

Interaction Between Gas & Electricity National Transmission Networks

Winter 2002/2003

National Grid Operations & Trading/Transco National Transmission & Trading

Introduction

This report provides an assessment of the Interaction between the Transco Natural Gas National Transmission System (NTS) and the National Grid Electricity Transmission System for Winter 2002/2003. The work follows up on a similar exercise performed for Winter 2001/2002 which explored more of the background to the issues.

The report is based on common assumptions with regard to supply, demand and plant availability.

Summary

Robust communications are in place between Transco and National Grid to share non-commercially sensitive information with regard to power station supplies.

During a large scale gas supply failure, arrangements could be put in place which maximise the security of supply for both gas and electricity consumers by using the variation in demand for both gas and electricity over a 24 hour period

The DTI sponsored Joint Response Team (JRT) provides a secure mechanism for the co-ordination of gas and electricity supply during a Network Gas Supply Emergency

Adequate supplies are forecast to be available to meet firm power station demand on a 1 in 20 peak day and a 1 in 50 duration winter.

Generation on secondary fuels may be required to ensure that electricity demand management measures are not considered

The likelihood to interrupt process is in place to enable Transco to share information on forecast interruption by geographic area with the National Grid.

Experience of 2001/2002

Demand

UK daily gas demand reached a new record level of 4,626 GWh (427 mcm) on 2nd January 2002 which represents 82% of the forecast 1 in 20 peak day of 5,641 GWh (521 mcm).

Overall the 2001/2002 winter was a '1 in 74 warm' and was the 2nd warmest on record.

On 1st/2nd January 2002 Transco called interruption in the South East to resolve a transportation constraint. This included the interruption of a number of gas fired power stations. The communication process between Transco and National Grid was effective and there was no disruption to electricity supply.

Electricity demand reached a new record high on Thursday 3rd January 2002 of 51,548MW for the half-hour ending 17:30hrs. This was over 500MW higher than the previous record set on 16th January 2001.

This new record occurred during the Christmas and New Year holiday period when underlying demand is depressed. If the same weather conditions had occurred on 11th December 2001 (which had the highest normal working day demand of 51,420MW) it is estimated that demand would have reached 52,900MW.

Generation Plant Margin

Power generation availability in early December was approximately 56.5GW in real time. This implies that a demand of 54.5GW could be met before demand management was considered assuming an operating margin of around 2GW.

Electricity Prices

Day ahead base load electricity prices rose from £14/MWh at the beginning of November to just under £30/MWh by mid-December. They then jumped to £38/MWh on 18 December due to high continental prices before dropping back over the Christmas holiday period.

