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Auction design for capacity allocation in gas transmission networks

FINAL REPORT PREPARED FOR ACER

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Executive Summary

ACER appointed Frontier Economics to review the auction design for allocation of transmission network capacity at EU Interconnection Points (IPs) set out in the Network Code for the Capacity Allocation Mechanism (NC CAM). The NC CAM has been prepared by ENTSOG on the basis of a Framework Guidelines issued by ACER. The process adopted included significant stakeholder involvement and a number of formal consultations. Following formal submission of the NC CAM to ACER in early March 2012, ACER will prepare a reasoned opinion of the document for consideration by ENTSOG, according to the process set out in Gas Regulation 715/2009.

The NC CAM

The NC CAM responds to the provisions of the Framework Guidelines by defining a set of standardised capacity products to be offered in transparent and non-discriminatory online auctions at IPs. There are expected to be some 130-150 IPs. The intention is that TSOs on each side of an IP will offer bundled capacity permitting a shipper to move gas from a hub located in one entry exit system to a hub located in another. The NC CAM includes a process to achieve bundling of capacity. At least 10% of the capacity is to be reserved for short term products equal to one quarter or less. The auctions for each product type will take place concurrently at all IPs. The NC CAM defines in some detail the auction methodologies to be used by the TSOs for different product types.

Our approach

The objectives of the NC CAM are:

- to ensure a more efficient allocation of the capacity at IPs between and within Member States; and
- to support the creation of efficient gas wholesale markets.

We have accordingly based our review on objectives of efficient allocation, compatibility with existing wholesale markets, non-discrimination and transparency and workability. We have also looked at academic papers on modern auction practice. Finally, we have considered recent experience in the design and implementation of gas release auction in Europe and the results of the simulation exercise conducted with NRAs.

We first address whether the NC CAM is compliant with the Framework Guidelines. We then review the capacity products defined in the NC CAM and the design of the auctions through which the products will be sold.

Compliance with the Framework Guidelines

Our view is that the NC CAM provides a high degree of compliance with the Framework Guidelines. There are nevertheless some areas where the NC CAM is either only partially compliant or non-compliant. These are:

- Standardised contracts – there are standardised products but no standardised model contracts to support them, as required by Section 1.4 of the Framework Guidelines.

- TSO co-operation – ENTSOG found it impossible to agree a harmonised method of capacity calculation at IPs among TSOs in order to determine the capacity that they shall jointly offer at IPs, an implied requirement of Section 2 of the Framework Guidelines.

- Interruptible capacity - very little is said about the process to be used for alignment of interruptible capacity services among TSOs, as required by Section 2.2 of the Framework Guidelines.

ENTSOG acknowledges the first two of these issues in a supporting document and gives reasons for departing from the requirements of the Framework Guidelines.

Depending on the interpretation of the Framework Guidelines, the fact that the NC CAM does not apply the definition of standardised products and the establishment of booking platforms to new capacity may also be considered as non-compliant. However, we note that Section 1.2 of the Framework Guidelines is not clear on this point.

A final point concerns implicit auctions of capacity, otherwise referred to as market coupling. While the NC CAM is compliant with the Framework Guidelines in recognising that TSOs may implement implicit auctions, we note that in practice significant day ahead capacity would have to be available if market coupling were to be a practical proposition. The reservation of 10% for all shorter term products is unlikely to achieve this. Some capacity for coupling may be provided by UIOLI arrangements under the CMP. However, if there is to be market coupling, consideration should be given to holding back a proportion of capacity for day ahead use in coupling.

We now summarise the results of our review of the capacity products to be offered and of the action designs to be employed, as set out in the NC CAM. These are both areas where the proposals are compliant and our aim is to consider whether there is scope for improvement in the context of the objectives and criteria set out above.

Executive Summary

Review of capacity products

The NC CAM proposes standardised Yearly, Quarterly, Monthly, Daily and Within Day Products. Subject to the capacity reserved for shorter term products, all capacity is to be offered in the form of Yearly Products from the following Gas Year out to Year 15.

With regard to this long-term capacity offering, we suggest that ACER may wish to consider whether it is desirable to offer all of the capacity out to Year 15 without any limit. We think a quota on the proportion of the capacity that can be offered beyond Year 5 could well be beneficial for the proper functioning of competition in the gas market. Our suggestion would be to reserve at least 35% of capacity to be offered only in the period out to Year 5[1], leaving 65%, or less, to be offered for Year 6 – Year 15. As in the case of the reservation for shorter term products, NRAs could decide to reserve a higher proportion of capacity to be offered only in this medium term period.

With regard to the capacity products to be sold in the long term auctions, we have noted that a significant minority favoured Quarterly Products rather than the Yearly Products proposed in the NC CAM. The reason is a desire on the part of some shippers to acquire profiled capacity. Our view is that this is not a sufficient reason to oppose the view of the majority. However, we think that to some extent this preference for Quarterly Products expressed by some shippers may be due to their expectation that quarterly and monthly tariffs will not reflect economic cost and we recommend that seasonal capacity tariff differentials be carefully considered in the context of the Tariff Code to ensure that they are consistent with the pattern of demand.

With regard to the shorter term products, we suggest that it would be beneficial to liquidity to offer the Quarterly Product in June for both Year 1 and Year 2 (8 quarters in total). This may be helpful to the significant number of stakeholders who would have preferred use of a Quarterly Product in the longer term auctions. We note that implementing this requires a change to way that the current reservation of capacity for short term products is defined and may all also require an explicit reservation of capacity that is released two years ahead.

The NC CAM recognises that at some IPs, the relevant TSOs will not agree on the capacity on either side leaving an unmatched amount after capacity bundling. With regard to the proposal to sell unmatched, unbundled capacity, we have concluded that this could impede the objective set out in the Framework Guidelines to bundle all capacity. This could occur if, after sale of the unbundled capacity, there is an increase in the capacity at the other side of the IP. We think this proposal should be reconsidered.

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1 This includes the reservation for shorter term products of at least 10%.

The NC CAM reflects the requirement to reserve at least 10% of the technical capacity for shorter term capacity products but makes this subject to there being at least 10% of the technical capacity being available for allocation. We agree with this approach. In the absence of a common methodology to determine technical capacity, there is a risk that the TSOs will still have a different view of what has to be sold as short-term products. We think that to avoid any potential disagreement between TSOs, the 10% should apply to the lower estimate of the technical capacity.

The role of interruptible products in releasing booked but unused capacity will be less significant after adoption of the guidelines on congestion management procedures, notably Use It or Lose It (UIOLI) arrangements. In this context, the NC CAM says that, as a minimum, TSOs must offer a day ahead product and must also offer virtual back haul where there is no physical reverse flow. The NC CAM also proposes a default interruption notice time of 2 hours but says that TSOs may jointly agree a different period. We suggest two adjustments to these proposals:

- First, we think TSOs should have to justify any reduction in the 2 hour default interruption lead time to their NRAs.

- Second, we think that in relation to interruptible, virtual backhaul capacity, TSOs should consult on what products to offer before limiting the offering the Day Ahead Product alone[2].

Finally, there are three other general matters in relation to products where we think that the NC CAM could be improved. These are:

- The rights of holders of Yearly, Quarterly and Monthly Products to cascade the capacity into a number of shorter term products that can then be traded in the secondary markets should be made explicit.

- The NC CAM should stipulate that the maximum size that TSOs can set for the minimum contract size and the volume increment is equivalent to 24 MWh per day, to provide a high degree of flexibility.

- Capacity that is surrendered or re-offered due to UIOLI under the CMP code should be identified specifically in the calculation of capacity to be offered and, the allocation rules for it made explicit in the auction algorithms once the CMP proposals are finalised. The capacity would be offered in the same auction as unsold capacity and the product would be identical from the viewpoint of shippers.

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2 We note that on one interpretation of the NC CAM, there may already be a requirement to offer a full range of interruptible backhaul products.

Review of auction design

The NC CAM proposes co-ordinated but independent auctions of each product type at each IP. For example, there would be annual auctions of 15 Yearly Products in which the capacity for each year is offered independently at each IP. Shippers will need to be allocated capacity in each auction in order to acquire a continuous band of capacity.

The NC CAM proposes use of an ascending clock auction algorithm for all products other than the Day Ahead and Within Day. These are to be sold using a sealed bid, uniform price auction.

We fully support use of the ascending clock auction as we think that price discovery will be a valuable feature for many shippers at this stage of development of the gas market. We also support the use of uniform price methodologies as they encourage efficient allocation and facilitate participation by less experienced shippers.

To simplify the auctions as much as possible, IPs that link the same entry/exit zones are to be offered as virtual IPs, but this may take up to 5 years to implement after the NC CAM comes into force. If there are likely to be significant delays before virtual IP implementation is possible, we suggest consideration be given in the ascending clock auctions to applying the monotonicity activity rule not to each IP singly but to shipper"s aggregate demand across the relevant IPs. This would allow shippers to move their demand from one IP to the next as the auction proceeds in response to the information made available at the end of each round.

Even once virtual IPs are in place, there will continue to be indirect substitutes, with gas flowing via another entry/exit zone, and capacity at different borders which are complementary in relation to gas flows contemplated by shippers. These relationships can be challenging to handle in independent auctions, especially at time horizons where there is limited price information from the gas commodity markets. We suggest that consideration be given to enabling the release of long term capacity (the annual auctions of Yearly Products) in at least two tranches so that shippers have a second chance to acquire the capacity that they need. This approach would be an option available to TSOs if there were a shipper preference for its use at specific groups of IPs and the relevant NRAs were in agreement. The auctions for each tranche of capacity would take place sequentially with a short interval of time between each one.

With regard to the sale of capacity for periods beyond the lead time for investment in incremental IP capacity, we have concluded that shippers face a significant risk if they pay a premium for the existing capacity and this is subsequently increased. We think that serious consideration should be given to some form of protection for shippers in the event that such an expansion occurs. A possible arrangement to explore would be not requiring shippers to pay any

more than those acquiring incremental capacity at the same IP for the same period in open seasons.

We have considered whether the ascending clock algorithm is likely to lead to prices for capacity that are the lowest possible, while premiums reflect market demand. Our conclusion is the approach proposed in the NC CAM is likely to lead to slightly higher premiums than one based on partial or pro-rata allocation of capacity. However, we do not think that its magnitude is likely to justify any amendment of the rules set out in the NC CAM for this form of auction.

With regard to the exercise of market power, we think that larger bidders will be able to use the dynamic characteristics of the ascending clock methodology to close the auction earlier than would be the case if all shippers were small. However, in the context of the NC CAM, we do not think that this behaviour, if adopted, will be prejudicial to the objectives.

The NC CAM proposes use of the ascending clock method for the Yearly, Quarterly and Monthly Products. We think that for products for which there are parallels in a liquid gas commodity market on each side of the IP, this could cause shippers some difficulty, given the time required to conduct these auctions and the possibility of commodity price movements in the market. Under these conditions, a short, uniform price, sealed bid auction could be more appropriate. However, we understand some importance is attached to maintain a common methodology for the same product across the EU at this stage and only consider such changes when the NC CAM is formally reviewed in the light of practical experience. We think that this is a reasonable approach.

In relation to the uniform price, sealed bid method, we suggest that the current drafting of the methodology should be reviewed to clarify the rules for partial and pro rata allocation of capacity and the application of the constraint that bidders will not be allocated less than the minimum capacity specified in their bids. These rules are necessary to ensure that capacity is allocated but the present approach is not completely clear. The specific issues are explained in the body of our report.

With regard to Within Day capacity, we see no reason why this should not be offered by auction, rather than solely be nomination. On some interpretations of the Framework Guidelines, this was already permitted although ENTSOG does not appear to think so. To auction this capacity, TSOs will need to define the volume to be offered.

Finally, there are a number of conclusions and recommendations which apply to both methodologies:

- If the decision is made in the context of the Tariff Code to adopt floating prices for capacity, then we think that it would be simpler for shippers to bid the premium that they are willing to pay, rather than the full price.

- The requirements that reserve prices for shorter term products be set using multipliers to guarantee revenue equivalence to annual capacity may pre-empt decisions yet to be taken in the context of the Tariff Code concerning financial incentives to encourage allocation of day ahead and within day capacity. We suggest ACER consider this issue in its opinion.

- As *both* algorithms are uniform price auctions, we suggest the second approach is referred to as a sealed bid auction or sealed bid, uniform price auction to avoid any confusion about the basis for pricing.

- The NC CAM should state explicitly that the credit status of bids should be verified as part of bid validation and before the end of each round in the ascending clock method.

- Information published after the auction should include the total number of bidders participating and the number of successful bidders.

1 Introduction

ACER appointed Frontier Economics to review the auction design for allocation of gas transmission network capacity in December 2011. The purpose of the study is to assist ACER to evaluate the proposed auction design presented by ENTSOG in the Network Code on the Capacity Allocation Mechanism (known as NC CAM), on the basis of Framework Guidelines FG-2011-00 ("the Framework Guidelines"). Following formal submission, ACER will prepare a reasoned opinion on the code for consideration by ENTSOG. Once an agreed version of the NC CAM is available, the comitology process will start in order for Member States and the European Commission (EC) to adopt the code as a set of binding guidelines.

Our work covers the definition of the products to be auctioned but does not include the steps envisaged with respect to capacity bundling or the amendment of existing capacity contracts.

The purpose of this report is to set out our findings on the NC CAM both in relation to the capacity products to be sold and the auction design that will allocate them to network users.

1.1 Background to development of the NC CAM

The NC CAM is being prepared under the provisions of the third energy package and, in particular, under the arrangements set out in Regulation 715/2009. Article 6 provides for ENTSOG to prepare draft NCs in a number of areas based on Framework Guidelines issued by ACER.

We understand that ENTSOG began work in early 2011 on the basis of a pilot framework guideline prepared by ERGEG. Following a number of stakeholder workshops, ENTSOG produced a NC CAM and a supporting, explanatory document in June 2011 which was issued for consultation. The responses indicated a lack of consensus on a number of aspects of the NC CAM, including elements of the auction design. The EC then proposed an extension to the original timetable and ENTSOG decided to use this time to launch a second consultation on new and modified concepts in October 2011.

Auction simulation workshops were held in July and in November at which alternative approaches were trialled with stakeholders using Excel-based bid input forms.

In mid-December 2011 ENTSOG issued a Stakeholder Update on the CAM Network Code Development providing feedback on the results of the second consultation and indicating in broad terms the direction to be taken in the revised version of the NC CAM with respect to auction design and other matters.

The revised NC CAM was published on January 30, 2012 and presented to stakeholders at a meeting in Brussels on the following day. Our review is based on this version of the NC CAM. We understand that a further version was formally submitted to ACER on 6th March that is substantially the same as the version that we reviewed.

1.2 Interconnection points

The NC CAM will deal with the allocation of capacity at interconnection points (IPs) between EU TSOs. Our understanding is that the code will apply to IPs between TSOs located in different Member States and between market areas located within a single Member State. It may also be adopted at IPs between an EU Member State and a member of the Energy Community (who have collectively agreed voluntarily to implement the third energy package). It will not apply to IPs for the import of gas from non-EU countries[3]. Nor will it apply to LNG import terminals, entry and exit points from storage, exit points to distribution networks and large consumers and entry points from production facilities.

Based on the ENTSOG gas transmission network map of August 2011, we estimate the following numbers of physical IPs (taking into account gas flows in both feasible directions where presently possible):

- 104 IPs between EU Member States and a further 10 classified as EU interconnection points but which involve a non-EU TSO (TSOs for Switzerland, Croatia, Macedonia; Serbia, Bosnia-Herzegovina and Russia-Kaliningrad);
- 25 IPs within Member States in Austria, France, Denmark, Germany and Poland; and
- 10 IPs with Energy Community members of which 5 are included in the list of EU IPs (with Serbia, Croatia, Macedonia and Bosnia Herzegovina). The others are with Moldova and the Ukraine.

Currently, there are 129 full EU physical IPs to which the arrangement would apply[4]. Some of these are likely to be bundled into virtual IPs. On the other hand, there is likely to be an increase in the number of IPs as a result of reverse flow projects and new pipeline construction. Furthermore, it may be possible to

3 However, ACER may wish to recognise that what is done at EU-third country IPs could have implications for the allocation of capacity at IPs that are covered by the NC CAM.

