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How Splitting Energy Markets Promotes Transparency, Liquidity & Efficient Investment

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Energy Regulation Insights

From the Editor

What energy market institutions are best for efficiency, competition, and liquidity?

Many European commentators have argued in favour of widening market areas, to bring together more traders and larger volumes of gas. The German government has put this recommendation into a draft regulation. However, the European Commission has just agreed that Svenska Kraftnät, the Swedish national grid company, should divide the Swedish transmission network into more than one market zone so that internal transmission constraints can be resolved more transparently.

This edition of Energy Regulation Insights examines the effect of combining market areas and alternative ways to promote competition. It concludes that creating artificially large market areas, without proper consideration of network constraints within them, may promote a spurious kind of liquidity and harm the prospects for efficient investment—in gas pipelines at least. This ERI describes a solution that makes market institutions look more, not less, like the physical infrastructure that underpins them.

Graham Shuttleworth, Editor

Background

In April 2010, the European Commission (EC) and Svenska Kraftnät (SvK), the Swedish national grid company, reached an agreement under which SvK will divide the Swedish transmission network into more than one market zone, to allow internal transmission constraints to be settled through a pricing mechanism.[1] In contrast, in May 2010, the German Ministry of Economics and Technology published a Draft Ordinance that requires gas pipelines to widen transmission market areas, reducing their number from six to two by 2013.[2] These and similar decisions reveal conflicting aims at the heart of European competition policy for the energy sector. The resolution of this conflict will depend upon whether European energy policy makers think it is more important to facilitate trading than to encourage efficient investment.

The EC has reached agreement with SvK over its behaviour during times when capacity constraints emerge on the Swedish electricity transmission network. SvK stands accused of managing internal congestion in a discriminatory fashion, by curtailing capacity on cross-border interconnectors linking Sweden with neighbouring countries. As part of the agreement, SvK will divide the Swedish electricity market into separate pricing zones by 1 November 2011. In the interim, SvK will manage congestion through counter-trades, i.e., by paying producers or consumers to adjust their input and offtake schedules before resorting to the curtailment of interconnector capacity.

The move towards a more segmented market in Sweden runs contrary to the tendency in other European energy markets. For some time now, the German network regulator, the Bundesnetzagentur (BnetzA) has been requesting gas companies to consolidate their systems into larger "market areas" operating a unified entry-exit system with one "virtual"

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marketplace. The British electricity market followed a similar pattern in 2005, when "BETTA" (a market covering all of Great Britain) replaced separate markets for England and Wales ("NETA") and Scotland. However, the Swedish case highlights an economic problem that affects all attempts to create wide market areas, and has major implications for the efficiency of investment. The only question is where and when similar problems will require other energy markets to be split.

The Motivation for Wider Market Areas

The tendency to combine large areas of an electricity network or gas pipeline system into one market derives from concern that independent traders may be isolated within smaller markets. The aim of these reforms is to increase liquidity by bringing together more traders and larger volumes over a wider geographical area, whilst making it easier for traders to access capacity. Traders and regulators have supported such moves.[3]

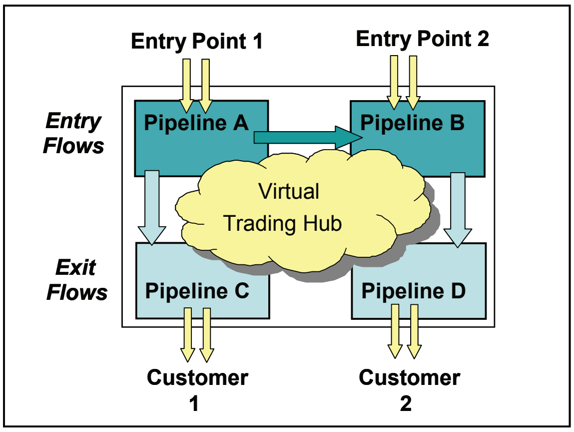
The policy springs from the perceived problems faced by an independent energy trader who possesses energy (electricity or gas) in a specific location (as defined in a contract). The trader often has few potential trading partners at that location and would have to rely on the incumbent to provide backup supplies or an outlet for surpluses. Traders can trade at other locations, but poor transparency has denied them cheap and easy access to network capacity. The lack of quick, transparent and low-cost access exposes traders to basis risks if they can only hedge price risk in one market whilst trading energy on another market with different characteristics. Bringing traders together into wider markets seems to reduce both basis risk and reliance on the incumbent. Regulators and competition authorities see this solution as promoting competition, whilst many traders welcome the simplification of their task.[4]