Average Electricity Product Prices Winter 2001/2002

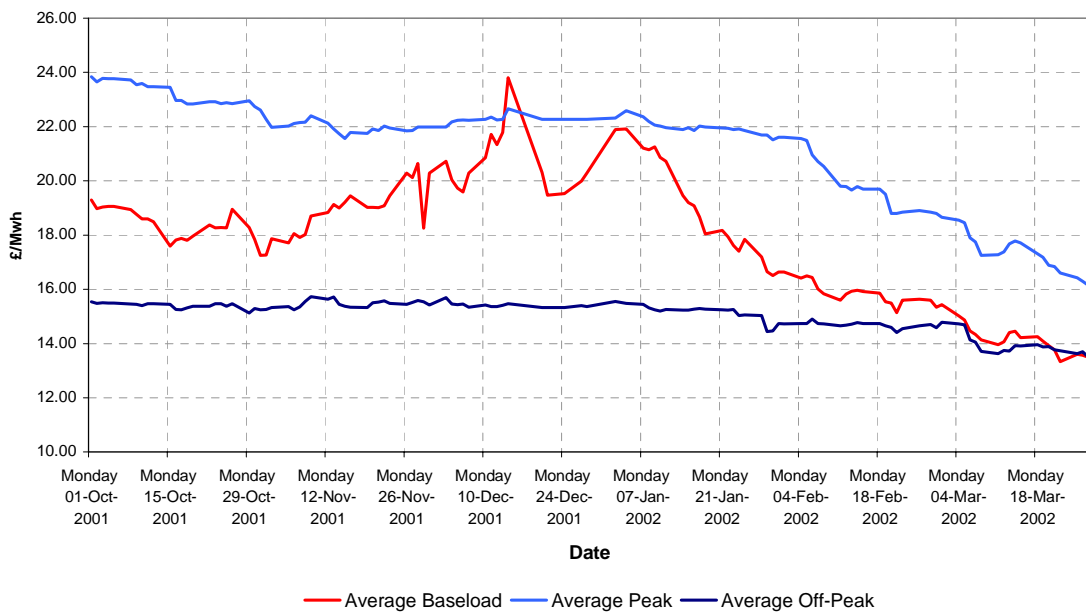


Figure 1: Average Electricity Prices Winter 2001/2002

Following the holidays they climbed back up to £30/MWh during the cold spell at the beginning of January but quickly fell to below £20/MWh as the mild weather started in mid-January. Prices then continued a downward slide to around £13.50/MWh by the end of March. Peak load prices have followed the same pattern but with more volatility, reaching £54/MWh on 18 December.

NETA

Within day trading and half hourly pricing under NETA gave generators the ability to adjust prices in line with fuel prices. It appears as a consequence that generators were less likely to declare themselves unavailable for commercial reasons than under POOL arrangements.

In addition, the risk of exposure to System Buy Prices meant that generators reacted to a gas interruption by either switching to gas oil, replacing CCGT output with their own coal or oil plant, or buying power elsewhere.

Changes to trading arrangements have therefore had a positive impact on the ability of the electricity industry to cope with gas market issues.

However, a number of warning signs have been observed –

- Participation in the Balancing Mechanism and the provision of Balancing Services under contract is voluntary. This has meant on occasion that National Grid has not had access to generation which may have alleviated problems, even at times of high Balancing Mechanism prices.
- One generator failed to switch over to secondary fuels during the Transco interruptions on 2nd January 2002. This highlights the need to apply caution to the assessment of secondary fuel capability.

Communications between National Grid and Transco

Operational liaison

Regular operational meetings are held between National Grid and Transco to ensure a consistent approach is taken to contingency planning and emergency management. These include:

- Winter Operations Meeting – where information is shared on the winter outlook and any supply issues or network constraints. The process for the sharing of likelihood to interrupt information is also confirmed.
- Summer Operations Meeting - where the impact of maintenance and capacity expansion work is shared and the implications for electricity supply reviewed.
- Ad-hoc liaison between the National Grid Control Centre at Wokingham and the Transco National Control Centre to discuss specific operational issues.

Commercially sensitive site specific information is not shared during these discussions.

Likelihood to Interrupt

Transco provides National Grid with a daily notice of likelihood of Transco interruption during the Winter. The notice provides a high/medium/low indication of likelihood of interruption by geographic area but does not refer to specific power stations.

The information is used by National Grid to adjust Operating Margin to cover potential additional generation losses.

Gas Industry Emergency Committee

In November 2000 the Gas Industry Emergency Committee (GIEC) was established with participation from all industry sectors and the DTI. The GIEC remit was to co-ordinate contingency planning and to ensure arrangements were in place to manage a large scale gas supply failure. The GIEC recommended a number of changes to existing emergency arrangements and the establishment of a Joint Response Team (JRT).

The new arrangements will be tested during the industry emergency exercise to be conducted in September 2002 subject to Ofgem approval of the necessary Network Code modifications.

Joint Response Team

The JRT has representation from Transco, National Grid, Scottish electricity transmission operators and is chaired by the DTI. In the event of a Network Gas Supply Emergency (NGSE) it provides a mechanism for the Network Emergency Coordinator (NEC) acting on behalf of the gas industry, to share the emergency strategy with the electricity industry.