4 Some of these IPs currently have an exemption from third party access so the arrangement would only apply after the exemption has expired e.g. IUK between the UK and Belgium.

offer backhaul capacity on an interruptible basis at IPs where reverse flow is not physically possible.

One of the ENTSOG working documents mentions the expectation that capacity at approximately 150 IPs would be offered in the auctions.

1.3 Structure of the report

This report is set out as follows:

- Section 2 explains the objectives and summarises our approach.
- Section 3 provides an overview of the NC CAM and assesses its compliance with the Framework Guidelines.
- Section 4 presents the results of our review of the capacity products to be offered.
- Section 5 presents the results of our review of the two auction designs that are proposed to sell the capacity products.
- Section 6 sets out our main conclusions and recommendations.

There are two annexes. Annex A provides short case studies of capacity allocation auction experience in Member States. Annex B describes the auction simulation exercise we undertook with NRA participants of the ascending clock auction methodology.

2 Objectives and methodology

In this section we briefly consider the objectives of the NC CAM and use these to derive criteria to inform our evaluation. We then describe the approach we have adopted to undertake the review.

2.1 Objectives

The Framework Guidelines sets out the following objectives for the NC CAM:

- to ensure a more efficient allocation of the capacity at IPs between and within Member States; and
- to support the creation of efficient gas wholesale markets.

The Framework Guidelines and the NC CAM will apply to the allocation of existing capacity and not to new capacity allocated via open season procedures, unless such capacity remains unsold following the initial offering.

We envisage that *efficiency* would be interpreted as maximising economic welfare. Since the capacity already exists, welfare maximisation will be achieved if the capacity is allocated to those who value it the most i.e. efficient investment is not directly under consideration, although the results of the auction may provide useful information to TSOs to guide investment decisions, as noted below.

Nevertheless, Article 16 of the Regulation says that the CAM shall also facilitate investment in new infrastructure. The prices that emerge from the allocation process will provide an indication of willingness to pay for capacity which can be compared by TSOs to the cost of investment to provide incremental capacity at the relevant IP.

It is important to note that the Framework Guidelines and the NC CAM requires TSOs to establish booking platforms not only to offer primary capacity but also for shippers to offer and obtain secondary capacity on the same platform. In the event that a primary allocation is not achieved optimally through the CAM or, due to uncertainty, turns out to be sub-optimal later on, this can, in principle, be corrected by trading in secondary markets.

Based on the aims set out in the Framework Guidelines and the Regulation, we think that the following criteria are the right ones to use to assess the ENTSOG proposals, in addition to compliance with the Framework Guidelines:

- efficient allocation as defined above;
- compatibility with existing wholesale markets and support for the further development of competition – competition in wholesale gas markets is likely to be the primary source of consumer benefit;
- non-discrimination and transparency of the arrangements, subject to mitigation of any possible anti-competitive behaviour; and
- simplicity and workability for all shippers, including small shippers, to encourage participation.

2.2 Methodology

The methodology we adopted focused on the design of the market for sale of cross-border gas transport capacity – in other words, our work was not restricted narrowly to the design of the auction mechanisms themselves.

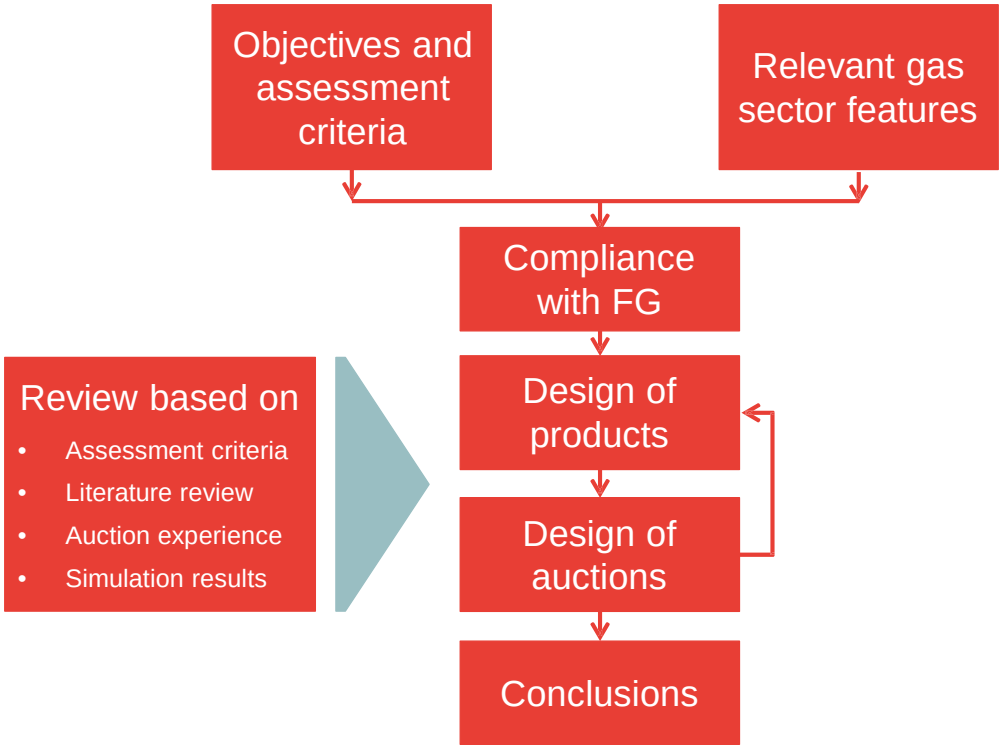
The methodology involved the following steps:

- confirmation of the objectives of market design and elaboration of the criteria that these imply for assessment of the design of the products to be sold and the auction format – we did this with ACER in the early stages of the study and the results are set out above;
- confirmation of our understanding of the characteristics of the gas sector that are most relevant to product and auction design – these are set out below;
- review of compliance with the Framework Guidelines;
- assessment of the proposed design of capacity products and any alternative options;
- assessment of the proposed auction algorithms, given sector characteristics and the capacity products to be sold; and
- development of conclusions including any new design elements that may be required.

These steps are shown graphically in **Figure 1**.

The feedback loop indicates that features of the auction design could have an impact on the product specification.

Figure 1. Outline of proposed assessment methodology for product and auction design



Source: Frontier Economics

2.3 Key features of the gas sector relevant to product and auction design

We think the following features of the gas sector are those which are most important for the assessment of the products and auction designs set out in the NC CAM:

- Given very limited national gas production in Europe, the high dependence of most countries on IPs for their gas supply, limited in some maritime countries by the recent growth in LNG imports. In this sense the gas sector is quite unlike the power sector where most countries have national production which is closely aligned to demand and cross-border trading is about cost efficiency at the margin rather than being fundamental to supply of national markets.

- The limited liquidity in forward products on gas wholesale markets relative to the durations on which shippers have wished to book transport capacity –

according to Argus Gas[5], price quotes on even the most liquid markets such as UK NBP and Zeebrugge do not extend beyond 2015 and 2013 respectively at present.

- TSOs focus on the management of volumetric gas flows while shippers are focussed on the transport of energy.
- Differences in the calorific value of the gas in different networks which may limit the scope to create virtual IPs and to manage gas flows in the way that would be possible were the product to be truly homogenous[6].
- The long-term character of many gas supply agreements with gas exporting countries at present – in the absence of liquid markets for transport capacity, shippers have often sought similarly long-term capacity contracts.
- The lead time needed to develop incremental transport capacity at IPs and on the related networks where it is needed. This depends on the characteristics of the IP and related networks but 3-5 years would be typical, although compression can often be added more quickly.
- Many IPs have little or no unsold capacity[7] but there are often no constraints on physical gas flows because not all of the capacity is nominated – they are said to be contractually congested.
- The use of firm and interruptible transport capacity products, with interruptible products being offered with many different terms and conditions (e.g. notice periods, length of interruption etc.). Interruptible capacity is often offered where there is unutilised booked capacity.

5 Argus Gas is an industry journal published by Argus Media that appears twice a month.

6 This is still an issue with the use of low calorific value gas from the Netherlands in some neighbouring countries although in the Netherlands and in Germany there are market areas which encompass both high and low calorific value gas.

7 This observation is based on the Energy Sector Enquiry but we understand that ENTSOG has provided data to the EC that indicates that such congestion is now less common.

3 Overview of CAM NC and compliance with Framework Guidelines

In this section we provide a brief summary of the contents of the NC CAM and then review it for compliance with the Framework Guideline.

3.1 Overview of the NC CAM

The overview is based on the NC CAM published on 30th January 2012 for a final round of stakeholder consultation. It consists of the following elements:

- Section 1 sets of definitions of terms used in the code and describes its relationship to European and national legislation.
- Section 2 says that the code shall apply to all existing capacity at all in IPs between Member States and between market areas within Member States.
- Section 3 sets out the principles for cooperation between TSOs in relation to maintenance co-ordination, communication standards and the calculation/maximisation of transmission capacity.
- Section 4 deals with the allocation of capacity and contains the heart of the code
  - Section 4.1 says that auctions will be used to allocate capacity at applicable IPs, starting with the capacity products with the longest duration. It also provides that at least 10% of the technical capacity at each IP shall be reserved for products with durations equal to one quarter or less, subject to there being sufficient available (unsold) capacity at the time the code comes into force. Exact proportions are to be the subject of stakeholder consultations led by the relevant TSOs at cross-border level and may differ between IPs.
  - Section 4.2 defines five standard durations of capacity products: yearly, quarterly, monthly, daily and within-day capacity.
  - Section 4.3 requires capacity to be defined in term of energy flows and not in terms of volume flows.
  - Section 4.4 requires auction of yearly capacity to be held annually in March for capacity in each year, from the following Gas Year out to Year 15, using an ascending clock algorithm and contains a formula defining the capacity to be offered.

- Section 4.5 requires auctions of quarterly capacity to be held annually in June for the four quarters of the following Gas Year using the ascending clock algorithm and contains a formula defining the capacity to be offered.
- Section 4.6 requires auction of monthly capacity to be held on a rolling monthly basis for the following month using the same ascending clock algorithm and contains a formula defining the capacity to be offered.
- Section 4.7 requires auction of daily capacity to be held on a rolling daily basis for the following day using what the code describes as the uniform price auction algorithm and contains a formula defining the capacity to be offered.
- Section 4.8 requires auction of within-day capacity to be held on a rolling hourly basis from the publication of the results of the daily capacity auction using the uniform price auction algorithm and defines the capacity to be offered.
- Section 4.9 says that where two or more capacity products are being offered, the relevant auction algorithms shall be applied separately for each product.
- Section 4.10 defines the ascending clock auction algorithm.
- Section 4.11 defines the sealed bid, uniform price auction algorithm.

There is a recognition that the volume of capacity to be offered will depend to some degree on the separate congestion management guidelines.

- Section 5 requires TSOs to offer jointly bundled products for exit from one system and entry into the other at each IP and sets out how this is to be achieved, starting from the current approach by which each TSO separately offers unbundled capacity.

- Section 6 deals with the offering and allocation of interruptible capacity – there is a minimum obligation to offer day ahead interruptible capacity – and with the harmonisation of certain aspects of the product and interruption process between neighbouring TSOs.

- Section 7 deals with the use of regulated tariffs as the reserve price in the auctions and the allocation of premium revenues between TSOs. This section touches on a number of points that will be defined in more detail in the context of the separate Tariff Code on which preliminary discussions have recently started.

Overview of CAM NC and compliance with Framework Guidelines

- Section 8 deals with booking platforms and requires ENTSOG to prepare a reasoned assessment of the costs and time to move towards an EU booking platform and a corresponding action plan following up to 12 month of market consultation. Until an EU platform if available, a range of solutions can be employed. Booking platforms must allow shippers to offer and obtain secondary capacity.

- Section 9 says that matters not defined in the NC CAM which are necessary for implementation shall be defined at cross-border level.

- Section 10 deals with implementation and provides for nine months to adapt terms and conditions and a further 18 months to adapt IT systems for implementation of the NC CAM.

3.2 Compliance with the Framework Guidelines

Our reading of the NC CAM is that it presents a high degree of compliance with the Framework Guidelines. Our assessment against each of the elements of the Framework Guidelines is set out in **Table 1** below.

In summary, while the NC CAM closely reflects the Framework Guidelines, there are a few areas where we think the NC CAM is only partially compliant or non-compliant. These areas are:

- Standardised contracts – there are standardised products but no standardised model contracts to support them.

- TSO co-operation – it was not possible to agree a harmonised method of capacity calculation at IPs.

- Interruptible capacity - very little is said about the process to be used for alignment of interruptible capacity services among TSOs.

ENTSOG acknowledges the first two of these issues in a supporting document and gives reasons for departing from the requirements of the Framework Guidelines, as explained in the detailed assessment.

We also note that the NC CAM anticipates a formal decision by ACER to amend the Framework Guidelines so that the definition of short-term firm products, to which the 10% reservation applies, includes the Quarterly Product.

There is a further point about which elements of the NC CAM apply to all capacity (existing and new) and which elements apply to existing capacity only. The second paragraph in Section 1.2 of the Framework Guidelines seems to say that the whole of the Framework Guidelines only apply to existing capacity. However, the third paragraph of this section states that specifically the capacity

allocation guidelines do not apply to new capacity allocated via open season procedures, suggesting that the remainder of the guidelines do apply to all capacity. In practical terms, the NC CAM says that Articles 4, 6 and 7 do not apply to new capacity. These articles encompass not only the allocation arrangements but also the definition of standardised products and establishment of booking platforms, provisions which, in our opinion, it would be desirable to apply to new capacity. ACER and ENTSOG will need to consider how the Framework Guidelines are to be interpreted in this regard.

A final point concerns implicit auctions of capacity otherwise referred to as market coupling. While the NC CAM is compliant with the Framework Guideline in recognising that TSOs may implement implicit auctions, we note that in practice significant capacity would have to be available for the day ahead product if market coupling were to be a practical proposition. Some capacity for coupling may be provided by UIOLI arrangements under the CMP. However, if there is to be market coupling, consideration should be given to holding back a proportion of capacity for day ahead use in coupling.

Table 1. Correspondence between requirements of Framework Guidelines and contents of NC CAM

FG Ref	FG Section title	Relevant NC CAM Article (s)	Comment
1.2	Application	2	Compliant, subject to interpretation of this section of the FG. As presently drafted, requirements related standardised products and booking platforms do not apply to new capacity. Although not mentioned in the FG, it could be helpful to clarify that the NC CAM does not apply to IPs between Member States and third countries.
1.3	Adaptation of existing transportation arrangements	10.1	Compliant with respect to adaptation of terms and conditions. Art 10.2 of the NC CAM provides an additional transitional period of 18 months for systems to become compliant.
1.4	Standardised contracts and communications	3.2	Compliant with respect to information and timing of communication but more technical aspects of communications e.g. message content and formats are not addressed on the grounds that these should be the subject of separate Data and Solutions Handbook. There is also no specific timetable for this as required by FG 1.5. Non-compliant with respect to standardised contracts. The NC CAM defines standardised products and provision for capacity bundling but ENTSOG explain that it does not consider it appropriate to prepare a model contract, in part due to differences in the legal framework among Member States.
1.5	TSO Cooperation	3.1 – 3.3	Partially compliant. The principles of cooperation with respect to maintenance coordination, communication and capacity calculation/ maximisation are set down but, as ENTSOG explain in the supporting document, that it was not possible to agree a harmonised method of capacity calculation.