However, in practice, such moves do not promote competition in a real commodity. Within wider markets traders and investors soon find that the definition and pricing of "available capacity" is complex and unpredictable. Transmission constraints within wider market areas require frequent market interventions by system operators. Combining distinct markets into wider areas - and relying on system operators to cover up the resulting problems - reduces transparency, harms liquidity, and hides opportunities for efficient investment.

An Illustration of a Virtual Trading Hub with Entry-Exit Capacity

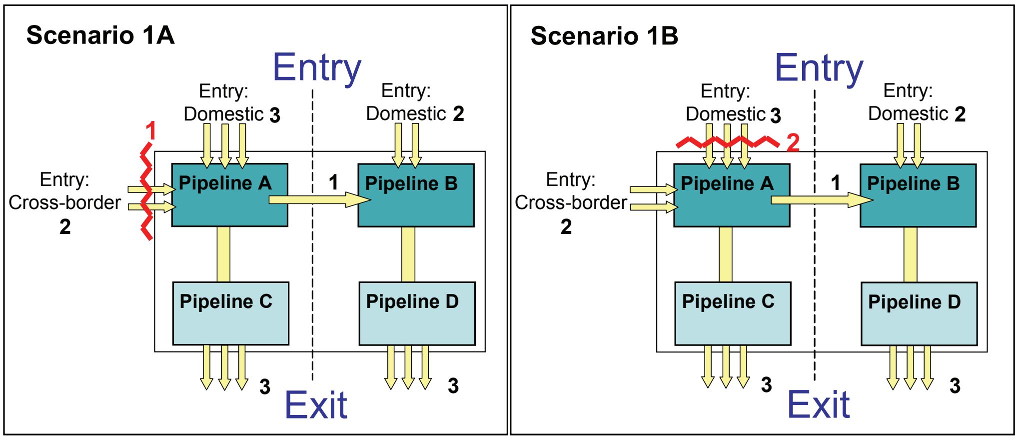
We can illustrate the problem with a gas pipeline network, but the same problems arise within electricity networks.
In Figure 1, two long-distance pipelines (A and B) and two distribution pipelines (C and D) have been assigned to the same market area. Pipeline A feeds gas into Pipeline C, but also into Pipeline B and from there to Pipeline D. Pipeline B has no direct or indirect connection to Pipeline C. However, the entry-exit tariff system hides this physical reality by creating a "virtual trading hub". The precise nature of these "virtual" hubs is rather nebulous, since they have no defined location. They consist mainly in an (admittedly unrealistic) assumption that all gas within the market area is interchangeable at the virtual trading hub.

Figure 1 Entry-Exit Tariffs in a "Two-Contract System"



The creation of a "virtual trading hub", with "entry capacity" leading into it, and "exit capacity" leading out of it, inevitably raises a question over the amount of capacity available at each entry or exit point. In the end, the allocation of real physical capacity among the virtual routes implied by entry and exit

Figure 2 Choices over Congestion Management in an Entry-Exit System



capacity remains a subjective (and not always transparent) choice by the pipeline operator.

