Advisory Note on the Draft Framework Guidelines on Capacity Allocation and Congestion Management for Electricity[1]

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On April 11, 2011, the Agency for the Cooperation of Energy Regulators (ACER) issued draft Framework Guidelines on Capacity Allocation and Congestion Management for Electricity ("CACM Framework Guidelines") for consultation, with comments due by June 10, 2011.[2]

Development of Framework Guidelines and associated network codes are part of a larger effort underway to achieve an integrated European electricity market under the Third Package Electricity Direction and Regulations ("Third Package.")[3] When finalised, these particular CACM Framework Guidelines will define the high level arrangements to be adopted for the calculation and allocation of transmission capacity between the zones of an integrated European electricity grid in the forward market, day-ahead and intra-day timescales. Detailed arrangements for the calculation and allocation of transmission capacity, reflecting the requirements of the finalised CACM Framework Guidelines, will be set out in "network codes" to be developed by ENTSO-E. These network codes will ultimately become European law and therefore binding on Member States.

The Regulatory Assistance Project has recently reviewed some of the key issues that will be addressed to implement market integration over the next three years, including the development of these specific capacity allocation network codes. Other guidelines and associated network codes are under development to address a wide range of market integration issues, including the allocation of network connection, transmission pricing, and balancing and settlement arrangements. The Regulatory Assistance Project review highlights ways that decisions on these issues could either advance, or interfere with,

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[2] ACER Framework Guidelines on Capacity Allocation and Congestion Management for Electricity; see http://www.acer.europa.eu/portal/page/portal/ACER_HOME/Stakeholder_involvement/Public_consultatations/Open_Public_Consultations/PC-03_FG_Electricity_CAM_and_CM/Consultation_document/DFGC_2011E002%20FG%20Elec%20CACM.doc

[3] Directive 2009/72/EC concerning the common rules for the internal market in electricity and repealing Directive 2003/54/EC; see http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:211:0055:0093:EN:PDF
Regulation No 714/2009 of the European Parliament and of the Council on Conditions for Access to the Network for Cross-Border Exchanges and repealing Regulation No 1228/2003; see http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:211:0015:0035:EN:PDF

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Europe's power sector decarbonisation agenda—including policy and other market reform initiatives to advance that agenda being considered by Member States (RAP, 2011).

This Advisory Note reviews the draft CACM Framework Guidelines from a similar perspective by focusing on potential interactions with the European decarbonisation agenda while, in addition, providing some comment on issues that may be significant from a market integration standpoint alone.

Below, we provide some background and context to the current ACER consultation, together with some "key messages" from our review followed by more detailed discussion of each issue.

Key Messages

- Market integration should work in concert with policies adopted by Member States to enable decarbonisation. While seeking to minimise unnecessary distortions to cross-border trade, rules for optimising energy flows between Member States should be designed to enable, rather than preclude, effective and necessary market support mechanisms for low-carbon resources.

- Market coupling could result in significant energy price differentials opening up across Europe, intensified by the deployment of the zero marginal cost intermittent renewable technologies as decarbonisation proceeds. These price differentials have the potential to delay the achievement of Europe's decarbonisation objectives and/or increase the cost of achieving those objectives. Consideration should therefore be given to measures that differentiate between intermittent renewable generation that cannot respond to locational signals emanating from these price differentials and generation resources that can.

- Strong regulatory incentives for the efficient *utilisation* of network and interconnector assets should be a key focus in the development of market integration guidelines and codes. Maximising the utilisation of these assets advances both the decarbonisation and market integration agendas by increasing power transfer capacity and reducing investment costs. In addition, regulations on both the Member State and European level that encourage objective choices between investment and "operational" or

innovative alternatives will promote the delivery of additional interconnection and transmission capability at minimum cost.

Background and Context

To put the concept of a single European electricity market into practice, the EU has focused in large part on facilitating more efficient use and allocation of interconnector capacity. For this purpose, the Third Package specifies the use of "explicit "or "implicit" auctions, and a "target model" has been developed to implement these requirements. Under this model, cross-border trading is facilitated by the explicit auctioning of interconnector capacity, with implicit auctioning of remaining capacity at the day-ahead and intra-day timeframes. Explicit auctioning involves holding a separate auction to allocate cross-border capacity in advance (potentially many months or even a year "forward") of the day-ahead time frame. Under implicit auctioning, cross-border capacity is allocated (implicitly) at the day ahead and intra-day timeframes through a process of "market coupling" that allows individual market power exchanges to coordinate sales and purchases of energy.

