

# **The European Regulation on Cross Border Trade: can one do without a standard market design?**

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S'è fatta mezzanotte, ma era in pieno giorno,  
Di colpo mi si è spenta la luce intorno.  
S'è fatta mezzanotte ed io non so perché!

Lucilla Galeazzi<sup>3</sup>

## **Introduction**

On February 3, 2003, the Council of the European Union reached a "Common Position ... with a view to the adoption of a Regulation of the European Parliament and of the Council on conditions for access to the network for cross-border exchanges in electricity" (Council 2003a). This Regulation is part of a package that also contains "...a Directive of the European Parliament and of the Council concerning common rules for the internal market in electricity and repealing Directive 96/92/EC" (Council 2003b) and " .... a Directive of the European Parliament and of the Council concerning

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<sup>3</sup> It is midnight, but it was broad daylight,

Suddenly the light went away.

It is midnight and I know not why!

Translation: Mary Pardoe

common rules for the internal market in natural gas and repealing Directive 98/30/EC" (Council 2003c). This paper deals with the Regulation on cross-border exchanges. It argues that, even though this new instrument constitutes a progress with respect to the current situation, it is essentially flawed: the Regulation indeed claims impossible things and neglects to implement what is possible.

Before elaborating on this claim, it is useful to place the Regulation in context. The creation of an Internal Electricity Market (IEM) in the European Union (EU) goes back to 1986 (Council 1986). The adoption of Directive 96/92/EC (Council and European Parliament 1996) in December 96 was the first achievement toward that objective. The legislation reflects the intense negotiation that its approval required. It grants a little bit of everything to everyone, which justified Hancher's calling it "a framework in the loosest sense of the word: its objectives are laid down in very general terminology and moreover, Member States are given a substantial degree of choice in how they are about introducing more competition into their electricity markets. Indeed the margin is so substantial that it would seem possible for the determined anti-market countries to avoid introducing any meaningful degree of competition at all" (Hancher 1998). This lack of structure could only produce unsatisfactory results. In its second Harmonisation report (European Commission 1999) the European Commission (the Commission) recognizes "the need to insure that the implementation of the Electricity directive does not result in 15 liberalized but separate and rather isolated electricity markets, thereby failing to create a common market". The Commission concluded to insufficient competition between companies located in different Member States and inferred that "obstacles to the cross-border trade of electricity among Member States have to be actively addressed".

In 1998, the Commission created the so-called Florence Regulatory Forum (the Forum) with the view of devising ways to remove obstacles to cross border trade and enhance competition in the Internal Electricity Market. This meant both facilitating the access to the network and managing congestion of the international interconnections. The first draft of the

Regulation on cross-border trade appeared in March 2001 (European Commission 2001a); it addresses these two objectives. An analysis of that proposal and of several accompanying documents is given in Boucher-Smeers 2002. The Commission had intended to discuss the draft Regulation, together with the accompanying draft Directive amending the previous electricity and gas Directives (European Commission 2001b) at the European Summit in Stockholm a few weeks later. Different but equally compelling reasons led France and Germany to rebuff these hopes. A new round of negotiations then began both in the European Parliament and the Forum. The Parliament proposed 34 amendments of which a new June 2002 draft of the Regulation retains 6 (European Commission 2002a). The Common Position adopted by the Council in February 2003 (Council 2003 a) again differs from the June version. Altogether these three drafts provide interesting indications about the evolution of the European thinking on cross-border trade. We conduct our analysis on the basis of extracts of these different versions of the Regulation that are given in the appendix. The full versions of the two first drafts can be found on the web site of the Directorate-General Transport Energy (see [http://europa.eu.int/comm/dgs/energy\\_transport/index\\_en.html](http://europa.eu.int/comm/dgs/energy_transport/index_en.html) under the heading "Opening up Markets/Electricity"). We adopt the presentation of the Commission that simultaneously reproduces the March 2001 language and the changes introduced in the June 2002 version. The Common Position, together with the successive versions of the Regulation produced in the recent months can be found on the Council's site (<http://ue.eu.int/>). We also refer to other organisations and sites. The European Association of Electricity Transmission Systems (hereafter ETSO) is a key participant to the Forum. Its public documents can be downloaded from <http://www.ets-net.org/>. The Council of European Energy Regulators (hereafter CEER) is an other key actor. Relevant documents from this organisation, together with the minutes of the Florence Regulatory Forum (hereafter the Forum) can be downloaded from the site of the Directorate-General Transport Energy (see [http://europa.eu.int/comm/dgs/energy\\_transport/index\\_en.html](http://europa.eu.int/comm/dgs/energy_transport/index_en.html) under "Opening up Markets/Electricity/The Florence Regulatory process". The CEER's site only provides very general information

The electricity system that emerged from the transposition of Directive 96/92/EC into national law was balkanized and over-segmented. Contract paths ruled cross-border trade and are still commonly used today for congestion management. Contract paths posit that cross border transactions only use the grids located on a certain path joining the origin and the destination of the transaction. Traders located in two different control zones and willing to conclude a transaction thus need to get access to each of these grids. This segments the market and mismanages congestion. It limits cross border-trade and, in the reasoning of the Commission, hampers competition in the European electricity market. The Forum was to devise and propose a better system. As we shall see the objective remains far of reach and references to contract paths are still found in the Regulation.

The Forum had produced several documents but no real recommendation when the first draft of the Regulation was issued in March 2001. These are reviewed in Boucher-Smeers 2002. The work continued after March 2001. In April 2001, ETSO proposed a European wide "Co-ordinated Auctioning" (ETSO 2001a) in order to handle congestion at the different interfaces. It suffices to say here (see section 5.4 for a more extensive discussion) that this method completely departs from the contract path approach. The Forum extensively discussed congestion management (see the list of documents presented at the 8<sup>th</sup> and 9<sup>th</sup> meetings on the site of the Directorate-General Transport Energy) but never transformed ETSO's proposal into an EU standard. In November 2002, CEER issued general recommendations for congestion management (CEER 2002a) but did not propose any implementation. In short, there has been very little progress towards a consistent European wide congestion management method since the inception of the Forum in 1998. Contract paths together with local auctions or capacity allocation methods still rule congestion. This justifies the Commission's repeated complaint that congestion is not properly managed in the Internal Electricity Market (European Commission 1999, 2002b, 2002c and the minutes of the 8<sup>th</sup> and 9<sup>th</sup> meetings of the Forum). Advances on access to the network were more significant. The Forum tried to streamline the process that required agents to negotiate access to each grid of the contract path. This

resulted in an agreement referred to as the "provisional cross-border tariffication system" or also the "temporary mechanism" in February 2002 (see the minutes of the 8<sup>th</sup> meeting of the Forum and ETSO 2000a, 2001b,). The principles of this agreement have since been largely confirmed in October 2002 (see the minutes of the 9<sup>th</sup> meeting of the Forum and ETSO 2002a). This mechanism, because it is no longer based on contract paths, is effectively a real progress.

The paper is organized as follows. Section 2 introduces some background methodology used in the analysis. The rest of the paper follows the structure of the different drafts of the Regulation. Articles 1 and 2 delineate the scope of the legislation and define important concepts. They are discussed in section 3. We conclude that some definitions are puzzling. Articles 3 and 4 focus on the access to the network, the domain where progress has been real. We argue that some of this progress is subject to conditions that are impossible to achieve on the basis of our current knowledge. This is elaborated in section 4. Articles 5 and 6 of the Regulation tackle congestion management. This is the domain where, notwithstanding our considerable theoretical and practical understanding of the subject, the Forum has made least progress. This is discussed in section 5. The rest of the Regulation (articles 7 to 15) deals with new interconnections not built by TSOs (article 7) and procedural matters (articles 8 to 15). New interconnections that are not built by TSOs (Merchant lines) are a subject in itself (see Joskow and Tirole 2003). Procedural aspects are of utmost importance in the weak and intricate institutional framework of the European Union. But these questions belong to Political Science, a domain where the authors have no competence. For these reasons articles 7 to 15 are not discussed in this paper. In short, the market design, or lack thereof, embedded in the Regulation (Article 1 to 6) is the focus of this paper. As in Boucher-Smeers 2002, we extensively resort to documents produced by ETSO and CEER for the Forum. These organizations were indeed instrumental in the whole thinking that led to the Regulation and will be intensely involved in its implementation. Conclusions terminate the paper. Throughout the analysis we take stock of the arguments presented in Boucher Smeers 2002 but do not repeat them.

## 2. Background

### 2.1. *A single market or a set of linked markets?*

Directive 96/92/EC (Council and European Parliament 1996) was the first achievement of the Internal Electricity Market. It initiated an important but possibly misguided reform of the European power sector. The outcome of its transposition into national law raises the question of whether this restructuring had itself any structure. In two visionary papers, Hancher (1997, 1998) pointed to the weaknesses of the Directive. Her discourse is in sharp contrast with some statements of the Commission that saw directive 96/92/EC as a strategic step that only needed to be completed by some add ups "It was in the logic of a gradual approach to implementing the internal electricity market that specific issues have to be addressed after the principal strategic implementation choices have been made by the Member States" (European Commission 1999). The difficulty of the European electricity reform lies in the postulate, directly inherited from an abuse of the pervasive subsidiary principle (see Begg et al. 1993 for a discussion of the economic principles of subsidiarity), that one can construct a single European electricity market on the basis of diverging market structures and without market design (see Stoft (2002) for a discussion of the notions of market structure and design). This principle was most clearly stated in a document prepared by ETSO for the 8<sup>th</sup> meeting of the Forum (ETSO 2002b)

- "1. Our goal is to create the network access arrangements that the market needs to enable effective competition across Europe, and to optimize the use of network in a pan-European perspective.
2. This goal will be achieved by providing practical market-based mechanisms to manage congestion between regions, while allowing the co-existence and evolution of different market structures within regions."