Problems with Defining Entry Capacity

Figure 2 represents the flows over these networks on a day when customers wish to take three units of gas from pipeline C and another three units of gas from pipeline D. (A unit is defined in millions of cubic feet, or cubic metres, or some equivalent denominated in energy terms.)
Suppose traders try to meet all six units of demand by injecting five units into pipeline A (two units from international sources and three units from domestic sources) and only one unit into pipeline B. The link between pipeline A and pipeline B has sufficient physical capacity to transport one unit of gas. Pipeline A can therefore deliver at most four units—three to the customers of Pipeline C and one unit to Pipeline B. Traders want to inject one unit more into Pipeline A than the system can transport. In an entry-exit system, the system operator must step in to ensure a feasible pattern of injections.

The two scenarios in Figure 2 show how, in order to deal with the congestion within pipeline A, the transmission system operator restricts entry capacity to Pipeline A, curtailing either the cross-border entry point (Scenario 1A) or the domestic entry point (Scenario 1B). Combinations lying somewhere between these extremes are also possible.

Although specified in terms of a gas pipeline system, scenarios 1A and 1B illustrate the type of problem that arose on the Swedish electricity transmission system. In the Swedish case, SvK chose to manage internal congestion first by restricting capacity on cross-border electricity lines.

Such choices can be criticised as arbitrary or discriminatory, and are certainly unpredictable. Even a small change in demand on pipeline C would tighten or loosen the constraint on flows into Pipeline A. The definition of entry capacity therefore depends on fluctuating measures (or assumptions) about demand in different parts of the network.

What is more, network tariffs for entry-exit capacity cannot be cost-reflective, stable, and transparent, because capacity is defined in a way that is remote from specific assets or costs. Some networks manage with a postage stamp or uniform tariff. Such tariffs may be stable and transparent, but they do not provide useful cost signals to system users when constraints arise (or threaten to arise). Potential investors cannot see where the congestion arises on the link between Pipelines A and B, how much the congestion costs, or precisely where new investment would alleviate the congestion.[5] On the other hand, trying to update tariffs and available capacity in the light of changing network conditions undermines the stability of the methodology and reduces transparency.

Conventional Responses

Choices over the allocation of entry capacity have arisen in wide European gas market areas for many years. The responses have taken several forms.

For example, the system operator can define capacity in a way that is consistent with all future patterns of demand. Generally, that means only one thing—a very low level of capacity, which traders and regulators alike find unacceptably inefficient. System operators have therefore developed various forms of intervention designed to provide a more flexible (but subjective) response to changing conditions, and to offer a higher level of capacity.

In Britain, National Grid recently[6] developed an "Entry Capacity Substitution (ECS) Methodology," setting out a complex methodology for deciding how unsold capacity at one entry point can be transferred to meet demand for additional entry capacity elsewhere on the network. For example, National Grid asked to shift entry capacity from the Teesside entry terminal in North East England to the Barrow entry terminal in the Northwest.[7] In May 2010, Ofgem approved the shift on the basis that National Grid had acted in accordance with its transmission licence and applied the ECS Methodology. However, even this highly complex methodology does not entirely remove the need for the system operator to exercise judgment. The ECS Methodology leaves several important choices for National Grid to resolve in its sole discretion, in addition to the possibility of revising the methodology when conditions change. Hence, long-term planning is still difficult for system users.

A second solution, applied within many electricity and gas networks, is the one that SvK is required to adopt immediately, namely arranging "countertrades". Instead of managing internal congestion by curtailing entry capacity, SvK will have to enter the market to buy and sell electricity in different locations. In terms of Scenario 1A, the system operator would buy one unit of energy at the entry point into Pipeline B and sell one unit of energy at the entry point into Pipeline A. Taken together, these trades construct a flow in the opposite direction to physical flows, i.e., a "countertrade" from B to A, which alleviates the congestion on the route from A to B.

