European Network of
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for Electricity

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FIRMNESS EXPLANATORY DOCUMENT

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Content

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FIRMNESS EXPLANATORY DOCUMENT

From: MIWG
Date: December 2013

1. Introduction

On 1st October 2013, after one year of intensive work and stakeholder involvement, ENTSO-E submitted its draft of the Forward Capacity Allocation Network Code (FCA NC) to ACER. One of the most contentious topics of this code is firmness. Although ENTSO-E has sought compromise solutions, diverging views have persisted between ENTSO-E, ACER and some stakeholder organisations.

The aim of this paper is to explain ENTSO-E's position on firmness as set out in the FCA NC and more particularly, to respond to ACER's position paper. The diverging positions between the two organisations (ACER, ENTSO-E) are due to a different perspective on the type of long term cross zonal capacity products TSOs provide to the market. These capacity products facilitate trade between bidding zones, thereby encouraging the growth of a pan European electricity market for the benefit of end users. From the TSO´s perspective they provide these capacity products to the market reflecting the capability of the transmission network to transfer energy. However from ACER´s perspective TSOs provide a financial product to allow market participants to hedge their positions between different bidding zones. These two positions differ over who should bear the risks associated with the physical characteristics of the assets underpinning the capacity (e.g. curtailment). TSOs believe that the risks should be shared between those using these capacity products and TSOs, while ACER believes that all the risk should be borne by TSOs and financed through congestion income. This will reduce the income that can be used maintain or increase interconnector capacities or reduce network tariffs which may then impact end user tariffs.

This document is divided up into five sections. Section 2 describes the different firmness regimes under discussion between ACER and ENTSO-E, while Section 3 analyses ACER's assumptions that have led to its current position. Section 4 examines the impact of the different firmness regimes, based on analysis of historical data from several borders and Section 5 presents ENTSO-E's conclusion.

Firmness costs and where they originate

The firmness debate revolves around the question of how the risks for long term cross zonal capacity curtailments are shared, whether it is wholly placed on TSOs or shared with the users of the capacity. Capacity curtailments can happen for many reasons (such as faults etc.), and there are financial consequences as the energy arbitrage opportunity between the two bidding zones is curtailed. The cost of curtailment is ultimately a cost to the market and the key question is how this cost can be best attributed to the different parties in an efficient, transparent and non-discriminatory manner. On many European borders when capacity is curtailed in forward timescales, TSOs reimburse the holders of the cross zonal rights the amount the capacity holder has paid at auction for the capacity (initial price paid compensation). ACER's preference is for TSOs to reimburse the day-ahead market spread, instead of the price paid at auction. The risk is that the day ahead market spread is unknown at the time of allocation and can be many times greater

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than the initial price paid at auction. To the extent that the market spread exceeds the initial price paid at auction, the TSO has to cover the costs from elsewhere, be it congestion income from the current or other timeframes or from network tariffs. Consequently, if congestion income or network tariffs are used to cover these payments through socialisation of costs, the costs of these capacity products are not providing an effective economic incentive to those using them as they are not being exposed to the true costs of providing the increased firmness. This may lead to an increase in end user tariffs if these costs are not properly reflected.

Congestion income

Congestion income is the TSO revenue derived from selling cross zonal capacity products. Existing European legislation[1] defines how congestion income is used and these are listed below. Legislation also requires TSOs to report on the use of any congestion income and NRAs to verify that this complies with legislation.

Uses of congestion income:

a) guaranteeing the actual availability of the allocated capacity; and/or

b) maintaining or increasing interconnection capacities through network investments, in particular in new interconnectors.

c) If revenues cannot be efficiently used for the above, they can be used to reduce network tariffs, subject to NRA approval.

The consequence of firmness regimes that allocate all risks to TSOs covering these increased costs through congestion income is that it reduces TSO congestion income for the other uses that the legislation provides for. In particular it reduces the ability of TSOs to increase interconnector capacities and to reduce network tariffs. It might also jeopardise future interconnection investment as reducing congestion income by ring fencing part of it to cover firmness costs makes investment less attractive and can potentially lead to an investment becoming unviable.

It should be recognised that the European Commission has granted exemptions to some TSOs from the use of revenues obligations. These TSOs are interconnector TSOs, sometimes termed "merchant" interconnectors. They are built on the precondition that they receive congestion income to finance the construction and operation of the interconnector investment, without which they would not be built. For these TSOs, the impacts are even more severe than for traditional TSOs.

