

ISP Harmonisation CBA Information Request

QUESTIONS AND ANSWERS

Introduction

ACER has reviewed the draft Network Code for Energy Balancing (NC EB) and has proposed that the Imbalance Settlement Period (ISP) duration be harmonised at 15 minutes. ACER also proposes that its recommendation on the ISP be assessed by a cost benefit analysis (CBA) to be undertaken by ENTSO-E before the NC EB enters the Comitology process.

ENTSO-E has asked Frontier to support the process of undertaking a CBA of a change in ISP. To obtain relevant inputs to the CBA process ENTSO-E is asking for data from stakeholders across Europe via a questionnaire.

The questions and answers listed here are intended to assist stakeholders in responding to the questionnaire.

The questions and answers are grouped according to general questions and to the structure of the questionnaire:

- general;
- respondent details;
- current system;
- costs; and
- benefits.

This is a live document and will be updated from time to time.

General

1. Q: Is it possible to subscribe to any updates to the information on the 'Cost Benefit Analysis for the Imbalance Settlement Period' webpage? And, for when details of the Cost Benefit Analysis webinars are made available?

A: No automatic function is possible. Notification could be sent to the Balancing Services Group (BSG) after an update.

2. Q: The spreadsheet is locked so that we cannot increase the width of the rows in the spreadsheet. While we can put in all the data we need, this wouldn't necessarily all be visible to Frontier or others, e.g. when printing, unless the reader clicks on each cell. So I don't know whether Frontier

would consider releasing an unlocked version so we can expand the row width and make all our data visible?

A: Frontier will import all data provided in the Excel spreadsheet, including the “non-visible” data. Therefore, no data will be lost. For your convenience, an updated file is available online where the width of rows and columns can be edited.

3. Q: Is it possible to enter N/A in a cell that requires a quantitative response?

A: We would prefer the cell to be left blank in this case.

4. Q: Would a response be valuable for the analysis in cases where a respondent is able to speculate on the general impact of the proposed changes, and identify areas where they think there would be a benefit, a cost, or an impact on volumes, but cannot possibly provide cost/benefit values or actual volumes?

A: We would appreciate if you could provide qualitative responses in case quantitative ones seem not feasible for you, either under comments or in a separate document.

5. Q: On the questions where for some reason it has been assumed that the effects of a shorter ISP would be a reduction of costs, decrease market order spreads etc, I wonder how it is possible to instead indicate increased costs, larger spreads etc in the response sheet? The fact is that in some markets and trading phases the effects can be clearly negative, and in general a CBA shall never assume the effects of a change to only be positive or negative.

A: On the “benefits” tab, the reduction of costs is asked for. In case a stakeholder expects rising costs he can either fill this in the cost sheet under a comparable item or insert a negative value in the benefits sheet. Double counting should hereby be avoided. A comment for clarification is welcome.

6. Q: How will Strict Confidentiality of cost/revenue figures given by specific Parties be assured? Is it simply possible to declare that all inputs must be treated confidentially, thus only published in aggregated form for all respondents?

A: Data will only be published in aggregated form on country level and stakeholder group. Where there is only one stakeholder in the stakeholder group in a given country, intermediate calculation steps will be described qualitatively, calculation outputs will also be published, but only non-confidential data inputs will be published.

7. Q: How will transparency of background assumptions be assured for figures on added costs and revenue that regulated monopolies that are not part of the competitive market (eg TSOs) have provided? The reason for the importance of such transparency is that reduction of costs or added revenues for such (TSO) entities can be transferred (and often negatively) to

companies part of the competitive market without them having any chance to be compensated for it.

A: The same confidentiality conditions will be applied to regulated monopolies as for all other stakeholders. When changing the ISP some costs may be shifted from TSOs to stakeholders. We will ensure consistency in the responses, and the report will be transparent in the assumptions made in terms of transfer of costs and revenues across different stakeholders.

8. Q: Are stakeholders expected to answer for all three degrees of certainty (low, central, high) for all costs and benefits items?

A: Stakeholders are encouraged to answer for all three degrees of certainty as this will be used in the cost benefit analysis eventually. If respondents are not able to quantify a lower and an upper case, we would ask that they aim to indicate qualitatively in the comments column their view on the potential degree of deviation from their central estimate. This will aim to avoid that the central estimate is misinterpreted as a certain value.