As we shall see, this position is implicitly recalled in Article 1 of the Council's Common Position of February 2003. ETSO seems to have later

moderated its faith in this principle. In an insightful paper prepared for the 9<sup>th</sup> meeting of the Forum (ETSO 2002c), the European Association cautiously explains that it is important to first determine whether the goal of the European restructuring is to immediately arrive at "a Single European Market" or to "a set of linked local Markets". The question contrasts with the Commission persistent reference to a "real integrated electricity market". Whatever the reasons for the system operators' skepticism, it is relevant in this paper to note that ETSO's description of the "single European Market" resembles PJM's (<http://www.pjm.com/>), a system that has recently been proposed as the model of the standard market design in the US (see the extensive discussion of Standard Market Design on FERC's site <http://www.ferc.gov>). The sole observation of the European electricity system and the comparison with PJM makes ETSO's question purely rhetorical. Notwithstanding the proclaimed objectives and the official discourse, the evidence is that Europe is at best striving towards linking "local Markets". ETSO's distinction between "a single European Market" and "a set of linked Markets" will be used throughout the rest of the paper.

## *2.2. Two unsolved problems*

The two following postulates are also central to the analysis of the Regulation.

### *2.2.1. Postulate 1: Markets are necessary for managing international congestion, but can be dispensed with in domestic congestion*

Congestion management in electricity is extensively researched and needs no introduction. A common claim is that congestion is negligible in individual control areas but significant at the interconnections. Similar claims of mild or absent congestion in previously regulated systems have generally proved wrong after agents learned how to take advantage of inadequately designed market rules. Notwithstanding the evidence that congestion is a global network phenomenon, European political contingencies restrict the scope of the Regulation to congestion due to international transactions which, by

definition, are not under the jurisdiction of individual Member States. Congestion management is driven by economic efficiency and constraints of network security. This is implicitly recognized by the Regulation that indeed mandates that congestion of interconnections be managed through market mechanisms. The most relevant standard criterion of economic efficiency in this context is the absence of distortion with respect to the security-constrained economic dispatch. This is justified by the high operating costs of generation stations. A lot is known about this problem and its solution (see the extensive bibliographies on the "Harvard Electricity Policy Group" (<http://www.ksg.harvard.edu/hepg/>) and UC Energy Institute (<http://www.ucci.berkeley.edu>) web sites). The nodal and flowgate models, which are the favorite market mechanisms in the domain, would be good candidates to manage congestion of European interconnections. But no control area in continental Europe implements any sort of nodal or flowgate model. An academically interesting and practically relevant question is thus whether one can devise a market mechanism that manages congestion of the interconnections in the absence of any such mechanism in the individual control areas and without a central transmission system operator. The Regulation posit a positive answer to this question. It does not impose any single TSO; it does not intervene in the organization of the congestion management of individual control areas (except for a very general statement in Article 9)<sup>4</sup>. But it mandates market mechanisms for managing congestion created by cross-border transactions. That this is possible was never substantiated in theory or in practice. In particular, the more modest objective of a zonal pricing operated by a single TSO sometimes produced mixed results in practice. In short, the regulation assumes the solution to an unsolved problem. One could avoid the problem altogether. This would require to first impose a common market design that implements one of the known congestion management mechanisms in the different control areas. This is FERC "standard market design" 's idea mentioned in section 2.1.

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<sup>4</sup> "The regulatory authorities, when carrying out their responsibilities, shall ensure compliance with this Regulation and the guidelines adopted pursuant to Article 8. Where appropriate to fulfil the aims of this Regulation they shall cooperate with each other and with the Commission."

Referring to ETSO's question, this would have created "a Single European Market". Lack of knowledge may have made that endeavor technically impossible at the time of Directive 96/92. Political constraints make it impossible now.

*2.2.2 Postulate 2: Network costs can be recovered by meaningful locational signals*

Managing congestion by market mechanisms, whatever their form, creates revenues. These can be used to cover part of the network costs. It is generally admitted (see Boucher et al. (1998) and Perrez Arriga et al. (1995)) that, except for drastically undersized, and hence highly congested, systems these revenues do not cover the whole cost of the network. This leaves a residual cost that we define as the difference between the total cost of the network and the revenue accruing from congestion management. Economies of scale and scope in the grid explain this high residual cost: pricing at marginal cost in optimally sized infrastructures subject to economies of scale does not cover the total cost of this infrastructure. Maybe less discussed is that economies of scope and of scale also jeopardize the theoretical capability of the price signals sent by the nodal or flowgate systems to guarantee long run economic efficiency (e.g. efficient plant siting). Because congestion pricing does not generate sufficient revenue to cover the cost of the network and may not be sufficient to send the right siting signals, additional instruments are necessary. This is the second question assigned to the Forum and legislated upon by the Regulation. Additional revenues can always be collected through postage stamps but these send no location signals. More sophisticated tariffs should be invoked. Revenue collection and long-term economic efficiency (e.g. good siting signals) are thus the two objectives pursued by the Forum for accessing the network. The problem is that we do not know how to achieve these objectives. Here too the Regulation assumes the solution to an unsolved problem.

These two postulates structure the analysis in the rest of the paper. Can one cover the residual cost of the network by economically efficient charges? Can

one devise a market mechanism to manage congestion between control areas without domestic market based congestion management mechanisms and without a central transmission system operator. These questions are of utmost interest. The Regulation supposes that they can be answered; but we do not know these answers.

## Articles 1 and 2

### 3.1. *Background*

Previous legislations, had considered the general subject of transit. Article 1 moves the Regulation from transit to cross-border flows and exchanges. Article 2 defines important concepts such as congestion, export, import and transit.

### 3.2 *Article 1: Subject-matter and scope*

#### 3.2.1 *From transit to cross-border trade*

The goal of the Regulation as stated in the initial draft is to stimulate "cross-border exchanges of electricity" by the introduction of different mechanisms; this includes, a "compensation mechanism for transit", "harmonized principles on cross-border transmission charges and the "allocation of available capacities of interconnection". Cross-border flows replaced "Transit" in the later versions. This replacement is justified. Cross-border flows, not only transit, create the economic externalities that complicate the management of electricity flows. The Regulation should thus introduce instrument for internalizing these externalities.

#### 3.2.2 *The importance of national system idiosyncracies*

Article 1 of the Common Position states that "enhancing competition within the internal electricity market" should be done "taking into account the specificities of national and regional markets". This relates to the widely accepted, but so far unproven, principle that it is possible to devise a single electricity market on the basis of markets that diverge both in structure and design. The reference to this principle did not appear in the March 2001 and June 2002 versions. It signals a dangerous evolution of thinking. Physical and economic realities justify a single legislation covering all transactions in a synchronized AC grid. In contrast, European political contingences impose

that domestic transactions be a matter of national jurisdiction and restrict supranational coverage to non-domestic trade. This imposes a daunting task on the management of cross-border flows. As we shall argue, neither the Regulation nor the proposals of the Forum really show that this task can be done.

### *3.3 Article 2: Definitions*

Article 2 defines cross-border flow, congestion, import and export. The Common Position also introduces a definition of transit based on contract paths ("nominated path"). The evolution of these definitions through the different versions of the Regulation indicates a progressive weakening of the legislation. First, the concepts of loop flows and parallel flows that appeared in the March 2001 draft disappeared in the subsequent versions. The elimination of any reference to these key physical phenomena, even though it does not modify the substance of the Regulation, is regrettable. A mention of loop flows and parallel flows would indeed have emphasized the distinction between cross-border trade and cross-border flows that is sometimes blurred in the Regulation.

By definition, cross-border flows on the network of a Member State are due to "the activity of either generators or consumers outside of that Member State". This definition complies with physics.

The definition of congestion in paragraph 1 (b) corrects some shortcomings of the March 2001 version but retains others. The first draft only referred to lack of interconnector capacity as the cause of congestion. The June 2002 draft and the Common Position recognize that congestion can also be caused by insufficient capacities of domestic network. This is in line with physical realities and therefore constitutes an improvement of the Regulation. In contrast, the sole reference to international transactions in the definition of congestion is a serious flows that persists through all drafts of the Regulation. International and domestic transactions are indeed

indistinguishable in congestion, whether they saturate domestic lines or interconnectors.

All transactions can have the same physical impact and any attempt to attribute congestion to one or the other is physically and economically arbitrary. This argument is well known; it is elaborated at length in Boucher-Smeers 2002 and is not to be repeated here. The conclusion is that Paragraph 2 (c) implicitly prioritizes domestic transactions over international ones. This is at variance with the definition of Paragraph 2(b) that attributes cross-border flows to all transactions. Referring to ETSO's distinction between single and linked markets (ETSO 2002c), this priority is incompatible with "a Single European Market" but fits well within "a set of linked local markets". The adoption of the definition of congestion may also induce dangerous behaviors in linked markets. As an example, consider the case of wind power intended for domestic consumption in a country like Germany which developed a large capacity of these stations. The output of these generators depends on wind condition and hence is subject to some common mode failure (the absence of wind). Take the real example of the sudden loss of several GW of wind power in Germany that is not announced in advance to other TSOs. Such events have triggered flows crossing borders and congestion on non German grids. This puts parts of the European grid at risk. These congestions in the sense of physics are not congestions in the sense of the Regulation. Indeed, no international trade is involved and hence according to paragraph 2 (c) there is no congestion. These discrepancies between physical and legal realities can have serious impacts. The development of wind power is a major objective of the EU and these generators generally have priority in the dispatch. Security of supply is another major European objective. Their combination mandates that the grid accommodates important and fast variations of generation levels. This requirement is not reflected in the law. The definition of paragraph 2 (c) only recognizes congestion created by wind power in international trade. Dropping the word "international" would reconcile the Regulation with physical and economic realities and allow one to accommodate phenomena of the type mentioned above. But dropping the

word "international" would also make all transactions legally equal and hence force "a Single European Market"!

