

Potential Gas Supply Shocks Outside Transco's Control

Background

Transco and National Grid's recent joint report "Interaction Between Gas & Electricity Networks Winter 2002/2003" provided an assessment of the interactions between the two transmission networks in the 2002/2003 winter. In particular, it highlighted a number of measures available to ensure that the transmission systems could be operated in a safe and secure manner. These measures include:

- Robust communications between NGC and Transco to share non-commercially sensitive information in relation to power station supplies
- Use of variations in daily demand profiles in the event of a large scale gas supply failure
- Emergency co-ordination through the DTI sponsored Joint Response Team (JRT)
- The availability of adequate gas supplies, including those for firm power station demand
- Use of secondary fuel generation to prevent electricity demand management
- Rigorous interruption procedures and shared information for forecasting interruption

These measures to ensure safe and secure network operation the gas network are applicable for most operational circumstances that can be expected and planned for during a winter. These include plans for a peak day, a severe winter and operational difficulties such as plant failure (offshore and onshore), demand forecast changes etc..

There are however a number potential events, outside Transco's management control, that may, in the event of market failure, require Transco to utilise its emergency procedures in order to ensure the continued safe operation of the network. Such low probability but high impact events may be regarded as 'supply shocks', and may lead to supply loss as a result of emergency measures required to maintain safe and secure operation of the gas network.

Overview of Supply Shocks

In any initial assessment of supply shocks there are two components to consider:

- The probability of the event
- The resultant volume loss or impact

Whilst it may be possible to estimate probabilities based on time series analysis, in general such assessments should be treated with caution given the scale of regime change and the inevitable limitations of historical data associated with extremely rare events.

The volume loss associated with a supply shock is the resultant rate loss multiplied by the duration of the event. To maintain supplies in particular circumstances, Transco

already books Operating Margins gas to cover for short term supply losses (up to 12 hours). However, there is no strategic source of gas to cover a longer duration shock, which reflects both the assumption that such a need is likely to be rare and the expectation that market mechanisms will normally be sufficient to manage the issue. Where market mechanisms are not sufficient to ensure continued safe operation of the network, emergency procedures would be utilised. There is no specific volumetric rate loss that would be likely to trigger the use of emergency procedures, since this would depend on many factors at the time. For the purpose of this note, however, a loss of 10% of typical winter demand (40 mcm/d) for a sustained duration is assumed to constitute a significant event that could have a material impact, particularly during cold weather, and hence potentially cause market failure and require emergency measures to be taken.

Potential supply shocks could occur throughout the length of the gas supply chain. Whilst the list below is not exhaustive it covers the most significant potential supply shocks that could result in emergency measures and a consequent loss of supply.

Offshore Supply Shocks

To illustrate the scale of losses being experienced at present, the Appendix below lists actual occurrences of offshore supply losses of 30mcm/d or more since the beginning of 2001. It should be noted that many of these outages were relatively short in duration, although a number lasted for over six hours. While network security has been maintained despite these losses, the possibility of longer duration or simultaneous failures cannot be ruled out.

Offshore supply shocks can be categorised as follows:

Production Failure

With the exception of one producing field, the largest UK gas fields typically produce 20 mcm/d. Simultaneous field failures could therefore result in a loss of more than 40 mcm/d. With offshore reliability being reported at 98% (and indications of a declining trend) the possibility of simultaneous failures is a real one. It is unlikely, however, that such a situation would last for a prolonged duration, with the available evidence suggesting that most failures are of relatively short duration as set out in the Appendix.

Offshore Pipeline Failure

Many offshore pipelines flow around or in excess of 40 mcm/d. The recent history of UK offshore pipelines contains numerous incidents resulting in the loss of a pipeline for weeks, and even months. These have occurred for a variety of reasons including corrosion, external damage through ships anchors and unplanned liquid ingress. Besides technical failure, there is also the possibility of industrial action affecting supplies, as happened in the late 1980's when Norwegian pipeline supplies to the UK were curtailed.