9. Q: If the current ISP duration in the local market area is 30 minutes, are respondents from that market area expected to fill in only the columns considering a move to 15 or 5 minutes?

A: In this case, respondents should fill in the columns considering a move to 15 or 5 minutes. Respondents are also invited to share their expertise on the costs and benefits of moving to 30 minutes. Stakeholders should clarify in the comments boxes that their response builds on past experience and provide appropriate justification for the costs and benefits values they indicate. Frontier Economics and ENTSO-E will take such responses into account when deriving the CBA, with due consideration being given to the specific context of the estimates provided.

10. Q: In the case where an industry association is collating answers from several stakeholders, can the association compile a single answer for each relevant stakeholder role, including by taking the average of estimates (scaled where appropriate) provided by various stakeholders?

A: In principle this is fine, however there is a risk that the averages will hide the diversity of views among stakeholders. The CBA should in the end reflect this diversity. Therefore the industry association should use the lower/upper cases as well as the comments boxes to document the diversity of views (or flag where there is no diversity of views).

11. Q: Where should stakeholders comment on additional issues not envisaged in the survey structure?

A: Respondents should use the comments columns as well as the “other” rows in order to flag any issues, costs or benefits which are not captured elsewhere in the questionnaire.

Respondent details

1. Q: How can the respondent know what inflation rate to use (sub-section 0.1)?

A: We assume that when projecting forward costs or benefits to 2020 and to 2030 that the respondent will have explicitly taken a view as to how to inflate prices. We are asking for the respondent's assumption about inflation used to inflate its cost or benefits in order for us to calculate the net present value.

2. Q: Do respondents necessarily have to use an inflation assumption?

A: Respondents who fill in the questionnaire on a real basis, without inflating prices, we ask that they specify this in the inflation section as well as in the assumptions boxes. Respondents should note that these answers will be inflated as part of the cost benefit analysis.

3. Q: What is the difference between an aggregator and a broker (sub-section 0.2)?

A: A broker brings together a buyer and a seller (in this case of contracts for the delivery of power in the future) thereby facilitating or arranging a transaction. An aggregator pools the supply from a number of different small generation sites or small end user sites. For example, in GB demand side aggregators are used in order to reach the minimum scale required to sell balancing services to the TSO. An aggregator could also, for example, pool supply and/or demand for the purposes of imbalance settlement.

4. Q: How should a respondent fill in the allocation of benefits and allocation of costs (sub-section 0.2)?

A: The sum of each column (cost and benefits) should be 100%. Where a respondent has multiple activities, e.g. generation and retail supply, it can either use this section of the questionnaire to allocate benefits and costs between the two activities (e.g. 60%/40% for costs and 55%/45% for benefits). In this case all costs and all benefits would be allocated between the two activities according to the percentages.

Alternatively, the respondent could fill in a separate questionnaire for each of its activities. This allows a more detailed cost and benefit breakdown between activities.

Here we would like the respondent to provide information about their direct costs or benefits. For example, where a TSO directly incurs costs and these costs are all passed to end consumers through tariffs, we would like to know about the TSO's direct costs. The TSO should note in a comment box if its costs are passed to others and to whom.

5. Clarification: Scale (sub-section 0.3 to 0.11).

A: It would help with the cost benefit analysis if TSOs or NRAs could provide information about the aggregate size of the market where possible for sub-sections 0.3 to 0.11.

6. Q: Are trading volumes gross or net volumes (sub-section 0.3)?

A: Gross traded volumes, i.e. the sum of volumes bought plus the sum of volumes sold.

Where TSOs buy loss energy from the wholesale market and sell RES-E energy in the wholesale market they should report both as traded volumes.

7. Q: Is the number of settlement transactions for imbalance settlements the number of invoices or the number of transactions (sub-section 0.4)?

A: The number of transactions. For example, if there were one transaction per settlement period in a balancing zone with 15 BRPs and a 60 minute ISP, the TSO (or central settlement agency) would face $15 \times 24 \times 365$ transactions per year.

8. Q: Should TSOs reply to sub-section 0.5?

A: Yes it would be very helpful for TSOs to reply to the questions about scale since they will help us to understand the size of the market. For example, for an activity the TSO could say that it doesn't participate in the activity while still providing information about the size of the market.

9. Q: Do you mean MW or MWh for reserve power (sub-section 0.5)?

A: Average MW.