Table 1. Correspondence between requirements of Framework Guidelines and contents of NC CAM

FG Ref	FG Section title	Relevant NC CAM Article (s)	Comment
1.6	Stakeholder involvement	4.1.7 and 9.1	Compliant. There is provision for stakeholder consultation in relation to the proportion of capacity set aside for short term capacity services in 4.1.7 and in relation to provisions beyond the minimum requirement of the NC in 9.1
2.1	Firm capacity services	4.2	Compliant. A small number of harmonised capacity services are defined.
2.2	Interruptible capacity services	6	Partially compliant. There are brief statements about minimum interruption lead times, co-ordination of the interruption process, defined sequence of interruptions and reasons for interruptions but very little is said about how alignment of interruptible capacity services is to be achieved.
2.3	Breakdown and offer of capacity services	4.1	Compliant. The NC CAM addresses the basis of allocation and the breakdown between long and short-term services. The definition of short-term as being equal to or less than one quarter is a change agreed informally between ENTSOG and ACER and is scheduled to be formally approved by ACER.
2.4.1	Bundled capacity services	5.1	Compliant.
2.4.2	Amendment of existing contracts	5.2	Compliant. The detailed assessment of the proposed default rule is out of our scope of work.
2.4.3	Virtual interconnection points	5.1.10	Compliant. However, we understand from ENTSOG that the requirements do create VIPs within 5 years has been challenged by some TSOs.
3.1.1	Auction design	4.4-4.11	Compliant. The NC CAM sets out harmonised auction designs for implementation at all IPs for products of the same duration. The auctions are

Table 1. Correspondence between requirements of Framework Guidelines and contents of NC CAM

FG Ref	FG Section title	Relevant NC CAM Article (s)	Comment
			to be anonymous, transparent and online. We comment in the body of the report in relation to the scope for abuse of dominant market positions. Implicit auctions (i.e. market coupling) are not impeded.
3.1.2	Reserve price	4.10, 4.11, 7.2	Compliant. Both auction methodologies include a reserve price. Decisions on the precise form this will take are to be determined by the Tariff Guidelines.
3.1.3	Auction revenues	7.6	Compliant. NRAs are to approve use of revenue from auctions in excess of regulated tariffs.
3.1.4	Allocation of interruptible services	6.1.4	Compliant. There is an explicit statement that such allocation shall not be detrimental to the amount of firm capacity on offer.
3.1.5	Within day capacity	4.8, 6.1.7	Compliant. The NC CAM says that firm within day capacity will be allocated by auctions. Interruptible within day capacity will be allocated by nominations, although ENTSOG has said that it disagrees with this element of the FG.
3.2	Unsold capacity	4.4-4.8	Compliant. The formulae determining the capacity to be offered in the referenced articles have the effect that unsold capacity from an auction is offered again in auctions for shorter capacity products.
3.3	Booking platforms	8	Compliant. The article provides for joint platforms to implement the allocation process and provides a process to determine a plan for establishing a single EU platform.

Table 1. Correspondence between requirements of Framework Guidelines and contents of NC CAM

FG Ref	FG Section title	Relevant NC CAM Article (s)	Comment

Source: Frontier Economics

Overview of CAM NC and compliance with Framework Guidelines

4 Review of capacity products

We have reviewed the products proposed in the NC CAM to assess to what extent they meet the objectives and criteria described in Section 2, especially the enhancement of competition in the gas market. We consider in turn:

- long-term bundled firm products;
- short-term bundled firm products;
- unbundled firm products;
- interruptible products;
- application of the 10% reservation rule for short-term capacity; and
- other points relevant to all products.

4.1 Long-term firm bundled product

The focus here is on the offering of capacity from the following year to the longer term. The NC CAM provides for sale of capacity out to a 15 year time horizon. We consider three issues:

- the sale of time slices versus continuous bands of capacity;
- to what extent all capacity not offered as short-term products should be offered out to Year 15; and
- choice of the annual or quarterly product to be sold in the long-term auctions.

4.1.1 Time slices versus continuous bands

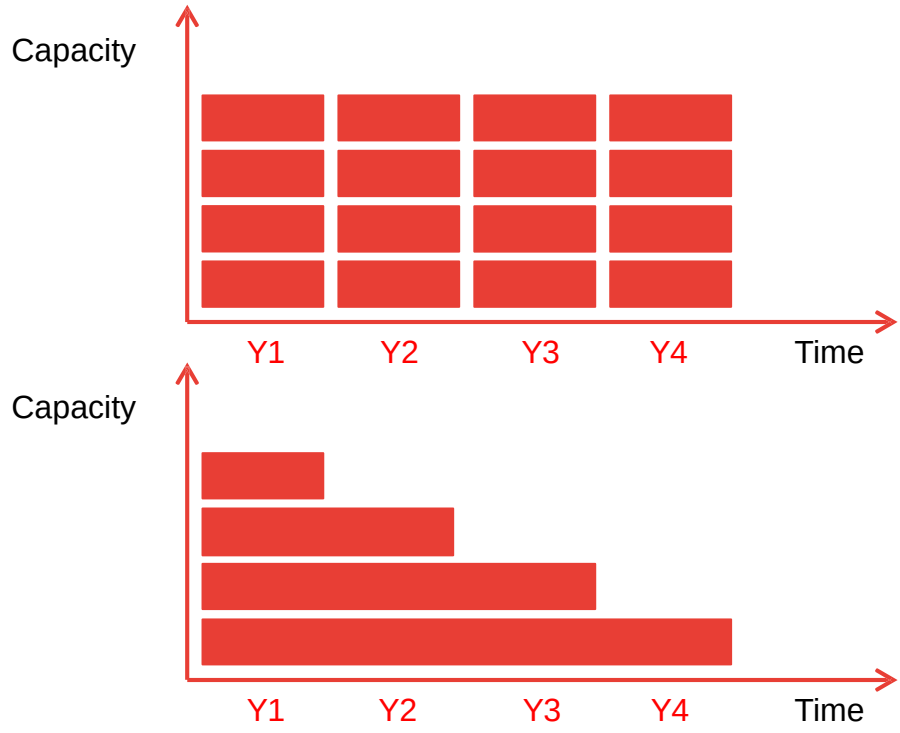
The NC CAM proposes that capacity be offered out to Year 15 in discrete Yearly Products, each a time slice, in a series of concurrent but independent auctions.

The issue here is that if shippers have to bid for time slices in independent auctions there is a risk, if their demand for transport is price sensitive[8], that they may be allocated a non-continuous series of products. The alternative would be to offer a series of continuous bands of increasing duration Y1, (Y1+Y2),

8 We note that if shippers bid the same quantity at all price steps in an auction for each time slice, they are guaranteed to be allocated a continuous series of time slices if there is sufficient capacity.

(Y1+Y2+Y3), (Y1+Y2+Y3+Y4). The two options are shown in **Figure 2**. Continuous bands with a duration of up to 4 years have been used in electricity release auctions, such as the EDF virtual power plant auctions, to give bidders a choice of different product durations.

Figure 2. Sale of discrete years versus continuous bands



While recognising the concern that some shippers may not be able to acquire a continuous band of capacity, we think there are a number of reasons why sale of bands would not be a better approach. These are:

- Practice on the traded gas market is to sell discrete time slices and gas trading and competition is most likely to be encouraged by selling transport capacity on the same basis.
- Sale of continuous bands, if adopted in the form shown above, could limit the amount of capacity sold for the long-term to the extent that shippers chose shorter bands.
- It would no longer be possible to have independent auctions for each product since sales of the Y1-Y4 product would reduce capacity available for sale as Y1 only.

Review of capacity products

- Sale of bands would make the position of the new entrant shippers, wanting to increase future bookings of transport capacity to match their projected sales growth more difficult. This approach could therefore be detrimental to competition.

Shippers will therefore have to manage the risk of not acquiring a continuous band of capacity in the independent auctions using the secondary capacity markets or by gas trading.

4.1.2 Longer term capacity reservations or quotas

The Framework Guidelines specifies the minimum capacity to be reserved for short-term products but says nothing about the horizon year[9] for sale of capacity or the proportion to be sold on different longer term durations. The NC CAM proposal that TSOs sell all capacity not reserved for short-term products out to Year 15 in annual auctions is therefore, as noted in Section 3, fully compatible with the Framework Guidelines.

Nevertheless, we have a concern that this approach could not be consistent with the objective to foster competition in energy markets. It seems to us that the main interest in long-term capacity beyond Years 5-7 is most likely to come from incumbents in the gas sector with access to similarly long-term gas supply contracts. New market entrants are much more likely to buy gas on a hub for periods up to four or five years when they first enter the market, rather than sign a long-term commitment with a gas exporting country. There is therefore some risk that incumbents could buy up the long-term capacity out to Year 15 at a time when new shippers are not willing to enter into such long-term commitments. Their ability to acquire capacity at a later stage, consistent with their time horizon, would then be more difficult.

In this regard we have noted that the recent German gas network ordinance[10] takes a different approach to the Framework Guidelines by reserving 20% of entry capacity for short-term products and *also* limiting capacity sold with a contract duration of more than four years to 65% of the total. Our understanding is that the reason for the quota on release of longer term capacity is to support proper functioning of competition in the gas market, including full participation by smaller shippers and new entrants.

In contrast, the UK offers capacity out to Year 17 without any limits. However, this is in part because the purpose is to test demand for investment in

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9 By horizon year we mean the time between the date when the capacity is sold and the earliest date when shippers would acquire rights to flow gas.

10 Gasnetzzugangsverordnung vom 3. September 2010. We note that the definition of short-term is a duration of up to and including two years in this ordinance.

incremental capacity in auctions which integrate allocation of existing capacity and the function of an open season commitment process.

We suggest that ACER might wish to reconsider this issue in preparing its reasoned opinion even though such a longer term reservations or volume quota were not contemplated by the Framework Guidelines. Our suggestion would be to reserve at least 35% of capacity to be offered only in the period out to Year 5[11], leaving 65%, or less, to be offered for Year 6 – Year 15. As in the case of the reservation for shorter term products, NRAs could decide to reserve a higher proportion of capacity to be offered only in this medium term period.

We have thought about whether this suggestion would in any way weaken the value of the price signals from the auctions of long term capacity for investment planning purposes. We do not think it would arise. Shippers would know that the full 100% of capacity would be released at some stage. This means that the prices realised in the longer term auctions would still be a useful indication of the willingness to pay for incremental capacity.

4.1.3 Sale of quarterly or yearly products in the longer term auctions

The June 2011 draft of the NC CAM envisaged using Quarterly Products[12] as the basis for the long-term sale of capacity out to Year 15. This is the approach adopted in the UK auctions of entry capacity. However, following consultations in the early autumn, the decision was made to replace sale of 60 Quarterly Products with 15 Yearly Products, although a substantial minority of stakeholders remained in favour of the Quarterly Product. The same minority in favour of Quarterly products is reflected in the response to the recent consultation process launched in relation to the final version of the NC CAM (10 out of 29 respondents).

Our understanding is that the main argument for a Quarterly Product is to allow shippers to acquire capacity with a seasonal profile, typically with more capacity in winter than summer. With a Yearly product, shippers who wish to acquire a seasonal profile either have to

- buy less capacity than they need in the form of the Yearly Product and hope that they will make up the balance of their requirements in the short-term auctions for winter Quarters; or

- buy their full peak winter requirement with the Yearly Product and sell the surplus summer capacity in the secondary market.

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11 This includes the reservation for shorter term products of at least 10%.

12 The NC CAM now defines the quarterly product as a short-term product but in the original Framework Guidelines this was considered to be a long-term product.

The concern is that there might be little demand for the summer product and/or that it might not sell for as much as the reserve price, leaving such shippers with unwanted capacity or a financial loss.

We think the preference for Quarterly Products among some shippers wanting seasonal capacity reflects:

- limited or illiquid secondary markets in some countries, making it difficult or expensive to sell unwanted capacity – this will in substantial part be addressed by the surrender provisions of the CMP; and

- regimes where the seasonal tariff profile does not fully reflect the driver of investment in new capacity, with lower prices in winter and higher prices in summer than the pattern of demand would imply. Under these circumstances, those wishing to transport a seasonal flow of gas may benefit financially from buying Quarterly Products at the expense of those with flatter gas profiles[13].

On balance, our view is that sale of Yearly Products is unlikely to cause major concerns, as indicated by the majority of shippers' stated preferences, provided that there are effective arrangements for capacity surrender and/or secondary trading and that tariffs take account of the extent to which demand in winter is the driver for investment in new capacity.

We have also noted a concern that the sale of a Yearly Product to a shipper with seasonal flows could trigger the long-term UIOLI provisions as a consequence of low average utilisation. However, our understanding is that the CMP decision only applies long-term UIOLI if the shipper has not sold, or offered to sell on reasonable terms, the surplus capacity. We do not therefore think that the sale of Yearly Product will lead to shippers with seasonal gas flows being forced to lose capacity[14].

4.2 Short-term firm, bundled products

The focus here is on the offering of shorter term capacity products, defined in the current NC CAM as equal or less than one quarter. We have identified two issues:

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13 In the extreme, if there were not risk of a shortfall in capacity in summer and winter demand was fully responsible for new investment, the economic cost of summer capacity would be close to zero. With a very low summer tariff, shippers would be indifferent between holding annual capacity or seasonally profiled capacity.

14 This does however highlight a possible weakness in the UIOLI regulations. It could be difficult to demonstrate that a shipper has not offered to sell capacity for a reasonable price.

- the horizon over which the Quarterly Product should be offered; and
- the case for an annual auction of twelve Monthly Products in addition to the rolling auctions of Monthly Products for capacity in the following month.

4.2.1 Horizon for sale of Quarterly products

The code proposes annual auctions in June for four quarters ahead starting on 1st October of the same year.

There are arguments for offering Quarterly Products for more than a single year ahead. This would effectively lengthen the horizon over which short-term (defined as less than or equal to one quarter) capacity would be available to the market and could help to address the concerns of some shippers who would have preferred the long-term auctions to offer a Quarterly product. This might also be helpful to smaller shippers and new entrants.

We have also noted that German practice is to offer up to 8 Quarters ahead, reflecting the requirements to offer 20% of capacity in products with a duration of less than or equal to two years.

Although, we see no evidence from any of the ENTSOG consultations that shippers have expressed a wish for sale of 8 Quarterly Products rather than only 4, this may have been masked by the one third of stakeholders who have continued to state a preference for use of Quarterly Product in the longer term auction. On balance, we think it would be beneficial to offer 8 Quarterly Products on an annual basis and to amend the NC CAM accordingly. Two changes would need to be considered. The reservation of 10%, if intended to apply to an horizon encompassing only the next gas year, would need to be re-expressed. At the moment the reservation is for sale in products of less than a one year duration. Consideration should also be given to an explicit reservation of capacity that only becomes available for the second year out in time so that when Quarters of Year 2 are sold, there is some capacity available that does not depend on undersell of annual capacity products.

4.2.2 The case for annual auctions of Monthly Products

The NC CAM does not propose an annual auction of twelve Monthly Products. Monthly Products will only be offered in rolling monthly auction to sell capacity for the following month. This proposal appears to be supported by shippers.

The NC CAM approach differs from that adopted in the UK where there are annual auctions *and* rolling monthly auctions. According to National Grid, shippers in the UK value the opportunity to acquire monthly capacity for a whole year during a single auction because they can buy profiled capacity to transport a seasonal gas flow.

This argument is very similar to the case for offering Quarterly rather than Yearly Products in the long-term auctions. If shippers want a monthly profile they can, in principle, buy Quarterly Products and sell unwanted capacity for the relevant months. No stakeholders have argued explicitly for annual auctions of Monthly Products but one has argued for more capacity to be offered in the form of monthly products.

On balance, we think that with capacity surrender under the CMP decision reinforcing secondary markets, there would be limited additional benefit in annual auctions of Monthly Products. As with the case for longer term Quarterly Product, we think that some of the attractions of buying seasonally profiled capacity may lie in the fact that monthly transport tariffs are not cost reflective, with too much of the cost being recovered in summer months.

4.3 Sale of unbundled products

Art 5.1.5 of the NC CAM says that TSOs shall offer as unbundled capacity any difference in the technical capacity on either side of an IP. We are surprised by this provision. It is difficult to see any conventional value in such unbundled capacity to a shipper without matching rights on the other side of the border. If unbundled capacity were sold, and there were subsequently to be an increase in technical capacity on other side of the IP, that too would then need to be offered as unbundled capacity, frustrating the clear aim of the Framework Guidelines that all capacity should be bundled. We note that the idea of limiting the duration of the sale can only be applied where the timing of any increase in capacity on the other side of the IP is known at the time of the sale.

We think that unmatched technical capacity at an IP should not be sold until matching capacity becomes available on the other side of the IP. This would have the added benefit of giving TSOs an incentive to reach agreement on the technical capacity on both sides of the IP.

4.4 Interruptible products

We have noted that the NC CAM has a minimum requirement to offer a daily interruptible capacity product. Any decision to offer longer term interruptible products would be a matter for the TSOs and NRAs on either side of an IP.

Offering interruptible capacity has, historically, been used a means of addressing contractual congestion. Given the CMP proposals for both long-term and short-term UIOLI, our view is that there is unlikely to be a general case for offering longer term interruptible capacity.