The new drafts single out exports and imports. These definitions are absent from the original language but were progressively introduced and expanded in later versions as a result of the work of the Forum. Imports and exports are anachronisms in a single market but fit well in linked markets. As we shall see, imports and exports are the basic concepts of the compensation mechanism in article 3 (see section 4).

Last, one should note the appearance of contract paths ("nominated path") in a new definition of transit introduced in the Common Position. The fallacy of the contract paths is now well recognized and the appearance of this discredited notion in the latter draft of this new legislation can only create confusion.

### 3.3. *Summing up:*

Articles 1 and 2 set the scene: domestic and international transactions are indistinguishable in physics and economics, but not in European law. Even though Kirchoff's laws do not identify which transactions saturate network resources, the Regulation put the guilt on international trade. This priority given to national over international transactions is in line with the appearance of exports and imports in the June 2002 and February 2003 drafts. This fits well within "a set of linked markets" but is inconsistent with "a Single European Market". This definition fail to recognize the economic externalities implied by physical laws (even though these externalities are recognized is the definition of cross-border flows). This is dangerous. Economics teaches that agents take advantage of neglected externalities. Physics suggests that this may put the European grid at risk. System operators confirm that this is already the case (see RTE/ELIA 2002).

## **4. Articles 3 and 4**

### *4.1. Background*

Article 3 introduces a mechanism for compensating the costs incurred by TSOs because of cross-border flows. Article 4 deals with the access to the domestic network. The Forum had not yet proposed any implementation of this mechanism at the time of the first draft Regulation. It reached a consensus on a temporary implementation of Article 3 and 4 at the 8<sup>th</sup> meeting in February 2002 (see the conclusions of the meeting). Altogether, the accord introduces three instruments: an export charge (E) takes care of the compensation mechanism; generation (G) and load (L) charges give access to the grid. This agreement partially fulfills one of the objectives assigned to the Forum namely the elimination of the pancaked access to the European grid. The Electric Industry (Eurelectric) referred to the accord as "a breakthrough". But the export charge (E) introduced to achieve this breakthrough so blatantly contradicts the principle of the internal electricity market that the Commission had no choice but to resist it. As Guardian of the Treaties it first tried to oppose the tax; it gave in at the 8<sup>th</sup> meeting of the Forum in order not to stall the whole process but planned the repelling of the tax immediately after having been forced to concede it. The elimination of the export charge is now foreseen in the June 2002 and February 2003 drafts of the Regulation. In October 2002, ETSO revised the February 2002 accord and produced an updated system that retains the three-tier structure of the temporary mechanism (see the conclusions of the 9<sup>th</sup> Forum and ETSO 2002a). These negotiations had a damaging impact on the substance of the Regulation. The export tax indeed creates logical inconsistencies that are only remedied by introducing unrealistic objectives in the Regulation. Specifically the elimination of the export charges is now conditioned on in the Regulation the implementation of efficient locational charges, something that, as we shall argue below, we cannot presently compute.

## 4.2. *Article 3 the compensation mechanism*

### 4.2.1. *Externalities: Properly Recognized and Internalised*

Article 3, paragraph 1 states that cross-border flows create externalities that need to be compensated. This cannot be disputed. Cross-border flows in the Regulation are those induced by non-domestic transactions. Article 3, paragraph 1 therefore properly recognizes the externalities affecting a given network. The implementation of Article 3 by the Forum concurs with the Regulation. The temporary mechanism agreed upon at the Forum 8<sup>th</sup> meeting and its update of the 9<sup>th</sup> meeting indeed define cross-border flow through declared imports and exports and correct the measured on the basis of measured physical cross-border flows.

### 4.2.2. *Embedded vs. incremental costs*

Article 3, paragraph 6 of the Regulation discusses the principles of the compensation mechanism. All versions of the Regulation affirm that the costs incurred as a result of cross-border flows "shall be established on the basis of the forward-looking long run average incremental costs" (ALRIC). The June 2002 and the Common position drafts do not reproduce the definition of ALRIC given in the March 2001 version. They instead replace it with a list of what ALRIC can encompass. This includes "an appropriate proportion of the cost of existing infrastructure, as far as existing infrastructure was built to transmit cross-border flows". We argued in Boucher-Smeers 2002 that the measurement of the "forward-looking long run average incremental costs" in cross-border trade is technically difficult if not impossible. But suppose, for the sake of the reasoning, that it can be done. The definition of ALRIC of March 2001 ("reflecting costs and benefits that a network bears from hosting transit flows compared to the costs it would bear in the absence of such flows") is consistent with standard economic definition. But the list of items mentioned in the latter drafts is not. Specifically "an appropriate proportion of the cost of existing infrastructure" is not part of a "forward-looking long run average cost". This change of the language introduces both a logical

contradiction and a change of substance: one imposes incremental costs but allows embedded costs. This evolution originates in the action of two heavily transited countries (Belgium and Switzerland) who pressed the Forum to include some embedded costs in the compensation mechanism. The Forum finally gave in to these requests. This logical inconsistency is unlikely to have much practical impact. While all drafts of the Regulation advocate "forward-looking long-run average incremental costs", the Forum neither discussed nor implemented anything but embedded costs.

#### *4.2.3. A currently impossible task?*

None of the papers issued by ETSO and CEER for the Forum indeed give any clue as to how to compute "forward-looking long run average cost". They instead focus on different allocations of the embedded network cost between international trade and domestic transactions. The "horizontal network" (ETSO 2000a) plays a key role in this allocation. By definition, it is the part of the existing network allegedly "used" by international transactions. The compensation mechanism should thus cover the sunk cost of the "horizontal network". Needless to say sunk costs of an existing "horizontal network" are not "forward-looking long run average incremental costs" of the network. There exist other indices of this discrepancy between the law and its implementation. ETSO and CEER disagree on the method to use for implementing the compensation mechanism (see respectively ETSO 2002d and CEER 2002b). But the dispute is about cost allocation, not incremental costs. The reference to forward-looking long run average costs in the Regulation therefore appears irrelevant in practice. Interestingly enough this has recently been indirectly acknowledged by ETSO in its discussion of single market vs. linked markets. As recalled in section 2, the organisation recommended in ETSO 2002c to first determine whether the goal of the Florence process is to immediately arrive at "a single European market" or at "a set of linked local markets". We concluded in section 2 and further argued later that, notwithstanding the official rhetoric about integrated markets, the EU is at best striving to link local markets. ETSO, referring to "linked local Markets" states in section 33 "Cost reflectivity through marginal forward

looking costs is not possible in this world...". While one may dispute ETSO's reasoning, one cannot escape that the organisation that is principle in charge of computing forward-looking long run average incremental costs acknowledges that this cannot be done in the current organization of the market!

This discrepancy between the language of the Regulation and its practical implementation should not come as a surprise. Article 3 requires compensating for externalities incurred on the network, at the exception of congestion costs. This means compensating for the costs of incremental investments and losses due to cross-border flows after paying for the cost of congestion. It is fair to say that, even if the economic principles underlying incremental costs are relatively clear, we do not know how to apply them to cross-border flows. This is due to three major difficulties. First the long-run cost function of a network is difficult to compute because of the pervasive indivisibilities and economies of scope of the grid. Second this cost function exhibits bad properties of non-convexity and non-differentiability that reinforce the arbitrariness of any computation of long-run average incremental costs. Last, the externalities that pervade both the long run and short-run operation of the network make it extremely difficult to attribute any incremental cost to a particular transaction or flow. We are thus bound to stick to ETSO and CEER's embedded costs, at least for the time being. But, why then refer to ALRIC in the Regulation?

Possibly less important, but still worth a mention, the different drafts of the Regulation consistently refers to "standard-costing methodologies". But the Forum only advocates "standardized methods for computing cost" (see the minute of the 8<sup>th</sup> meeting). This difference is intriguing: "Standard-costs" are well known in cost accounting" even if, as we believe, they have not yet been applied to the transmission of electricity. To the best of our knowledge "standardized methods for computing costs" are still awaiting a definition.

### *4.3. Article 4: charges for access to networks*

#### *4.3.1. The export tax*

Article 4 paragraph 2 introduces charges to be paid by generators (G) and consumers (L) for accessing the network. These define a license plate system that gives access to the whole European network. Such systems exist elsewhere and we shall not discuss them here. We elaborate on the new emphasis put by the Common Position on "locational signals". This can best be analyzed by referring to Article 4, paragraph 4.