[1] Article 16.6 of regulation EC 714/2009 defines the uses of congestion income.

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2. Description of potential different firmness regimes

ENTSO-E proposal

When ENTSO-E submitted the Forward Capacity Allocation network code to ACER, ENTSO-E proposed a monthly capped market spread compensation. It introduced a concept called the long term firmness deadline. This is in line with the principle of the day-ahead firmness deadline provided for in the Capacity Allocation and Congestion Management network code but specific to the long term timeframe. This long term firmness deadline is the nomination deadline for physical transmission rights. For financial transmission rights it is between 19 and 2 hours before day-ahead market gate closure. For curtailments between the auction and the long term firmness deadline, compensation is capped at the long term transmission rights' congestion income. For curtailments between the long term firmness deadline and the day-ahead firmness deadline, compensation is capped at the total monthly congestion income.

Where the compensation cap is hit, priority in compensation payments will be given to curtailments occurring between the long term firmness deadline and the day-ahead firmness deadline. This increases the level of firmness market participants see the closer they get to real time and reflects the shorter time they have to react. This proposal is balanced in terms of risk sharing and introduces the incentives for market participants to support system security.

ACER Firmness Paper

ACER's position paper presented four alternative firmness regimes that will be briefly described and evaluated in the following paragraphs:

Option A – Firmness based on initial price paid

Initial price paid compensation gives transmission right holders compensation usually between 100% and 110% of the original price paid at auction, although this is border dependent. This is the most common compensation arrangement across Europe today.

This was part of ENTSO-E's original position as can be seen in the March FCA network code submitted for consultation. However responding to stakeholder and ACER feedback, ENTSO-E has moved away from this position and has provided a compromise solution. This will improve the firmness regimes for market parties on 24 borders across Europe.

Option B1 – Firmness based on capped market spread compensation (congestion income cap)

Capped market spread compensation means that curtailed transmission rights holders are compensated on the market spread between bidding zones as long as there has been sufficient congestion income received by TSOs to pay out from. Compensation is capped by a predefined time period of congestion revenue (e.g. monthly or annual).

Under this regime, market participants share the risks with TSOs. Under normal curtailment conditions, market parties receive market spread compensation. However when an extreme event occurs, the cap for the compensation may be reached so that market parties share some of the financial burden. Compared

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with initial price paid compensation (option A) moving to capped market spread is a significant increase in firmness costs compensation for many borders and TSOs.

Option B2 - Firmness based on capped market spread compensation (price cap)

Price capped market spread compensation means that curtailed transmission rights holders are compensated on the market spread differential as long as it is less than a predefined cap. This ensures that under normal system conditions, market spread compensation is paid. However when an extreme event occurs, the price cap may be reached. Under these circumstances, market parties would share some of the financial burden (similar as for option B1). TSOs envisage that price cap compensation could be implemented together with a congestion revenue cap, rather than being mutually exclusive. The reason for combining a price cap with a congestion cap is to avoid situations where extreme price differentials and multiple curtailments exhaust all congestion income leaving some parties uncompensated. This ensures that as many market parties as possible are compensated.

Option C - Firmness based on full market spread compensation

Market spread compensation means that curtailed transmission rights holders are compensated at the market spread between bidding zones. Under this regime, market participants do not share any of the risks and TSOs are exposed to the full risk and associated financial consequences which may impact network tariffs.

3. Analysis of ACER´s assumptions

The ACER position paper is based on underlying assumptions which ENTSO-E does not fully agree with, these are set out below:

TSOs are best placed to manage curtailment risk

In an efficient market, risk is allocated to those who are best placed to manage it. Close to real time TSOs have sufficient tools to manage curtailment risk as they have the resources and responsibility for operating the power system in real-time which is their core business. However in the forward timeframes, the tools at a TSO's disposal are dramatically reduced. For example if a TSO had a curtailment that lasted for a few weeks or days, they might manage the curtailment by countertrading or cross-zonal redispatch. Market parties can and do trade cross zonal as this is a core business task for many market parties. TSOs generally focus more on balancing timeframes, whereas this firmness risk is best managed forward. Therefore it is not evident that TSOs could trade more efficiently than market parties and consequently it is not clear that TSOs are best placed to manage this risk.