Government powers can be obtained where it is appropriate to adjust the emergency strategy to maintain electricity supply.

It is only under these circumstances that Transco can advise National Grid of specific station information to protect the security of supply.

Outlook for Winter 2002/2003

Power Generation Gas Demand

Forecast power generation gas demand from the National Transmission System (NTS) for the 2002/03 Winter is shown in the following table.

| | Firm | Interruptible | F & I | Total |
|-----------------------|-------------|----------------------|------------------|--------------|
| Max gas demand (GWhd) | 720 | 354 | | 1074 |
| Number of sites | 18 | 11 | 2 | 31 |

Table 1: NTS Power Generation Demand 2002/2003

For 2002/2003 there are 31 power generation sites connected to the NTS with a further 15 generators connected to downstream Network systems. Three sites have access to gas supplies other than the NTS and only take a supply from the NTS as a contingency arrangement. These have been excluded from the above figures.

Firm Power Generation Gas Demand

The maximum firm power generation demand for Winter 2002/2003 is 776 GWhd (72 mcmd) which represents 13% of firm 1 in 20 peak day demand.

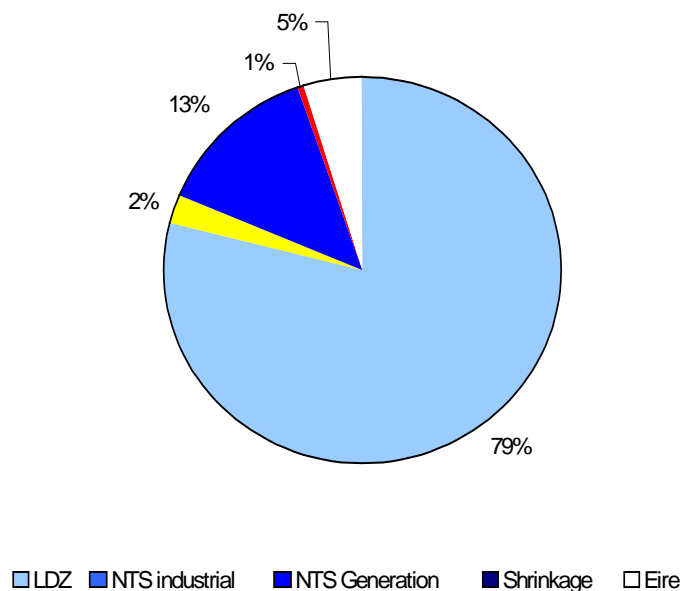


Figure 2: Firm Gas Demand 2002/2003

On all days in a 1 in 50 winter other than the 1 in 20 peak day Transco assume a maximum power generation demand of 69% of the 1 in 20 peak day demand.

There is sufficient available deliverability from supply sources (beach, European Interconnector and storage) to:

- support 100% of firm power generation demand on the 1 in 20 peak day

and sufficient gas in store to:

- sustain a firm power generation daily offtake of 69% of the 1 in 20 firm demand for the duration of a 1 in 50 Winter.

Interruptible Power Generation Gas Demand

The maximum interruptible NTS power generation demand for 2002/02 is 352 GWhd (32.5 mcmd) which is 41% of all interruptible demand (excluding direct access supply).