Consider the March 2001 and June 2002 versions of paragraph 4. The prohibition in the March 2001 version of the Regulation of "any specific charge in addition to the general charges for access to the national networks" seems obvious in "a single market". It also indirectly, but usefully restricts the differentiation between national and domestic transactions introduced by the definitions of Article 2 and their implementation in Article 3. This prohibition disappears in the June 2002 and February 2003 versions. This is in line with the accomplishments of the Forum: The export charge agreed at the 8<sup>th</sup> meeting of the Forum in February 2002 is indeed a true "specific charge in addition to the general charges for access to the national networks" forbidden in the March 2001 draft. The June 2002 and February 2003 versions of the Regulation implicitly recognize and accept this tax as long as "appropriate and efficient locational signals are (not) in place". The inception of the export charge was the price to pay to arrive at the "breakthrough" of the 8<sup>th</sup> meeting of the Forum. But this concession is so blatantly inconsistent with an internal market, even interpreted as a set of linked markets, that something had to be done to eliminate it (see the minutes of the 9<sup>th</sup> meeting, paragraph 1.1.2.). The new drafts of the Regulation is an attempt to reconcile logic with political constraints. Given the impossibility of immediately repelling the export charge, the latter drafts of paragraph 4 at least plan its repealing; they indeed require "Providing that appropriate and efficient locational signals are in place, in accordance with paragraph 2, charges for access to national networks applied to generators and consumers

shall be applied independently of the country of destination and, origin, respectively, of the electricity, as specified in the underlying commercial arrangement". It is useful to note for the following that the locational charges of this paragraph differ from congestion charges; indeed as stated in the same paragraph, "This shall be without prejudice to charges on exports and imports resulting from congestion management referred to in Article 6".

Paragraph 4 therefore conditions the prohibition of "any specific charge in addition to the general charges for access to the national networks", such as the export charge to the introduction of a new instrument that induces efficient location. The Forum extensively discussed this instrument at its 9<sup>th</sup> meeting (see the minutes and ETSO 2002c and CEER 2002b, 2002c). These papers, together with economic reasoning, uncover a very serious difficulty: except for locational prices arising from congestion costs, one does not know, at this stage, how to compute "efficient locational signals". One could probably do so if one were able to compute "forward-looking long run average incremental costs" of injections and withdrawals in the network. This is simpler than computing ALRIC of cross-border flows, but it remains a significant endeavor. One knows the principle and one has the computational machinery. But the computational complexity of the problem remains daunting. Moreover economic reasoning tells us that the bad properties of the cost function of the network cast doubts on the usefulness of the result. One can also recall that, in ETSO 2002c, transmission system operators argued that the long-run signals require "a single market". This suggest that either the tax will stay, or that it will be repealed after the introduction of probably inefficient "locational charges".

#### 4.4. *In conclusion*

The evolution of Articles 3 and 4 of the Regulation between the first draft and common position reveals increasing contradictions and a weakening of the law. Article 3, paragraph 1 correctly states that TSO should be compensated for the costs induced by cross-border flows. But the implementation of this principle is lacking. Article 3, paragraph 6 orders that

the compensation be computed on the basis of forward-looking long run average incremental costs. But these can encompass embedded costs! Moreover, notwithstanding the persistent reference of the successive drafts to ALRIC, the Forum only computes embedded costs. This discrepancy between principle and practice is justified. As ETSO recognizes, we indeed cannot compute sensible the forward-looking long run average incremental costs of transaction in a set of linked meshed electrical networks. Even moving from a set of linked networks to a single network would still lead to an extremely difficult problem that could only be solved at the cost of drastic simplifications. Why then refer to something that one does not do and does not plan to do? It is better to recognize that certain objectives are unrealistic than to claim impossible things. Unrealistic statements may only creates ambiguities that will hamper the development of a consistent jurisprudence.

Article 4 is in the same vein. The eradication of barriers to trade has been a major goal of the Common Market since its very foundation. Notwithstanding this fundamental principle, the Commission had no choice but to accept an export charge as a first step of the removal of barriers to electricity trade! The Regulation foresees the elimination of the export tax but only after the introduction of "efficient locational signals". The problem is that we do not know how to compute these signals. Still, one must recognise that the "temporary mechanism" and its update, even with the export tax, constitute a significant progress with respect to the previous balkanized access system.

## 5. Article 5 and 6

### 5.1. *Background*

Articles 5 and 6 focus on congestion management. Several paragraphs were added to the June 2002 version of Article 6 and became Article 7 in the Common Position. These articles deal with infrastructures developed by non-TSO agents. These "merchant lines" constitute a subject in itself (see Joskow and Tirole 2003) and hence are not considered in this paper. Our discussion of Article 6 is thus limited to paragraphs 1 to 6 of the different drafts, as reproduced in annex 1 and 2. Article 5 and these paragraphs of article 6 remained largely unchanged through the different drafts. This parallels the lack of progress of the Forum on congestion management (see the minutes of the 8<sup>th</sup> and 9<sup>th</sup> meetings of the Forum). The opportunity for advances existed however. Specifically, ETSO's contribution on co-ordinated auction issued in April 2001 (ETSO 2001a) offered a solid basis for structured discussions and elaborations. It remain far from a comprehensive market design but could develop into one. This opportunity was missed. The minutes and position papers of the 8<sup>th</sup> and 9<sup>th</sup> meetings of the Forum that preceded the second and third drafts of the Regulation, and the accompanying documents, indeed only report vague and inconclusive discussions. Large consumers presented an alternative proposal, referred to as "Coordinated Cost +" that we only mention in passing in this paper (see ETSO 2003). The Council of European Energy Regulators published a list of objectives for congestion management (CEER 2002a) in preparation for the 9<sup>th</sup> meeting of the Forum. But CEER did not give any hint as to how to accomplish these objectives. This lack of progress should not be interpreted as evidence of an already efficient congestion management in Europe. On the contrary, a study conducted for the Commission (Haubrich et al. (2001)), reveals that many European Interconnectors are frequently congested. The second benchmarking report (European Commission 2002b) confirm that finding; it recognizes the lack of harmonization of congestion management methods and singles out the absence of market mechanisms to allocate the capacity of some interconnections. Some TSOs (RTE/ELIA 2002) send a more distressing

message: the management of congestion by contract paths already put some parts of the European network at risk in certain periods of the year.

Why is there no more progress? The fate of ETSO's proposal on coordinated auction (ETSO 2001a) is an interesting case. The document introduces a drastic evolution of the view on "Transfer Capacities", which is the cornerstone of Articles 5 and 6. It also contains the first elements of a true market design that one could benchmark against existing models of congestion management. Last, ETSO's coordinated auctions introduces the skeleton of a European RTO. Such changes of the common wisdom would have generated heated debates and a flurry of papers in the US. Not so in Europe where the minutes of the 8<sup>th</sup> and 9<sup>th</sup> meetings only reveal a desperately passive Forum. In any case, ETSO's proposal did not materialize into any "Breakthrough in Florence" with the result that the changes of the language through the different drafts of the Regulation are minor and essentially irrelevant. In fact, articles 5 and 6 are written in such general terms that they can accommodate almost anything that mentions the words congestion management, market, transparent, open and non-discrimination. A true market design requires more structure.

## 5.2. *Article 5: Provision of information on interconnection capacities*

Article 5 introduces transfer capacities but does not define them. The extensive literature on congestion management suggests that this concept is flawed.

### 5.2.1. *The pipeline model*

The notion of transfer capacity comes from the gas industry where it has been used to allocate pipeline capacities. An essential characteristics of gas networks, not present in electricity, is the capability to redirect gas flows. This makes it possible to decompose the gas transportation grid into stretches of well-defined capacities and to independently allocate their use to operators. This allocation can be done through market mechanisms by

granting property rights on the use of capacities. One commonly distinguishes physical and financial rights. Physical rights grant the effective use of a capacity. Financial rights give the right to use the capacity when available or be compensated financially otherwise. Financial rights require a market in order to determine the compensation. Financial and physical rights can both be used in natural gas but physical rights will usually suffice. Traders need a portfolio of rights of adequate capacities on the different segments of a path that link the origin to destination of their transaction. Multi-round auctions or secondary markets allow them to re-trade idle capacities in order to constitute this portfolio. The capability of redirecting flows on the different stretches of a gas grid is a key property of gas networks. It permits to define transmission capacities of pipeline segments and to associate both physical and financial property rights to them. It also facilitates an organization of markets that allow operators to construct a portfolio of rights of adequate capacities in order to complete their the transactions. Networks endowed with these properties are said to obey the pipeline model. Contract paths fit well with the pipeline model.

### 5.2.2. Application

Radial electricity grids are trivially amenable to the pipeline model. There is only a single path between any pair of nodes and, neglecting voltage and stability phenomena, thermal constraints determine the maximal power acceptable on the line and hence its transfer capacity. The pipeline model is only an approximation, possibly of debatable quality, in a meshed electrical network. The approximation is good in the Nordic system where it led to a well functioning congestion management system known as market splitting (see ETSO 1999, 2001c and 2002e for the discussion of market splitting). The attempt to transpose that system to California and the definition of a transmission capacity on Path 15 joining the North and South of the State created recurring difficulties well before the final meltdown of the Californian restructuring experience. In short, the use of a pipeline model for managing congestion in meshed electrical network is a delicate business.

All this is well known and only recalled here to put the problem in perspective. ETSO also knows this very well and extensively elaborated in several early reports on the difficulty of defining meaningful transfer capacities (see ETSO 2001c and 2002d). These arguments are analyzed in Boucher-Smeers 2002 and are not repeated here. But ETSO went further in its argument against a blind use of transfer capacities. In April 2001, one month after the publication of the first draft of the Regulation, the organization argued (ETSO 2001e) that the Nordic market splitting approach cannot be applied to the rest of Europe because of the inadequacy of the pipeline model to represent the meshed continental grid. In the same month, ETSO proposed the coordinated auction model (ETSO 2001a). In ETSO 2002e, it explains that the coordinated auction contains market splitting as a particular case, when the pipeline model is correct. In the same paper ETSO proposal explicitly discards the pipeline model as a universally valid representation of the grid. It assumes instead an aggregate representation of the electrical grid (hereafter called the "aggregate network") that does not make the assumption that flows can be redirected at will. ETSO explains that some testing is needed to verify the validity of its approach and in particular the adequacy of the "aggregate network". But this testing is in no way meant to simplify the representation of the grid into a pipeline model; the intention is instead to check whether the aggregation is not too coarse. Notwithstanding the accumulating evidence against the use of transfer capacities in meshed electrical networks, Article 5 (as hence also Article 6) remains essentially unchanged through the different drafts. One may wonder whether the vagueness of the language is deliberate and aims at accommodating conflicting opinions among Europeans. But one may be worried by some statements such as Article 6 paragraph 3 because of the way they refer to transfer capacity "The maximum capacity of the interconnections and/or the transmission network affecting cross-border flows shall be made available to market participants, complying with safety standards of secure network operation". This requirement, if interpreted strictly, only makes sense in a pipeline model. TSOs can indeed strive to simultaneously maximize the capacity of each line in a pipeline model. But it is impossible to

simultaneously maximize the capacity of all interconnectors to all market participants in a meshed electrical grid.