Art 6.1.3 deals with the requirement to offer virtual backhaul capacity, at least on an interruptible basis, where there is no physical reverse flow. Taking into consideration the whole of Art 6, it could be concluded that TSOs need only

offer daily interruptible capacity for virtual backhaul. On the other hand, the reference to Articles 4.4 to 4.8 in article 6.1.3 may indicate that a full range of backhaul products are to be offered. We certainly think that there would be a good argument for TSOs to consult shippers on the potential demand for a longer term interruptible product and, if there is demand, to offer more than a day ahead product.

The Framework Guidelines require the TSOs to implement standardised procedures, including the definition of interruption lead times, to ensure that interruptions take place in a coordinated and standardised manner. The NC CAM (Art 6.2.2) provides for a default lead time of 2 hours from the next hour bar but permits adjacent TSOs to agree a different lead time. In effect, there is no obligation on the definition of interruption lead time. To ensure this provision of the Framework Guidelines has some meaning, we suggest that the NC CAM should specify that TSOs should have to justify and gain approval from NRAs for any reduction in the default lead time of 2 hours.

4.5 Application of the 10% reservation rule

The NC CAM interprets the Framework Guidelines requirement to set aside at least 10% of the available capacity for offering as short-term capacity. It says that the amount to set aside shall be equal to 10% of the technical capacity, subject to the condition that if the available capacity when the NC CAM comes into force is less than 10%, this lower amount will be offered as short-term capacity.

Available is not a defined term but in this context we think it must mean unsold under existing contracts with a duration of more than one Quarter.

It is worth highlighting the consequence of the approach adopted in the NC CAM to the reservation of capacity for short-term products. If 10% or less of technical capacity becomes available at an IPs due to the continuation of existing contracts, the approach means that all such capacity will be offered in the form of short-term products.

There is an issue in relation to the calculation of the capacity represented by the 10% reservation. The inability of TSOs to agree a methodology for capacity calculation within the framework of the NC CAM (see Section 3) increases the likelihood that adjacent TSOs will have different views about the technical capacity on each side of an IP to which the 10% would apply. This could lead to a mismatch in views about the capacity to be offered in short-term products. To avoid this issue, the 10% rule would need to apply to the lower estimate of the IP capacity, leading to the same absolute volume to be offered in shorter term products.

4.6 Other matters

There are three other matters in relation to product definitions on which we wish to comment.

- **Cascading capacity**: in traded gas markets, longer term forward products "cascade" into shorter term ones as the contract approaches maturity. Thus a Yearly Product might become three Monthly Products (for the closest quarter) and three Quarterly Products. This ability to split longer term products into shorter ones is essential for the effective operation of the secondary market. We have been told that TSOs will normally permit this cascading to happen but we think that it would be helpful to have it stated clearly in the NC CAM that a capacity holder has *a right* to register capacity held on this basis and then to sell some of the products that result.

- **Minimum contract size and tick size**: the NC CAM is explicit that capacity must be offered in energy units but is silent on the smallest amount of capacity that can be purchased and the smallest increments or ticks by which this can be increased. To assist smaller shippers, this should be consistent with the rules used for gas trading at adjacent hubs. EEX allows contracts of as small as 1MWh/h or 24 MWh/day to be registered on the OTC market (10 MW minimum on the exchange). Powernext allows volume ticks of 50 MWh/day and requires a minimum order of 250 MWh. For trading at the NBP in GB, the volume tick is 1000 therms per day (29.3071 MWh per day). No single solution will match all markets. A good approach, in our view, would be for the NC CAM to stipulate that the maximum size that TSOs can set for a minimum contract size and volume increment be equivalent to 24 MWh per day, to provide a high degree of flexibility.

- **Surrendered capacity**: for each type of auction in Art 4.4 to 4.8, the NC CAM refers to the capacity to be offered as being limited by "previously sold Technical Capacity, adjusted by the capacity which is re-offered in accordance with the applicable congestion management procedures". We assume that this refers to capacity that is surrendered voluntarily and capacity that is subject to the short or long-term use-it-or-lose-it mechanisms. We suggest that it would be clearer if this capacity were identified by a separate term in the equations in Section 4.4 - 4.8 of the NC CAM. Furthermore, the draft CMP decision says that surrendered capacity will only be allocated after the offer of primary capacity is exhausted and we assume that the same provision would apply to capacity offered as a result of

the use-it-or-lose-it mechanism[15]. Once the CMP code is finalised, this requirement needs to be integrated into the auction algorithm of NC CAM to ensure the two codes are consistent. Surrendered capacity would be offered in the same auction as unsold capacity and the product would be identical from the view point of shippers[16].

15 We note that in the UK, shippers who surrender capacity have the option of saying that they are willing to accept less than the reserve price an in return their surrendered capacity is allocated in preference to unsold primary capacity.

16 We also note that the CMP will need to determine what happens to the payment obligations of shippers surrendering or losing capacity, especially if these were greater than the prices realised in the auction at which the capacity is re-offered.

5 Review of auction design

Our review of auction design distinguishes between the overall auction strategy and the specific auction algorithms – the mechanics of how an auction is conducted - proposed for different types of product at each individual IPs. At the end of this section we also consider workability and practicality.

5.1 Auction strategy

The NC CAM says that auctions at all IPs for the same capacity product type will be held concurrently but that each auction will be independent of the others. The intention is that shippers have the option to participate in all auctions at the same time. Owing to the requirements in the Framework Guidelines, the NC CAM only deals with the allocation of existing capacity.

We have considered two issues in relation to the auction strategy. These are:

- the treatment of capacity at IPs which may be considered as substitutes (i.e. alternatives) or complements (i.e. having one is of no value without the other); and
- the link between the sale of existing capacity and the separate open season process for obtaining commitments to incremental capacity.

5.1.1 Substitutes and complements

We first consider substitutes, then look at complements and finally turn to an example where both exist at the same time. Some of the issues associated with substitutes and complements were explored in the auction simulation that we ran for NRAs and which is described in Annex B.

Substitute IPs

Two IPs that can be used to flow gas between the same two gas entry-exit zones are substitute IPs. If these are offered separately, the issue for shippers is on which IP they should bid to acquire capacity. If many shippers choose the same IPs, there may be excess demand at prices above the reserve price and the capacity may command a significant premium. At the same time the capacity on the other IPs may sell at the reserve price. The rules for independent, ascending clock auctions for each IP, as proposed in the CAM, do not allow a shipper to

shift demand in, say, Round 2, from the expensive IP to the cheaper one when the relative price difference becomes apparent[17].

In anticipation of this problem, the shipper may participate in both auctions and reduce demand on the basis of the aggregate end of round demand information at the most expensive IP. But this approach carries the risk of a shipper acquiring more capacity than is needed if the auction closes sooner than he anticipates, leaving him without the opportunity to reduce demand. Such excess capacity can then be resold in the secondary market or by the surrender process. It can also be sub-let to other shippers to flow gas without reselling.

In this situation, the obvious answer is to bundle the capacity into a single virtual IP, as required by the Framework Guidelines. This solves the shippers" dilemma. However, we understand that it could take up to five years to achieve from the date the NC CAM enters into force, as indicated by Art 5.1.10[18].

At borders where substitutes have to be offered in separate auctions, one possibility to address the problem would be to apply the activity rule (i.e. that bids must be for equal or less capacity as price steps increase) *across the capacity of the two IPs taken together*. This would require the products to be sold on the same platform so that such an aggregate activity rule could be applied. The need for such an approach depends on how many such cases exist and how long it will take to establish virtual IPs.

A related issue may arise at some IPs where the problem is not how shippers can best allocate their demand between two substitute IPs but how TSOs can best allocate capacity among two IPs when there is a trade-off between the amount of capacity that can be offered i.e. capacity offered at one IP reduces the capacity available to offer at another. The TRAC-X platform in Germany has made specific provision for this issue by giving TSOs the option to define total capacity for two IPs together and then to allocate it pro rata to demand. The auction clears once aggregate demand across both IPs is less than or equal to the total capacity and the capacity is then distributed accordingly.

We have raised this issue with ENTSOG. Their view is that this is not a common requirement and that such adjusted auction designs could be applied locally where there is a need. They do not see any conflict with the NC CAM.

Complements

We now consider complements.

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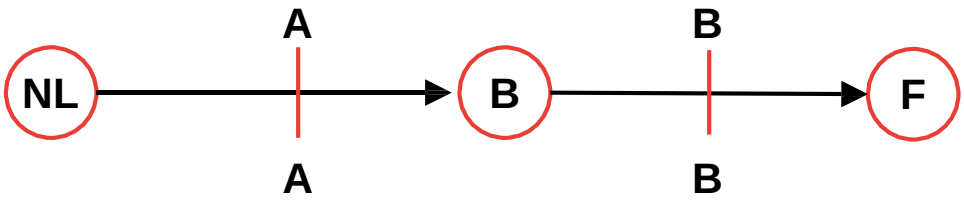
17 We note that in the context of recurring auctions for capacity of different durations, the relative values may be apparent to most shippers.

18 A specific example of this issue arises in relation to Spain and Portugal which have IPs in the South at Badajoz (ES) / Campo Maior (PT) and in the North at Valença do Minho (PT) / Tuy (ES). We understand that these will take some time to be combined into a virtual IP.

An example of a concrete situation with complements is shown in **Figure 3** below. A shipper wants to flow gas from the Netherlands to France (where he has customers) via Belgium provided transport is not too expensive.

Figure 3. Example of two complementary borders



Source: Frontier Economics

The shipper can participate in both the auctions for capacity at IPs A and B and seek to acquire the same amount of capacity on both. He can only guarantee this if he bids the same quantity in both auctions without regard to price since there is no way to link bids for both IPs[19]. If the shipper acquires capacity on IP B but capacity at IP A becomes too expensive, alternative strategies would be to either sell gas in the Netherlands and buy gas in Belgium for transport to meet the demand in France; or to buy gas in France, thus avoiding the need to flow gas across the IPs at all (the capacity at IP B would then no longer be needed). The issue is that acquiring capacity in this way poses some risks for shippers if matching capacity is not allocated at both IPs.

One possible solution, based on adapting the auction methodology, would be to allow shippers to withdraw bids after auction closure for a complementary product if they were not allocated sufficient capacity at the other border. Such a post closure reduction at one IP would need to correspond to an unsuccessful bid on a complementary IP[20] in order to limit possible exploitation of this rule to avoid commitments. A rule of this sort would require that the auction of the relevant IPs take place on the same platform so such an interdependent rule could be implemented. Such „chaining" might have the practical effect that all IPs would need to be auctioned on the same platform. The rule would increase the unsold capacity in the auction and this would then be re-offered in shorter terms auctions.

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19 It is also of interest that in the power sector the CASC auction specification provided for this linking of bids at two borders but this was never introduced due to lack of demand. However, cross border flows are far more important in the gas sector.

20 For example, a shipper bids for 15 GWh/day at IP A and 5 GWh /day at IPs B in Round 1. IP A closes in Round 2 and the shipper is allocated the full demand of 15 GWh/day. The auction of capacity at IP B continues to higher price steps and in Round 4 the shipper decides the capacity is too expensive and reduces his bid to zero. He would then be entitled, with this rule change, to reduce the capacity allocated at IP A from 15 to 10 GWh/day.

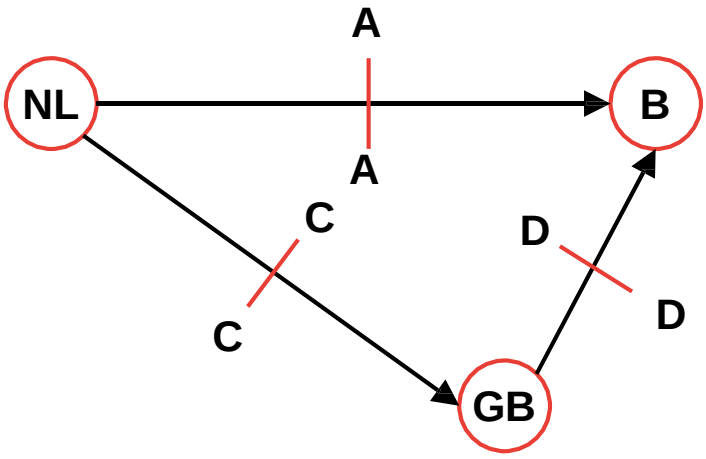
We also note that under the Art 2 of the Framework Guidelines any offer of a bundled product for capacity at both border A and B could be construed as offering separate capacity for transit, which is forbidden. However, we do not think that facilitating the acquisition of matching capacity at two borders would fall under this condition.

The introduction of such a rule change would have a downside in the sense that the auction result could change from that originally announced at the end of the final round. We consider the more complex case of substitutes combined with complements before reaching any conclusion on this matter.

Substitutes combined with complements

Finally, we consider a more complex situation in **Figure 4** with both complements and substitutes. In this case shippers in the Netherlands wish to move gas to Belgium. They can do so directly by acquiring capacity at border A or by acquiring the complementary capacity at borders C and D routing the gas flow by UK. IPs C and D are complements which, taken together, are a substitute for capacity at IP A.

Figure 4. Examples of substitutes and complements in a triangle of hubs



Source: Frontier Economics

In this case, the substitution problem cannot be resolved by establishing a virtual IP because the substitute involves an intermediate country. The solution of applying a modified activity rule across the two substitutes would also be impractical, given the intermediate country.

The acquisition of the complementary capacity products for borders C and D is subject to the same considerations discussed above for the first example.

One pragmatic way to deal with this situation would be to release the capacity at the three IPs in two or more "tranches". The auctions for each tranche of

capacity would be take place sequentially with a short interval of time between each one. This would only be applied to the long term auctions where the most uncertainty over value lies.

The main benefit of this approach would be that shippers would have a second chance to participate in an auction to buy capacity in the knowledge of the outcome of the auction for the first tranche[21]. They would not then be constrained by their initial bidding behaviour. This would be helpful where network configurations made the value of capacity at different IPs that might constitute alternative or complementary products difficult to predict.

However, there are a number of disadvantages:

- Shippers would have to decide whether to participate in the auctions for each tranches or for only one of the tranches.
- There could be a different clearing price in the auction of each tranche even though the product is identical and the timing very similar.
- If applied universally, there would be additional auctions at IPs where sale in tranches would offer no incremental benefit. But if applied more selectively, the concurrent nature of all auctions for the same product would no longer be respected – although we note that given the independent nature of the auctions, such close harmonisation is of limited value to shippers.

We think release of some capacity in the long term annual auctions in tranches would be advantageous at *some* IPs. We therefore suggest that it should be included in the NC CAM as an option available for use by TSOs. Sale in tranches would only be adopted with support from shippers and approval from the relevant NRAs. It would only apply at IPs where there were the benefits were expected to outweigh the disadvantages.

We have also considered the possibility of combinatorial auctions, of the type used successfully to sell radio spectrum. In these auctions a bid consists of a single price for a package of different products. Multiple bids may be submitted. Bids are accepted in their entirety or not at all, removing issues about substitutes and complements. However, our assessment is that this approach would be too complex at this stage for the gas sector[22]. There would also be an issue over how to divide the revenues among the TSOs responsible for the different products in the package.

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21 Dividing the sale into a small number of tranches is used in the sealed bid auctions run by National Grid in GB as a simple form of price discovery in pay-as-bid auctions.

22 The auction solution is determined by a mathematical solver and is not as transparent as the ascending clock. The auctions also take longer to conduct.

5.1.2 Link between sale of existing capacity and long-term investment

The NC CAM is consistent with the Framework Guidelines in addressing only the allocation of existing capacity at IPs. However, the offer of existing capacity out to Year 15 creates uncertainty about its value beyond the lead time for investment to expand capacity, likely to be about 3-4 years. Although shippers will be aware of the long-term investment plans of each TSO, these can evolve. Shipper could be allocated capacity at a significant premium in an auction, based on limited capacity availability, and later find that there was sufficient capacity to meet demand. This is the reason why the long-term auctions in the UK combine the function of capacity allocation and those of a binding open season. ENTSOG are fully aware of this issue.

Given the regulatory context, the work done so far, and the wish to start allocation of existing capacity using auctions as soon as possible, it is not going to be possible to merge the offering of existing and new capacity into a single process before the NC CAM is implemented. Our view is therefore that TSOs should consider offering auction participants a guarantee to protect against the risk of excess payment. This might take the following form. Successful bidders in the auction would not have to pay any more than those acquiring new capacity for the same time period, if the capacity of the IP is subsequently increased following an open season or similar process. A firm decision on this point should be made in the context of the Tariff Guidelines to which this issue is closely related.

