

THE IMPLICATIONS OF RENEWABLES AND INTERMITTENT GENERATION ON GAS MARKETS

A new Pöyry multi-client study

Drawing on the recently completed major multi-client study on the implications of intermittency on electricity systems, Pöyry Energy Consulting is now looking at the impacts of a high-renewables world on the gas industry. The study has already been joined ten member companies from GB, Ireland and France and the first preliminary results have recently been presented to the members.

The very significant impacts of intermittent generation on the electricity system in GB and Ireland have been clearly identified in the Implication of Intermittency work carried out between November 2008 and May 2009. In the current study, Pöyry is looking at the resulting implications on gas markets, regarding system operation issues, gas prices, the value of flexibility and storage, as well as market arrangements.

Background

If renewable sources are to account for more than 30% of electricity generation by 2020 in GB and Ireland, gas fired generation will move from a baseload/mid-merit to a peak and balancing position.

With high wind penetration, CCGTs will run when wind is not blowing, and therefore the intermittency of wind will be passed on through to gas demand.

While temperature has been the main driver for gas consumption historically, wind will become the major determinant of prices and consumption in the future.

The ultimate aim of the study is to answer the question 'How will the impact of intermittent generation affect the wholesale gas markets in GB and Ireland?', based around areas of investigation as varied as gas prices, system operation and market arrangements.

Wind intermittency is passed on to gas demand

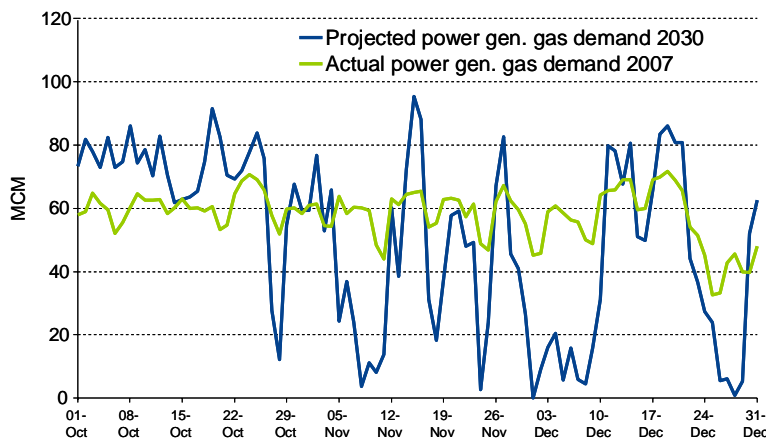


Diagram compares daily gas demand for power generation for the first three months of a gas year in 2007 (actual realised) and in 2030 (with 43GW of wind on the system): wind intermittency involves high variability of gas demand

The study began in September 2009 with final results and report following in early 2010. The study is still open to new Study Members for a cost of £25,000.

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Proposed issues for investigation

System operation issues	<ul style="list-style-type: none">▪ How much more swing will there be in gas demand from power generation?▪ How much extra stress will this place on the gas grid (depletion of linepack, short-term and locational issues, increased balancing actions and costs)?▪ To what extent will shipper balancing performance deteriorate?▪ Will cost reflectivity and allocation of costs be affected?▪ Will uncertainty over short and long term gas demand for power generation increase?▪ To what extent will uncertainty of long term demand from other sectors grow, with the emergence of renewable heat, biogas and district heating, etc.
Impact on gas prices	<ul style="list-style-type: none">▪ Will seasonality be affected?<ul style="list-style-type: none">– Will more wind in winter dampen gas demand?– Will less wind in summer increase gas demand?▪ Increased volatility of prices within-day and between days<ul style="list-style-type: none">– Increased exposure or increased opportunities?– Will increased balancing actions result in a wider spread of cashout prices and balancing penalties?▪ Will requirements for flexibility increase, and what are the associated costs and opportunities?
Value of flexibility and storage	<ul style="list-style-type: none">▪ Will shippers need greater access to within-day flexible supplies to meet changing gas demand at short-notice?▪ Will the extrinsic value of storage increase?▪ What is the impact on revenues for different types of storage (slow vs. high cycle storage facilities)?
Market arrangements	<ul style="list-style-type: none">▪ Are the current market arrangements fit for such a world?<ul style="list-style-type: none">– Do National Grid incentives on gas and electricity networks have to change?– What are the implications for capacity booking mechanisms, particularly at Exit, for low load factor plant?– Balancing arrangements and nomination rules – are changes required?– Does increased transparency and information within-day (real time?) mitigate potential issues?▪ How does the industry avoid hourly/short-term balancing arrangements?

Project co-ordination

The intent behind the multi-client nature of the study is that it provides the opportunity for debate and consensus on a number of important points, which will improve the quality of the final results for all participants. Furthermore, we hope participants would be able to contribute data (suitably anonymised) to further increase the accuracy of the work.

We anticipate two levels of participation.

- **‘Study Member’ status** which includes two detailed presentations on the study findings and the final report, along with all the data in those reports.
- **‘Founder’ status** for first movers which includes a place on the steering committee, the opportunity to shape the study, and a private workshop. ***The study is now closed to new Founders.***

It is envisaged that further client-specific and confidential work would be carried out at preferential rates for individual participants.