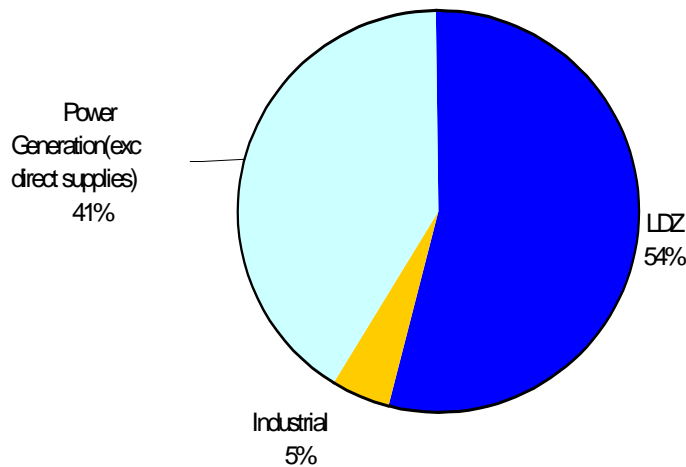


Figure 3: Interruptible Gas Demand 2002-/2003

There is insufficient UK supply deliverability to support any interruptible gas demand on the 1 in 20 peak day and insufficient UK storage capacity to sustain all interruptible gas demand for the full duration of a 1 in 50 winter.

Interruption for NTS Transmission Constraints

For Winter 2002/2003 there are two NTS transmission constraints at Aylesbury compressor and Chelmsford compressor affecting supplies to the South West and South East respectively.

Constrained Liquefied Natural Gas (LNG) storage support and interruption would be necessary to overcome the constraints. The following table shows the required quantities of LNG and interruption.

| Constraint | Aylesbury | Chelmsford |
|--------------------------------|--------------------|------------------------|
| CLNG support | Avonmouth (77 GWh) | Isle of Grain (37 GWh) |
| Interruptible Power Generation | 2 Sites (110 GWh) | 2 Sites (97 GWh) |
| Network Interruptible | 19 sites (87 GWh) | 37 sites (89 GWh) |

Table 2: NTS Transmission Constraints Winter 2002/2003

The constraint process is triggered when the flow through the compressor reaches its maximum. Partial or complete interruption of downstream power generation and Network sites is then invoked and when this is exhausted, constrained LNG is utilised.

Interruption

In a severe winter, interruption would be required to balance supply and demand and take account of diminishing UK storage stocks. This may be done by Shippers or, by default, carried out by Transco. Transco interruption will be equitable between VLDMC and Network demand.

In the absence of commercial interruption, and assuming full use and availability of beach gas, it is possible to get an indication of the level of interruption that Transco could be required to call in order to maintain the UK storage stocks at minimum Top-Up security levels and take account of NTS transmission constraints.

A number of different weather patterns can be modelled with early and late cold spells and the charts below show examples of 1 in 20 and 1 in 50 winters, and represents the minimum amount of Transco interruption that could be expected.