5.2 Auction algorithms

ENTSOG proposes an ascending clock methodology for all products other than Day Ahead and With Day and a uniform price, sealed bid auction for the Day Ahead and Within Day products.

We consider each algorithm in turn.

5.2.1 Ascending clock algorithm

We are very supportive of the use of the ascending clock auction methodology for sale of divisible goods, especially where valuations depend on the market as a whole and there is significant uncertainty[23]. This format has been used for the majority of gas release auctions in continental Europe and is widely supported by experts in auction theory[24].

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23 This is in contrast to auction of products in which each bidder knows his own valuation and this is independent of the valuation of other bidders.

24 See for example, Auctioning Many Divisible Goods by Lawrence M. Ausubel and Peter Cramton, University of Maryland, Journal of the European Economic Association April–May 2004

The most important attribute of the ascending clock methodology is that bidders receive feedback at the end of each round on aggregate demand, thus facilitating price discovery and improving the efficiency of capacity allocation.

We consider the following issues in relation to the proposed implementation of the ascending clock algorithm:

- the use of large and small price increments and how these are determined;
- the determination of the clearing price and the impact on tariffs;
- the scope for using market power in the auctions;
- the application of this methodology to all products and all IPs (other than for Day Ahead and With Day capacity); and
- timing of round and recesses.

Price increments

The approach proposed by ENTSOG is that bidders place bids in rounds at price steps announced by the auction system starting at the reserve price which is equal to the regulated tariff. The price steps are announced in advance of the auction and are based on a large price increment which can be fixed or variable[25] in size. As soon as demand falls below the supply of capacity, known as "a first time undersell", the price clock is reset at the value in the previous round plus a small price increment and the auction then proceeds until it clears. This may be at one of the small price increments or at the price at which the "first time undersell" first occurred (if this is reached again).

This approach has been adopted to make the auction as mechanical as possible[26] and to reduce undersell of capacity of the scale that might occur if only large price increments were used.

At least one stakeholder has argued against the process of "winding back" the price clock in this manner and has stated a preference for using a single price increment and accepting that the volume of unsold capacity (reoffered in other auctions) could be greater.

The only alternatives we see to the approach proposed by ENTSOG if undersell is to be limited are:

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25 We understand that ENTSOG had in mind the use of a constant percentage increase on the price in the preceding round which would generate a variable price.

26 It would not be practical for the TSO to determine price steps specific to the auction of capacity at each IP and for each time period

- to use a small price step during the whole auction which would risk the auction continuing for a long time; or

- to allow bidders to specify both a quantity and an intermediate price between the last and current round prices, as was done in most gas release auctions. This has the effect of giving bidders the option of expressing their demand at intermediate prices.

However, we have noted that TRAC-X in Germany is successfully using the approach proposed by ENTSOG. We also carried out a successful simulation of same approach with NRAs. We therefore see no reason not to accept this proposal.

However, the TSOs responsible for each IP will have discretion, subject to stakeholder consultation, to determine the size of the large and small price increments. In this regard, we think that the guidance in Art 4.10.11 on how TSOs should determine the large price increments is not soundly based. The text says the large price step should be set to minimise…..the length of the auction process. Taken to extremes, this would indicate a very large step so that the rounds based on small price increments would start immediately. Unless there is unlikely to be any excess demand at the reserve price, the large price increment should be chosen to make a reasonable trade-off between the value of price discovery and the desire that auctions should close in as short a time as possible. For example, TSOs might choose large price increments on the expectation that the first price undersell would occur in round 3 or round 4.

Clearing prices and impact on tariffs

ACER has specifically asked us to consider whether the auction methodology would lead to an allocation with the lowest suitable, but still market demand-reflecting premium.

The clearing rule in the ascending clock algorithm is that clearing occurs when aggregate demand is less than or equal to the capacity offered. During the stakeholder consultation process, there was an adverse reaction against any partial or pro rata allocation of capacity and this approach avoids such an allocation[27]. However, in order to do so the clearing price may be a little higher than if an alternative clearing rule, using partial and pro rata allocation, were to be adopted. This point, based on a note provided to us by the CRE, is shown in **Figure 5**. It does not matter in principle whether the price steps are large or small.

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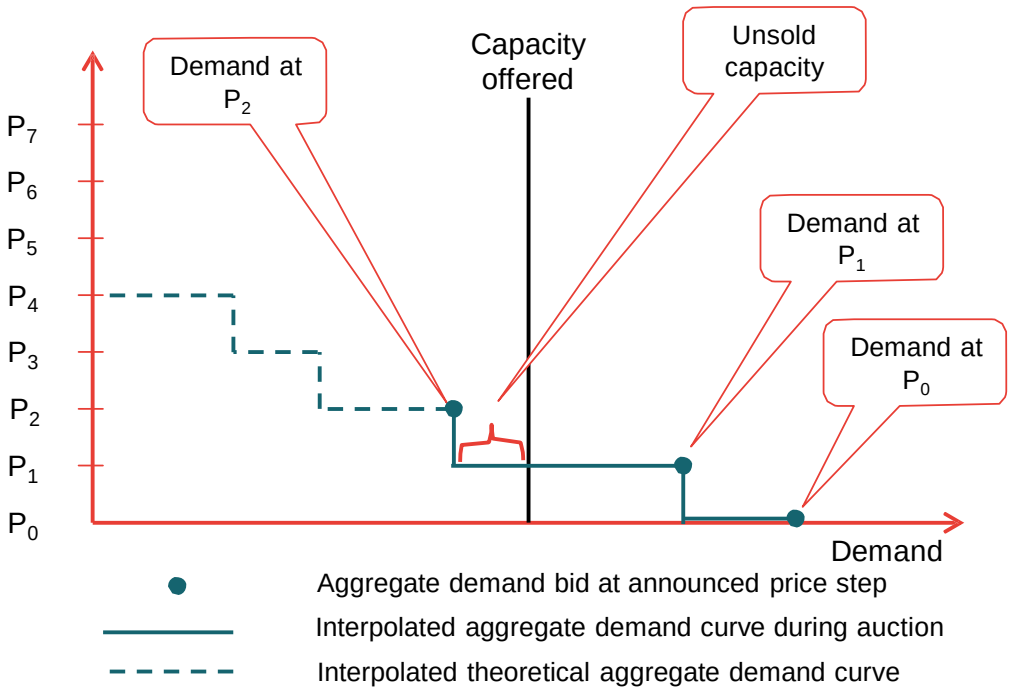
27 Unsold capacity is reoffered in the next auction. As explained below, the uniform price, sealed bid auction does provide for pro rata allocation.

Figure 5. Determination of the clearing price in the ascending clock auction



Source: Frontier Economics based on paper prepared by the CRE

In the auction, there is excess aggregate demand at P_0 and the auction proceeds to the next round. There is still excess demand at P_1 and the auction proceeds to the next round when aggregate demand falls below the capacity offered.

One approach, similar to that adopted for sealed bid, uniform price auction, would be allocate the capacity to fulfil the full demand of those bidding in the last round and to allocate the remaining capacity pro rata to the reduction in demand between P_1 and P_2. The clearing price would then be P_1.

The rules in the NC CAM clear the auction at P_2 and carry the undersold capacity forward to the auction of the next product. Shippers therefore pay an excess premium equal to P_2-P_1 above that which would have applied if the alternative rule had been adopted.

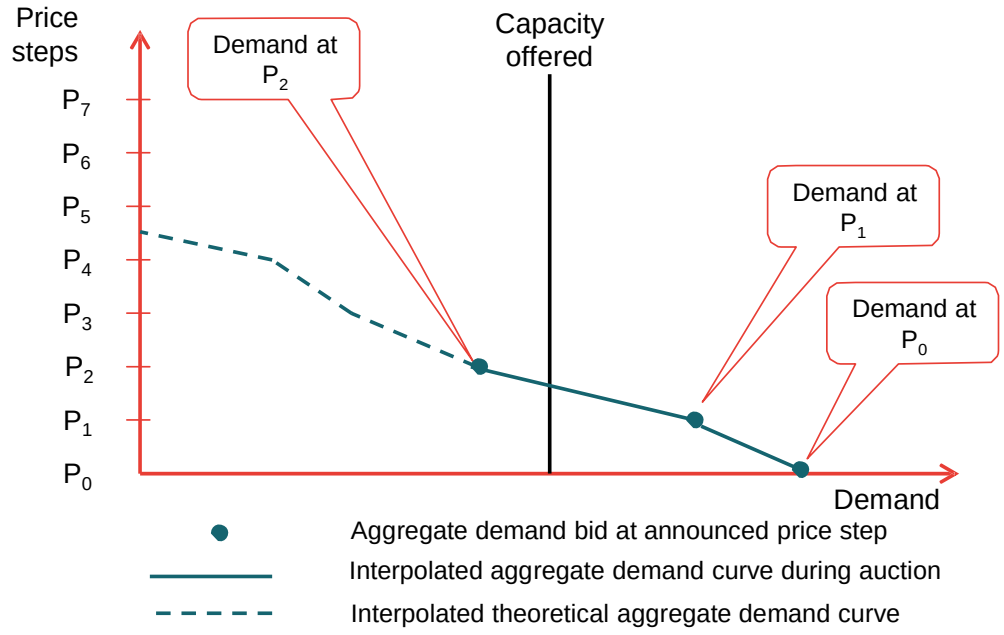
Given the use of large and small price increments in the ascending clock auction, it is likely that this excess premium will be quite small.

Furthermore, we think that the excess premium, as calculated above, probably overstates the excess over a market-demand reflecting premium. This is because the only real information on aggregate demand is represented by the data at each price step – the small circles on the graph. The rest of the curve is an interpolation of aggregated demand based on the extreme assumption that, at *any*

price above P_n aggregate demand immediately drops to that at P_{n+1}. In practice, we think it more likely that the observed aggregate demand at each price step would be joined by a sloping line so the true clearing price would lie between P_1 and P_2. This is shown in **Figure 6**. A consequence of this thinking is that the alternative auction rules, with partial or pro-rata allocation, would allocate capacity at a little less than the true clearing price.

On balance we do not think the scale of this effect is sufficient to suggest any changes to the rules proposed by ENTSOG for the ascending clock algorithm.

Figure 6. Demand curve with piecewise linear interpolation between observed aggregate demand



Source: Frontier Economics

Scope for exercise of market power

We have considered carefully the potential to exercise market power under the ascending clock methodology.

The publication of information on aggregate demand at the end of each Round will provide opportunities for large shippers/bidders to "clinch"; that is to reduce demand more quickly than their own valuations would suggest is correct in order to close the auction at a lower price. Such clinching behaviour, if adopted, is likely to:

- reduce overall auction revenues; and

Review of auction design

- lower the allocation of capacity to large bidders relative to small bidders producing an allocation which is economically less efficient than implied by bidder valuations.

However, we do not think the potential to clinch outweighs the benefits of price discovery that the ascending clock approach makes possible. Given reserve prices, TSOs will not generally depend on the auction revenues to recover their permitted revenues and NRAs may decide to return premium revenues to network users. Any less efficient allocation is to the benefit of small shippers and is at the discretion of larger shippers who decide whether to clinch. On balance we do not think that the possibility of clinching constitutes a serious problem in the circumstances of the NC CAM.

Proposed scope of application of ascending clock algorithm

As noted above, the NC CAM requires that the ascending clock algorithm applies to all products with durations of one month or more at all IPs, without regard to liquidity at the adjacent hubs.

An ascending clock auction take longer to conduct than a sealed bid auction and is more complex for bidders. Bidders do have the option to use the automated bidding facility and would not therefore need to enter bids at the end of each round - so this practical issue is not a problem. However, bidder valuations of capacity will be based on expectations of price differentials between commodity markets at the adjacent hubs. In liquid markets, forward gas prices can change during the day. Automated bids for monthly and quarterly products may therefore need to be updated[28]. Given transparent gas prices, the price discovery features of the ascending clock method may have limited value and shippers may prefer to have capacity allocated more quickly so that they can trade gas rather than wait until the outcome of a long auction process. Under these conditions, a short, uniform price, sealed bid auction could be more appropriate.

However, while we see this as a potential concern, it has not been raised by stakeholders, even in respect of liquid markets. We understand that the NC CAM steering group favour maintaining a common methodology for the same product across the EU at this stage and only consider such changes when the NC CAM is formally reviewed in the light of practical experience. We think that this is a reasonable approach.

Timing of rounds and recesses

With regard to timing of the rounds and the recesses between rounds, we think that the proposed times are quite generous in comparison to our own experience

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28 The same could also be true of the first two three years of the annual auction of Yearly Products but there is unlikely to be liquidity much beyond this point.

but may be justified in the context of the simultaneous offering of capacity at many IPs. However, we think that it reasonable to wait to learn from experience and only make changes in a few years' time when the whole of the NC CAM is reviewed.

5.2.2 Uniform price, sealed bid algorithm

We comment on the following issues with the proposed implementation of the uniform price, sealed bid algorithm:

- definition of the rule for partial and pro rata capacity allocation; and
- basis for allocation of within day interruptible capacity.

Partial and pro rata allocation

Under the uniform price algorithm, used for day ahead and within day capacity, there is a rule which provides for partial allocation of capacity demanded in bids when the sum of the successful bids does not exactly equal the capacity offered[29]. The rule is that where the volume demanded in the marginal bid is greater than the remaining capacity, the remaining capacity is allocated to this bidder. However, the capacity must be greater than the minimum amount of capacity which a bidder is willing to be allocated, which can also be stated in the bid.

This rule needs to be considered in the context that bidders may submit up to 10 bids each. What is not clear about the rules as drafted is whether the minimum amount of capacity constraint applies to the individual bid or over all successful bids submitted by that bidder. Our view is that the latter would make most sense. However, we know that partial allocation was a controversial point for bidders and it is therefore important to know what was intended. Another concern may have been they would be allocated fractional volumes of capacity not corresponding to the tick size on traded gas markets.

There is a further issue where two or more bids are made at the same price and these constitute the joint, lowest-ranked, successful bids. In this case, the remaining capacity is allocated pro rata to the amounts demanded, subject to the minimum amount of capacity stated in the bids.

If there were two such bids and these were the only bids made by these two bidders, we think that as drafted *no* capacity would be allocated if the pro rata allocation were less than the minimum amount of capacity specified by each of the bidders. This would occur even if the remaining capacity was, in total,

[29] It would be quite unlikely that aggregate demand at the different prices in bids was exactly equal to capacity offered if there were multiple bidders.

sufficient to satisfy the minimum amount of capacity of one or other (or either one if considered alone) of the bidders).

What seems to us to be needed here, in order to reduce the risk of unsold capacity, is a rule that allocates all of the remaining capacity to one of the bidders, chosen, for example, by selecting the bid with the earliest timestamp.

A similar issue can arise with more than two tied bidders.

We think that the uniform price algorithm needs to be revised to take these points into account.

Allocation of within day capacity

At present the Framework Guidelines says that shippers will be allowed to submit nominations for within day interruptible capacity at any time, without any formal allocation process. This is reflected in the NC CAM. We understand that the original thinking was to avoid TSOs having to decide how much capacity to offer. On some interpretations of the Framework Guidelines, allocation by auction was also permitted although ENTSOG does not appear to think so. We note sale by auction requires the TSOs to define the capacity to be offered.

The TSOs have made it clear that they disagree with the nomination approach and would prefer capacity to be determined and allocated formally. We see no reason not to extend this auction method to within day interruptible capacity so that the volume of such capacity allocated is clearly established. The UK already holds such auctions for entry capacity, demonstrating that they are feasible.

5.2.3 Points common to both algorithms

There are a number of other observations which fall under the auction algorithms heading but which are not specific to the ascending clock or uniform price, sealed bid auctions. These observations are:

- whether it is appropriate for the auction price to represent the full price of capacity as oppose to the premium over the reserve price;
- specification of reserve prices;
- description of the second algorithm as a uniform price auction;
- verification of the credit status of bidders; and
- policy on release of information after the auction.

We briefly consider each of these points in turn.