Market coupling utilises optimisation algorithms to satisfy total energy demand at the lowest price, based upon participant offers and bids in the coupled regions. Where interconnector capacity is sufficient to accommodate the optimal energy flows determined by the market coupling algorithm, a single energy price will emerge. However, when capacity is insufficient, the interconnector is said to be "congested" and energy prices in the coupled markets will diverge. In this instance, energy is effectively bought at one market price, exported across the interconnector and sold at a higher energy price, giving rise to a congestion "rent" (the product of the interconnector flow and the energy price differential). Market coupling therefore produces energy prices that reflect the value of energy based upon participant offers and bids in the coupled regions, taking into account the impacts of interconnection congestion.

The aim of electricity market integration through market coupling is to develop cost-reflective energy pricing across Europe that removes trade distortions across national boundaries. However, how best to achieve these objectives alongside the need to accelerate decarbonisation of the European power sector raises issues for consideration in designing and implementing a CACM approach that advances both agendas, rather than market integration alone. In particular, we discuss below the need for CACM arrangements that are consistent with the market support mechanisms for low-carbon

and reliability resources being adopted by individual Member States. In addition, we highlight the potential impact of locational signals emanating from market coupling on renewable resources forced to locate in particular areas, together with the need for strong European (and national) regulatory incentives to encourage the efficient utilisation of transmission assets as an aid to the development of an integrated, decarbonised, European market.

The need for Market Coupling to accommodate Market Support Mechanisms

Most Member States and many countries worldwide have adopted mechanisms to support low-carbon and reliability resources, either in the interests of supply security or the attainment of carbon reduction goals. Support mechanisms related to security may be a prominent feature of market design, for example in PJM's Forward Capacity Market[4]; or to take a less obvious form, for example contracting for reserve or peaking capacity.[5] Mechanisms designed to encourage the deployment of renewable technologies include Feed-in Tariff designs and renewables obligations or quotas, among others.

Irrespective of the particular design adopted, support mechanisms provide additional income for qualifying generation over and above that obtained from energy sales and have the potential to influence market energy prices. From the singular perspective of optimising energy flows via cross-border trading, support mechanisms could be seen as undermining the efficient operation of energy markets. However, in the context of Europe's aggressive decarbonisation agenda, the more relevant inquiry for CACM and other market integration issues would be to address the following, two-part question:

I. What policies and related power market arrangements are needed in the near- and mid-term to attract sufficient investment in (and deployment of) low-carbon resources capable of putting Europe on track to meet its 2050 carbon reduction targets? and;

[4] PJM is a regional transmission operator that operates the largest competitive wholesale electricity market in the world, encompassing a number of large, US mid-Atlantic states. PJM runs a capacity auction three years in advance in which both supply- and demand-side resources can compete to meet future peak demand in the region. See: http://www.roadmap2050.eu/attachments/files/PolicyBriefMay2010RM2050%5b4%5d.pdf.

[5] System operators often contract in advance for reserves in the form of generation capacity/demand reduction – for example National Grid's STOR arrangements for Great Britain's electricity market.

II. How should European market integration be accomplished so that it will sustain the decarbonised resource mix over the long-term, including the optimal trading of clean resources across national borders?

As progress is made towards a single European electricity market though market coupling and the integration of regional markets, the focus on ensuring that wholesale energy prices are both consistent in nature and economically efficient could have unintended consequences that undermine Europe's broader decarbonisation objectives. The challenge will be to effectively coordinate the harmonisation of existing national practices with the broader inquiry outlined above. Rather than considering market integration and measures to support power sector decarbonisation separately, they should both be advanced together in a complementary, reinforcing fashion.

It would be helpful if the final CACM Framework Guidelines issued by ACER recognised the need for market integration and decarbonisation support measures to co-exist. While measures to support decarbonisation or reliability are likely to have little, if any, impact on arrangements for the calculation of interconnection capacity, there could be implications for market coupling design. Complementary development should allow potential conflicts to be addressed however, and Annex 2 of our more comprehensive review (RAP, 2011) gives a practical example of how the use of capacity payments to support reliability by individual Member States could be accommodated satisfactorily within implicit auction arrangements.

