Energy demand behaviour in competitive open markets

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It would be convenient to assume that demand behaviour for energy could be treated with the same economic principles applicable to other commodities. This unfortunately is not the case. If supply and demand were the two factors that would influence the price and hence the level of consumption, then a lot of us would find energy demand management altogether easier to handle.

Energy demand arises from three very broad areas. The first is the easiest understood: the end user demand for running machinery, plants, heating, lighting etc. The second is where the energy is the driver source for a secondary source. The best example of course is the use of gas to generate electricity through CCGTs . In this case, the demand for gas becomes directly linked to the demand for power generation and by extension, this will have an impact on the pricing of both energy types. The third area of demand lies in the shadowy world of open markets. Energy markets now have trading capabilities and the very nature of trading tends to be speculative. It is therefore a very real danger that gas and oil can be traded heavily on a speculative basis and presents a demand pattern of consumption which is not real. Trading facilities however do serve a very important function by providing the ability to cover short term procurement bottlenecks and to keep the system moving.

The fact that power and energy are now being traded on an open market categorises them as commodities. In fact many vendors of risk management and trading systems have slowly started rebranding their products as Commodity Trading and Risk Management (CTRM) as opposed to the earlier classic of Energy Trading and Risk Management (ETRM). This has certain implications on the way that perceptions of energy has changed in the last 20 odd years.

Rather than explore a global analysis of energy demand behaviour, let us, for the purposes of this paper look closer to home in this region. The Balkans do not have significant oil or natural gas reserves and so these countries of the Balkans region are neither

major energy producers nor consumers. Most of the region's natural gas imports come from Russia. Although the region does hold some important fossil fuel deposits, these resources are not significant on a world scale, and the political and economic instability in the Balkans in recent years has discouraged any substantial foreign investment in the respective countries' energy sectors. Rather, the region is becoming more important as *a transit centre* for Russian and Caspian Sea region oil exports to Western consumers. If this is to be seriously considered, then equally seriously should it be viewed that a huge potential exists for the Balkan region to act as a "Hub" or even a series of "Hubs" for the transition and distribution of natural gas to the whole of the rest of the European continent. The satisfaction of demand can only be achieved through delivery and for delivery to take place, there has to be a delivery mechanism: the pipeline.

Progress in this direction can be seen from an agreement in place signed by representatives from all of the Balkan Countries indicating their support for a proposed natural gas pipeline from Greece, through the Balkans and into Austria. The pipeline would be extension of an interconnection being considered between Turkey and Greece.

With gas there is a strong connection with oil, both in terms of exploration and pumping mechanics but in price co-relations as well. Further, most major gas producers are also oil producers and a good indication of future intentions for the supply of gas can be noticed from the programmes being undertaken for oil transportation. Where such pipelines for oil exist, especially if they are large, it will follow that pipelines for gas stand a good chance to be introduced because it makes for strong logistic sense to couple the two. From that point of view if we look at the proposed projects running through the Balkans for oil, we can apply a similar expectation for gas transition. Some examples of piplines are:

The Albania-Macedonia-Bulgaria Oil Pipeline (AMBO), a proposed 570-mile, 750,000-bbl/d pipeline connecting the Bulgarian Black Sea port of Burgas with the Albanian Adriatic port of Vlore, allowing for sea borne oil exports from Russia and the Caspian Sea region to flow overland between the Black Sea to the Adriatic, bypassing Turkey's increasingly congested Bosporus and Dardanelles.

Druzhba-Adria Integration

Reversal of the Adria pipeline, which extends between Croatia's port of Omisalj on the Adriatic Sea and Hungary has been under consideration since the 1990s. The pipeline, which was completed in 1974, was originally designed to load Middle Eastern oil at Omisalj, then pipe it northward to Yugoslavia and on to Hungary. However, given the Adria pipeline's existing interconnection with the Russian system, the pipeline's operators and transit states have since considered reversing the pipeline's flow, thus giving Russia a new export outlet on the Adriatic Sea.

Connecting the pipeline to Russia's Southern Druzhba system would entail the cooperation of six countries (Russia, Belarus, Ukraine, Slovakia, Hungary, and Croatia). Though a preliminary agreement has been signed, progress has been slow, as the transit states have wrangled over tariffs and environmental issues. Should the countries come to an agreement, some analysts expect that the Adria pipeline could transit roughly 100,000 bbl/d of Russian crude in the short term, with an ultimate capacity of approximately 300,000 bbl/d.