10. Q: sub-section 0.11 – where a power exchange covers several countries (balancing zones), should respondents indicate the percentage of the number and volume of trades on the whole power exchange or the percentage of the number and volume of trades in the local market area only?

A: The percentage of the number and volume of trades in the local market area only.

11. Clarification: sub-section 0.7. In keeping with the approach taken to estimating the cost of changing meters, respondents should indicate here the number of meters read and settled at ISP duration, and express this as a % of the total number of meters read and settled at ISP duration in the relevant market area.

12. Q: questions regarding numbers of meters/customers (0.7.5, 0.8.3, 0.9.4 and 0.9.6) – note that this question was asked in relation to GB specifically; respondents from other countries need not consider this unless a similar issue arises in their market area.

If the respondent does not know number of customers and also the absolute number of meters in the market, can the respondent provide total number of

MPANS (30min ISP meters) and MSIDs (30Min ISP meters), which are probably a close enough proxy (although some MPANS may have 2 meters, eg Peak and Off peak and for the large ISP meters eg at power stations, there is often an “Active” and “Check” meter)?

Also it is the “Outstation” that sends the meter data back into settlement for the big ISP sites that will need to be changed/recalibrated in most circumstances (this is complicated by the meter and outstation being either integrated in one unit or separated) rather than the meter itself. And as mentioned there are often master “Active” and back-up “check” meters at each site that will need to be considered. This means for example that 4 Unit power stations could either have a minimum of 4 “active” meters stated in the response or 8 “Active and Check” meters as well as other closely related grid meters in pairs.

A: The description of assumptions will be helpful for interpreting the responses in these circumstances. Please provide the number of MPANs and / or MSIDs, and specify whether these are the only meters that would need to be changed with the change to ISP duration (i.e. the response to 0.9.4)?

Regarding the number of meters, where the respondent knows the total number of meters (i.e. active and check), the respondent should provide (i) the number of active meters; and (ii) the number of active + check meters. This will allow us to ensure data is consistent across responses while also allowing us to scale costs up to the entire market.

13. Q: when providing the market level data (denominator) for 0.4.4 (settled volumes % of market), several options could be taken. Note that this questions was asked for GB specifically; respondents from other countries need not consider this unless a similar issue arises in their market area.

Options include every ISP (30mins) in year multiplied by number of settlement runs (5 inc reconciliation runs) by number of BMUs... Since each BSC reconciliation run (and dispute runs, and extra-settlement runs) involve calculations at the settlement period resolution, and all include data volumes at that resolution, should they be counted? Note that data number will huge and sub-options including using MWhs for transmission losses and other market activity has been considered. Also, if a party only uses its Production Account, does it have settlement transactions against its Consumption Account (and vice-versa)? The numbers are always zero, but calculations are taking place and systems are validating them. An alternative would be to use the number of invoices issue which is roughly one per working day but includes the net bill for all settlement runs for that day

A: We would use the number of settlement transactions (0.4.2) and the settled volumes (0.4.3) to scale up the cost of changes to systems and processes to calculate and settle imbalances systems to represent the entire

market. The relevant number of settlement transactions would refer to the settlement for each ISP and BMU account, e.g. 17520 x (number of BMU production accounts + BMU consumption accounts).

14. Q: Should the detail of demand from large pumped storage power stations in the UK be included in the demand information provided in section 0.9?

A: Yes, please include the information in 0.9 and make a comment that this relates to two large pumped storage power stations.

15. Q: In question 0.5.1, what is your definition of reserve power, and how are you defining primary, secondary and tertiary reserve?

A: This question asks if you contribute to balancing markets, concretely in primary, secondary or tertiary. Primary relates to Frequency Containment Reserves, Secondary to automatic Frequency Restoration Reserves and Tertiary to manual Frequency Restoration Reserves and Replacement Reserves.

Follow-up Q: Is your definition of Reserve power completely relating to instructions that are issued by the Transmission System Operator (TSO) to generators to vary their outputs to manage the system frequency?

Follow-up A: Yes, this relates to instructions that are issued by the TSO to vary output to manage system frequency. This is also to be seen in relation with benefit questions under 3.1 which ask for the expected reduction in balancing actions by TSOs / increased actions by BRPs.

16. Q: For question 0.5.2 how are you defining 'trades' within the context of reserve power?

A: This question asks for trades made, thus offers in balancing market which have been selected.

Follow-up Q: Are the 'trades' you refer to relating to instructions issued by the TSO to vary output for frequency management purposes?