Market parties have no influence on curtailments

Curtailments happen for a variety of reasons, some of which are TSO controlled, while some are caused by the actions (or inaction) of market parties. Market parties can contribute significantly to the impact of the curtailments, both in the severity and the length as sometimes it is their assets that are needed for re-dispatch to avoid curtailment. Therefore if market parties influence curtailments via their market behaviour, then they shall also share the responsibility and associated risks.

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There is surplus congestion income available for firmness related cost compensation

As explained previously, existing European legislation defines how congestion income can be used whether it is to guarantee or increase interconnector capacity. Where these uses are not possible or efficient, it can be used to reduce network tariffs. Therefore the consequence of changing firmness regimes and covering these increased costs through congestion income is that it reduces the income for increasing interconnector capacities or reducing network tariffs.

Investment decisions are not influenced by congestion income.

Price differences and therefore congestion income is one of the signals that indicate more investment is needed across a border. For some TSOs and in some regulatory regimes, there is a strong link between investment decisions and congestion income. Therefore if the firmness regime is made more onerous financially, it will reduce congestion income available for cross-border investments and hence lower cross zonal investment.

TSOs curtailment and re-dispatch decisions are influenced by firmness compensation

ACER assumes that if firmness compensation payments were increased, this would incentivise TSOs to reduce the amount of curtailments. Furthermore, ACER also assumes that congestion income would be increased, (as users no longer price in the risk of curtailment) and therefore this increased income would allow TSOs to make more use of re-dispatch to avoid curtailment. However TSOs curtail capacity for operational security reasons and firmness compensation is not a driving factor.. Therefore a more onerous firmness regime will not change the amount of curtailment or re-dispatch, simply the imposed cost borne by TSOs.

4. Impact of different firmness regimes

ACER's firmness paper concluded that its preferred firmness policy was option C (full financial firmness) although option B1 (capped congestion income cap) is also permissible due to the significant uncertainties surrounding the impact of implementing option C. Therefore ENTSO-E has analysed the two ACER preferred options and compared them against its own proposal in the code. ENTSO-E's analysis has used historical data on 25 borders between January 2011 and June 2013, although for some borders a slightly different time period was selected due to data availability issues.[2]

Financial risk exposure of market spread compensation

The price spread between neighbouring bidding zones can be significant. For example price caps in the NWE region after NWE go live will be harmonized at +3000/-500€/MWh. Therefore theoretically, the maximum price spread can be €3500. In practice large price spreads are seen and can persist for significant

[2] Data from the CH-FR border are available from 01.2012 onwards and in the direction CH to FR no long term capacities have been allocated. On the border PL-CZ no long term capacities have been allocated in the direction PL to CZ and data on maximum price difference are available until 12.2012. On the border NL-GB data is available from 04.2011 onwards. On the borders PL-DE and PL-SK data is available until 12.2012 and there have been no long term allocation s in the direction DE to PL and SK to PL.

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periods of time. Figure 1 shows the price spread between France and Britain on 8th February 2012. The high price spread was due to a spike in the French day ahead prices (the French price reached 1938.5 €/MWh). Similar price spreads have been seen on other borders and in other regions and this is shown in Figure 2.

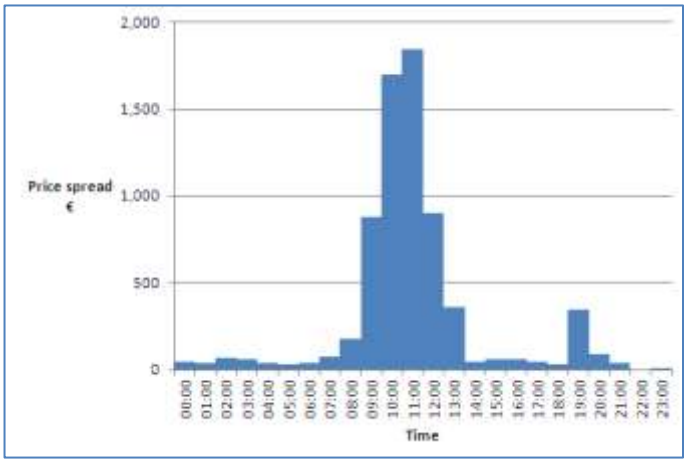

Figure 1 Price spread between FR-GB on 8th February 2012

Figure 2 shows the maximum monthly price spreads by border and direction using the historical period analysed. The maximum of the hourly price spreads were taken for each month. The spread of these maxima were then analysed and this is shown below. There are two bars for each border representing the different price spreads in each direction. Each bar is split at the average maximum monthly price spread. If the maximum monthly price spread is greater than €500, the actual figure is displayed on the right hand edge of the graph.