It is not known at present whether the price paid in the auction will be a floating one – in other words, it will change after the auction is over and the capacity

allocated as the underlying transport tariffs change, or a fixed one, in which TSOs carry the risk of any price movements after the auction and then recover any under recovery later through adjustment mechanisms. This question will be decided in the context of the Tariff Guidelines. If the decision is to leave the risk of subsequent changes in transport tariff for capacity sold in the auction with the shippers (i.e. a floating price), we think there is a case for basing bids in the auction on the premium to be paid over the tariff rather than the full price. The advantage is that the prices realised in the auction would then apply without adjustment and simply be added to the underlying tariff for bundled capacity[30].

Section 7 of the NC CAM determines how reserve prices are to be established. It states that the reserve price shall equal the regulated tariff for the IP – in practice the sum of the regulated tariffs on both sides of the IP. For the shorter term products, the reserve prices are to be set using the annual reserve price times a multiplier, such that the revenue is equivalent to the tariff for annual capacity. We note that this approach would appear to foreclose an issue that is yet to be fully debated in the context of the Tariff Code, namely the use of fractional or zero reserve prices to encourage purchase of unallocated day ahead and within day capacity. The intention is no doubt to protect TSO revenue streams but we think that is already achieved by Section 7.6 which requires NRAs to approve over and under recovery mechanisms.

We strongly support the use in *both* auction methods of uniform pricing rather than pay-as-bid or discriminatory pricing[31]. We think that this works much better for small shippers who may be more uncertain about the value of capacity. It is an approach that has been widely applied in the energy sector. Since both of the methodologies used in the NC CAM are uniform price auctions, it might be clearer to call the "uniform price auction algorithm" a "sealed bid auction algorithm" in order not to imply that the ascending clock is not uniform price.

The credit status of participants is always an important issue in auctions. The NC CAM says nothing about this and effectively leaves the issue to the terms and conditions of the adjacent TSOs at each IP. We think that there is a potential interaction with auction design in that some auction implementations assess the credit status of bidders *after* bids have been submitted and rounds have closed, rejecting those that fail to have sufficient credit. This could lead to misleading information in the context of an ascending clock auction. Any risk of this occurring could be addressed by an NC CAM requirement that TSOs verify the compliance of bids with credit rules before they are accepted.

A final issue is policy on release of information after the auction. At present the NC CAM only says that information on aggregated capacity and the clearing

30 This approach was used in the German gas release auctions and is currently used by TRAC-X.

31 The latter approach is used in the UK entry capacity auctions.

price shall be published. We think it would be useful to go further and give the number of participants and the number of winning bidders. We have also noted that CASC publish the name of the winning bidders but not the capacity allocated. CASC told us that this practice provides transparency concerning allocation and encourage bilateral trading in the secondary market. However, the EC has very recently adopted new guidelines on the definition of the technical information necessary for network users to gain effective access to the system[32] and we hesitate to recommend such a radical change so soon after adoption of these guidelines without stronger evidence that it is important for the secondary market.

5.3 Workability and practicality

ACER has asked us to comment on the workability and practicality of the proposals set out in the NC CAM for the auction of IP capacity.

It seemed to us that there are two aspects to this question:

- the provision of software platforms on which adjacent TSOs can offer IP capacity concurrently across Europe; and
- participation by shippers in multiple concurrent auctions in order to bid for capacity.

On the first aspect, we have noted the existing experience of National Grid in the UK and TRAC-X in Germany of offering multiple points simultaneously. TRAC-X have also told us that their platform is scalable and there is already a proposal that the same platform be used for Austrian IPs. We have noted that a similar tendency towards the addition of further capacity auctions to an existing platform occurred with CASC. Other platforms such as **cap**square could also offer primary capacity. In summary, we have no doubt that the proposals are workable from the point of view of the platform providers.

For auctions to take place, there also needs to be agreement between the adjacent TSOs for each IP on the way forward. If there are difference of view, the NRA will need to intervene and if there are still unresolved issues ACER may have a role to play in saying what is needed to comply with the guidelines[33].

On the second aspect, workability for shippers, we think that very small shippers with an interest in only one or two IPs will not have any problem. Nor do we have any concern for large shippers who will often have team specialising in

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32 Commission Decision of 10 November 2010 amending Chapter 3 of Annex I to Regulation (EC) No 715/2009

33 Although it is still possible that both could be compliant in different ways.

different areas of Europe and thus the ability to manage multiple auctions. Medium-sized shippers may face greater challenges if they have an interest in multiple IPs but only a small number of staff to take part in auctions. However, we have noted that the NC CAM makes provision for automated bidding tools to avoid the need to monitor ascending clock auctions on a round by round basis – although the benefit of price discovery will be lost if these are used.

Given that there will be more than 2 years to prepare after the NC CAM enters into force, we think that shippers will have sufficient time to make any necessary adaptations.

6 Conclusions and recommendations

Our main conclusions are that the NC CAM does a good job at delivering on the requirements set out in the Framework Guidelines and that there is strong evidence of stakeholder involvement and consultation in its preparation.

There are nonetheless three points where the NC CAM is not fully compliant with the Framework Guidelines. These are:

- Standardised contracts – there are standardised products but no standardised model contracts to support them.
- TSO co-operation – it was not possible to agree a harmonised method of capacity calculation at IPs.
- Interruptible capacity - very little is said about the process to be used for alignment of interruptible capacity services among TSOs.

ENTSOG acknowledge the first two points and gives reasons for them in the supporting documentation. The third point is based on our own comparison of the requirement in the Framework Guidelines and the response set out in the NC CAM.

Depending on the interpretation of the Framework Guidelines, the fact that the NC CAM does not apply the definition of standardised products and the establishment of booking platforms to new capacity may also be considered as non-compliant. However, we note that Section 1.2 of the Framework Guidelines is not clear on this point.

A final point concerns implicit auctions of capacity, otherwise referred to as market coupling. While the NC CAM is compliant with the Framework Guideline in recognising that TSOs may implement implicit auctions, we note that in practice significant day ahead capacity would have to be available if market coupling were to be a practical proposition. The reservation of 10% for all shorter term products is unlikely leave sufficient capacity at the day ahead stage. Although UIOLI under CMP may provide some day ahead capacity, consideration should be given to assuring that a capacity is available for coupling by a quota reserving such capacity.

We have also reviewed the NC CAM to consider the potential for improvement in terms of the capacity products to be offered and the auction strategy/design to allocate them.

6.1.1 Capacity products

With regard to the long-term capacity offering, we suggest that ACER may wish to consider whether it is desirable to offer all of the capacity that is not reserved

for the short-term products out to Year 15 without any limit. We think a quota on the proportion of the capacity that can be offered beyond Year 5 would be beneficial to the proper functioning of competition in the gas market. Our suggestion would be to reserve at least 35% of capacity to be offered only in the period out to Year 5[34], leaving 65%, or less, to be offered for Year 6 – Year 15. As in the case of the reservation for shorter term products, NRAs could decide to reserve a higher proportion of capacity to be offered only in this medium term period.

With regard to the capacity product to be sold in the long term auctions, we have noted the significant minority in favour of the Quarterly Product rather than the Yearly Product proposed in the NC CAM. We think that to some extent this preference may be due to quarterly and monthly tariffs that do not reflect economic cost and we recommend that seasonal capacity tariff differentials be carefully considered in the context of the Tariff Code to ensure that they take into account the probability of not meeting demand for nominated gas flows.

With regard to the shorter term products, we suggest that it would be beneficial to offer the Quarterly Product in June for both Year 1 and Year 2 (8 quarters in total). This may be helpful to the significant number of stakeholders who would have preferred use of a Quarterly Product in the longer term auctions.

The NC CAM says that TSOs will sell, unbundled capacity, even when this arises as a result of a difference in views between adjacent TSOs on the capacity of the IP. We have concluded that such sales are likely to impede the objective set out in the Framework Guidelines to bundle all capacity. We think sales of unbundled capacity in these circumstances should be reconsidered.

We suggest two adjustments to the proposals for interruptible products:

- First, we think TSOs should have to justify any reduction in the 2 hour default interruption lead time to the relevant NRAs.

- Second, we think that in relation to interruptible, virtual backhaul capacity, TSOs should consult on what products to offer before limiting the offering to the Day Ahead Product[35].

We agree with the way in which the NC CAM applies the 10% reservation for shorter term capacity products. However, we think that to avoid potential disagreement between TSOs, the 10% should apply to the lowest estimate of the technical capacity, in case the methods used by each TSO lead to different results.

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34 This includes the reservation for shorter term products of at least 10%.

35 We note that on one interpretation of the NC CAM, it may already be a requirement to offer a full range of interruptible products.

Finally, there are three other general matters in relation to products where we think that the NC CAM could be improved. These are

- The rights of holders of Yearly, Quarterly and Monthly products to cascade the capacity into a number of shorter term products that can then be traded in the secondary markets should be made explicit.
- The NC CAM should stipulate a maximum for the minimum contract size and volume increment equivalent to 24 MWh per day, to provide a high degree of flexibility.
- For clarity, we suggest that capacity that is surrendered or re-offered due to UIOLI under the CMP provisions should be identified specifically in the equations of NC CAM that determine what is to be sold in each auction and the allocation rules for it made explicit in the auction algorithms as soon as the CMP arrangements are finalised. The capacity would be identical to unsold capacity from the viewpoint of shippers.

6.1.2 Auction design

With regard to different IPs between the same entry/exit zones, we think that it is important that these are offered as a single virtual IPs as soon as possible. If there are likely to be significant delays before implementation is possible, we suggest consideration be given in the ascending clock auctions to defining the activity rule restricting increases in demand at higher price steps as applying across all relevant IPs. This would allow shippers to move their demand as the auction proceeds in response to the information made available at the end of each round about aggregate demand at each IP.

Even once virtual IPs are in place, there will continue to be indirect substitutes, with gas flowing via another Member State, and capacity at different borders which are complementary in relation to the gas flows contemplated by shippers. These relationships can be challenging to handle in independent auctions, especially at horizons where there is limited liquidity in the gas commodity markets. We suggest that consideration be given to inclusion of an option in the NC CAM for TSOs to release long term capacity at certain IPs (the annual auctions of Yearly Products) in at least two tranches if sufficient shippers would prefer this approach and NRAs support it. The auctions for each tranche of capacity would be take place sequentially with a short interval of time between each one. This approach would give shippers a second chance to acquire the capacity that they need where the network configuration makes successful bidding in independent, concurrent auctions challenging.

With regard to the sale of capacity for periods beyond investment lead times, we have concluded that shippers face a significant risk if they pay a premium for the existing IP capacity and the capacity is subsequently increased. We recommend

that the NC CAM should include some form of protection for shippers in the event that such an expansion occurs. For example, shippers might not be required to pay any more than those acquiring incremental capacity at the same IP for the same period in open seasons. This matter needs to be decided in the context of the Tariff Code.

We have considered whether the ascending clock algorithm is likely to lead to prices for capacity that are the lowest possible, whilst premiums reflect market demand. Our conclusion is that the methodology is likely to lead to a small excess premium but we do not think that this is sufficient to propose any changes to rules set out in the NC CAM.

With regard to the exercise of market power, we think that larger bidders will be able to use the dynamic characteristics of this methodology to close the auction earlier than would be the case if the capacity was held by a number of smaller shippers. However, in the context of the NC CAM, we do not think that this behaviour, if adopted, will be prejudicial to the objectives.

The NC CAM proposed use of the ascending clock method for all products other than the Day Ahead and Within Day. We think that for products for which there are parallels in a liquid gas commodity market, this could cause shippers some difficulty, given the time required to conduct these auctions and the possibility of commodity price movements during this period. Under these conditions, a short, uniform price, sealed bid auction could be more appropriate. However, we understand the wish to maintain a common methodology for the same product across the EU at this stage and only consider such changes when the NC CAM is formally reviewed in the light of practical experience. We think that this approach is reasonable.

We suggest that for capacity products for the short-term future, the ascending clock auction should continue to be the default method but that the NC CAM should provide a mechanism to change to the uniform price, sealed bid method if this can be justified to NRAs.

In relation to the uniform price, sealed bid method, we suggest that the current drafting of the methodology should be reviewed to clarify application of the partial and pro rata allocation of capacity and the application of the constraint that bidders will not be allocated less than the minimum capacity specified in their bids. Specific points are set out in Section 5.

With regard to Within Day capacity, we see no reason why this should not be offered by auction rather than solely by equal nomination.

Finally, there are a number of conclusions and recommendations which apply to both methodologies:

Conclusions and recommendations

- If the decision is made in the context of the Tariff Code to adopt floating prices for capacity, then we think that it would be simple for shipper to bid the premium that they are willing to pay, rather than the full price.

- The requirements that reserve prices for shorter term products be set using multipliers to guarantee revenue equivalence to annual capacity may pre-empt decisions yet to be taken in the context of the Tariff Code concerning financial incentives to encourage allocation of day ahead and within day capacity. We suggest ACER consider this issue in its opinion.

- As *both* algorithms are uniform price auctions, we suggest the second approach is referred to as a sealed bid auction or sealed bid, uniform price auction to avoid any confusion about the basis for pricing.

- The NC CAM should state explicitly that the credit status of bids should be verified during bid validation and before the end of each round in the ascending clock method.

- Information published after the auction should include the total number of bidders participating and the number of successful bidders.

Glossary

Glossary of terms used in the report

Acronym	Meaning
ACER	Agency for the cooperation of energy regulators
CAM	Capacity allocation mechanism
CASC	Capacity Allocation Service Company
CMP	Congestion management procedures
FCFS	First come, first served
IP	Interconnection point
NC	Network code
NBP	National Balancing Point
NRA	National Regulatory Authority
TSO	Transmission system operator
UIOLI	Use it or lose it

Annex A – Experience in Member States to date

This annex summaries research on what is happening currently in a small number of EU countries which already have gas transport capacity auctions. It also provides a summary of the approach adopted by the Joint Auction Office (known as CASC) in the power sector. It is based on web research and telephone interviews with National Grid, TRAC-X and CASC.

Denmark

Energienet.dk, the Danish TSO, began auctioning rolling monthly capacity at two interconnection points (Ellund with Germany and Dragor with Sweden). These are seen as interim measures pending further work to offer longer duration bundled capacity and daily capacity at these and other IPs. Daily capacity continues, for the present, to be allocated on a FCFS basis.

- Monthly firm and interruptible capacity products are available at each point.
- Ellund exit capacity (firm and interruptible) is sold on different days in Week 3 of the month followed by an auction of interruptible backhaul capacity. The bidding window is 9.00 – 15.00.
- The methodology is as follows:
  - Profiled monthly reserve prices are established based on regulated annual prices – these are P0 in the monthly auctions.
  - Bidder can add quantities to a ladder of increasing prices above P0 for each month. The price increments on the ladder are initially small and then increase up to P29.
  - Quantities at higher prices must be equal to or below those at lower prices.
  - Bidders may state the minimum amount of capacity they are willing to be allocated on a pro rata basis (see below).
  - Bids are ranked in ascending order of price from the lowest to the highest. Capacity is allocated from the top down to the highest price at which demand is smaller than or equal to supply. Unsold monthly capacity is then offered in the daily auction.
  - All successful bidders pay the price of the lowest successful bid.

- If total bids exceed available capacity at the maximum price (P29), capacity is allocated pro rata to bid size subject to any minimum capacity constraint expressed by the bidder.

France

GRTgaz has started to offer daily capacity by auctions at a number of different points. The reserve price for auctions is 1/200th of the annual regulated tariff. Participants are free to submit bids in the form of price, quantity pairs. The methodology appears to be a uniform price, sealed bid auction but the details available on the site of the TSO are limited.

NB. GRTgaz, Fluxys and OGE all offer part of primary capacity (bundled products) at IPs on the "**cap**square" platform, the primary purpose of which is trading in secondary capacity. The allocation methodology is based on FCFS, and payment is at the reserve price.

In order to prepare the implementation of the NC CAM, CRE has consulted on a new proposal to allocate long term products. CRE has decided to replace the current FCFS arrangements by an allocation based on giving priority to demands for capacity with a duration equal to or greater than 5 years and followed then by a pro rata approach.