Also, in the GB market, frequency instructions are issued automatically by the TSO. Generators have a mandatory requirement to respond to these instructions, offering Primary, Secondary and High frequency response types. In addition the TSO can enter into long-term contracts with generators for the provision of frequency response, with the generator running at a contracted output to enable provision of agreed frequency response volumes when instructed. Therefore when you ask for 'Number of Trades' is the expected answer for a GB based generator the number of individual instructions to vary output for frequency response management? And equally for Average Bid (MW) are you looking for the average volume of output variation per frequency instruction?

Follow-up A: Yes, these questions relate to instructions that are issued by the TSO to vary output to manage system frequency. This is also to be seen in relation with benefit questions under 3.1 which ask for the expected reduction in balancing actions by TSOs / increased actions by BRPs.

Yes, when we ask for 'Number of Trades' the expected answer for a GB based generator is the number of individual instructions to vary output for frequency response management.

The average bid corresponds to the bids made by generators offering frequency response that the TSO can then activate.

17. Q: In cases when the overall volume for a given market product or Ancillary Service is not known publically per Member State, Bidding Zone or Region how shall participants provide answers to questions that are based on giving info on their market share? Is it simply ok to note volumes in MWh per given geographic and product dimension?

A: Volumes per stakeholder per geographic and product dimension is fine if overall market volume is not known. Estimates are also welcome.

18. Q: What is the appropriate source for the denominator in order to calculate a value for 0.3.4?

A: The denominator for this question should be total gross traded volume in the relevant market area. Information on this variable would typically be found in reports by the regulator, power exchanges or market operators.

19. Q: Should suppliers and generators answer the questionnaires as BSPs and/or BRPs?

A: Stakeholders should answer the questionnaire for all the roles that they play on the relevant market area. Whether both supplier and generators answer as BRPs will depend on local rules regarding balancing responsibility. Equally, both suppliers and generators could be BSPs to the extent that Demand Side Response might be able to provide balancing services in the local market area.

Current system

1. Q: Do all respondents need to provide information about the current system?

A: It is important that TSOs, DSOs (or DNOs) and NRAs provide information about the current system for each country. Not all respondents need to fill in this section of the questionnaire.

2. Clarification: Imbalance settlement (sub-section 1.1).

ISP Harmonisation CBA Information Request

A: This group of data is labelled as relating to imbalance settlement. However, some of the information relates to imbalance settlement and some relates to the physical operation of the network, e.g. Final Physical Notifications. In the case where a TSO is not responsible for imbalance settlement, it could choose to provide data only related to the physical operation of the system i.e. elements 1.1.3 and 1.1.4.

3. Clarification: Gate closure time (sub-section 1.1.3).

A: The help box linked to the comment cell asks for the time before gate closure. This is incorrect and it should ask for the time before the beginning of the start of the ISP. This has been updated in the latest version of the tool. Note that this gate closure refers to the point in time by when final physical notifications of BRPs must be submitted to the TSO.

4. Q: What is a Physical Notification (sub-section 1.1.4)?

A: The physical notification is the information about expected output from a generation unit or expected consumption from a consumption unit that is provided to the entity managing the transmission system, e.g. TSO. The final physical notification would be required to be made prior to the final gate closure before the start of the ISP.

5. Clarification: Granularity of Final Physical Notifications (sub-section 1.1.4).

A: For the purposes of the cost benefit analysis we assume and would like respondents to assume that where the granularity (e.g. 30 minutes) of the information provided by the final physical notification is the same as the ISP duration (e.g. 30 minutes) that the granularity of the information changes in line with any change to ISP duration. Where the granularity of the information provided by the final physical notification (e.g. 1 minute) is independent of the ISP duration (e.g. 30 minutes) the granularity of the information is not affected by the ISP duration, so long as the ISP duration is as long or longer than the granularity of the information provided by the final physical notification.

The help box linked to the comment cell asks for when the final physical notification takes place. This is incorrect and should ask for the granularity of the information provided by the final physical notification, in minutes. This has been updated in the latest version of the tool.