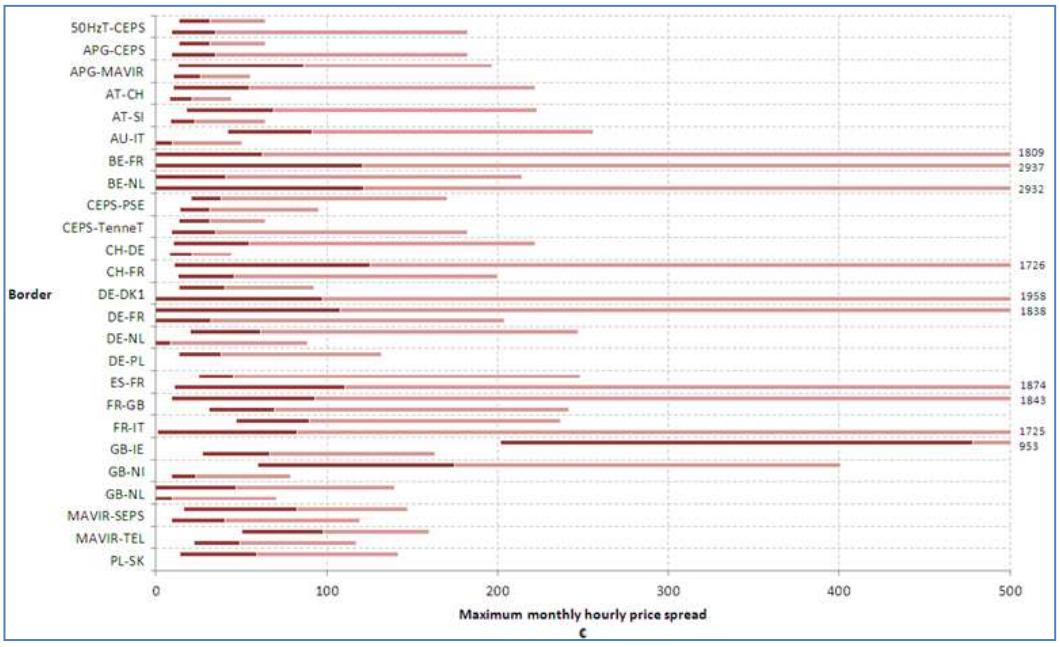

Figure 2 Maximum monthly price spreads by border and by direction

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Capacities between bidding zones are variable, but are generally of the order of a few GW. Therefore combining the above price spreads with the potential capacity that can be curtailed gives the maximum financial risk exposure that TSOs would face with market spread compensation. This is shown in **Figure 3**.

Price spread (€/MW)	Curtailment volume (MW)				
	100	500	1 000	2 000	3 000
10	1 k€	5 k€	10 k€	20 k€	30 k€
100	10 k€	50 k€	100 k€	200 k€	300 k€
500	50 k€	250 k€	500 k€	1 000 k€	1 500 k€
1 000	100 k€	500 k€	1 000 k€	2 000 k€	3 000 k€
2 000	200 k€	1 000 k€	2 000 k€	4 000 k€	6 000 k€
3 000	300 k€	1 500 k€	3 000 k€	6 000 k€	9 000 k€

Figure 3 TSO risk exposure per hour for different price spreads and curtailment volumes

Figure 3 shows that under market spread compensation, for a 3000MW curtailment and with a €3000 price spread, TSOs would be obliged to pay out €9million per hour. It shows that the costs of market spread compensation can be considerable and can reach magnitudes of the order of €millions per hour. If the curtailment lasted a few hours/days/weeks/months, then the compensation amounts can be considerable and significantly more than the congestion income available. Furthermore, if all capacity was curtailed then there would also be no income from the day ahead allocation. This missing money means the TSO has to cover the costs from elsewhere be it congestion income from other timeframes, or directly from network tariffs.

Impact of a monthly congestion revenue compensation cap

As shown in Figure 3, potential market spread compensation costs can be very high. Therefore ENTSO-E has proposed a capped market spread compensation regime. The following figures show that the ENTSO-E's proposal does not limit market spread compensation under normal conditions and only in very extreme events are the caps reached. This ensures that risks are shared between market parties and TSOs.