The Impact of Locational Signals delivered through Market Coupling on Intermittent Renewable Generation

The use of market coupling as a means of integrating national markets and ultimately delivering a single European market will expose generation and demand to locational signals, in addition to those which may be applied by some Member States through transmission use-of-system pricing. Experience to date with locational pricing in regional wholesale markets suggests that these pricing differentials can be dramatic and highly variable[6]. Furthermore, the need to exploit areas of high wind, solar and hydro resources in pursuit of Europe's decarbonisation goals can be expected to result in large

[6] For example, PJM's forward capacity market incorporates locational pricing that is based on the same pricing principles as market coupling. In the most recent capacity auction, locational pricing resulted in market prices as high as $245 per MW-Day in certain transmission congested zones, compared to a low of $27.73 per MW-day in uncongested zones. For the previous auction year, capacity prices ranged from $16.46 per MW-year (uncongested) to a high of $139.73 (congested). See Figure 2 (page 11) PJM market results at http://www.pjm.com/markets-and-operations/rpm/~/media/markets-ops/rpm/rpm-auction-info/2013-2014-base-residual-auction-report.ashx

power flows across national borders, giving rise to increased congestion and the potential for large market price differentials. [7]

Addressing the issue of locational signals from a market integration perspective alone may well suggest that a technology-neutral approach would best serve the interests of cost reflectivity and non-discrimination. However, the potential impact of large, possibly extreme, market price differentials on intermittent renewable generation raises issues to consider in the development of the CACM Framework Guidelines and the allocation of transmission rights, particularly in the context of the Renewables Directive and more generally, Europe's overall decarbonisation agenda.

While providing locational signals that accurately reflect costs incurred seems appropriate for conventional generation, which has some ability to respond both in terms of location and subsequent operation, the same may not be appropriate for intermittent renewables. Wind, marine and solar technologies are more constrained in terms of location than conventional generation and, in the interests of reducing carbon emissions, need to operate whenever their primary resource is available. Furthermore, as renewable targets become more demanding, areas of renewable resource will need to more heavily exploited (i.e. North Sea, Baltic coast or Scottish wind resource) with renewable projects effectively directed to locate in specific areas. Applying locational pricing signals to generation technologies that have little or no ability to respond may constrain deployment and delay the achievement of Europe's renewable objectives and/or increase the cost of achieving those objectives.

One way of achieving a more appropriate balancing of policy objectives might be to preferentially allocate to renewables the transmission rights associated with a congested boundary (RAP, 2011). A review of electricity markets where physical or financial transmission rights are employed suggests that rights are normally allocated by auction, to reflect the redistribution of economic rents through market reform or a participant's investment in transmission capacity. However, progression to a decarbonised European electricity system, where renewable and low carbon sources will have a natural priority in dispatch and significant additional transmission capacity will be required to support flows of renewable energy, suggests that renewable or low carbon resources should also have preferential access to that capacity. This would be

[7] Although investment in transmission and cross border interconnection capacity will mitigate congestion, developing a "copper plate" transmission system will be neither practicable nor economic. Furthermore, the increased availability of zero marginal cost renewable technologies such as wind and solar will depress energy prices in exporting areas of the network and increase price differentials across coupled markets, thereby increasing the costs of dealing with congestion via market coupling.

consistent with the requirements of Article 16 of Directive 2009/28/EC[8], which requires Member States to ensure that energy from renewable sources has priority or guaranteed access to the electricity grid.

The CACM Framework Guidelines envisage the use of both physical and financial transmission rights as a hedge against congestion, but invites responses to the proposition that financial rights are to be preferred. While financial rights have the advantage over physical rights in that all transfer capacity is made available to the implicit auction process, either arrangement could accommodate preferential allocation to intermittent renewable generation. Physical transmission rights could be utilised by intermittent generation to gain access to higher value in adjacent markets (created by interconnector congestion) or sold on to other users in situations where insufficient renewable resource was available in the event. Where transmission rights are financial, preferential allocation to intermittent renewable generation would provide access to congestion rents and thereby at least some protection from energy price differentials, irrespective of whether or not sufficient renewable resource was available to utilise the allocated rights[9].