6. Q: Regarding meter roll-out, item 1.3.1.d : where the replacement of meters is already on-going, the new (smart) meters are set up with values suitable for the present local ISP duration. To fit to a future new ISP duration, they will need to be reconfigured remotely. We consider that such a future remote reconfiguration doesn't come within the scope of item 1.3.1.d that only deal with the current system. Thus, we only intend to charge the relevant item (2.2.1) of the sheet « Costs » with the related costs. Could please give us your

view on that point? Respondents should note this question was asked specifically in relation to France, where a smart meter roll out has been decided. The answer should be seen as relevant to all those countries where a smart meter roll out has been decided.

A: This is correct. As the smart meter rollout in your case has already been decided and is ongoing, this should be assumed as part of the status quo. So, in 1.3.1 the number of meters which can be remotely reconfigured should be the number of meters that will have to be remotely reconfigured after the already decided rollout. Costs arising for a future change of these meters due to the ISP change should be filled under item 2.2.1.

Costs

1. Q: Where the zone in which a respondent operates is not going to move to a 30 minute ISP (e.g. if it already has a 30 minute or 15 minute ISP, or they do not intend to go to a 30 minute ISP where the current ISP is 60 minutes) does the respondent need to enter data under the 30 minute ISP columns in costs?

A: No, please leave the cells blank in this case. However, where the respondent has experience of the costs of moving from a different ISP to its existing ISP duration, this information would be helpful. The respondent should indicate in the comments section that no change is required and that the cost information provided for its current ISP duration is for information purposes only.

2. Q: Column BW is labelled “Introduction of 5 minutes ISP duration”. What do you want respondents to enter?

A: The column should be labelled “Introduction of 10 minutes ISP duration”. We would like respondents to indicate whether and how costs would differ from those required for the introduction of the 5 minutes ISP duration. This has been updated in the latest version of the tool.

3. Q: What should be entered for depreciation period?

A: The number of years of the depreciation period for the asset to which the capex relates.

4. Clarification: Scope of costs.

A: We would like respondents to provide information about the costs they face. If costs that other stakeholders face are included, please indicate this in the comments to avoid us double counting costs.

5. Clarification: Breakdown of costs by category.

A: We would like respondents to where possible break down costs into the categories provided. Where it is impossible to breakdown costs, respondents

could bundle costs into fewer categories than provided. If costs are bundled please indicate this since this will help us when reviewing responses and looking for outliers.

6. Q: I am aware that there may be some derogations allowing a delayed implementation of the change to ISP duration. How should this be taken into account in the response?

A: We would like respondents to assume the implementation date of late 2019 when estimating their costs. However, were a delayed implementation to have a large effect on costs, respondents may indicate this in the comments column. In this case, please indicate the assumption regarding implementation and the size of the effect of costs.

7. Clarification: Metering and notification systems (sub-section 2.2).

A: The guidance document states that “*the meters considered here are only those that are read for the purpose of imbalance settlements; a meter is changed/reconfigured to match ISP duration only if prior to the ISP reduction the meter reading period matched ISP duration; and all meters whose meter reading period matched the ISP duration prior to the ISP change are updated to match the new ISP duration.*”

We clarify that only those meters that are currently read and settled on an ISP basis *and* for which a change to the reading and settlement period would likely be beneficial would need to be changed/reconfigured in line with a change to the ISP. The intention is not to assume that meters are changed/reconfigured where the costs would clearly outweigh the benefits as would likely be the case for household customers if the ISP were changed from, say, 60 minutes to 15 minutes or 5 minutes.

8. Q: We believe that reducing the ISP doesn't have any “necessary” implications in domestic customers (sub-section 2.2). However, we believe that changing the MTU for the intraday market implies changing domestic smart-meters already rolled out. We can do two different things in the CBA: (i) consider that the MTU in the intraday market changes to 5/15/30 min and domestic smart-meters already installed have to be modified or replaced accordingly; or (ii) consider that the MTU in the intraday market remains at 60 min and domestic smart-meters already installed don't have to be replaced. What should we assume?

A: Respondents should assume that the market time unit (MTU) for intraday markets corresponds to the ISP. Further, respondents should assume that not all meters would have to be modified or replaced, e.g. for domestic consumers profiling could be used to avoid the high costs of meter modification or replacement. In this case, respondents should include the cost of changing profiling systems (under reconfiguration costs).

9. Q: What does settlement mean (sub-section 2.3): imbalances for balance groups within a control area or unintended deviation of each control block? If we are talking about imbalances for balance groups, which point covers the ENTSO-E settlement including unintended deviation and ITC mechanism? Or, are these two processes not considered in attached questionnaire?

