Maximising Your Gas Network

How to Manage Pan-European Gas Portfolios on a Single Screen

By Larry Hickey & Russ Hecker

EUROPE'S GAS BALANCING regimes involve moving gas on and off a balancing zone. A shipper must have entry capacity to enter and exit capacity to exit the balancing zone. Shippers are identified by unique codes issued by the network operator. This basically covers the common elements.

One must then examine the differences. At OpenLink, we've spent much of the past two years thinking about these differences in a systematic way. When you get past the administrative items, you're left with an array of differences that can be traced back to two fundamental questions:

1. What is an imbalance?
2. What does it cost?

The right answers maximize the value of the gas network and define the optimal balancing regime, which is easier said than done.

Neighbouring countries can reach very different conclusions, resulting in Europe's patchwork quilt of balancing regimes. These differences can be particularly challenging for shippers challenged to manage a pan-European gas portfolio. But help is at hand.

What is an Imbalance?

In simple terms, gas receipts minus deliveries (1) in a 'given' area over a 'given' period. It is the contractual model that defines the 'given' area and period. The area is the balancing zone. But the country may have a single balancing zone or multiple zones. The period may be daily or hourly.

> The problem of getting imbalance charges right is complicated by the absence of relevant published index prices in these new markets

The objective is to create a contractual model that is as simple as possible while still capturing the essential limitations of the physical network. Simple means transparent and accessible in order to promote market entry, competition and liquidity. Daily balancing in a single balancing zone is simple and describes the balancing regime in Belgium, Denmark, UK, Italy, Luxembourg, and Spain.

Limitations Must be Incorporated Into the Design of the Contractual Model

A single balancing zone may suffice if there are no bottlenecks in the network. But if there are congestion points, multiple balancing zones may be required. Likewise, if gas flow through the network is low relative to the storage capacity of the network, daily balancing may be sufficient. If not, hourly balancing may be required, as is currently the case in Germany, The Netherlands, Austria, and Latvia.

If the contractual model is a poor representation of the physical network, interventions may be necessary simply to bridge the gap between the two.

For example, a producer who tends to produce a little less in the morning and a little more in the afternoon faces no imbalance cost in a daily balancing regime. But if the network operator is forced to buy gas in the morning and sell it in the afternoon to keep pressure in band, costs are incurred. To the extent that these costs are borne by others, gaming is encouraged and overall costs will rise.

As long as gas into the balancing zone equals gas out, pressures remain constant (2). Net imbalances cause pressure changes. If the change is drastic, the network operator (as the balancing agent of last resort) has to act to move pressure back in band. The network operator is providing flexibility.

Hourly *gMotion*

Two years ago, OpenLink set about to fill the systems gap for European gas scheduling. The journey began with an analysis of the spreadsheet solutions in use. OpenLink's SVP, Energy Solutions, Jonathan Stochel puts it this way.

"The pivotal point in our design came when we met with schedulers who were very content with a well designed spreadsheet. The spreadsheet allowed the schedulers to do their job efficiently, but was completely detached from a trading or risk management system. We knew we needed to build a screen with all that rich functionality, seamlessly integrated into our existing Endur infrastructure."

OpenLink was compelled to develop a gas scheduling solution that was flexible enough to handle the variations between balancing regimes and at the same time leverage what was common among them. That common thread is the balancing zone. After some re-toolling that enabled point-to-point transport service to be modelled as a balancing zone, Europe began to look a lot like a network of interconnected circles.

The solution that emerged, Hourly *gMotion*, a gas logistics module which was, designed from the ground up to address the specific requirements of European markets. Hourly *gMotion* is a fully integrated module within Endur, OpenLink's industry leading energy trading, risk management and settlement system. Operational details are incorporated into the far corners of the application on a real time basis. The scheduling position is reflected in P&L reporting, the credit calculation, VaR, and the settlement desktop.

Hourly *gMotion* In Action

At the heart of Hourly gMotion is the balancing zone model. A single, real time screen is used to manage receipts and deliveries, and track any resulting imbalance, on a particular balancing zone for a specified range of gas days. Receipts and deliveries are separated into two blotters; a contract blotter for flows the shipper cannot change and a flexible blotter for flows the shipper can change. Essentially, imbalances are created in the contract blotter and 'fixed' in the flexible blotter. An imbalance blotter keeps an hourly and running tally of the difference between receipts and deliveries. This same running imbalance is also presented in a graph and any applicable imbalance limits are displayed. Point to point transport and balancing zones with service gas are conveniently handled within the same framework because losses are incorporated into the balance calculation.

This simple, intuitive screen belies the powerful and flexible functionality within. On the screen, users are able to move contracts between the flexible and contract blotters. Users rank flexible contracts to determine the order in which they will be dispatched to 'fix' imbalances. At the press of a button, users can balance a day or range of days. Automatic balancing can be accomplished as soon as possible or in a straight line, over the rest of the day.

Each column in the contract and flexible blotters is a particular volume type associated with a particular deal. Volume types might be nominated, confirmed, allocated and final, for example. Users decide which volume types will appear, the order in which they will appear, which ones will have an impact on the imbalance calculation and which ones will be used to default nomination quantities.

