to ensure the realization of a firm reservation of rights of access to interconnections.

All these difficulties could challenge the free trade principle applied to capacity rights trade that is formulated in the 2006 SoS Directive, which refers to the articles of the European Treaty.

6. Conclusion: The need of some minimal harmonization principles in matter of capacity adequacy

6. 1. Some necessary conditions to avoid negative externalities between systems

We argue that harmonization of adequacy capacity at any cost has no sense as soon as intraday and reserve markets (balancing , ancillary systems) have been (will be) improved by the target model implementation for allowing better valuation of flexibility service and market integration. This will allow a better short term solidarity than now. It does not solve in itself the problem of interferences between systems when adequacy and reliability market designs are different. So it appears necessary to give priority to a number of measures of homogeneisation.

- To adopt a homogenous probabilistic criteria of adequacy and reliability (among which criteria of curtailment) by taking into account statistical mutual contribution to the adequacy of the other systems, because it is the best principle for making systems responsible of their own risks;
- To adopt a minimal criterion of adequacy;
- To adopt a similar price cap to avoid difference of incentives to invest in peaking and reserve units.

In short the Member States (MS) should converge on the same incentives to invest in order to reach the minimum level of probabilistic precaution. MS are free to go beyond the minimum criteria but it is necessary in this case to amend some rules of exchanges in order to avoid some capacity leakages towards less precautionary MS. In this sense it is worthwhile to underline that the algorithm of the market coupling software on the curtailment rules re-enforces de facto the

short term solidarity between systems, but it is at the detriment of the precautionary system. Indeed it aims at equalizing the ratio of curtailment of total load in each system. It is an example of some amendments that appear to be needed.

6.2. The adoption a set of minimum principles in the design of CRM

1. To avoid direct influence of the capacity mechanism on the different markets (day ahead, intraday, balancing) in particular in the case of the strategic reserves,
2. To rely on market-based incentives: auctioning, decentralised obligation with certificates exchanges,
3. To search symmetry of the treatment between supply options and demand options (load shedding, etc),

These minimum rules would never suppress the long term impacts on investment in the market with better incentives than in its neighboring markets with other CRMs or no CRM at all. But is is mainly at the detriment of consumers of the more precautionary systems in terms of costs. Moreover differences of adequacy approaches do not oppose to competition principles in the way that the EC apply these principles.

6. 3. On existing (or nearly existing) capacity mechanisms.

The end of overcapacity by the closures of polluting generation equipment as well as the large scale development of intermittent production makes sense that member states begin by acting act by their own for their long term security of supply, because long term insurance by guaranteed reliable capacity was not recognized as an economic product. Consequently it is considered as relying on public service obligation.

First it appears irrealistic to cancel the existing mechanisms in the name of the “levelization” of the playing field. We shall not forget that the playing field is already degraded by the development out of market of the RES-E with low variables costs, and by the non guaranteed production of intermittent RES-E, even after the suppression of the priority access rules.

Second it appears that first movers could influence their neighboring countries to adopt à CRM if they are needed in the future because of the large scale development of intermittent renewables. But it does not mean that any MS should be forced to adopt one CRM. There is a need to understand where we need a mechanism and which one is the most adequate (i.e. the type of random to cope with).

Third we insist on that it is not possible to have homogeneity and real harmonisation between the countries with mandatory pool architectures and those with bilateral markets.

Annex 1

Could we overcome historical and institutional constraints by implementing one single CRM?

One alternative could be the adoption of a capacity market managed by a strict coordination of TSOs on the model of "locational" forward capacity contracts applied in the PJM markets in the USA. This mechanism takes into account congestions between zones in times of scarcity, and the auctions help to reveal different values of capacity rights. It is a signal for installing new generation equipment or best, new transmission lines. But such a solution involves too many institutional conditions to be feasible in the context of the European Union. In particular it requires very close coordination of TSOs, as if they would be a unique TSO in the same way as there is a unique ISO between the different companies of the three jurisdictions of the PJM.