Usually, the system operator pays a high price at B, where energy is in short supply, and receives a low price at A, when energy is in surplus. Such price differences can help a monopoly transmission company figure out how much a planned investment in the network would be worth. However, they also undermine liquidity by creating a monopoly over trades at different prices (and hence risks that traders cannot hedge). Such countertrades help to maintain the "fiction" of the wider market area, but any resulting liquidity is of course equally fictitious.

The EC was concerned that SvK could only maintain the "fiction" of a unified Swedish electricity market by discriminating against flows to and from neighbouring countries. However, many regulators appear to tolerate similar discrimination—or else other forms of subjective intervention by system operators—in order to promote the "fiction" of a wide gas market area.

Gas markets face the same problems for pricing and risks. National energy regulators and European institutions (ERGEG) have tried to promote trade in energy and capacity, but on the basis of virtual trading hubs and entry-exit capacity. The resulting energy and capacity prices offer little incentive for efficient investment. Construction of gas pipeline capacity is not a monopoly. The system operator may capture information on different gas prices by making counter-trades. Market participants may see prices for congested entry or exit capacity. However, these energy and capacity prices do not offer competing pipelines an incentive for efficient investment. Price differences visible only at the level of a market area do not tell project developers where the congestion lies, how much this congestion costs, or what investment would alleviate it at least cost. Consumers will use gas sub-optimally, if they cannot see where congestion arises. The widening of gas market areas therefore deepens reliance on central planning and reduces the potential for efficient use of market signals.

Potential Solutions

To promote efficient investment and trading, electricity and gas markets need to combine long-term capacity contracts, for stability, with short-term trading, for flexibility and ease of access.

Electricity markets have little choice but to accept monopoly planning of transmission networks, but they can provide flexible, efficient short-term energy trading over a wide area by splitting energy markets. The SvK decision provides one example of splitting short-term markets. The challenge facing the European electricity sector is to offer investors (both generators and consumers) some long-term stability. Long-term transferable contracts for transmission capacity (both internal and cross-border) would help here. Such arrangements would be novel in most of Europe.

Gas markets, on the other hand, have plenty of experience with using long-term contracts to encourage investment in pipeline capacity. Sometimes, European energy regulators have restricted the use or duration of such contracts to deal with specific concerns about competition.[8] The challenge facing the European gas sector is to set up long-term capacity rights that reflect the underlying physical facilities and that also promote competitive short-term trading.

US federal authorities (the courts, as well as the Federal Energy Regulatory Commission) appear to have achieved this outcome. Over a long period, they created a highly efficient market in gas pipeline capacity, by regulating the form and structure of pipeline contracts. The rules that emerged from this process are summarised in Figure 3. The result is a set of contractual property rights, covering the whole pipeline system, that mimic the physical nature (point-to-point capacity) and the cost structure (mostly fixed and sunk) of the underlying facilities. Unbundling networks and imposing obligations on them to facilitate capacity trading created a competitive market in these property rights.[9] Short-term traders can therefore gain access to pipeline capacity on the same competitive terms as long-term investors.

Figure 3 Regulatory Conditions for Efficient Investment in, Use of, and Access to Gas Pipelines

For Efficient Investment	Key Benefits
Open seasons	Enables cooperation by private investors to exploit economies of scale
Obligation to provide taps	Avoids inefficient duplication of capacity Preserves competition in pipeline expansion
For Efficient Use	**Key Benefits**
Point to point charging in long-term contracts	Aligns the service offering with physical capacity and incremental costs
"Straight fixed variable" charging structure	Promotes efficient utilisation: Variable usage charges = Variable costs
For Efficient Access	**Key Benefits**
Unbundling	Allows a market price for capacity to emerge Prevents vertical foreclosure
Capacity Trading: Standardised terms and trading platforms	Traders are familiar with capacity products on all long-distance gas pipelines Market access to capacity is cheap and quick

Source: NERA (2009).