### *5.3. Article 6: General principles of congestion management*

Article 6 promises a lot but the Forum delivers little. It requests TSOs to behave cooperatively and in a benevolent way. But it does not offer any suggestion on how to achieve that goal. This is the problem that we discuss first. Assuming cooperative and benevolent TSOs, Article 6 set other objectives that can be fulfilled. But the Forum carefully avoids the means to do so. This is discussed next. All in all, after four years of discussion, the Forum did not produce any congestion management proposal.

#### *5.3.1. Paragraphs 2 and 5: TSO's incentives*

Article 6, paragraph 2 remains essentially unchanged through the three drafts except for reducing TSOs liabilities. The paragraph indeed removes the obligation for TSOs to compensate operators in case of curtailment due to "force-majeure". This alleviates the already weak obligation contained in the first draft that requires TSOs to compensate for curtailment but says nothing about the amount of the compensation. A non-mandatory compensation reduces the incentive of the TSOs to deliver the promised capacity. It also unduly transfers to energy operators market risks that are better borne by TSOs. In economic parlance, it reinforces the moral hazard and adverse selection issues resulting from the technicalities of network operations. To see this, consider again the example of the windmills introduced in section 3.2. Suppose a congestion created in system A by a sudden but somehow foreseeable change of wind generation in control area B. Suppose that these windmills are not involved in international transactions. The Regulation introduces no incentive for TSO B to counter-trade or redispatch in order to heal congestion on network A. There is even no incentive for TSO B to inform TSO A of the change of wind generation and electricity flows. TSO A can certainly acquire some of that information on its own but this is costly. Moreover, whatever its effort, TSO A will always be in a worse position than

TSO B to find out what happens in control area B. But the situation is more intricate. While TSO B sees not advantage in helping TSO A, it has a strong incentive to remedy the problems of its own control area. This may include counter-trading and redispatching activities that aggravate the problems of TSO A without TSO B suffering any penalty for this. Worse, it may ruin any effort of TSO A to forecast the impact of the change of wind in control area B: TSO A may indeed acquire information on events taking place in B and their impact on its network. It will be much more difficult if not impossible to foresee the counter-trading and redispatching actions of TSO B in reaction to these wind changes. TSO A thus faces both adverse selection (B has better information) and moral hazard (B will not work in the interest of A) phenomena. Consider now the incentives of TSO A to act in the interest of market participants in control area A. As we just saw, TSO A can try its utmost to remedy the problems arising from the vagaries in control area B. This may imply collecting information on system B and engaging in cooperation agreements with B to induce this TSO to correctly inform A. This is costly for TSO A. Alternatively it can do nothing and instead argue, pursuant paragraph 2, that changes of wind in A are a case of "force-majeure". More likely, TSO A will reserve resources in its own control area in order to secure its network. Quite likely too, it will pay for these resources at accounting but not at opportunity cost. This may create losses for the generators. Here again, there is no incentive for TSO A to adopt the measures that are most efficient for market participants (a moral hazard problem). Moreover, commercial considerations will prevent market participants to access the necessary information to assess whether TSO A's is active or lazy (adverse selection). These problems occur in a two control area problems. The reality involves many TSOs and other factors than wind. The problem is thus much more intricate than this simple example shows.

In a similar vein, the new drafts of paragraph 5 replace the former "In any event, transactions that relieve the congestion shall never be denied" by "having full regard to network security, transactions that relieve congestion shall never be denied". It is one of the key objectives of congestion management to take full advantage of counter-flows (referred to as netting in

EU electricity parlance) because they relieve congestion. Disregarding them reduces the capacities of the network. It is the established policy of some TSOs to oppose netting, arguing that it jeopardizes network security when an operator does not comply with its commitment to counter-flows (see European Commission 2002b). This argument is overstretched. Security (physical, economic, legal) is always degraded when agents do not fulfill their commitments because there is no law to impose them to do so or the law is not enforced. Obligating agents to fulfill their commitments is what Contract Law, Regulation and Courts are for. It is true that some agents will not fulfill their commitments, but this does not justify enacting a legislation that assumes away contractual obligations. On the contrary what is needed is a legislation and Regulators that require agents to either fulfill their obligation or pay for the damages that their default imposes on the system. This is again a phenomenon of adverse selection and moral hazard. The invoked reason of "network security" cannot reasonably be verified by Regulators, neither the effort made by the TSO to force agents to fulfill their commitment to counter-flow. In short, this modification of the Regulation brings us in a grey area where TSOs can deny "transactions that relieve congestion" without one being sure that this is indeed for "security reasons" and that everything reasonably economic has been done to maintain security by other means.

One may argue that this progressive weakening of Article 5 through the different drafts is compensated by additional constraints that reduce the discretionary use of the additional flexibility granted to TSOs. Paragraph 2, in the two latter drafts, indeed asserts that curtailment "shall be applied in a non-discriminatory manner". Similarly the two latter versions of Paragraph 4 require "Any allocated capacity that will not be used shall be reattributed to the market, in an open, transparent and non-discriminatory manner". These additions are too soft to be effective. We know neither how to incentivise TSOs to act in a nondiscriminatory way (see Benintendi and Boccard 2002), nor how to verify that they indeed do so. Worse, the possibility of strategic curtailment cannot be excluded. This is particularly true in a network where externalities allow one to export security problems to other networks (see

Glachant and Pignon 2003 for examples of strategic export of congestion). Not knowing much about incentives is no reason to abandon the little that we know: diminishing the liabilities of the TSOs in case of interruption does not induce them to reduce curtailments. The only reasonable justification for this added flexibility is that curtailing transactions and restricting transfer capacities maybe the only feasible solution for loosely coordinated TSOs to manage congestion through transfer capacities and contract paths.

### *5.3.2. Market solutions for congestion management*

Paragraph 1 mandates that "Network congestion problems shall be addressed with non-discriminatory market based solutions which give efficient economic signals to market participants and transmission system operators involved". The Regulation does not elaborate any further on how to achieve this objective. It was thus the task of the Forum to propose methods to do so. After several papers elaborating on the difficulties of working with transfer capacities, (ETSO 1999, 2000b, 2001c, 2001), the European Transmission System Operators introduced a proposal on coordinated auction in April 2001. Except for the "Coordinated Cost +" of the large consumers, this remains the only formalized proposal for congestion management submitted to the Forum so far. The papers on transfer capacities produced before April 2001 are discussed in Boucher Smeers 2002. We briefly analyze the proposal for a coordinated auction in this paper. Its content and contribution are presented first. We next turn to its shortcomings while also saying a few words on the "Coordinated Cost +" proposal of the large consumers (see ETSO 2003 for comments on "coordinated counter-trading").

### *5.3.3. ETSO's coordinated auction is a major step forward*

ETSO's coordinated auction is a simplified version of the extensively debated flowgate system (see "Research papers" on <http://www.ksg.harvard.edu/hepg/>). The method can be described in three steps. One constructs a representation of the European grid as a set of control areas connected by bundles of lines; each bundle is an interconnector. One

then attaches capacities and other electrical characteristics to these interconnectors (see below). Last one defines an auction mechanism to allocate the capacities taking into account the other electrical characteristics. We briefly review these elements.

ETSO's aggregate network decomposes the European grid into zones each associated with a control area. The lines connecting these zones are aggregated into interconnectors. Capacities specify the maximal allowable flow through interconnectors. These capacities can be interpreted as the transfer capacities of Articles 5 and 6. Interconnectors are also endowed with characteristics that make them akin to true electrical lines. As a result, the aggregate network does not obey the pipeline model but is a true, even if simplified, electrical model. This makes it possible, at least in principle, to compute Power Distribution Factors (PDFs). These constitute a simplified representation of the load flow equations that determine electric flows in network (see Boucher-Smeers 2002 for a reminder of this notion). PDFs are defined with respect to a given hub and can be used to compute the flows induced by a transaction in the different parts of the grid. Zone to zone transmission services can be offered on this network. ETSO 2001c discusses two transmission services, namely options (the right to transmit) and obligations (the obligation to transmit). The coordinated auction proposal deals with obligations, that is commitments to inject and withdraw as foreseen. The representation of the European grid into zones, each based on a control area, is a key simplification of the proposal. It supposes for instance, that transactions from Northern or Southern France to Italy are identical in terms of their use of the European grid. ETSO recognizes that this simplification should be assessed. The persistent controversy over zonal, nodal and flowgate systems in the US confirms the need for that assessment. A remarkable factor of this proposal is that its interpretation of transfer capacities completely departs from contract paths.