Moreover it supposes that major internal congestions in each TSO are taken into account, that is congruent with the nodal pricing applied in the PJM and its short term incentives, while in the EU, the enlargement of market coupling --which is a zonal pricing between systems—ignores internal congestions which could increasingly result from loop flows coming from windpower inflows in the interconnections from othj er systems) does not help to create short term incentives inside systems.

Another fundamental difference is that in the EU, the TSOs are owners of the infrastructures while it is not the case of the ISO in the PJM. That means that there is a clear stake of creating incentives to develop transmission lines by the way of the price signal by the locational capacity price (and not only by the nodal pricing), while incentives of other nature exists in the EU member-states, in particular via the zonal tariff for building new interconnections.

Annex 2

Free trade of capacity rights is not a relevant issue.

Harmonization in matter of capacity adequacy is not on the 2014 agenda of electricity markets integration. But the Council of European Energy Regulators (CEER), the European Commission and different European bodies of stakeholders have engaged reflections on this issue. A guideline of good practices on generation adequacy and capacity remuneration mechanisms (CRM) initiated by the CEER is currently in discussion. The DG Energy is partly focusing the redaction of its next October Internal market communication on CRM among different issues, free trading and cross-border contracting on capacity rights are on the top of the list.

According to the Treaty of Functioning of the European Union (TFEU) and EU Directives, no limitations should be accepted beyond the cross-border constraints, for the capacity rights as well as for energy. The exclusion of external capacities from the capacity remuneration mechanism of one market (bilateral capacity obligation, centralized auctioning of forward capacity contract, etc.) would be similar to a measure of trade restriction, which is prohibited by the article 34 and 35 of the Treaty. From another side, Article 4.3 in the Security of Supply Directive 2005/89/EC specifies : "(...) Member States shall not discriminate between cross-border contracts and national contracts".(e.g. a French generators should have the right to join the Italian capacity mechanism to the extent they can actually deliver "reliability" in Italy in times of scarcity in France, Germany and Belgium). But the principle of free trading of the European law supposes conditions allowing transactions on physical exchanges of good or service (identification, measurability) which are not met with exchange of capacity rights between systems, which, according to us, should not make this principle roughly applicable to the capacity rights. Some Member States developing a CRM could prefer to account external contributions to capacity adequacy in a statistical way and to exclude bilateral transactions with external capacities. We question in the first section the relevance of trading capacity rights between systems and then we claim in favor of the exemption of capacity rights exchanges from the free trade provision of the TFUE by analyzing in legal terms its conformity to the TFUE and the European jurisprudence.

1. **We do not know what we exchange with accuracy**

The discussion on the conformity of possible restrictions to trade capacity rights to the TFUE evacuate some crucial questions about the nature of property rights on guaranteed capacity and their transferability between systems.two types of property rights related to two collective goods managed by the Transmission System Operator (TSO), the reliability of the system and the capacity adequacy. Reliability rights are offered by every generation unit which produces and could adjust their production, or which are in reserve, ready to produce energy, to offer the balancing services and ancillary services sold to the TSO which is in charge to guarantee the system reliability to every producer and consumer. So the reliability rights cover not only the different types of reserve and balancing services bought by the TSO but also all the energy which is forward exchanged between producers and loads which are "balancing responsible" for a delivery hour in bilateral transactions, on the day ahead and the intraday markets just before the "real time" during which the TSO takes the complete control. So any kWh

injected in the system also includes an implicit “reliability right”.

A capacity right is related to the capacity adequacy of a system, a “collective good” which is a long term insurance of supply reliability during scarcity periods obtained by targeting a reserve margin. This helps the Transmission System Operator (TSO) who is in charge to manage the system reliability, to be sure to have sufficient reliability rights in the system. These rights come from existing units as well as new generation units installed under the incentives of the CRM, which both commit to be reliable during peaks on the delivery date by signing up their forward contract . So a capacity right is a simple promise of reliability in scarcity periods, under the incentive of a penalty. Bilateral capacity obligation (BCO) or forward capacity contracts central auctioning (FCM) create such capacity rights which in turn will contribute to generate reliability rights during scarcity periods. As the TSO is in charge of the system reliability in any annual period, it should have the exclusivity of reliability rights purchases in last resort or at least it should have the total control of their use in last resort in scarcity periods in its own system.