Impact of a cap between the long term firmness deadline and day ahead firmness deadline

Figure 4 forecasts the impact of a monthly congestion revenue cap[3] between the long term firmness deadline and the day ahead deadline for five different scenarios. The chosen scenarios reflect both very extreme scenarios (where market parties should share some of the risk), and realistic scenarios (where TSOs manage the risk). The percentages show how much of the time half of the border capacity could be curtailed and market spread compensation paid to market parties without capping.

As can be seen in the next page, a congestion revenue cap based on long term and daily allocation does not limit compensation payments in most realistic scenarios and on most borders. Therefore market parties will receive uncapped market spread compensation in normal circumstances and only in very extreme scenarios will the cap be reached, sharing the risks between TSOs and market parties.

[3] For the sake of readability the figures are based on a monthly congestion revenue cap on border basis

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		Extreme Scenario ⟵				⟶ Severe, but realistic scenario
		In how many percent of the months could the compensation be paid uncapped when curtailed **after** the Long Term Firmness Deadline, if...				
		A	B	C	D	E
		Compensation with price difference 3000€ for four hours	Compensation with price difference 1000€ for four hours	Compensation with price difference 100€ for 24 hours	Compensation with price difference 100€ for four hours	Compensation with price difference is the monthly maximum applied for four hours
AT	HU	27%	77%	93%	100%	100%
AT	SL	20%	73%	77%	100%	100%
AT	CH	13%	57%	87%	100%	100%
AT	IT	100%	100%	100%	100%	100%
BE	FR	13%	27%	33%	100%	97%
BE	NL	30%	97%	97%	100%	97%
CZ	50HzT	0%	0%	13%	90%	100%
CZ	TTG	0%	33%	70%	100%	100%
CZ	APG	0%	3%	47%	100%	100%
DE	CH	7%	60%	87%	100%	100%
DE	FR	43%	100%	100%	100%	100%
DE	NL	27%	57%	73%	97%	97%
DK1	DE	80%	100%	100%	100%	100%
FR	CH	33%	100%	100%	100%	100%
FR	ES	87%	100%	100%	100%	100%
FR	GB	30%	100%	100%	100%	100%
FR	IT	100%	100%	100%	100%	100%
GB	NI	50%	100%	100%	100%	100%
GB	IE	100%	100%	100%	100%	100%
NL	GB	67%	89%	100%	100%	100%
PL	DE	100%	100%	100%	100%	100%
PL	SK	79%	96%	96%	96%	96%
PL	CZ	80%	93%	93%	100%	100%
RO	HU	0%	23%	43%	100%	100%
SL	HU	10%	70%	80%	100%	100%

Figure 4 Percentage of time that full market spread compensation could be paid with a monthly total congestion income cap when half of the border capacity is curtailed between the long term firmness deadline and day ahead firmness deadline

Figure 5 is very similar to Figure 4, but instead of curtailing half the border capacity, it curtails the full border capacity. As for Figure 4, the conclusion is similar and only in very extreme scenarios will the cap be reached. However it should be recognised that curtailing the whole capacity on borders with several lines and a high interconnection capacity involved is unlikely.

		Very Extreme Scenario ⟵				⟶ Less Extreme, but still very severe
		In how many percent of the months could the compensation be paid uncapped when curtailed **after** the Long Term Firmness Deadline, if...				
		A	B	C	D	E
		Compensation with price difference 3000€ for four hours	Compensation with price difference 1000€ for four hours	Compensation with price difference 100€ for 24 hours	Compensation with price difference 100€ for four hours	Compensation with price difference is the monthly maximum applied for four hours
AT	HU	3%	53%	73%	100%	100%
AT	SL	0%	47%	67%	97%	100%
AT	CH	0%	37%	53%	100%	100%
AT	IT	100%	100%	100%	100%	100%
BE	FR	3%	17%	27%	47%	97%
BE	NL	3%	60%	90%	100%	97%
CZ	50HzT	0%	0%	0%	90%	93%
CZ	TTG	0%	0%	10%	100%	100%
CZ	APG	0%	0%	0%	100%	100%
DE	CH	0%	23%	53%	100%	100%
DE	FR	17%	77%	100%	100%	100%
DE	NL	13%	37%	57%	97%	97%
DK1	DE	40%	90%	100%	100%	100%
FR	CH	0%	72%	94%	100%	100%
FR	ES	37%	97%	100%	100%	100%
FR	GB	0%	97%	100%	100%	97%
FR	IT	83%	100%	100%	100%	100%
GB	NI	0%	100%	100%	100%	100%
GB	IE	0%	100%	100%	100%	100%
NL	GB	26%	74%	81%	100%	100%
PL	DE	61%	100%	100%	100%	100%
PL	SK	67%	88%	96%	96%	96%
PL	CZ	53%	90%	93%	100%	100%
RO	HU	0%	0%	7%	100%	100%
SL	HU	0%	40%	60%	97%	100%