Germany

Auctions of transport capacity between German market areas (bundled) and at IPs with other EU Member States (unbundled) started in August 2011. The 12 German TSOs collaborate on a single auction/booking platform provided by TRAC-X. There are some 40 IPs between market areas (80 if both directions are counted) and a further 35 with other EU states. The details of the arrangements are as follows:

- The following standardised products are available at each points:
  - annual auctions – yearly products for Y3 to Y15;
  - four quarterly auctions in each year as follows –Q1-Q8, Q2- Q8, Q3 – Q8 and Q4-Q8;
  - monthly auctions – for capacity in the following month; and
  - daily auctions – for capacity in the following day.
- Firm, conditional and other capacity types auctioned on successive days.
- Prices expressed in terms of ct/kWh/h /product duration and represent premiums over the reserve prices.

Annex A – Experience in Member States to date

- Large and small price increments (premium on regulated prices) are pre-defined for each type of product. Small increments are 20% of the large increments.

- Methodology for Y, Q and M products
  - first quantity bid at the regulated tariff – window open 10 hours;
  - if excess demand, then first bidding window opened with a large bid increment;
  - if there is still excess demand, process continues –all bidders can see excess demand from previous bid window;
  - if there is undersell at a large bid increment, then auction continues at the original bid window start price with a small bid increment;
  - quantity bids must reduce as price rises;
  - allocation occurs when aggregate demand falls below supply using the small price increments;
  - no limit on number of price increments that are possible – but the longest auction to date is 9 rounds (7 large increments and 2 small ones);
  - option to upgrade existing holding of interruptible capacity to firm capacity;

- Methodology for D products
  - bidding starts at a premium of zero;
  - there is a single bidding window;
  - quantity bids can be defined for a ladder of price increments (without limit) defined on the system;
  - quantity demanded must fall or remain unchanged as price rises;
  - allocation when aggregate quantity falls below demand;
  - option to pre-submit fixed bids for daily auctions.

- Where gas flows across two IPs are interdependent, TSOs have the option to offer both together with a single combined capacity and to use the auction to allocate it among between the two IPs.

UK

National Grid (NG) has for many years auctioned entry capacity to the National Transmission System. Exit capacity is currently not allocated by auction but from October 2012 short-term exit capacity will be auctioned. The entry capacity is offered on an entry point by entry point basis where entry points correspond to the landfalls of submarine pipelines, LNG import terminals, interconnected gas storage facilities and onshore production sites. There are currently 24 entry points.

National Grid is not responsible for the gas interconnectors between the UK and Belgium and the UK and the Netherlands. These are investor-owned pipelines which have long-term contracts for their primary capacity and operate at present with derogations from regulated third party access. National Grid is responsible for the IP at Moffat in Scotland where the pipeline from Ireland joins the national transmission system.

Prices in all cases are expressed in pence per kWh per day.

The following auctions take place:

- Sale of unsold baseline and incremental quarterly capacity from Year 2 to Year 17 held annually in March of Year 0 (QSEC).
- Sale of monthly capacity for the last 6 months of the current gas year and all 12 months of the following gas year, held annually in February of the preceding year (AMSEC) – the capacity is offered in four tranches each of which is separated by a number of days.
- Sale of monthly capacity in Rolling Monthly Trade and Transfer auctions held monthly to offer unsold monthly capacity and offer existing capacity holders a market to surrender capacity (RMTnTSEC).
- Sale of daily capacity held during D-1 of each day in a number of allocation sessions to allocate unsold daily capacity (DADSEC).
- Sale of daily interruptible capacity offered on D-1 of each day and comprising "Use It or Lose It Capacity" and discretionary interruptible capacity (DISEC).
- Sale of within day daily capacity held hourly within day (WDDSEC).

QSEC (UK)

Up to 90% of baseline capacity (as defined in NG"s licence for each Aggregated System Entry Point) is offered in the QSEC process. The QSEC auction may also lead to incremental capacity (i.e. capacity released above the baseline which

may require new investment) being sold if there is sufficient demand. Such capacity is then referred to as incremental obligated capacity. The test for sufficient demand is that the present value of the incremental revenue must be equal to at least 50% of the cost of the incremental investment at the clearing prices for each increment. Several different potential increments may be considered in the same auction. The default lead time before this test is applied is 42 months. In the event that the test is not satisfied, the clearing prices are equal to the price step, starting from the reserve price, at which demand is first equal to or less than the available capacity without releasing incremental capacity.

The reserve price for unsold capacity is the regulated entry price.

The auction is held over 10 sequential working days. At the end of each day NG announces the price step for each quarter at which aggregate demand is first equal to, or less than, the incremental quantities being offered.

At the end of the 10 day period, the auction closes and the tests referred to above are carried out to allocate incremental obligated capacity.

AMSEC (UK)

NG publishes the available monthly capacity for each entry point for each month of the 18 month period and reserve prices for each point, one for April to September and one for October to March.

The capacity is offered in four tranches of 25% each on four working days in a two week period.

Bidders may participate in the auction for each tranche. A bid comprises a price (above or equal to the reserve price) and a quantity of monthly capacity and the minimum amount of capacity that the bidder is willing to be allocated. No bidder can make more than 20 bids in each auction.

Bids are ranked in order of bid price from the highest to the lowest and accepted in this order. The quantity of the lowest accepted bid may be reduced where there is insufficient unallocated capacity to meet the bid in full, subject to the minimum capacity a bidder is willing to be allocated. Bids with the same price are allocated on a pro rata basis.

Accepted bids are pay-as-bid (i.e. this is not a uniform price auction).

After the auction the following information is published:

- volume allocated;
- number of shippers taking part and the number of successful shippers;
- highest and lowest bids accepted and the corresponding volumes;
- weighted average of all accepted bids and of the highest 50% of bids; and

- any unsold volumes.

RMnTSEC (UK)

These auctions, held monthly, are used to sell monthly capacity as follows:

- capacity that shippers wish to surrender and have reallocated to another shipper; and
- unsold capacity for the relevant month and any available incremental capacity.

NG first issues an invitation to shippers to notify capacity they wish to surrender. Shippers offering to surrender capacity may state the minimum price that they are willing to accept.

The auctions take place on a single day. NG publishes the following information before the auction:

- the reserve price for each entry point;
- the unsold entry capacity; and
- the total volume of surrendered entry capacity and the volumes for which the minimum surrender price is:
  - less than the reserve price
  - equal to the reserve price
  - more than the reserve price.

Details of the auction and allocation mechanism are similar to the AMSEC process (i.e. it is a pay-as-bid sealed bid auction) except that:

In the allocation of bids to the capacity offered, the surrendered capacity with a minimum price of less than or equal to the reserve price is given priority; and

There is a methodology to transfer unsold or to trade previously sold capacity from one entry point to another in order to meet unsatisfied demand, as expressed in this auction. The methodology involves gas flow modelling to identify an "exchange rate" for capacity moved from donor entry points to recipient entry points.

DADSEC (UK)

This is the day-ahead process for allocation of daily capacity.

Bids for daily capacity may be submitted up to 7 days before the gas flow day until 6am at the start of the gas flow day. They must be equal to or above the reserve price (which has a 33% discount on the daily reserve price applied in the medium and longer term auctions).

Annex A – Experience in Member States to date

Capacity allocation starts at 1pm on the day before the gas flow day and continues at each hour bar until 6am at the start of the gas flow day.

Details of the allocation process are similar to the AMSEC auctions.

WDDSEC (Within-Day Daily System Entry Capacity) auctions

This is the within-day process for allocation of daily capacity.

Bids for daily capacity may be submitted from 6am at the start of the gas flow day until 2am on the gas flow day. They must be equal to or above zero (the reserve price in this auction has a 100% discount on the daily reserve price applied in the medium and longer term auctions).

Capacity allocation starts from 7am at the start of the gas flow day and continues each hour bar until 3am on the gas flow day.

Bids can include fixed quantities or a quantity that reduces as the time in hours between bid submission and capacity allocation increases.

Details of the allocation process are similar to the AMSEC auctions.

DISEC (UK)

NG notifies availability of DISEC at 12.00 on D-1. For each entry point this is the daily average unutilised capacity for the last 30 days plus any discretionary quantities that NG chooses to make available.

Bids must be greater than the reserve price.

Allocation is based on the same ranking and pay-as-bid methodology as used in AMSEC.

Joint Auction Office (CASC) for the power sector

Capacity Allocation Service Company (CASC) for the Central West European Electricity market was set up in 2008 and began to auction capacity on the border of CWE countries (B,F, D, L and NL) in 2009. The scope has since been broadened to cover Austria, Greece, Italy, Slovenia and Switzerland. In all CASC covers 12 different borders (virtual capacity) except in relation to the German border where there are two virtual interconnection points on each border corresponding to the different German TSOs.

Annual and monthly auctions take place at all borders but daily auctions at the CWE borders are implicit as a result of market coupling (with a fall back to explicit auctions in case market coupling is suspended).

The summary below is based on Version 1 of the Auction Rules implemented from 2012.

- The following standardised products are available:

- annual baseload (released in two tranches at some borders);
- monthly baseload, peakload and offpeak products; and
- daily products except on CWE borders and the Italian-Slovenia border.

The volumes are decided by the respective TSOs. The allocation of volume between products of different durations is not covered in the central rules.

- Capacity is allocated in units of 1 MW. Price is defined in terms of € /MW/h
- With regard to the auction calendar:
  - Capacity in both directions is sold on the same day.
  - A period of one day is provided for bid submission in monthly auctions – longer for annual auctions.
  - Due to the Dutch Grid code annual capacity at NL borders is released in two tranches in Sept/Oct and Nov/December.
  - Yearly auctions for some borders take place on the same day, others on different days (closely related borders appear to be sold together).
  - Monthly auctions for some borders take place on the same day, others on different days. Base and peak products are offered on sequential days.
- The auction methodology is common for all products:
  - Use of uniform sealed bid auction format – participants bid a quantity and a price.
  - The marginal price is the price of the lowest bid accepted in an auction.
  - If there is less demand than capacity offered, the marginal price is zero (national network charges still apply to participants).
  - The algorithm ranks bids in decreasing order.
  - Bids which do not meet the credit limit can be eliminated at this stage and the bids ranking revised.
  - Bids are accepted down to the lowest price bid at which the aggregate demanded quantity is equal to or greater than capacity offered – the marginal bids are then scaled back and rounded to the nearest MW so the allocation is equal to the capacity.
  - In the event of bids marginal bids at the same price, the scaling back is done across tied bids in proportion to the capacity requested.

Annex A – Experience in Member States to date

- The software used has the ability to permit bidder to link their bids for capacity at two different borders. However, this has never been requested and this type of bid has not been included in the auction rules.

- The rules contain provisions for a secondary market in which capacity can be transferred to third parties or resold in the CASC auctions

- The rules deal with capacity usage (programming authorisations, compensation in the event of capacity reductions by TSOs and nominations). They contain "Use it or Sell it" provisions for automatically re-selling yearly and monthly capacity that is not nominated in the daily market.

- CASC publishes the following information on its auctions
  - marginal price;
  - capacity allocated;
  - the full demand curve;
  - number of participants and number of winning participants; and
  - names of winning participants for annual and monthly products (but not the quantities allocated to each one) – the purpose of this is to stimulate secondary trading.

Annex B – The simulated auction

We conducted a simulation of the ascending clock algorithm with 9 teams from a number of NRAs on 29th February 2012. We offered capacity at three different IPs for a single time period. The IPs provided capacity to flow gas between three different hubs. The configuration was chosen to illustrate the challenges of bidding when the IPs are substitutes and/or complements.

The script given to the participants is set out below. This has been modified to include data given separately to the participants. Modifications are indicated by italics.

Following the script we present the results of the auction and then comment on the issues facing the bidders.

We note that a single auction of this sort is more challenging than an auction in the real world for which information about previous auctions historic gas flows would be available.

SCRIPT FOR THE SIMULATED AUCTION

Introduction

ACER has asked Frontier to undertake a cross-border gas auction simulation in order to test the proposed auction methodology as set out in ENTSOG"s NC CAM.

This note is intended to help ensure that the simulation achieves its objective by guiding the participants of the simulation to behave in a way similar to that of real market actors.

Setting the scene

Participants and their objectives

The participants will be grouped into nine teams, with each team asked to act as though it were an independent Firm operating in a competitive gas market. We ask that teams do not collude (i.e. please do not exchange data or details of bids).

Each Firm has the objective to meet the projected demand from its own customers at least cost (i.e. the cost of gas + transport charges). Demand is assumed to be perfectly inelastic, i.e. demand is a fixed quantity invariant with price. We do not offer a reward for "winning" the game and therefore rely on each team to attempt to meet its objective as best as possible.

The exercise concerns a time in the future at which Firm transport capacity is being offered. However, there is significant uncertainty about future gas prices.

To avoid complexity, the teams may buy gas in the forward market but it is not permitted to sell gas.

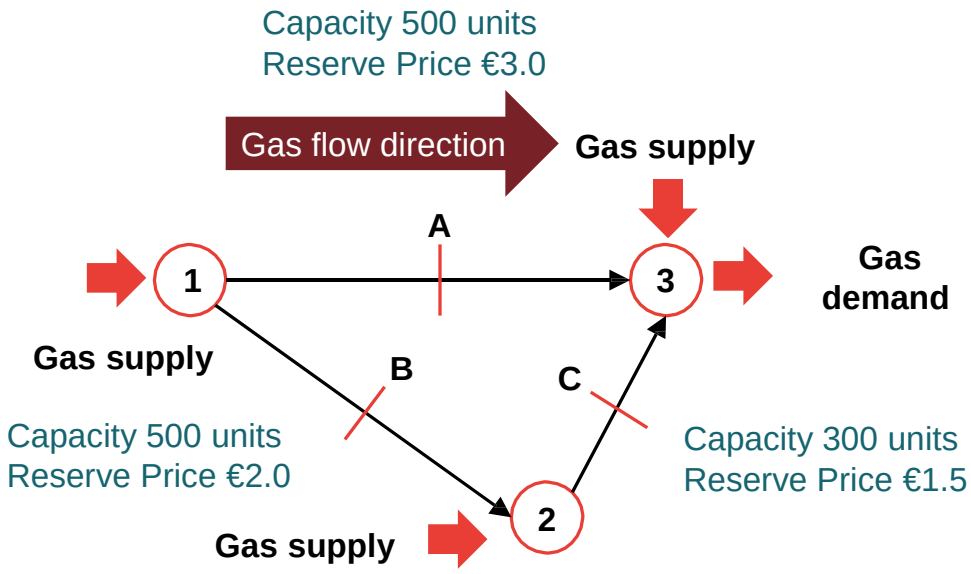
Gas network

The Firms (teams) operate in a world with a simplified gas network comprising three hubs (countries) and three interconnection points (IPs), as illustrated by **Figure 7**. All Firms have gas demand that they are required to meet at Hub 3.

It is possible to meet gas demand by buying gas at one or more of the three Hubs. If a Firm chooses to buy gas at Hub 1 or 2, it must also buy the corresponding volume of capacity at IP A, B and / or C in order to deliver the gas to Hub 3. Gas may not be sold other than to meet demand.

The general flow direction of gas is from left to right and the flow direction of capacity that can be bought at each IP is indicated by the arrows. There is no reverse flow and capacity is only offered in the forward direction.

Figure 7. The simple gas market used in the simulation (*with capacity and reserve prices added)*



Source: Frontier Economics

Each Firm (team) will be given the following information about the gas market on the day before the simulated auction:

1. The exact demand the Firm has to meet at Hub 3; *different demands were given to each shipper such that total demand was 1000 units of gas.*

2. An estimate of the aggregate demand to be met by all Firms at Hub 3 – *this was 600 – 1000 units*; and

3. An estimate of the price of gas that is available to buy at each hub. *The price at Hub 3 was €35 per unit, at Hub 2 was €33.5 per unit and estimated prices at Hub 1 ranged from €21 to €28.4 per unit.*

The aggregate demand and price information provided to each Firm will differ slightly in order to mimic real world uncertainty.

All Firms will also be given the same information about the volume of capacity available to buy at each IP and the reserve price of the capacity at each IP. *This information has now been added to the diagram.* They will also be told in advance the value of the Large and Small Price Steps to be used in the auctions. *These were €1.5 per unit and €0.3 per unit, one fifth of the large price step.*

The auction

Product and timeframe

An independent auction will be held for bundled capacity at each IP. By bundled, we mean that entry and exit capacity at the border point is released as a single product.