Alternatively, or in addition to the option outlined above, the algorithms employed in market coupling or other forms of marginal locational pricing may need to advance to take into account the carbon attribute of the resource selling into each zone or pricing node. Whatever route is chosen, it will be necessary for market integration to proceed on a basis that does not jeopardise the deployment of the renewable and low carbon resources necessary to deliver Europe's ambitious decarbonisation objectives.

Efficient Utilisation of Interconnector Assets

Major investment in transmission assets will be required in order to enable both market integration and connect the new intermittent and often remotely connected generation technologies associated with decarbonisation (European Climate Foundation, 2010). At the same time, accommodating significantly more generation capacity than there is demand to be supplied together with the large and volatile power flows associated with an integrated and decarbonised electricity system can be expected to reduce overall

[8] See http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0016:0062:en:PDF

[9] In situations where insufficient resource was available for renewable generation to fully utilise allocated rights, it may be appropriate to reallocate the resale value (physical) or congestion rent (financial). However, in a decarbonised electricity network, congestion is likely to be very much reduced during periods of low renewable resource availability and the resale value or congestion rents would also be much reduced.

transmission system utilisation from already low levels[10]. This reduction in asset utilisation will add to the transmission investment burden, and measures that are effective in enhancing transmission capacity and overall system utilisation are therefore likely to advance both the decarbonisation and market integration agendas. Strong regulatory incentives for the efficient utilisation of these assets through innovation and "smart" operation should, therefore, be a key focus in the development of the Framework Guidelines and Codes.

It is generally acknowledged that regulation falls short of providing such incentives, both at the European and Member State level. (ERGEG, 2009). In particular, under current national regulatory regimes, TSOs are encouraged to minimise internal congestion costs. Minimising cross-border energy flows can be effective in reducing internal congestion and TSOs therefore have an incentive to conservatively estimate interconnector (and internal transmission) capacity.[11] Although solving internal congestion by limiting cross-border flows is generally prohibited under European law, exceptions are permissible and existing interconnector capacity is often under-utilised (Glachant, 2010). Regulatory rules for cost recovery can also have the unintended consequences of encouraging TSOs to maximise the size of their regulated asset base, that is, to increase their investment in (and conservatively estimate available capacity of) "wires and poles." This creates little incentive for TSOs to increase the utilisation of existing assets or innovate if doing so imposes financial risks or reduces the justification for new investment (Baker, 2010).

Nonetheless, existing European regulation does currently require TSOs to maximise the interconnector capability made available to market participants[12] and the draft CACM Framework Guidelines call for flow-based methods that will allow interconnection capacity to be determined more accurately. The intent of existing regulation and the draft CACM Framework Guidelines in this respect could be strengthened through the

[10] For example, historic transmission system utilisation in Great Britain is around 30%.

[11] Most TSOs are incentivised by national regulation to minimise internal network congestion. As interconnector flows generally add to internal congestion, there is an incentive to minimise those flows. This is sometimes referred to as "moving congestion to national borders". An example of this would be the Great Britain "System Operator Incentive Scheme", which exposes National Grid to most of the variation between the difference in the actual costs of managing congestion, relative to *ex ante* forecasts of those costs. As a result, on those occasions when Great Britain exports energy via the interconnector to France, congestion within Great Britain will increase, exposing National Grid to the risk of unrecoverable costs and reduced profit.

[12] Regulation (EC) 1228/2003, Article 6.3 requires that the maximum capacity of interconnectors and transmission networks affecting cross-border flows shall be made available to market participants – subject to maintaining secure system operation.

development of incentives that encourage TSOs to increase the utilisation of interconnector and internal network capacity, over and above that achieved historically. More generally, a regulatory environment that encouraged TSOs to make objective choices between investment and operational measures or innovation, rather than favouring investment in assets, would also promote increased utilisation of interconnector and other transmission assets.

The development of incentives to maximise the utilisation of existing transmission assets and optimize future investment may not be an issue that can be addressed directly via the current CACM Framework Guidelines consultation. However, it appears that a "European" dimension to national transmission regulation is required that recognises the need to maximise the utilisation of existing and future interconnector capacity, thereby maximising the potential for cross-border trade.

Issues related to Market Integration Alone

In addition to the interactions between market integration and decarbonisation agendas considered above, we believe that the following issues raised by the CACM Framework Guidelines are worthy of note from a market integration perspective.

Are the CACM Framework Guidelines Sufficiently Detailed?