It is easier to define realistic contractual property rights on gas pipelines than on electricity networks. However, the benefits of such contracts are well known, thanks to the work of Ronald Coase.[10] Users who base their decisions on realistically defined property rights make efficient choices about the development, use and allocation of the underlying facilities.

Conclusions

In Europe, regulators have tried to promote liquid trade in energy by forcing traders into fewer, wider market areas. However, promoting "trade for trade's sake" has no real economic benefit, unless it also promotes economic efficiency. The cases listed above show that wider markets often cross – and therefore hide – congested parts of the network. These wider market areas are therefore based on a fiction – virtual trading hubs linked by virtual capacity – which undermines transparency. The reduction in transparency harms liquidity, as well as investment incentives and economic efficiency, because any resulting increase in trade volumes concerns a fictitious, or at least hypothetical, commodity.

In the future, European regulatory authorities will face a choice. They can continue to promote wider market areas, based on "virtual trading hubs" and "entry-exit" definitions of capacity. These systems will rely on continued action by monopolies to assist short-term energy traders and are unlikely to develop truly liquid markets in energy, or competitive and efficient investment in new infrastructure. Paradoxically, the creation of real liquidity may require markets to be split, as in the Swedish case. Efficient investment in the electricity sector may still rely on monopoly network companies, but gas markets can do better. Realistic contractual definitions of pipeline capacity (combined with regulation to encourage trading in this capacity) promote efficient and competitive investment. Europe's security of supply and energy market liquidity would therefore be boosted by embracing the physical reality of the energy network, rather than by hiding it behind a "virtual" system.

EndNotes

1 http://europa.eu/rapid/pressReleasesAction.do?reference=IP/10/425&format=HTML &aged=0&language=EN&guiLanguage=en

2 "Cabinet to Change Gas Network Access Ordinance", Ministry of Economics and Technology website, 19/05/10

3 Mathias Kurth, president of the BNetzA, has said that "reducing the number of market areas is another major milestone for competition in the gas sector that increases liquidity in the gas markets, makes the transaction of gas transports easier and allows for a more efficient management of regulating and balancing energy"(BNetzA press statement, 28 October 2009).

4 "Trader associations caution that wider domestic market areas must not come at the price of curtailment of border point capacity and that previous total firm capacity must be maintained and guaranteed by load flow commitments, capacity buy-backs or interruption compensations at the market price spread." Statement by European Federation of European Energy Traders, EFET Deutschland, May 2009.

5 Traders may be aware of congestion on the A-to-B link, but would have to construct a long pipeline to circumvent the whole system. Only the owners of the existing pipelines can identify a more targeted solution and so incumbents possess a competitive advantage in the market for new investment.

6 Approved by Ofgem, the British energy regulator, in December 2009.

7 See: http://www.ofgem.gov.uk/Pages/MoreInformation.aspx?file=Barrow%20 IECR%20approval%20letter%20final.pdf&refer=Networks/Trans/GasTransPolicy

8 On the grounds that long-term contracts pose an obstacle to competition, the German Federal Cartel Office has occasionally imposed a limit on the duration of gas supply contracts. On the same grounds the German government is about to pass a new ordinance on gas network access (GasNZV 2010) that will limit the duration of contracts for gas pipeline capacity.

9 For a description of the various regulatory constraints on the design of gas pipeline capacity contracts in the United States, see NERA (2009), Developing a Regulatory Framework for CCS Transportation Infrastructure, Vols. 1 and 2, NERA, 11 June 2009. The German network regulator started a procedure on the standardization of capacity contracts at border points and interconnection points of domestic gas market areas in February this year (BK7-1-001). However, it does not contain the same restrictions as the US federal authorities have applied over the last 20 years.

10 In his 1960 article, Coase argued that, if property rights are clearly specified, parties have an incentive to negotiate trades that are socially efficient as well as mutually beneficial. See Coase, R.L. (1960), "The Problem of Social Cost," Journal of Law and Economics, Vol. 3, pp. 1-44.

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