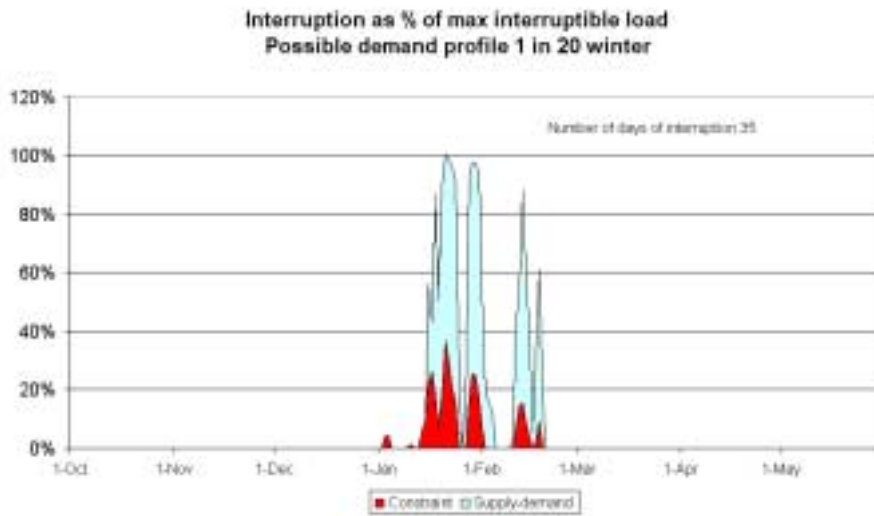


Figure 4: Transco Gas Interruption 1 in 20 Winter

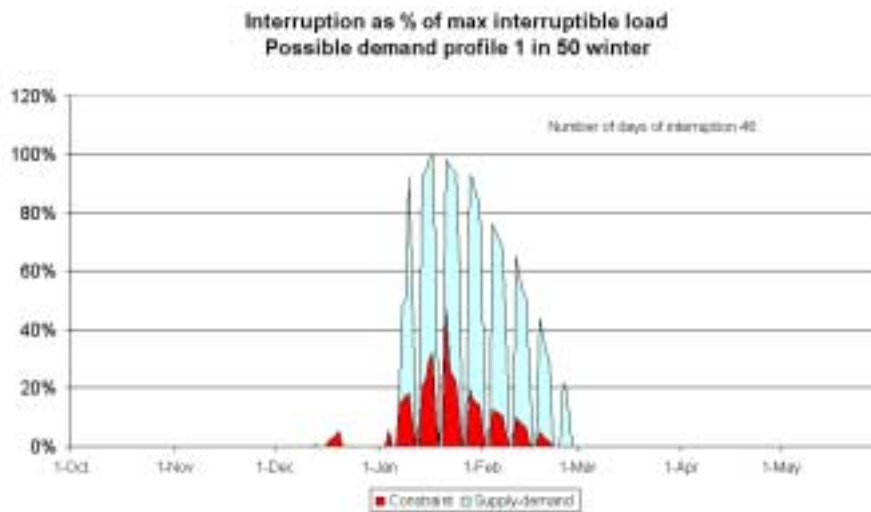


Figure 5: Transco Gas Interruption 1 in 50 Winter

Electricity Demand levels for 2002/2003

The predicted Average Cold Spell (ACS) electricity demand for the coming winter is expected to be 54.2GW compared with 53.7 GW last year giving a growth of 0.5 GW.

The actual metered demand in Winter 2001/2002 was 51.5 GW. National Grid expects to see a demand of around 52.0GW under 'normal' conditions in winter 2002/2003.

Generation

The level of available power generation has decreased since Winter 2001/2002 with significant amounts of generation being mothballed for commercial reasons. The net loss currently stands at 1,940MW, but it is likely that most of the mothballed capacity will return to service to take advantage of winter prices.

Indicated generation availability is approximately 61.5GW (63GW was quoted in last winter's briefing).

Figure 6 below compares this winter's forecast electricity demand with available generation. This suggests that on a peak day a 50% success rate of secondary fuel change over should mean that demand management is avoided. However, the loss of all interruptible generation would mean demand management would have to be considered for 2 or 3 hours.

Similarly, the load duration curve suggests that by relaxing gas supply interruptions to 20 out of 24 hours (ie not interrupting over the electricity demand peak) a significant proportion of risk could be removed.

Locational issues

Whilst we anticipate a high level of transmission system availability for this coming winter, even with a fully intact transmission system, there is the potential for constraints arising from the geographic distribution of generation. Based upon the indicated generation availability, we expect all identified transmission constraints to be capable of resolution.

The loss of output from gas fired power stations has been considered in the analysis of transmission constraints for this winter. Where a potential transmission constraint could exist if the gas fired generation becomes unavailable due to gas interruptions, the relevant station(s) have a secondary fuel capability. It is assumed that under these circumstances the notice to interrupt is sufficient for arrangements to be made for the station to change over to the secondary fuel.