A: Settlement costs means the costs related to central systems and processes required to calculate and settle imbalances and the participant systems which interact with these, and the cost of changing the systems and processes to facilitate the settlement of trades (bilaterally and on exchange). The costs of changes to other settlement systems required as a result of the ISP change should be included under '2.3.5 other'.

10. Q: When looking at figure 1 on page 11 of the guidebook, it seems that item « 2.2 Metering and notification systems » is not supposed to come within the scope of DSO's answers. Could you please confirm that costs charged on this item will be taken into account even if the questionnaire is filled in using the sole role « DSO »

A: We intend to assess as far as possible all costs and benefits. When drafting the guidebook we didn't expect DSOs to have cost information on item 2.2, but, if you do, please fill in your expected values and explain in the comment where these costs arise. We confirm this information will then be taken into account.

11. Q: Within the sheet 2_Costs what costs are expected to be entered for OPEX 2020 and OPEX 2030? Are these only the ongoing operational costs for the year 2020 alone and the year 2030 alone? For the year 2030 is it expected for the year 2030 or for the decade from 2021 to 2030?

A: The costs that are expected to be entered for OPEX 2020 and OPEX 2030 are the ongoing operational costs for the year 2020 alone and the year 2030 alone.

Benefits

1. Q: Column AI is labelled "Introduction of 5 minutes ISP duration". What do you want respondents to enter?

A: The column should be labelled "Introduction of 10 minutes ISP duration". We would like respondents to indicate whether and how benefits would differ from those required for the introduction of the 5 minutes ISP duration. This has been updated in the latest version of the tool.

2. Q: What do I respond if I am having difficulty estimating a quantitative response?

A: Please try to provide a quantitative response where possible and where you have a reasonable estimate, providing supporting assumptions. Even if a respondent cannot provide a quantitative response it should describe qualitatively how the change to ISP would affect outcomes, how this would translate into a benefit, to whom the benefit would accrue and the approximate scale of the benefit.

3. Q: Where the zone in which a respondent operates is not going to move to 30 minute ISP (e.g. if it already has a 30 minute or 15 minute ISP, or they do not intend to go to a 30 minute ISP where the current ISP is 60 minutes) does the respondent need to enter data under the 30 minute ISP columns in benefits?

A: No, please leave the cells blank in this case. However, where the respondent has experience of the benefits of moving from a different ISP to its existing ISP duration, this information would be helpful. The respondent should indicate in the comments section that no change is required and that the benefit information provided for its current ISP duration is for information purposes only.

4. Q: To quantify answers to questions of part 3 (benefits), we would need a view on the imbalances experienced by TSOs (i.e. ACE open loop), on at least a 5 minute basis. We see that currently on TSO websites with any data available, the granularity is at most on a 15 minute basis, which is insufficient to provide the required answers.

A: The data are not available and their computation would be complicated. Stakeholders should apply their best estimates.

5. Q: What are secondary trading volumes (sub-section 3.2)?

A: Secondary trading volumes refer to wholesale market trades of contracts to deliver power, in this sub-section with a focus on intra-day timescales.

6. Q: Throughout the assessment of benefits, what assumption should be made about the relationship between ISP and MTU? In particular, how should we treat countries where currently ISP and MTU are not aligned?

A: Respondents should assume that ISP duration and MTU have been aligned by the time the change in ISP duration is implemented. ISP duration and MTU would therefore be aligned to the status quo ISP duration, and MTU would have to be changed in the event of a change to ISP duration.

7. Q: What is the type of qualitative information that would be useful to provide? Please can you give an example?

A: Example for sub-benefit 3.1.3 cross-border effect. It would be useful for respondents to provide their assumptions on:

- The drivers for the reduction in unit costs: what is the type of technology (OCGT on gas, CCGT on gas, hydro, DSR etc.) that is accessed on a cross-border basis that allows a reduction in the cost of dispatch/price to be achieved?
- The volumes that are expected to be traded cross border, as a share of total load. This would reflect for instance the availability of the capacity discussed above, as well as interconnector capacity.

Frontier Economics Limited in Europe is a member of the Frontier Economics network, which consists of separate companies based in Europe (Brussels, Cologne, London & Madrid) and Australia (Melbourne & Sydney). The companies are independently owned, and legal commitments entered into by any one company do not impose any obligations on other companies in the network. All views expressed in this document are the views of Frontier Economics Limited.