It is now possible to understand what an exchange of capacity rights between two systems means. Simply saying, we do not know exactly what we exchange. It is a bilateral transaction between a buyer in the system A which is equipped with a CRM, -- a supplier in the BCO case, the TSO in the FCM case -- and a production unit located in the system B able to forward commit to be reliable and to send reliability rights on the delivery period into the system A. The parties need also to have firm reservation of access rights to guarantee the transferability of reliability rights associated to the capacity rights in the scarcity periods of the importer’s system, even in situation of congestion on the interconnection. Using a metaphor, we could consider the exporting unit of capacity rights as an enclave of the system A inside the system B with a interconnection corridor dedicated to it. Certainly this enclave is temporary, for the delivery year and the scarcity periods in the system A, but it should be a real complementary mean to offer energy and the associated reliability rights in the system A during this period.

This “capacity rights” transaction means that we are able to identify the physical flows of energy & reliability rights attached to them, and to separate these capacity rights from the statistical contribution of the system B to the adequacy of the system A which are physically integrated in one regional market. Indeed absence of traceability of electricity flows from one system to another one does not allow to follow the exchanges of the corresponding “reliability rights” at the delivery date in the scarcity period. This is not problematic if bilateral relations are very few (they would rely on a regime of exception in this case), and if there is a very low probability of congestion on the interconnections during scarcity periods, because we could suppose transferability of capacity rights and beyond, transferability of reliability rights during scarcity periods. But problems arise when transactions on capacity rights rely on a common regime, and when congestion exists on the interconnections during these periods and separates the two system’s markets of energy and reliability rights.
Let us remind some basic elements of the property rights theory about exchanges on property rights: First, property rights should be clearly defined by the market designs and should be homogenous if exchanges occur between two markets. Second, the exchanges must be acceptable by all the parties involved, in particular when collective goods monitored by public agencies are at stake. Third, their exchanges should be able to come true in every situation. Fourth, the transactions must be measurable. Exchanges of capacity rights between two electricity markets do not respect some of these conditions in every situation.

• Enforcement of property rights in view of exchanges between electricity systems will need the importer's TSO involvement (to certify) and the exporter's TSO (to control the reliability), the forward reservation of access rights to the interconnection, etc., what implies a clear cooperation between TSOs while their interests diverge. Moreover if there is difference of criteria in matter of capacity adequacy, and reliability, there will not be the same metric in the measure of the capacity rights.

• The exchange of capacity rights imposes that TSOs renounce to the exclusivity of reliability rights purchases in last resort in scarcity periods, which means that their central function of offering the collective good "reliability" is questioned, and that is not acceptable by the TSOs and their government.

• The commitment of external capacities to be reliable and to serve the reliability of the importer's system is not credible without firmness of access rights reservation, but firm reservation is not possible with the market coupling or the future financial transmission rights allocation. Moreover an eventual substitute by swaps of reliability rights which could be envisaged does not solve the problem if congestion separates the markets during scarcity periods.

• Bilateral transactions with an external capacity are not measurable and separable among the statistical contributions of the exporter's system to the importing system's adequacy, if we refer to a regional market with two systems only. Electrical energy flows (and so the associated "reliability right" flows) are not traceable. If bilateral exchanges of capacity rights are allowed, their contributions should have to be separated from these statistical contributions. As a consequence, the statistical contributions should be reduced by the substraction of this external capacity while nothing could prove that it effectively contribute to the reliability of the importer's system. Managing such a system of exchanges will be impossible, except if bilateral transactions on capacity rights are exceptional. We can guess that the problem will be magnified in a multi-system

Beyond these pitfalls of cross-border capacity rights exchanges, the central problem remains that we do not know with accuracy the exchangeable "product". Because of this fuzziness of transferable capacity rights, the legal discussion of restrictions on their trade which refers to the European jurisprudence might appear as a piece of scholastic.