Figure 5 Percentage of time that full market spread compensation could be paid with a monthly total congestion income cap when the full border capacity is curtailed between long term firmness deadline and day ahead firmness deadline

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Impact of a cap between the auction and the long term firmness deadline

		Extreme Scenario ← → Severe, but realistic scenario				
		In how many percent of the months could the compensation be paid uncapped when curtailed **before** the Long Term Firmness Deadline, if:				
		A	B	C	D	E
		Compensation with price difference 3000€ for four hours	Compensation with price difference 1000€ for four hours	Compensation with price difference 100€ for 24 hours	Compensation with price difference 100€ for four hours	Compensation with price difference is the monthly maximum applied for four hours
AT	HU	7%	60%	87%	100%	100%
AT	SL	0%	60%	67%	100%	100%
AT	CH	0%	40%	83%	100%	100%
AT	IT	97%	97%	97%	97%	97%
BE	FR	0%	10%	20%	100%	93%
BE	NL	0%	60%	97%	100%	97%
CZ	50HzT	0%	0%	0%	83%	100%
CZ	TTG	0%	10%	47%	100%	100%
CZ	APG	0%	0%	20%	100%	100%
DE	CH	0%	30%	77%	100%	100%
DE	FR	0%	77%	100%	100%	97%
DE	NL	0%	23%	43%	100%	100%
DK1	DE	0%	77%	100%	100%	100%
FR	CH	17%	89%	100%	100%	100%
FR	ES	37%	100%	100%	100%	100%
FR	GB	27%	100%	100%	100%	100%
FR	IT	100%	100%	100%	100%	100%
GB	NI	50%	100%	100%	100%	100%
GB	IE	100%	100%	100%	100%	100%
NL	GB	48%	81%	89%	100%	100%
PL	DE	48%	96%	100%	100%	100%
PL	SK	46%	71%	75%	92%	92%
PL	CZ	0%	47%	67%	100%	100%
RO	HU	0%	20%	37%	100%	100%
SI	HU	3%	63%	67%	100%	100%

Figure 6 Percentage of time that full market spread compensation could be paid with a monthly long term congestion income cap when half of the border capacity is curtailed between the long term auction and the long term firmness deadline

Figure 6 is very similar analysis to Figure 4. However this analysis only used the monthly forward auction revenue for compensation, while for Figure 4 it included both the forward and the day ahead congestion income. Therefore a cap in the amount of the long term congestion income also ensures that risks are shared between market parties and TSOs.

Impact on subsea cables and single circuit links.

The impact of changing the firmness regime has a severe impact on subsea cables and single circuit links. This is because the risk profile of these assets is fundamentally different compared with most borders and this impacts the ability of TSOs to provide a more secure firmness regime. Faults on subsea cables are of longer duration, while faults on single circuit links generally lead to curtailment as there are fewer contingencies (if any). Therefore (as can be seen in the ACER data) these links are more prone to curtailments and can last significantly longer.

The increase in compensation costs for single circuit cross zonal connections is compounded compared to borders with parallel circuits. When capacity is curtailed, price differentials between bidding zones increase. However with no parallel circuits to dampen the impact on market spreads, the increase can be marked, exacerbating compensation costs.

Potentially, faults on subsea cables can last for a significant period of time and generally longer than those on overhead lines. Therefore increasing the firmness regime and hence increasing curtailment costs impacts subsea cables and single circuit links significantly as there is less redundancy, they are more prone to curtailments and when curtailments happen, they may take significantly longer to resolve.

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Impact on merchant interconnectors

Merchant interconnectors have been built on the expectation that they receive congestion income without which they would not exist. Their business model requires enough congestion income to cover their operational costs (which may include the financing cost required to build the asset) and these can be considerable. Therefore if their congestion income is reduced through increased firmness costs, their business model may become unviable and the assets may cease to operate. Further for existing interconnectors changing the regulatory regime upon which the original investment was made imposes additional costs and there is little they can do to adjust.