Modelling

In addition to the highly sophisticated model developed for electricity modelling in the course of the electricity intermittency study, Pöyry has created a model of Britain and Ireland that looks at the corresponding issues on the gas side.

This model is built on our existing gas market modelling, through our widely recognised worldwide gas model *Pegasus*, and gas storage valuation platform *Maelström*.

This forms the building block of our assessment, simulating scenarios for the future gas use in the region

and enables us to determine what strategic investment choices should be made now to take advantage of the opportunity that these major changes represent.

Wind and thermal generation in January 2030

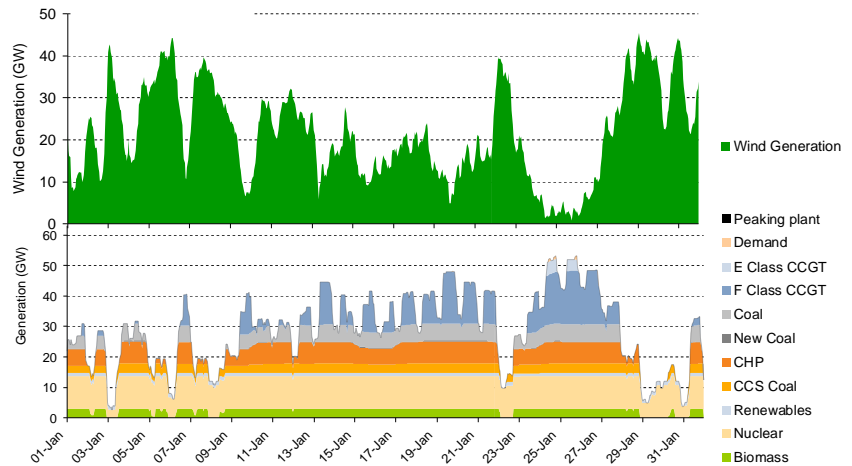


Diagram shows wind generation in 2030 with 43GW installed wind capacity, assuming wind patterns from across GB based on January 2000, and the effect on thermal generation

Daily flows in Great Britain for gas year 2029

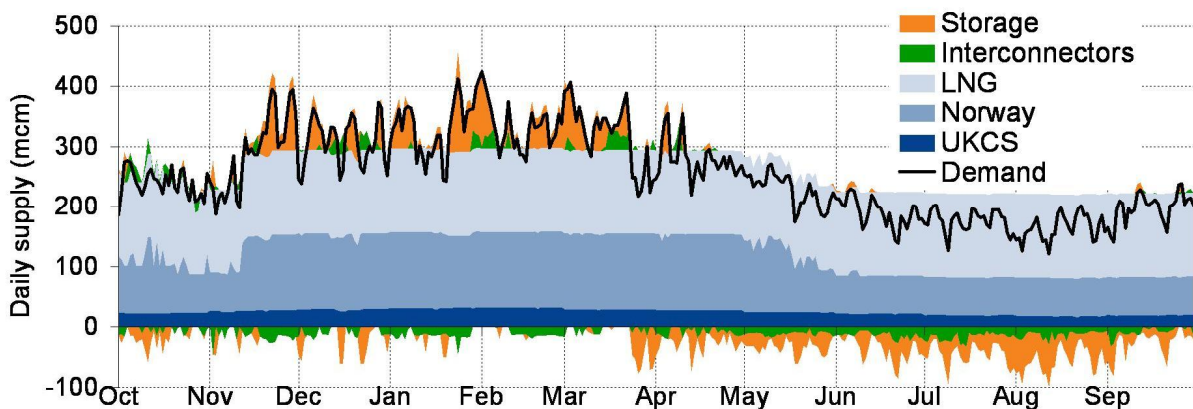


Diagram shows daily supply demand balance in Great Britain for gas year 2029. These results are based on wind patterns of September 2005 to October 2006.

Why Pöyry Energy Consulting?

Pöyry is ideally placed to carry out this multi-client study. We have highly sophisticated modelling capabilities that have been developed over nearly 20 years in the UK, Irish and wider European markets. We have also carried out studies in this area before, although not in so much depth, for the DTI/DECC (2006 – Strategic Storage and other options to ensure long-term Gas Security Report), UK Offshore Operators' Association (2005 – Storage, Gas Prices and Security of Supply Report), and numerous private companies for gas storage valuation and analysis in GB, Ireland and Continental Europe.

Implications of Intermittency

Pöyry Energy Consulting completed a major multi-client study to examine the implications of the expected rapid growth in electricity generation from variable renewable sources in spring 2009. The ultimate aim of the study is to answer the question 'How will the impact of intermittent generation affect the wholesale energy markets in GB and Ireland?'

The study has covered entirely new ground, and has given the first comprehensive analysis of the impact of wind on market players, along with commercial and strategic insights.

The study answered questions in the following areas:

- Market prices
- Plant operation and new thermal generation
- Wind revenue
- Reserve and response
- Interconnection and transmission
- Market arrangements

A public version of the report is available on our website at http://www.illexenergy.com/?t=7_0Latest#PublicIntermittency



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