Transmission services must, altogether, be compatible with the capabilities of the aggregate network. The auction mechanism takes care of that requirement as follows. At the opening of the market, agents bid for transactions rights

(in fact obligations) between zones. An entity selects the set of transactions that maximize the value of the accepted bids subject to constraints that insure the security of the network. This is done by a standard optimization software. The introduction of an entity in charge of a European transmission market is a second, remarkable, feature of ETSO's proposal. This agent calculates the PDFs and runs the optimization software. This role is the core of a European RTO, a notion conspicuously avoided in the Regulation.

#### *5.3.4. But just one step*

ETSO's proposal even though a real advance in the Forum's discussions, is not a comprehensive congestion management system. As mentioned above, zonal systems based on flowgates remain controversial. Second, and there is no controversy on this point, ETSO's proposal does not contain any real time market of electricity. As we shall argue this is a serious shortcoming.

##### 5.3.4.1. The zonal system remains controversial

ETSO's proposal is a zonal system in the sense that the flows induced by transactions between two different control areas are assumed independent of the origin and destination nodes in these control area. This is a fiction in theory but maybe a good approximation in practice. ETSO does not provide any information on the quality of this approximation. We discuss its possible impact.

Assume perfect foresight, or in other words, neglect line outages and unexpected changes of supply and demand between the closure of the auction and real time. An auction conducted on an aggregate network can only result in discrepancies between accepted offers and the real capabilities of the network. The better the aggregate representation of the grid, the smaller these discrepancies. Conversely working with a pipeline model of the European grid would increase these divergences. Discrepancies between accepted and feasible transactions can be accommodated in various ways. One scenario is to curtail certain transactions when the outcome of the auction is not feasible for the real network. The Regulation restricts uncompensated curtailment to

"force majeure". Accommodating accepted transactions into the real network is a day-to-day activity. Whatever the lack of adequate incentives, TSOs cannot invoke "force majeure" and refuse to compensate operators on a daily basis. The Regulation says nothing on the amount of the compensation; an other scenario is thus that TSOs curtail and give an inadequate compensation. But again, it is hard to imagine that this takes place on a regular basis. Another possibility is that TSOs engage in counter-trading in each zone or between zones so as to reduce the discrepancies between accepted and feasible transactions. This requires both adequate counter-trading resources and a good coordination of TSOs to manage these resources. Suppose perfect co-ordination. The question of the availability of adequate counter-trading resources remains. The necessary quantity of these resources depends on the quality of the approximate network: the better the approximation, the less the need for counter-trading resources. The availability of these resources depends on the economic incentives of agents to provide them, something that is discussed neither in the Regulation nor in ETSO's proposal or the Forum documents. In short, curtailment cannot be avoided if counter-trading resources are insufficient. Note that the availability of adequate counter-trading resources is also a key issue in the "Co-ordinated Cost +" proposed by large consumers, which is entirely based on counter-trading. In all these scenarios there is a risk that all transactions accepted in the auction cannot be accommodated in real time. This risk is not due to external uncertain events but to the very design of the market. The risk exists in the absence of any unforeseen event between the closure of the forward market (the coordinated auction) and real time (we have assumed that lines, supply and demand remain unchanged). This risk originates in the only change taking place between the forward and real time markets namely the replacement of the aggregate network by the real one. The risk of not being able to accommodate all accepted transactions is thus internally generated by the proposed design of the congestion management system. It is doubtful that a market of financial or insurance instruments will develop to cover these risks that are so susceptible of being manipulated by the beneficiaries of the coverage.

A last and quite likely possibility is that the TSOs play it safe and overly restrict transmission capacities in order to avoid curtailment altogether. This is in principle forbidden by Article 6, paragraph 3 that requires that "the maximum capacity of the interconnector shall be available to market participants...". But these terms are ambiguous and compliance with this obligation unverifiable. We thus take it that TSOs may indeed reduce the transmission capacities of the interconnectors in the aggregate network. This restricts cross-border transactions. This violates the objective of the Regulation but maybe the only possibility if the aggregate network is a bad approximation of the reality and adequate counter-trading resources are not available.

#### 5.3.4.2. The balancing mechanism....

The above reasoning assumes no line failure and no unforeseen change of demand and supply between the closure of the forward market and real time. The electrical reality is quite different. Line and plant outages occur and demand can change unexpectedly. These phenomena maybe important and should be taken into account. In order to simplify their analysis, assume that ETSO's proposal is boosted into a full nodal system. The network is the real one and transmission transactions are now defined as node to node. Marketers make offers to inject at some node and withdraw at another. As in ETSO 2001a, a special agent with EU wide responsibilities coordinates the auction and selects the offers that maximize the value collected from the accommodated transactions, taking into account the capabilities of the network. Were it not for uncertainty, the transactions accepted in the auction would thus be feasible in real time. But uncertainties pervade the electricity market and introduce variations between the closure of the forward market and real time. As a result transactions accepted in the forward market may no longer be feasible in real time. These discrepancies are resolved in real time by the balancing system. Neither ETSO's coordinated auction, nor any of the other Forum documents discusses this balancing system. In fact this is left to Member States both in the Electricity Directive 96/92/EC, the Regulation and the new Directive. The commission's discussion of balancing (European

Commission 2002b) reveals that there is at this stage no European wide balancing system and no plan to introduce one. Europeans try to "link separate markets" each endowed with its own balancing system.

#### 5.3.4.3. ....should be a European balancing market.

As argued above, counter-trading resources are necessary to accommodate accepted transactions in the real network. As suggested before, it maybe unrealistic to assume that the necessary counter-trading resources will be available whenever needed by TSOs or that they can be ordered by administrative measures. The incentives given to plant operators to be available for counter-trading therefore constitute a crucial determinant of the validity of the coordinated auction proposal. We argue that these incentives can only be present if the set of balancing systems of individual systems are integrated into a single European wide balancing market.

The need for a balancing market is now well recognized in US discussions, where proponents of nodal, zonal and flowgate systems, whatever their remaining divergences, indeed agree that unbalances between contracted and effectively available transmission need to be settled at prices obtained on an instantaneous nodal market (see O'Neill et al. 2002). The underlying reasoning is simple. Year, month and day rights ahead markets are all forward markets, hence based on expectations. A spot or real time market is thus necessary to form consistent forward expectations. These expectations condition the availability of adequate counter-trading resources. The prices granted for counter-trading indeed determine the incentive to be available in adequate quantities. The balancing market is what comes closest to the spot market. This real time market is absent from ETSO's proposal as well as from the discussions of the Forum. It is foreseen neither in the Regulation nor in the accompanying new electricity Directive. This is not surprising; its inception would indeed require a major overhaul of the European electricity system inherited from the transposition of Directive 96/92/EC. Because there is no real time market in the coordinated auction proposal, ETSO implicitly accepts that counter-trading resources, called upon to cast accepted

transactions in the real capacities of the network, may not receive market prices. The absence of a real time market also implies that the forward prices are not (risk neutral) expectations of real time prices. The result is that there is no market signal to guide operators in arbitraging between committing capacity to the energy and counter-trading (or adjustment) markets. Administratively determined prices on the balancing mechanism are no substitute to market prices and cannot adequately guide this arbitrage. Evidence that the real time balancing market is necessary for the completeness of the market is now growing. Restructuring in Texas (Public Utility Commission's of Texas 2003, Hogan 2001) is probably one of the latest relevant experiments to date. Very much like in ETSO proposal, forward trading in Texas is organized as a zonal system constructed from aggregate power distribution factors (Oren 2003). As in ETSO proposals, property rights on transmission services are granted by a coordinate auction run by a single RTO. But unlike ETSO's proposal, imbalances between the forward and the real time transmission service are settled on the basis of a real time market.

Similarly the absence of a real time balancing market raises the question of the compensation of curtailment, at least when TSO do not invoke "force majeure". The above reasoning applies here too. There is no real time price and hence no market signal to determine the compensation of curtailment. It is administratively managed and hence does not reflect the economic value of the interrupted transactions. This distorts trading: transactions that marketers see subject to erratic curtailments and inadequate compensations will not take place.

#### 5.3.4.4. Combining both effects

Uncertainty and network aggregation cumulate their effects. The aggregate network creates an imbalance between accepted transactions and available network capacities. The pervasive uncertainty present in electricity systems increases this imbalance. Adequate incentives to make counter-trading resources available are thus of extreme relevance in ETSO's proposal (as

well as in the coordinated counter-trading proposal of the large consumers). These incentives can only originate in consistent forward prices, that is localised prices formed as expectation of real time market prices computed over the whole of the internal electricity market. The Regulation does not foresee such mechanism. And it probably cannot do so as long as energy, transmission and balancing obey different (market and non-market) logics in national systems and cross-border trade.

#### 5.3.4.5. Other consequences

Suppose that ETSO's proposal is implemented. Coordinated auction defines, up to a constant, a zonal price system. These zonal prices are obtained by taking the price at some exchange as a reference (a hub) and adding the transmission prices found in the coordinated auction. This gives an energy price in each zone. But the existing power exchanges in Europe also determine zonal electricity prices. Will these zonal prices be the same? They should, by arbitrage. But it may not be that simple. One may indeed question the relevance of two separate markets that run at different times and trade different bundles of the same product (hourly electricity). This certainly creates business opportunities for arbitrageurs but it may not have much other use. Moreover, these two exchanges obey different logics and hence may create artificial arbitrage opportunities. This reminds of the controversial separation of the energy and transmission markets that pervaded the whole Californian reform. Combining both the coordinated auction of transmission services and the power exchanges in one single body seems a reasonable idea (see ETSO 2002h) but may encounter practical problem. We leave this question for an other paper

Because the response of demand to prices in real time is very small, electricity is a very volatile product. Agents operating in the market thus need hedges or insurances. Hedging techniques developed in finance can, at least partially, be adapted to electricity. The transposition requires both a spot market of electricity and a sufficiently well developed forward market. Because of uncertainty and non-storability the balancing is market the closest

analogy to the spot market of the financial world. The absence of this spot market renders the simple transposition of the financial reasoning at best hazardous, at worst impossible. What is a forward market worth when there is no spot market? In other words how are forward prices formed? In short, the absence of a European balancing market raises the question of how one can design meaningful hedges.