Merchant interconnectors have very limited tools available to manage the risks of curtailment. As it has been demonstrated, the TSOs financial risk exposure for increasing the firmness regime compensation is considerable and can be €million's per hour. Merchant interconnectors are small entities with a small balance sheet. Therefore the impact of the increased cash flow volatility and risk is something that would impact these entities considerably and it is unclear whether this is something that they could bear.

Merchant interconnectors can be in parallel on the same border. If firmness costs are paid for through congestion income and that is pooled by border and not by asset, then a merchant interconnector will be exposed to the financial impacts of any curtailments of its competitor. For example a merchant interconnector might have to pay compensation to its competitors' capacity right holders because its competitor had to curtail, which again undermines investment potential.

Finally, multiple billions of Euros in investments is needed in the North Sea to facilitate the growth of renewable generation. Within the GB regime there is further 5 GW of interconnectors contracted to connect. However these projects require solid business cases to proceed. Imposing increased firmness compensation costs and the increased cash flow volatility that the firmness regime proposed by ACER will reduce the attractiveness for investors and may jeopardise investments and hence limit future interconnector investment. This in turn reduces cross-border market growth possibilities.

5. Conclusion

This paper explains that the divergent position between ENTSO-E and ACER is due to a fundamental different perspective on the type of product TSOs offer to market parties. ACER believe that TSOs offer a financial hedge between bidding zones, whereas TSOs believe that they offer a capacity product reflecting the capability of the transmission network to transfer energy with the associated risks. TSOs believe that the risks should be shared between those using the interconnections and TSOs, whereas ACER believes that all the risk should be borne by TSOs. The danger is that by moving all the risk onto the TSOs, this removes market party incentives to help resolve curtailments and in some cases might actually exacerbate the situation if market power is an issue.

ACERs position is based on underlying assumptions which ENTSO-E does not accept. ACER believes that TSOs are best placed to manage curtailment risk and market parties should not be exposed to any risk. While this may be true close to real time as this is TSO core business (hence why TSOs guarantee physical firmness after the Day Ahead Firmness deadline), in other timeframes the tools at a TSO's disposal are

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dramatically reduced. Market parties can and do trade across bidding zones and for many of them this is a core business task. The same is not true for TSOs who generally focus on the balancing timeframe, whereas this firmness risk is best managed ahead of real-time. Consequently **it is not evident that TSOs are best placed to manage this risk in its entirety** and by requiring TSOs to do so, total system costs may rise.

Curtailments happen for a variety of reasons, some of which are TSO controlled, while some are for instance caused by the actions (or inaction) of market parties. Market parties can significantly influence curtailments via their market behaviour and so should also share some of the responsibility and associated risks. Moving all the risk to TSOs **removes the incentive for market parties to help resolve curtailments.** Ultimately this means that the costs of capacity products are not providing an effective economic incentive to those using them as they are not exposed to the true costs of providing the increased firmness. This may lead to an increase in end user tariffs if these costs are not properly reflected.

Congestion income is used to guarantee the availability, increase interconnector capacity and where this is not feasible, reduce network tariffs. Therefore if firmness costs increase and are financed through congestion income, this **reduces the income that can be used maintain or increase interconnector capacities or reduce network tariffs** which then impacts end user tariffs.

This paper illustrates that the impact of adopting the firmness regime proposed by ACER is potentially severe for TSOs and the impact on sub-sea cables and single circuit links is even more acute. This is because these links have less redundancy, are more prone to curtailments and when curtailments happen, they may take longer to resolve. This is compounded if the links are "merchant" as in practice they have very limited tools to minimise the risk and are more susceptible to the cash flow volatility. Therefore across Europe the assets that underpin cross zonal capacity products are fundamentally different both in their physical characteristics and the national regimes that provide them. Consequently if these differences are not reflected within the applicable firmness regime, total system costs may increase, while at the same time **reducing the incentives on impacted borders to build more cross border capacity** needed to foster a pan European electricity market.

Therefore ENTSO-E has proposed a balanced firmness regime that allows for these risks. This paper demonstrates that under normal and severe system conditions ENTSO-E's proposal gives market parties a financial hedge for most curtailments and only in very exceptional circumstances would this be capped to avoid an excessive impact on end users via network tariffs. In all other cases, the risk is not shared with market parties and is born entirely by TSOs.

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