Constanta-Omisalj-Trieste Pipeline

Another pipeline proposal entails the development of a 760-mile line connecting the Romanian Black Sea Port of Constanta with the the Croatian Adriatic port of Omisalj, and later possibly on to the Italian city of Trieste. As conceived by the Romanians, the proposed pipeline (known as both the South-East European Line--SEEL, and

the Contanta-Pancevo-Omisalj-Trieste pipeline--CPOT) would extend across Romania to the Serbian town of Pancevo (near Belgrade). From there, it would connect to an existing branch of the Adria pipeline, which runs across Serbia and Montenegro, Bosnia and Herzegovina, and Croatia to the port of Omisalj An alternative route for this project is a northern proposal, which would cross southern Hungary and central Slovenia instead of the Balkan states. It is expected that whichever option is decided upon, the pipeline would be used mostly to provide oil to the countries along the route, and would incorporate existing connections between Constanta and regional refineries.

These examples demonstrate a regional desire to avail of supplies through their territories. This of course promptly opens up huge opportunities for what can best be termed as Hub activities. Since most trades for gas are done on the basis of delivery at certain pre-agreed transit points or "hubs", the region could very easily develop an energy trading personality. Economically, this is a mixed bag since trading by very nature is speculative and if the facilities for storage are made available, then "stockpiling" for speculation can be a real problem, distorting market prices for reasons which are not purely economic and based on supply and demand.

Traditionally, demand behaviour could be assessed rationally because the variables were known. A national company knew its population and its expected rate of growth, its development plans and its generation capacities. But once we have an open market and with a transportation infrastructure which covers cross border markets, then the problems compound. This is mainly because supply can be from multiple sources and demand can be not just for national consumption but for export purposes. In which event, demand of the unknown market is needed which is difficult to compute by traditional methods. Further, does the exporter actually care about these demand patterns since the export happens purely based on the importer's demand? The answer should be yes. When the UK started running out of gas, major stockists in continental Europe hesitated to sell to the UK from their own stocks in storage for fear of running out themselves. In such a situation price itself cannot bring back the supply/demand equilibrium.

There is historical evidence to back this. In the oil crisis of the eighties, despite oil prices going up, global demand appeared to increase: a direct contradiction of basic economic principles. The reason was stockpiling. Stockists bought more for storage which registered this off take as demand. That drove the price up. This in turn convinced the speculators that prices would be going up even further. Stockpiling took place for two reasons. The first was the

genuine fear that OPEC would cut production and the second was a somewhat less noble one: with expected shortages, prices could be put up by the stockists to make a killing in the market. In the event, the markets suddenly realised that there was over supply and prices dropped. Production did not reduce because producers needed revenue for their development plans and the result was an oil glut and the market collapsing. Gas is quite capable of being subject to the same forces. Therefore, the assessment of demand for energy takes on a completely different complexion when considered in an open market environment.

Demand behaviour also changes when competitive market environments are introduced. Where in the past supply was a state undertaking with subsidising being the standard practice, in open market situations, the profitability issues are far more significant. It is therefore common to see various forms of incentives being given or offered to consumers based on consumption patterns being agreed to suit producers or generator's requirements. A good example of this is the Economy 7 scheme in the United Kingdom where lower tariffs are offered for off take during off-peak hours. Using a system of storage heating, power is used at night to generate heat which is stored and released gradually during the day. Similarly, timers switched on washing and drying machines late at night. This proved very popular for homes where elderly residents lived.

When it comes to industrials, again, through contracts which permitted interruptions or non off peak usage, tariffs could be offered which were very attractive.

In essence, while total demand within a predefined geographical area could remain more or less stable, the pattern of off take could vary considerably. This has of course implications on capacity management on both the Grid and the Pipeline for power and gas respectively. Increasingly we have seen the criteria for load analysis coming into smaller and smaller granularities for this very reason: currently quarter hourly predictions for electricity and hourly for gas.

Earlier, it was mentioned about energy trading and this is another factor that has to be considered with these smaller granularities. Treading is done in generation blocks and these correspond to the time windows mentioned such as the quarter hourly for electricity. The implication now would be that while power may be made available to the system, the price per block could vary significantly with no reference at all to the demand related equation.

This is the key difference: the cost of getting the demand forecasts wrong, especially in the short term where there is no time concession to make adjustments. This paper has attempted to present the overall picture at a very high level of the changes that have happened, are happening and is likely to happen in the future and we have used the Balkans as an example. All markets operating in liberalised environments will behave in a very similar manner.

In another paper to be also presented at this conference is a far more in depth study of the issues involved with the necessity to produce accurate load forecasts and is truly an analysis at a "micro" level while this paper should be seen as an approach from the "macro" level. It follows that both these papers should be read in conjunction to have a clearer perspective on the urgent and fundamental need for operators to understand demand behaviour and how to forecast for this essential and critical commodity in the short, medium and longer term horizons.

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