2. **The euro-compatiblity of exclusion of external capacities from a CRM**

In the legal discussion, the non-conformity character of the exclusion of external capacities from a CRM should be appreciated according to the alternative measure which is the accounting of the statistical contribution of external capacities across interconnection capacities to the power supply reliability during scarcity periods. The Treaty does not put barriers to restrictions which are justified by arguments of public security (art. 30). Along the European jurisprudence, the conformity of a restrictive measure or all measures with equivalent effect is subjected to three main conditions: the absence of total harmonisation of the derived law; the effectiveness of the measure; and the proportionality of the measure to the desired outcome which justifies the legitimate public policy objective, here the capacity adequacy for the long term supply reliability.

• On the first point, the SoS directive n° 2005/89 allows to State members to implement a number of measures in order to reach supply security. But this directive does not proceed to any harmonization by defining a set of principles or market rules, and lets a wide margin of maneuver to State members. The result is an absence of homogeneity of approaches in matter of adequacy, and reliability criteria, and in matter of adoption of a CRM. It is the homogeneity of capacity rights which are supposed to become exchangeable which is questionable.
Moreover the concept of supply security which needs to be clarified in a complex industry as electricity, is so vague in the texts than it could be interpreted in a way that measures in matter of harmonization might only concern the different energy markets and reliability rights exchanges (market coupling for day ahead, intraday, balancing, etc) with the implementation of the so-called Target Models. Indeed if free trade principle is evoked in the article 4.3 of the SoS directive in order to avoid discrimination "between cross-border contracts and national contracts", it might only be about trade of kWhs during scarcity periods (which implicitly incorporate reliability rights). Nothing designates explicitly the capacity right which is a forward guarantee of reliability during scarcity periods. The SoS directive does not define precisely the two imbricated objectives of "capacity adequacy" and "system reliability" which are concerned, referring only to the vague concept of "supply security". Capacity rights, which again are only forward commitments to be reliable and to deliver energy/reliability rights beyond the interconnection during scarcity periods, are clearly much less tradable than the latter ones. The current improvement of integration of day ahead, intraday and balancing markets via the future implementation of "target models" will deliver mutual advantages in terms of reliability.

• About the second criteria, a capacity mechanism is a direct response to the protected interest which is the long term reliability of the national electricity system. If there is a preference for the statistical approach into bilateral purchases of capacity rights to external units, it is because it creates more problem to the reliability of the system, than economic gains for the importer system. Indeed, if there is risk of congestion on the interconnection, there is no guarantee that the external capacity could deliver. Conversely if the market with CRM is confronted to numerous demands of capacity rights exports, -- which should have to be accepted in the name of reciprocity principle --, these bilateral sales of capacity rights in neighboring systems alter the ability of the TSO to guarantee the supply reliability in its system. It would be a good reason for governments who are the ultimate warrants of supply reliability, to be opposed to bilateral trade of capacity rights, which could jeopardize the system reliability during peak periods.

• Concerning the argument of proportionality, the statistical accounting of external contributions, via all the interconnections, to the capacity adequacy of a system, leads to the splitting of the cost of the remaining adequacy objective (after deduction of the statistical contributions) between the consumers: it is via the retailers' pricing in the BCO, or via the TSO uplift in the FCM. This splitting is defined in relation to the market share of the retailers in the BCO. This leads to consider that this measure does not affect in an excessive way the intra community exchanges according to the goal of supply security and reliability.

To conclude the true nature of transferable capacity rights is against the European principle of free trade. The common sense would not recommend to give substance to the intersystem trade of capacity rights. This is all the more so as the current improvement of the integration of energy and reliability rights markets (by the implementation of the Target Models) will help to the mutualization of the reserves between systems by the market, helping investment in the best place.

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