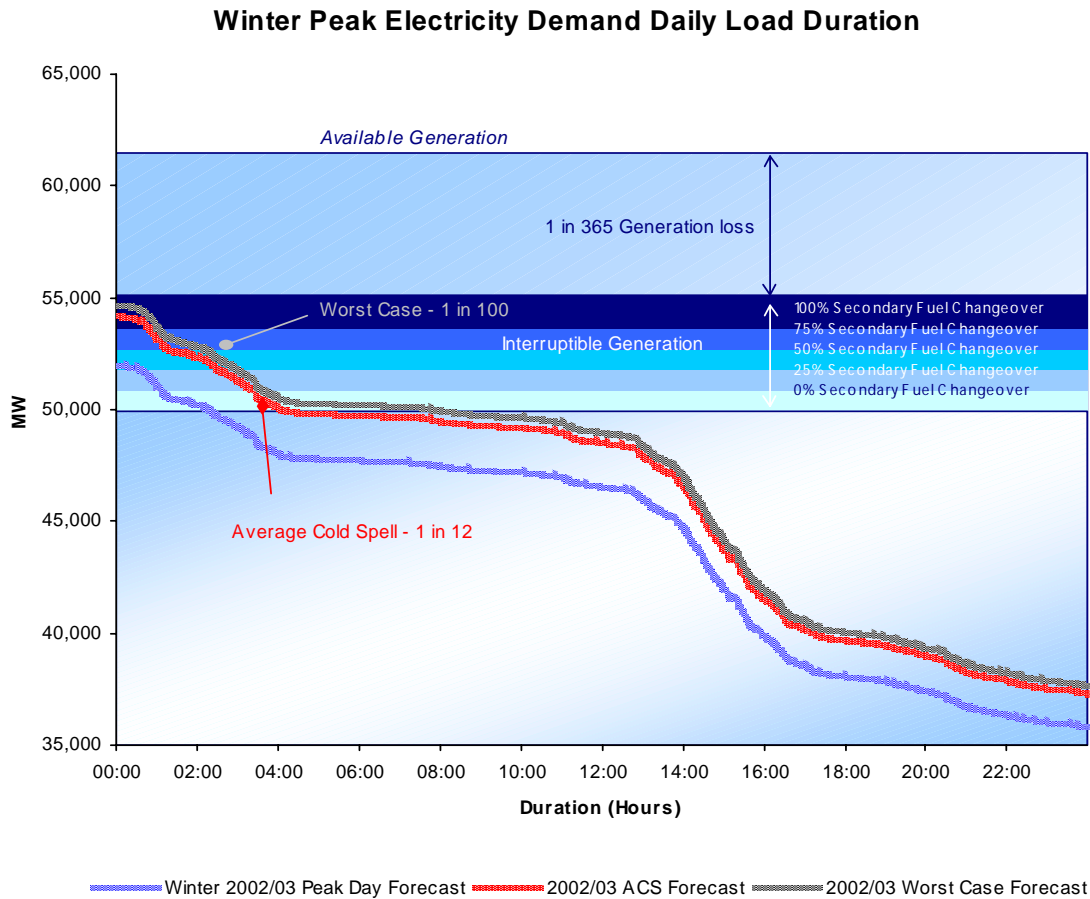


Figure 6: Winter Peak 2002/2003 Electricity Demand Forecast Load Duration Curve

Options for Improving Security of Supply

The DTI have initiated a review of the Fuel Security Code. The code provides for emergency powers to direct the operation and the fuel stock holding arrangements of power stations. The code further provides for any compensation arrangements applicable during declared Fuel Security Periods.

The new code will need to consider the alternate fuel arrangements for power stations and how their operation could be optimised in an emergency to protect the security of supply for both electricity and gas consumers.

Operation during gas and / or electricity emergencies come under the auspices of the DTI. During a large scale gas supply failure the variation in demand for both gas and electricity over a 24 hour period could present an opportunity to optimise the operation of both networks with the objective of maximising the security of supply for both gas and electricity consumers.

The winter load duration curve for electricity suggests that if gas supply interruptions to power stations could be restricted to 20 out of 24 hours (ie not interrupting over the electricity demand peak) a significant proportion of risk could be removed. In achieving this it may be necessary to reduce the output from gas fired power stations during the electricity demand off peak hours in order to reduce the total gas demand in a given 24 hour period.

There will need to be established detailed cross industry working arrangements and emergency powers such that both networks can be operated to maximise the security of supply. The recently established Gas Industries Emergency Committee could be used as a model for meeting these wider requirements.