#### 5.4. *A transient flaw*

The June 2002 version of Article 6 paragraph 6 saw the inception a particularly strange add-up that is fortunately removed from the Common Position. Comparing the different drafts, one sees that the statement "Any revenue resulting from the allocation of interconnection capacities shall be used for one or more of the following purpose..." of March 2001 was replaced by "Any revenues resulting from the allocation of interconnection capacities which exceed a reasonable return on investment shall be used for one or more of the following purpose...." in June 2002. The revenues mentioned in Article 6 accrue from congestion management of the interconnections. It is generally admitted that congestion revenues are notoriously insufficient to cover "a reasonable return on investment" on the relevant infrastructures except when their capacity is largely insufficient. Imposing that only congestion funds in excess of a reasonable return on investment can be used for some purpose prevents the use of these funds or constitutes an incentive to reduce transmission capacities. This very counter productive clause does not appear in the Common Position.

#### 5.5. *In conclusion*

Articles 5 and 6 are almost empty shells. But even their small content is worrisome when paralleled with the discussion of the Forum. Specifically, the introduction of the contract path in article 2, paragraph (e) and the persistent use of transfer capacities in Articles 5 and 6 suggest that contract paths are still driving the thinking of some participants to the Forum. Current practice of congestion management tends to confirm this conjecture. The fate

of ETSO's coordinated auction in the discussion of the Forum further reinforces that feeling. ETSO's proposal was a real attempt to both remove the erroneous initial concept of transfer capacity and replace it with a more consistent notion. The proposal had its weaknesses; it makes two fundamental simplifications. It assumes that, one can aggregate PDFs of real line and it supposes that one can dispense with a real time market. The first assumption may be acceptable, but the evidence is lacking. One cannot justify the second assumption except by neglecting the uncertainties between the closure of the forward market and real time. But none of these weaknesses was ever discussed, let alone argued, by the Forum against the proposal. It is the very notion of a common organized market for transmission capacities that failed to materialize in the Forum. At this stage, after four years of discussion, there is no European proposal for managing congestion at the interfaces.

## **General Conclusion**

This paper analyses some of the articles of the Regulation on cross-border trade; it discusses them both in absolute terms and with respect to their evolution between the initial draft of March 2001 and the Common Position of February 2003. This section summarizes our conclusion.

The draft Regulation went through various modifications between March 2001 and February 2003 but its substance did not change much. The Common Position is weaker than the already soft initial draft, but this degradation is more a matter of degree than substance. Article 1 extends the scope of the Regulation from transit to cross-border flows. The move is justified in principle but did not have much impact on the work of the Forum. Article 2 retains the flawed definition of congestion that was already present in March 2001. This definition prioritizes domestic transactions over international ones. This is inconsistent with the Commission's repeated goal of a "single integrated market". Worse it may create incentives for TSOs to export some of their domestic problems to other networks. The Common Position also introduces a new definition of transit on the basis of contract paths. The appearance of contract paths after the two year of consultation since the inception of the first draft is a real cause of concern.

The Regulation bases the compensation mechanism of Article 3 on forward-looking long run average incremental costs. The March 2001 draft of the Regulation defined the notion. The later drafts replace the definition by a list of items that includes embedded costs, a concept at variance with incremental costs. This will not have much impact. The reference to forward looking long run average incremental cost indeed appears purely cosmetic; the Forum never considered incremental costs and only computed embedded costs. The export tax now allowed by Article 4 is an unwelcome innovation. The Regulation plans to dispense with it after "efficient locational signals" are put in place. The problem is that we do not know how to compute "efficient locational signals".

Articles 5 and 6 remained largely unchanged and this is what is most puzzling. Article 5 construes congestion management on the basis of transfer capacities. This notion, when interpreted in the spirit of contract paths, is flawed. Article 6 recommends market-based solutions to allocate transfer capacities. But the only serious and sound, even if incomplete, proposal to implement this article, namely ETSO's co-ordinated auction, never made it into a Forum's accord. None of the immense knowledge on congestion management made it into article 5 and 6 that remain desperately vague.

This accumulation of contradictions, looseness and ad hoc fixes does not bode well for the future. It probably signals that the problem is ill posed. Basic economics suggests a diagnostic. Externalities pervade electricity both in the short run (operations issues treated in Articles 5 and 6) and long run (network investments treated in Articles 3 and 4). The importance of these externalities have been recognized neither at the time of Directive 96/92/EC nor in the new proposed Directive. The diagnostic suggest the treatment, namely a much deeper restructuring than the one inherited from the transposition of Directive 96/92/EC or foreseen in the proposed new Electricity Directive. The current European scepticism makes it impossible to administer this treatment. The problem was thus passed to the Forum and the Regulation which were given the task of integrating the national markets without questioning their restructuring. This task is probably impossible. We do not know how to do it and we have good reasons to believe that it cannot be done. As a result, the internal electricity market is likely to proceed through a succession of fixes aimed at remedying the shortcomings that its operations will reveal. A second consequence is that it will be difficult to develop a consistent jurisprudence on the basis of the inconsistent definitions contained in the Regulation. Experience shows that the gas (e.g. Phillips Petroleum v Wisconsin) and electricity industries (e.g. California) are vulnerable to inadequate legal decisions, with possibly catastrophic economic consequences. This experience should be taken on board in the new legislation and not simply assumed away.

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Articles 1 and 2

*Article 1*

**Subject-matter and scope**

This Regulation aims at stimulating cross-border exchanges in electricity and thus competition within the internal electricity market, through the establishment of a compensation mechanism for ~~transit??~~ **cross-border flows** of electricity and the setting of harmonised principles on cross-border transmission charges and the allocation of available capacities of interconnections between national transmission systems.

*Article 2*

**Definitions**

1. The following definitions shall also apply:
  - (a) **"cross-border flow"** means a physical flow of electricity ~~hosted on the transmission system of a Member State, which was neither produced nor is destined for consumption in that Member State, including transit flows which are commonly denominated as "loop flows" or "parallel flows";~~ **on a transmission network of a Member State that results from the activity of either generators or consumers outside of that Member State;**
  - (b) "congestion" means a situation in which an interconnection linking national transmission networks, cannot accommodate all transactions resulting from international trade by market operators, due to a lack of capacity **of the interconnectors and/or the national transmission systems concerned;**
  - (c) **"export" of electricity means the dispatch of electricity in one Member State with the understanding that the simultaneous corresponding take-up ("import") of electricity will take place in another Member State or a third country.**

*Article 3*

**Inter transmission system operator compensation mechanism**

1. Transmission system operators shall receive compensation for costs incurred as a result of hosting ~~transit~~ **cross-border** flows of electricity on their network.
2. The compensation referred to in paragraph 1 shall be paid by the operators of national transmission systems from which **cross-border** ~~transit~~ flows originate and/or the systems where those flows end.
5. The amounts of ~~transit~~ **cross-border** flows hosted and the amounts of ~~transit~~ **cross-border** flows **designated as** originating and/or ending in national transmission systems shall be determined on the basis of the physical flows of electricity actually measured in a given period of time.
6. The costs incurred as a result of hosting ~~transit~~ **cross-border** flows shall be established on the basis of the forward-looking long run average incremental costs (~~reflecting costs and benefits that a network bears from hosting transit flows compared to the costs it would bear in the absence of such flows~~), **taking into account losses, investment in new infrastructure and an appropriate proportion of the cost of existing infrastructure, as far as existing infrastructure was built to transmit cross-border flows. When establishing the costs incurred, standard-costing methodologies shall be used. Benefits that a network incurs as a result of hosting cross-border flows shall be taken into account.**

*Article 4*

**Charges for access to networks**

1. Charges applied by ~~national~~ network-operators for access to national networks shall be **transparent and** reflect actual costs incurred **in so far as they correspond**, ~~and shall be transparent, approximated~~ to those of an efficient **and structurally comparable** network operator and applied in a non-discriminatory manner. They shall not be distance-related.

2. Generators and consumers (load) may be charged for access to national networks. The proportion of the total amount of the network charges borne by generators shall be lower than the proportion borne by consumers. Where appropriate, the level of the tariffs applied to generators and/or consumers shall provide locational signals, and take into account the amount of network losses and congestion caused.
4. ~~Subject to paragraph 2,~~ **Providing that appropriate and efficient locational signals are in place, in accordance with paragraph 2,** charges for access to national networks applied to generators and consumers shall be applied independently of the country of destination and respectively origin of the electricity, as specified in the underlying commercial arrangement. ~~Exporters and importers shall not be charged any specific charge in addition to the general charge for access to national networks.~~ **This shall be without prejudice to charges on exports and imports resulting from congestion management referred to in Article 6.**
5. There shall be no specific network charge on individual transactions for transits of electricity. ~~covered by the inter-transmission system operator compensation mechanism.~~

## Articles 5 and 6

### *Article 5*

#### **Provision of information on interconnection capacities (March 2001, June 2002)**

1. **Transmission system operators shall put in place** co-ordination and information exchange mechanisms ~~shall be put in place by transmission system operators~~ to ensure the security of the networks in the context of congestion management.
2. The safety, operational and planning standards used by transmission system operators shall be made public. This publication shall include a general scheme for the calculation of the total transfer capacity and the transmission reliability margin based upon the electrical and physical features of the network. Such schemes shall be subject to the approval of the national regulatory authorities, **referred to in Article 22 of Directive 96/92/EC.**
3. Transmission system operators shall publish estimates of available transfer capacity for each day, indicating any available transfer capacity already reserved. These publications shall be made at specified time intervals before the day of transport and shall include, in any case, week-ahead and month-ahead estimates, ~~The data published shall include~~ **as well as** a quantitative indication of the expected reliability of the available capacity.