The development of appropriate rules for the coupling of national electricity markets is clearly crucial to the successful creation of an integrated European electricity system. This being the case, the CACM Framework Guidelines should be more prescriptive in setting out the detailed rules for the allocation of transmission capacity in the forward, day ahead and intra-day timeframes. As drafted, the Guidelines allow ENTSO-E considerable scope for interpretation, which is a concern given that the development of market rules would not usually be assigned to TSOs – as discussed below.

Stakeholder Involvement in Developing CACM Network Codes

Regulation 714/2009 clearly assigns the task of translating the high level requirements set out in Framework Guidelines into network codes to ENTSO-E. However, while many of the issues dealt with by the CACM Framework Guidelines (e.g. those relating to the calculation of transmission capacity) are a matter for TSOs and it is appropriate that ENTSO-E develops the associated detailed arrangements, others are not. For example, issues relating to the allocation of transmission capacity do not fall within the natural province of TSOs, who have particular commercial interests, and the development of the market rules governing capacity allocation would normally be the responsibility of

national regulators supported by other stakeholders including power exchange operators. It might therefore be appropriate for the development of detailed requirements relating to market design and capacity allocation to be allocated to working groups, appropriately populated by stakeholder representatives, under the auspices of ENTSO-E. This would satisfy the requirements of Regulation 714/2009, but allow stakeholders to be fully involved in the *development* of market rules, rather than being relegated to responding to proposals developed by ENTSO-E via periodic consultations. In a recent open letter[13] ENTSO-E proposes the establishment of a stakeholder group to coordinate comments. While this is to be welcomed, it will not give stakeholders a formal role in the development of CACM proposals.

Regulatory Oversight

Given the importance of the calculation and allocation of transmission capacity to the efficient operation of an integrated European electricity system, strong regulatory oversight will be required. The CACM Framework Guidelines should spell out ACER's role in ensuring adequate cooperation between TSOs in calculating transmission capacity and ensuring that capacity offered to the market is maximised. Given the pivotal role of power exchanges in the operation of an integrated market, the Guidelines should also indicate how these commercial entities are to be supervised.

TSOs role in the Operation of Secondary Transmission Capacity Markets

While the calculation of available transmission capacity is clearly a matter for TSOs, it is not clear why TSOs are to be required to establish platforms for the anonymous secondary trading of transmission capacity as required by section 4.2 of the CACM Framework Guidelines. The secondary trading of transmission capacity would more obviously be a power exchange role.

Pricing Zone Definition

Although implied, section 2.2 of the Framework Guidelines should set out specifically and clearly that bidding zones are to be defined on the basis of network topology and achieving an acceptable balance between redispatch and achieving adequate levels of liquidity, rather than to coincide with national or grid control boundaries. It would be useful if the Guidelines provided some guidance on the maximum acceptable level of redispatch/countertrade cost within a single bidding zone.

[13] See https://www.entsoe.eu/fileadmin/user_upload/_library/position_papers/Open_Letter_EC.pdf

Forward Capacity Allocation

Where sufficient financial liquidity exists on both sides of a boundary between bidding zones, section 4.1 of the CACM Framework Guidelines allows the use of financial hedging instruments (i.e. CfDs) as an alternative to the use of physical or financial transmission rights. However, it is not clear how CfDs can result in the efficient allocation of interconnection capacity or provide any incentive for TSOs to maximise that capacity, as these instruments are not related to interconnector capacity in any way and are not issued by TSOs. The CACM Framework Guidelines need to spell out what arrangements are to be adopted to encourage the efficient utilisation of interconnector capacity were CfDs are deployed.

Works Cited

Baker, M. &. (2010). *The Extent to which Economic Regulation Enables the Transition to a Sustainable Electricity System.*

ERGEG. (2009). *Incentive Schemes to Promote Cross Border Trade in Elecricity. A call for Evidence, Ref Ref: E08-ENM-07-04.*

European Climate Foundation. (2010). *Roadmap 2050. A pratical guide to a prosperous low-carbon Europe.*

Glachant, J. M. (2010). *The Achievement of the EU Internal Electricity Market through Market Coupling.*

Regulatory Assistance Project. (2011). *Advancing Both European Market Integration and Power Sector Decarbonisation: Keylissues to Consider, Briefing Paper by the Regulatory Assistance Project.*
http://www.raponline.org/docs/RAP_EUMarketIntegrationandPSDecarbonisation_2011_05_03.pdf