The capacity released through the auction represents the right to flow gas in a flat profile for the period of time. One product for a single time period will be auctioned at the IP between each hub. The period of time requires the ascending clock methodology to be used under the NC CAM.

For reasons of simplicity, we quote the estimated price of gas in € per unit and assume that 1 unit of capacity is required to transport 1 unit of gas.

The simulation takes no account of any actions that a Firm may be able to take prior to or after the auction, i.e. participants will have no opportunity to buy or sell IP capacity in secondary markets. In addition, no additional capacity tranches will be released through any subsequent auction.

Bidding and clearing

The independent auctions for capacity at each of the IPs will be held simultaneously. This means that it will not be possible to observe the outcome of one auction, or even the results of a single round, before deciding the best action for one of the other auctions.

The auction methodology is set out below in Rules 1 - 18 and shall apply separately at each IP. These rules are taken from those in the January 2012 version of NC CAM with minor adjustments for the purpose of the simulation – the algorithm is the same. In these rules the following definitions apply:

> A "Bidding Round" means the time period during which Firms can submit, amend and withdraw bids

A „First Time Undersell" means an occurrence where the aggregate demand across all Firms is less than the capacity offered at the end of the second Bidding Round or a subsequent Bidding Round.

1. Firms may place volume bids against escalating prices announced in consecutive Bidding Rounds, starting at the Reserve Price P_0.
2. The first Bidding Round, with an associated price equal to the Reserve Price P_0, shall have a duration of 30 minutes. There will be 30 minute recess between the first and second Bidding Rounds while the results are processed. Subsequent Bidding Rounds and recess periods shall have the same duration unless and until the Firms are notified of an updated schedule by the auctioneer.
3. A bid shall specify:
    a. the identity of the bidding Firm;
    b. the concerned IP; and
    c. the amount of capacity for the price step applicable to the current Bidding Round.
4. In order to participate in an auction, it shall be mandatory to place a volume bid in the first Bidding Round.
5. Once the relevant Bidding Round closes, all valid bids shall become binding commitments of the Firm concerned to book capacity to the amount requested per announced price, provided the clearing price of the auction is that announced in the relevant Bidding Round.
6. The volume bid in any Bidding Round per Firm shall be equal to or smaller than the offer of capacity in the relevant auction. The volume bid per Firm at a specific price shall be equal to or less than the volume bid placed by this Firm in the previous round, except where Rule 13 applies.
7. For the purpose of this simulation, bids may not be modified or withdrawn once submitted. In the event that invalid bids are submitted, the auctioneer reserves the right to amend bids. Blank bids will be interpreted as zero.
8. A Large Price Step and a Small Price Step shall be defined per Interconnection Point and published in advance of the relevant auction. The Small Price Step shall be set such that an increase by an integer number of Small Price Steps is equal to an increase by a Large Price Step.
9. If the aggregate demand across all Firms is less than or equal to the capacity offered at the end of the first Bidding Round, the auction shall close.
10. If the aggregate demand across all Firms is greater than the capacity offered at the end of the first Bidding Round or a subsequent Bidding

Round, a further Bidding Round shall be opened with a price equal to the price in the previous Bidding Round, plus the Large Price Step.

11. If the aggregate demand across all Firms is equal to the capacity offered at the end of the second Bidding Round or a subsequent Bidding Round, the auction shall close.

12. If a First Time Undersell occurs, a price reduction shall take place and a further Bidding Round shall be opened. The further Bidding Round will have a price equal to the price applicable in the Bidding Round preceding the First Time Undersell, plus the Small Price Step. Further Bidding Rounds with increments of the Small Price Step shall then be opened until the aggregate demand across all Firms is less than or equal to the capacity offered, at which point the auction shall close.

13. The volume bid per Firm in the first Bidding Round where Small Price Steps are applied shall be equal to or less than the volume bid placed by this Firm in the Bidding Round which preceded the First-Time Undersell. The volume bid per Firm in all Bidding Rounds where Small Price Steps are applied shall be equal to or greater than the volume bid placed by this Firm during the Bidding Round in which the First-Time Undersell occurred.

14. If the aggregate demand across all Firms is greater than the capacity offered in the Bidding Round with a price equal to that which led to the First Time Undersell, minus one Small Price Step, the auction shall close. The clearing price shall be the price that led to the First Time Undersell and the successful bids shall be those submitted during the original Bidding Round in which the First Time Undersell was shown.

15. After each Bidding Round, the demand of all Firms in a specific auction shall be published as soon as reasonably possible in an aggregated form.

16. The price announced for the last Bidding Round in which the auction closes shall be considered as the clearing price of the specific auction unless Rule 14 applies.

17. All Firms who have placed valid volume bids at the clearing price are allocated the capacity according to their volume bids at the clearing price. Successful Firms shall pay the clearing price of the specific auction.

18. Following closing of the auction, the final auction result including the aggregation of allocated capacities and the clearing price shall be published. Successful Firms shall be informed about the amount of capacities they will be allocated, whereby individual information shall be communicated only to concerned parties.

IT details

The IT tool is based on Excel and has been developed solely for the purpose of this simulation. There is limited error checking but sheets are not protected. Please only enter data in the cells marked for bid.

Each firm has a nominated representative who will be responsible for communications with Frontier Economics (bid submission, receipt of information). This is the only e-mail address that will be used by Frontier.

Firms will enter their volume bids for each of the three IPs on bid form contained within an Excel spreadsheet. Only three numbers need to be entered in each Bidding Round at the prices for each IP. In the first Bidding Round the prices will be the reserve prices.

Please only edit the three cells where it say "<== enter your bid here". The other cells are not protected. The current round and round price is to the left of these cells.

Data entered for each IP will be checked to ensure compliance with the Auction Rules. A cell below the bid entry cell will display an error message if the bid is invalid e.g. the bid volume exceeds the volume bid at a lower price step.

The bid forms will be sent to the nominated representative of each Firm by e-mail.

Once data has been entered on the bid forms they will be returned to Frontier at the following address cam.auctions@frontier-economics.com. This must be done according to the auction schedule set out later in this script.

During the recess, Frontier will process the data and then send updated bid forms to each Firm for the next Bidding Round. The updated bid forms will contain the following information:

- The individual bid volumes submitted for each IP by the Firm in the previous Bidding Round.
- The aggregated volumes bid by all Firms in the previous Bidding Round for each IP.
- If the auction of capacity at an IP did not clear in the previous Bidding Round, the form will show the price step at which bids must be placed in the current Bidding Round and whether this is based on a large or a small price increment.
- If the auction of capacity at an IP cleared in the previous Bidding Round, the IP will be marked as "CLEARED" to indicate that the auction has closed.

This process will continue until the auction at all three IPs has closed.

Firms will be sent a report showing the capacity allocated to each Firm at each IP and the total charges for booked capacity.

The Excel spreadsheet used will be compatible with Excel 2003 and later versions and be in the .xls format. The bid form file will not contain macros.

The auction schedule

The following auction schedule will apply until Round 3. Before then the auctioneer will send a schedule for subsequent rounds. Assuming bid preparation and processing is taking place in a timely manner, the schedule from Round 4 will provide less time for bidding and for the recess..

Firms are asked to return their e-mails and attached bidding forms as soon as they are completed to allow for the fact that e-mails may take a few minutes to arrive in London.

Once a number of round are completed and there is information on how quickly bids can be submitted and processed, the auctioneer will consider whether a more accelerated schedule is feasible.

Table 2. Auction Schedule applicable until updated – Times are in CET

	Start	End
Round 1	9.00	9.30
Recess 1	9.30	10.00
Round 2	10.00	10.20
Recess 2	10.20	10.40
Round 3	10.40	11.00
Recess 3	11.00	11.20

Frontier Economics

After the auction is completed

The results of the auction will be announced after the final Bidding Round.

Comments and observations about the simulation may be sent to the contact e-mail address above. Depending on the nature of the comments, the auctioneer may schedule a conference call to discuss the simulation.

23rd February 2012

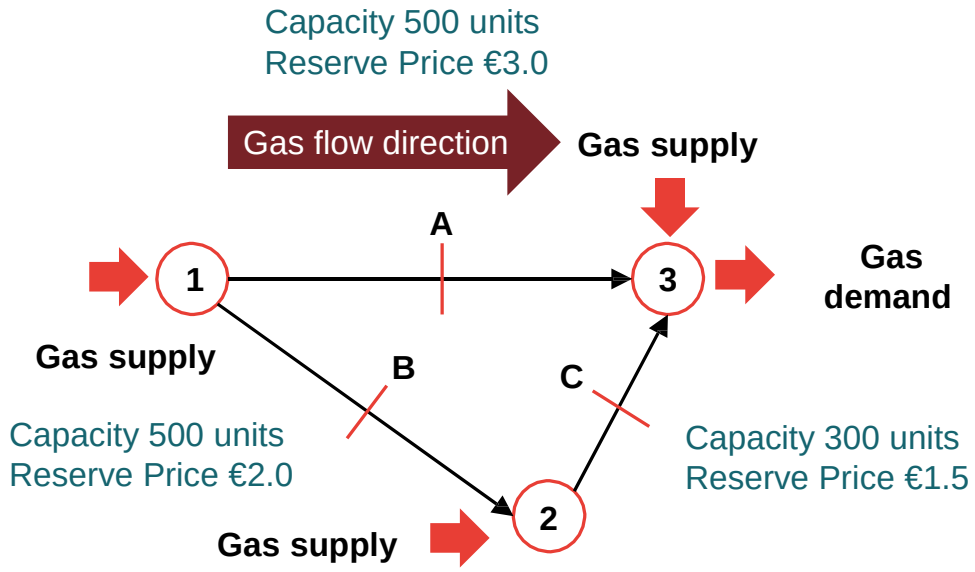
RESULTS AND COMMENTARY

A simulation of the ascending clock auction was held on 29th February in which nine teams from the NRAs and ACER participated successfully. This note summarises and comments on the results of the auction – the contents of this note will be included in our report to ACER.

Information provided to teams

Figure 8 below shows the network configuration given to the nine teams (IP A to C linking Hubs 1 – 3) with the capacity of each IP and the reserve prices.

Figure 8. Network configuration with capacity and reserve prices



Source: Frontier Economics

The shippers were also told that the estimated gas prices at Hub 2 and Hub 3 were €33.5 and €35 per unit respectively. In all cases, gas supply was price elastic so shipper did not need to be concerned about the impact of their demand on the price of gas.

Each team was then given the following team specific information about the estimated prices at Hub 1 and the demand that each shipper needed to serve at Hub 3. These data are shown in **Table 3**. There was, unknown to the NRAs, a tenth shipper participating. This was a dummy bidder managed by Frontier to provide extra control over the course of the auction in case of need – in practice, this bidder kept capacity demanded almost constant.

In addition, shippers were told that the estimated aggregate demand at Hub 3 was 600 – 1000 units. In fact it was 1000 as is apparent from the data.

Table 3. Data on price at Hub 1 and demand at Hub 3 given to each team

	Price at Hub 1 in €/unit	Demand at Hub 3 in units
Shipper 1	28.4	20
Shipper 2	28.3	60
Shipper 3	28.2	50
Shipper 4	26.7	60
Shipper 5	25.5	40
Shipper 6	25.3	20
Shipper 7	24.0	150
Shipper 8	23.0	150
Shipper 9	22.0	200
Shipper 10	21.0	250

Source: Frontier Economics

The price range chosen (P3 – P1) was intended to give some shippers no incentive to remain in the auction as the round prices increased. It would be cheaper for them to buy gas at Hub 3. Other shippers with a higher estimate of the P3-P1 price difference were expected continue bidding and be allocated capacity.

However, shippers had to decide whether to acquire capacity only on IP A or also to bid for capacity on the indirect route by combining capacity at IP B and IP C which were together complements to move gas from Hub 1 to Hub 3. This indirect route was a substitute for the direct route via IP A.

The results

Bid forms were successfully mailed to and from the bidding teams and Frontier"s office in London.

The results of the auction are summarised in **Table 4**.

Table 4. Summary results of the auction

Round	IP A			IP B			IP C		
	Price	**Agg Demand**	**Status**	**Price**	**Agg Demand**	**Status**	**Price**	**Agg Demand**	**Status**
1	3.00	965	Not cleared	2.00	778	Not cleared	1.50	948	Not cleared
2	4.50	955	Not cleared	3.50	698	Not cleared	3.00	738	Not cleared
3	6.00	905	Not cleared	5.00	390	First time undersel	4.50	390	Not cleared
4	7.50	680	Not cleared	3.80	390	Auction cleared	6.00	390	Not cleared
5	9.00	660	Not cleared				7.50	390	Not cleared
6	10.50	480	First time undersell				9.00	335	Not cleared
7	9.30	500	Auction cleared				10.50	230	First time undersell
8							9.30	270	Auction cleared
Undersell		*0*			*110*			*30*	

Source: Frontier Economics

The key points are:

- IP A cleared in the 7th Round with no undersell;
- IP B cleared in the 4th Round with an undersell of 110 units;
- IP C cleared in the 8th Round with an undersell of 30 units;
- small price increments were required to clear the auction in all cases; and
- for each IP there was only one small price increment round.

Commentary and analysis

With no prior knowledge of auctions at these IPs that could be used to predict flows, this was not an easy problem for the teams in spite of the simplification that gas could not be bought and sold for profit (only bought to meet demand) and that the full capacity was being offered (no holders of existing capacity). In practice, with a history of repeated auctions and knowledge of historic flows, we would expect the problem facing bidders would not be so difficult.

Given the aggregate demand estimate at Hub 3 of 600 – 1000 units, and cheaper gas at Hub 1, it was clear that IP A would be congested and there was a fair chance that IP C would also be congested – combined capacity to flow gas to Hub 3 being 800 units.

The gas price difference between Hub 3 and Hub 2 (P3-P2) was exactly equal to the reserve price for IP C so there was no benefit in buying gas at Hub 2 for transport to Hub 3, even if IP C were to sell at the reserve price.

Capacity at IP B and IP C was therefore only of interest to transport gas from Hub 1 to Hub 3 if justified by the estimated price differential between these hubs. For this purpose, matching capacity on both IP B and C was needed. This indirect route using Hub 2 as a stepping stone was an alternative to the direct route via IP A. Bidders could either choose one of these routes or, alternatively, divide their capacity requirements between the two routes. Note that the auction rule constraining bids to be monotonically declining with price increases makes it essential, if trying to win capacity on both routes to bid on the two from the start as it would be impossible to shift demand from IP A to IP B/C after Round 1.

Since IP C had only 300 units of capacity, the above considerations meant that IP B would have unused capacity and the auction was likely to clear at the reserve price with 200 units of capacity unsold. In practice, shippers bid above the reserve price but this was the first auction to clear. Unsold capacity was 110 units. Unless prices changed, the additional capacity acquired, 90 units, would have no value.

At the reserve price for IP A a gas price difference, P3- P1, of only €3 was needed to justify buying capacity at this IP. For the alternative route the price difference was bigger with the sum of the reserve prices being €3.50. The capacity at IP A could, as a minimum, justify a premium of €0.50 over the reserve price. Above this level, capacity on both routes had the same value as it would only be used to transport gas from Hub 1 to Hub 3. That value depended on the estimate of price differentials (P3- P1) given to each team.

In practice the auction of IP A and IP C proceeded as expected with demand reducing as the price clock increased and each team recognised that, at their estimates of the P3-P1 price differential, it was better to buy gas locally at P3. Both IPs cleared at the same price of €9.30. However, those allocated capacity at IP C had already acquired capacity at IP B at a price of €3.80 so the total cost of the IPB/C route was greater than the IP A route.

At closing of each auction there was no unsold capacity on IP A but 30 units were unsold on IP B.

Given gas demand of > 800 units at Hub 3, and any estimated price differential, P3-P1, of greater than €3.50, a central planner would have fully used all of the capacity at IP A and IP C to flow gas. The auction outcome came quite close to this result.

The implications of the activity rule were well understood by bidders. The rule is essential if price discovery is to be achieved. We do not see any alternative to this rule but we think that there may be a case for releasing long-term capacity in more than a single tranche to provide more opportunities to acquire capacity.

FRONTIER ECONOMICS EUROPE
BRUSSELS | COLOGNE | LONDON | MADRID

Frontier Economics Ltd 71 High Holborn London WC1V 6DA
Tel. +44 (0)20 7031 7000 Fax. +44 (0)20 7031 7001 www.frontier-economics.com