### *Article 6*

#### **General principles of congestion management (March 2001, June 2002)**

1. Network congestion problems shall be addressed with non-discriminatory market based solutions which give efficient economic signals to the market participants and transmission system operators involved.
2. Transaction curtailment procedures shall only be used in emergency situations where the transmission system operator must act in an expeditious manner and redispatching or countertrading is not possible. **Any such procedure shall be applied in a non-discriminatory manner.**

**Except in cases of "force-majeur"**, market participants who have been allocated capacity shall be compensated for any curtailment ~~of this capacity.~~

3. The maximum capacity of the interconnections shall be made available to market participants, complying with safety standards of secure network operation.
4. **Market participants shall inform the transmission system operators concerned a reasonable time ahead of the relevant operational period whether they intend to use allocated capacity.** Any allocated capacity that will not be used shall be reattributed to the market, **in an open, transparent and non-discriminatory manner.**
5. Transmission system operators shall, as far as technically possible, net the capacity requirements of any power flows in opposite direction over the congested interconnection line in order to use this line to its maximum capacity. ~~In any event,~~ **Having full regard to network security,** transactions that relieve the congestion shall never be denied.
6. Any ~~rents~~ revenues resulting from the allocation of interconnection capacities **which exceed a reasonable return on investment** shall be used for one or more of the following purposes:
  - (a) guaranteeing the actual availability of the allocated capacity;
  - (b) network investments maintaining or increasing interconnection capacities;
  - (c) reduction of network charges

~~These rents may be put into a fund that is managed by transmission system operators. They shall not constitute a source of extra profit for the transmission system operators.~~

## **Annex 2: Common Position**

### Articles 1 and 2

#### *Article 1*

##### **Subject-matter and scope**

This Regulation aims at setting fair rules for cross-border exchanges in electricity, thus enhancing competition within the internal electricity market, taking into account the specificities of national and regional markets. This will involve the establishment of a compensation mechanism for cross-border flows of electricity and the setting of harmonised principles on cross-border transmission charges and the allocation of available capacities of interconnections between national transmission systems.

#### *Article 2*

##### **Definitions 1**

1. For the purpose of this Regulation, the definitions contained in Article 2 of Directive 2003/.../EC concerning common rules for the internal market in electricity and repealing Directive 96/92/EC<sup>4</sup> shall apply with the exception of the definition of "interconnector" which shall be replaced by the following: "interconnector" means a transmission line which crosses or spans a border between Member States and which connects the national transmission systems of the Member States;
2. The following definitions shall also apply:
  - (a) "regulatory authorities" means the regulatory authorities referred to in Article 23(1) of Directive 2003/.../EC;
  - (b) "cross-border flow" means a physical flow of electricity on a transmission network of a Member State that results from the impact of the activity of producers and/or consumers outside of that Member State on its transmission network. In any case where transmission networks of two or more Member States form part, entirely or partly, of a single control block, the regulatory authorities of the Member States

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concerned may decide that, for the purpose of the inter-transmission system operator (TSO) compensation mechanism referred to in Article 3 of this Regulation only, the control block as a whole shall be considered as forming part of the transmission network of one of the Member States concerned, in order to ensure that flows within control blocks are not considered as cross-border flows and do not give rise to compensation payments under Article 3 of this Regulation;

- (c) "congestion" means a situation in which an interconnection linking national transmission networks, cannot accommodate all physical flows resulting from international trade requested by market participants, because of a lack of capacity of the interconnectors and/or the national transmission systems concerned;
- (d) "declared export" of electricity means the dispatch of electricity in one Member State on the basis of an underlying contractual arrangement to the effect that the simultaneous corresponding take-up ("declared import") of electricity will take place in another Member State or a third country;
- (e) "declared transit" of electricity means a circumstance where a "declared export" of electricity occurs and where the nominated path for the transaction involves a country in which neither the dispatch nor the simultaneous corresponding take-up of the electricity will take place;
- (f) "declared import" of electricity means the take-up of electricity in a Member State or a third country simultaneously with the dispatch of electricity ("declared export") in another Member State;
- (g) "new interconnector" means an interconnector not completed by the date of entry into force of this Regulation.

Articles 3 and 4

*Article 3*

**Inter transmission system operator compensation mechanism**

1. Transmission system operators shall receive compensation for costs incurred as a result of hosting cross-border flows of electricity on their networks.
2. The compensation referred to in paragraph 1 shall be paid by the operators of national transmission systems from which cross-border flows originate and the systems where those flows end.
3. Compensation payments shall be made on a regular basis with regard to a given period of time in the past. Ex-post adjustments of compensation paid shall be made where necessary to reflect costs actually incurred.

The first period of time for which compensation payments shall be made shall be determined in the guidelines referred to in Article 8.

4. Acting in accordance with the procedure referred to in Article 13(2), the Commission shall decide on the amounts of compensation payments payable.
5. The magnitude of cross-border flows hosted and the magnitude of cross-border flows designated as originating and/or ending in national transmission systems shall be determined on the basis of the physical flows of electricity actually measured in a given period of time.
6. The costs incurred as a result of hosting cross-border flows shall be established on the basis of the forward looking long-run average incremental costs, taking into account losses, investment in new infrastructure, and an appropriate proportion of the cost of existing infrastructure, as far as infrastructure is used for the transmission of cross-border flows, in particular taking into account the need to guarantee security of supply. When establishing the costs incurred, recognised standardcosting methodologies shall be used. Benefits that a network incurs as a result of hosting crossborder flows shall be taken into account to reduce the compensation received.

*Article 4*

**Charges for access to networks**

1. Charges applied by network-operators for access to networks shall be transparent, take into account the need for network security and reflect actual costs incurred insofar as they correspond to those of an efficient and structurally comparable network operator and applied in a non-discriminatory manner. Those charges shall not be distance-related.
2. Producers and consumers ("load") may be charged for access to networks. The proportion of the total amount of the network charges borne by producers shall, subject to the need to provide appropriate and efficient locational signals, be lower than the proportion borne by consumers. Where appropriate, the level of the tariffs applied to producers and/or consumers shall provide locational signals at European level, and take into account the amount of network losses and congestion caused, and investment costs for infrastructure. This shall not prevent Member States from providing locational signals within their territory or from applying mechanisms to ensure that network access charges borne by consumers ("load") are uniform throughout their territory.
3. When setting the charges for network access the following shall be taken into account:
  - Payments and receipts resulting from the inter-transmission system operator compensation mechanism;
  - Actual payments made and received as well as payments expected for future periods of time, estimated on the basis of pas periods.
4. Providing that appropriate and efficient locational signals are in place, in accordance with paragraph 2, charges for access to networks applied to producers and consumers shall be applied regardless of the countries of destination and, origin, respectively, of the electricity, as specified in the underlying commercial arrangement. This shall be without prejudice to charges on declared exports and declared imports resulting from congestion management referred to in Article 6 .
5. There shall be no specific network charge on individual transactions for declared transits of electricity.

## Articles 5 and 6

### *Article 5*

#### **Provision of information on interconnection capacities**

1. Transmission system operators shall put in place coordination and information exchange mechanisms to ensure the security of the networks in the context of congestion management.
2. The safety, operational and planning standards used by transmission system operators shall be made public. The information published shall include a general scheme for the calculation of the total transfer capacity and the transmission reliability margin based upon the electrical and physical features of the network. Such schemes shall be subject to the approval of the regulatory authorities.
3. Transmission system operators shall publish estimates of available transfer capacity for each day, indicating any available transfer capacity already reserved. These publications shall be made at specified intervals before the day of transport and shall include, in any case, week-ahead and month-ahead estimates, as well as a quantitative indication of the expected reliability of the available capacity.

### *Article 6*

#### **General principles of congestion management**

1. Network congestion problems shall be addressed by means of non-discriminatory market based solutions which give efficient economic signals to the market participants and transmission system operators involved.
2. Transaction curtailment procedures shall only be used in emergency situations where the transmission system operator must act in an expeditious manner and redispatching or countertrading is not possible. Any such procedure shall be applied in a non-discriminatory manner.

Except in cases of "force-majeure", market participants who have been allocated capacity shall be compensated for any curtailment.

3. The maximum capacity of the interconnections and/or the transmission networks affecting cross-border flows shall be made available to market participants, complying with safety standards of secure network operation.
4. Market participants shall inform the transmission system operators concerned a reasonable time ahead of the relevant operational period whether they intend to use allocated capacity. Any allocated capacity that will not be used shall be reattributed to the market, in an open, transparent and non-discriminatory manner.
5. Transmission system operators shall, as far as technically possible, net the capacity requirements of any power flows in opposite direction over the congested interconnection line in order to use this line to its maximum capacity. Having full regard to network security, transactions that relieve the congestion shall never be denied.
6. Any revenues resulting from the allocation of interconnection shall be used for one or more of the following purposes:
  - (a) guaranteeing the actual availability of the allocated capacity;
  - (b) network investments maintaining or increasing interconnection capacities;
  - (c) as an income to be taken into account by regulatory authorities when approving the methodology for calculating network tariffs, and/or in assessing whether tariffs should be modified.