Users can display the available entry or exit capacity at each location: Even though entry and exit capacity is traded in volume units, you will see the energy equivalent position on the screen. The system automatically uses the best available GCV to convert volumes into energy. This same functionality is used to convert counterparty nominations made in volume units into an equivalent energy position.

The screen is easy to navigate and includes tools to conveniently locate and move to specific contracts. A right click menu enables you to see the shipper codes associated with any volume type, or you can go to the deal in Endur.

'Deals' are flexibly defined, meeting current requirements and anticipating further market developments. Our deal structure includes odorisation services, GCV conversions, and pressure reduction services. Both imbalances and imbalance limits can be modelled as deals. Today, imbalance limits come bundled with capacity. As the market matures, limits may be unbundled and traded separately. Endur is ready.

So it's now possible to manage the full complexity of European gas markets under a single roof, OpenLink's Hourly gMotion. Pan-European shippers can say goodbye to the spreadsheets and associated operational risk and turn to the proven, integrated, powerful solution that today's European gas markets demand.

Trading and using storage are two of the ways the network operator may provide flexibility. Storage may consist of injections and withdrawals from a storage facility or the inherent storage capacity of the allowable pressure band for the network, called linepack. The network operator may also swing receipt or delivery contracts or engage the services of a 'balancing shipper'. In any case, flexibility incurs costs. Imbalance charges exist to pay for this flexibility.

What Does an Imbalance Cost?

Ideally, the cost to the party causing the imbalance would be the cost incurred by the network operator to remedy the imbalance. That way, shippers – who have primary balancing responsibility – would use network flexibility only when the network operator can provide it more cheaply than the shipper can.

Imbalance pricing is fraught with risk. If the costs are too high or the regime too complicated, market entry is deterred. If the costs are too low, the network operator will subsidise connected pipelines, to which the flexibility will be exported.

The problem of getting imbalance charges right is complicated by the absence of relevant published index prices in these new markets. Until recently, The Netherlands used quarterly oil prices and France still references the price at Zeebrugge, which is in Belgium. Prices in Italy are simply administratively set.

In reality, imbalance pricing is a messy affair. A grab bag of tolerance bands have emerged, with one price applying inside the band and another more punitive price applying outside. Tolerances range from 0 % in the UK to 20 % in France. Some tolerances are cumulative. Others apply to a single hour or day. Different limits may apply intra day versus at the end of the day and tolerances may be a function of temperature.

Another dimension of imbalance pricing is pooling and trading. In many regimes, imbalances may be pooled across zones. Some before the imbalance is created, others after. And some both. Some regimes also allow for trading of imbalances.

The final dimension of imbalance pricing is the cash out. Imbalances may be cashed out daily, monthly or never. Imbalances are typically cashed out against a bid-ask spread around an index. So whether the shipper is long or short, there is a loss on the transaction.

Administrative Differences

Besides the differences arising out of the fundamental definition and pricing of imbalances, there is a host of other issues that can bedevil the pan-European gas shipper:

Units: Gas may be traded in energy units of Therms, GJ, MWh, or kWh. It can also be traded in volume units of cm. To move gas onto or off of a balancing zone, you need entry or exit capacity. Entry and exit capacity is typically traded in cm. So we need to be able to convert volume into energy to determine how much energy we can transport using our entry and exit capacity. As the heat content of gas varies by time and place and is not known in advance, we use estimates, introducing another source of imbalances.

Currencies: Transactions take place in the national currency. In many cases, that's the euro. But it can also be in sterling, kroners, kronas, kroons, lats, litas, zlotys, korunas, forints or tolars.

Time Zones: Balancing zones can be in different time zones. The UK Interconnector is a good example, with a 1hr time difference between entry and exit points. Time zones may have unique daylight savings

time switching points, defining the 23, 24 & 25 hour days of the year.

Gas Day Start Times: Each balancing regime defines their own start time to the gas day. So you can have interconnected regimes, one with a 6 am start to the gas day and the other with an 8 am start, for example.

Quality Tolerances: All gas is not created equal. Natural gas is composed almost entirely of methane, but also contains heavier liquid hydrocarbons (pentanes, hexanes, etc). The quantity of these liquids in gas depends on the degree to which gas producers extract the liquids. If natural gas prices are high and liquids prices are low, gas producers may not fully process the gas. To protect against this, there may be an upper limit on the amount of liquid hydrocarbons in the gas. Limits might also apply to hydrogen sulphide, carbon dioxide, water and oxygen, which promote pipeline corrosion or nitrogen – an inert gas and therefore a free rider. There is a wide array of gas qualities and limits, which may apply to each network.

Shipper Codes: Each network operator assigns unique shipper codes. So instead of simply tracking counterparties, another level of abstraction must be supported. Further, there may be multiple shipper codes for each deal.

Nomination Requirements: Each network operator will set unique due times, limits on the number of renominations, the minimum renomination interval, blackout periods, and allowable deviations in nominations.

Maximize Your Network

In attempting to model the complexities of different balancing regimes, is it any wonder that so many companies have turned to the 'band aids' of the IT world? Otherwise sophisticated players are scheduling their European gas portfolios on spreadsheets.

Modelling flexibility is achieved at the cost of operational risk. Spreadsheets lack an audit trail, security protections, and support for multiple users or real time integration to a trading and risk system.

Happily, there is now an available alternative •

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