Jeroen De Joode, Hanneke De Jong and Laurens De Vries

CONGESTION MANAGEMENT IN MESHED GAS NETWORKS: CAN THE ELECTRICITY MARKET SERVE AS AN EXAMPLE?

Jeroen De Joode: Policy Studies Unit, Energy research Centre of the Netherlands (ECN)
Jaffalaan 5, 2628 BX Delft, the Netherlands
Phone: +31 (0)15-27887187, Fax +31 (0)15-2786439, E-mail: j.dejoode@tbm.tudelft.nl
H. De Jong, L. De Vries: Faculty of Technology, Policy and Management
Delft University of Technology, the Netherlands

Overview

As gas markets are being liberalized, it seems that current capacity allocation methods are inadequate. Current congestion management methods (such as first-come first served (FCFS)) are inefficient methods to allocate capacity (European Commission (EC), 2006) and may in some instances even threaten security of supply (Lise *et al*, 2005).

The issue of optimal use of existing transmission capacity is more prominently at stake in meshed gas networks such as the network in North-Western Europe. Moreover, complications arise when parallel gas pipelines run through different countries with different regulatory regimes in place, as is the case in the Netherlands and Germany. Due to strict regulation of network tariffs in the Netherlands and unregulated high transmission tariffs in Germany, the Dutch network may be used for transit purposes by German shippers to the extent that there may not be enough capacity to deliver to Dutch customers during demand peak (Lise *et al.* 2005).

A number of congestion management methods have been developed for electricity transmission (cf. Knops *et al.*, 2001; De Vries *et al.*, 2002). As the liberalization of Europe's electricity sectors started several years earlier than the liberalization of the gas sectors, there may be lessons which can be applied to the gas sector. This paper explores the scope for more optimal design of gas transmission regulation based on earlier experiences and regulatory regimes applied in electricity transmission.

Methods

The paper provides an overview of the main market-based congestion management methods for electricity: explicit auctions, implicit auctions (of which market splitting is one form) and locational marginal pricing (also known as nodal pricing). We then review congestion management methods currently applied in gas transmission and briefly describe the Dutch, German and UK transmission pricing methodology and congestion management method. Based on criteria related to efficiency, complexity and feasibility we discuss the theoretical added value of implementing LMP or auctioning to gas transmission capacity allocation. Finally we construct a simple network model representing the Dutch transmission network including a parallel German transmission line to assess the effect of implementing LMP or (forms of) auctioning in practice.

Results

Auctioning could in theory provide the same efficiency as LMP, but it's far easier to implement. In addition, it can be implemented on a very selective base, for example

on a gas interconnector. The feasibility of implementation is increased by the fact that auctioning is already considered to be a viable option for congestion management in a number of European countries. Implicit auctioning would be more difficult to implement due to the relatively underdeveloped gas exchanges in continental Europe.

Applying LMP and auctioning to a simple network representing the Dutch transmission network shows that both methods successfully deal with congestion caused by re-routed German gas flows. We argue that, from the Dutch point of view, it would be Pareto-optimal to consider the German-Dutch interconnector as the congested link instead of the Dutch internal transmission link. This result holds whether LMP or auctions are applied.

Conclusions

Different forms of auctioning are common methods for managing congestion in electricity transmission but LMP, while theoretically appealing, has so far have proven too complex to be introduced in European electricity systems. In gas transmission, distributive-based congestion management methods such as FCFS and pro-rata are, although economically inefficient, still frequently used. Implementation of LMP in the short run is infeasible since it requires a common integral market and system operator for the whole region and is operationally quite complex. Auctioning of gas transmission capacity is far less complex and does not necessarily imply large institutional changes. In contrast to LMP, auctioning could very well be applied to individual congested transmission lines.

Using a simple network model representing the Dutch network, including a parallel German transmission line, we show that implementation of congestion management methods based on LMP or auctioning would successfully deal with congestion caused by re-routed German gas flows. More specifically, we argue that, from the Dutch point of view, it would be Pareto optimal to consider the German-Dutch interconnector as the congested link instead of the Dutch internal transmission link. This result holds whether LMP or auctions are applied.

References

European Commission (2006). Sector Inquiry under Art 17 Regulation 1/2003 on the gas and electricity markets (preliminary report 16-02-2006, available on http://europa.eu.int/comm/competition/antitrust/others/sector_inquiries/energy/).

De Vries, L.J. and Hakvoort, R.A. (2002) "An Economic Assessment of Congestion Management Methods for Electricity Transmission Networks", *Journal of Network Industries* 3 (4), pp. 425-466.

Knops, H.P.A., De Vries, L.J. and Hakvoort, R.A. (2001) "Congestion management in the European electricity system: an evaluation of the alternatives", *Journal of Network Industries* 2 (3-4), pp. 311-351.

Lise, W., De Joode, J. and Boots, M.G. (2005) "Druk in de gasleiding, verband tussen tarieven voor gastransport, omleidingsstromen en congestie in Nederland". Amsterdam : ECN Beleidsstudies.