Failure of Liquids Systems

The biggest supply shock threat in terms of volumetric rate loss is undoubtedly that caused by the loss of offshore liquids gathering systems. Gas associated with a single major system accounts for about 30% (120 mcm/d) of all current UKCS gas production. In this case significant supplies would be lost from St Fergus, Teesside and Bacton terminals. With limited facilities to reinject liquids most of this gas production could be lost if this system went down. Whilst this is a low probability event, the pipeline incidents identified above highlight the possibility of this occurrence. Besides the offshore liquids pipeline, there are also onshore processing and liquids storage facilities which could also have a material impact on offshore gas production. This is because any loss of such facilities could in a relatively short timescale restrict offshore gas production. Indeed, whilst the offshore pipeline has not suffered a significant failure there have been a number of instances when the onshore operations have impacted offshore gas production.

Storage

The UK's primary seasonal storage facility is Rough; this can provide 40 mcm/d of gas for two months or more. Rough is comparable to an offshore field and as such can be broadly considered in the same vein in terms of reliability as offshore fields detailed above. There have of course been recent incidents that have resulted in the loss of supplies from Rough, notably the lightning strike in the winter of 1999/2000 and this year when a trawler hit the offshore platform. Fortunately, the most recent event was in the summer when Rough production was not required.

Onshore

Supply shocks resulting from onshore operations are associated with areas of gas supply concentration; primarily sub-terminals and terminals, and to a lesser extent, major pipelines and strategic compressor sites.

Transco has contingency plans detailing its response to onshore plant failure including the loss of reception terminals, offtakes, compressor stations and NTS pipelines. Key staff are trained on the contingency arrangements which are tested during the annual programme of emergency exercises.

A Network Code Modification Proposal (No. 0582) has also been implemented that changes the emergency procedures to enable normal commercial balancing arrangements to remain in place in specific circumstances, thereby giving maximum opportunity for operating difficulties to be resolved via market mechanisms. For a gas deficit emergency the current procedures will be applied when necessary to maintain the safety and security of the network, including suspension of commercial arrangements. In a transportation constraint emergency, however, commercial user and system balancing arrangements will continue to apply throughout the emergency. This negates the previous requirement to suspend commercial arrangements for a localised constraint.

Sub-terminal Failure

Gas supplies are most concentrated at network entry points (sub-terminals and terminals) and at key transportation nodes. Of these, sub-terminals have the least reliable delivery record due to the complexities of gas processing. In the UK, sub-terminals have frequently failed to deliver supplies for relatively short durations, however the possibility of a major incident has to be recognised as a risk as there has been a number of incidents worldwide that have resulted in the catastrophic loss of gas processing plant.

Loss of Terminal/ Strategic Compressor

In the longer term, the primary mitigations in relation to the risk of a major incident at a terminal or key compressor station would be an increase in supply diversity at entry and through 'insurance investments' such as network resilience and strategic storage projects, to provide alternative supply routes.

A related risk is the partial loss of the compressor fleet through a design fault impacting a number of compressor stations simultaneously. Whilst this could have a material impact on winter operations, it is thought to be a highly unlikely event due to machine diversity and a proven track record of this type of equipment both for Transco operation and in the aviation and power industries.

Transmission Pipe-break

Certain transmission pipe-breaks could result in the loss of over 40+ mcm/d. To cover this eventuality, Transco books operating margins gas at specific downstream strategic locations, although as explained above this is only planned to provide cover for 12 hours. Again this risk could be reduced through insurance investments.

Continental Interconnector

The interconnector to mainland Europe is expected to import around 20 mcm/d during times of high gas demand and high prices. However, scenarios exist in which the interconnector would not only cease imports but would export to the Continent. These scenarios could include:

- High US LNG spot prices, resulting in the diversion of continental bound LNG to the US, as occurred in 2001
- French nuclear plant problems resulting in reversal of the UK to France electricity interconnector, with a resulting increase in UK gas fired generation and gas exports for continental fired power generation
- Loss of continental supplies and or storage made up through UK exports.

The impact of the Interconnector reversing from import to export mode during the winter could result in an increased supply requirement of approximately 70 mcm/d. However as the maximum firm exit capacity at Bacton is only currently 30 mcm/d the resultant increase in supply could, with full interruption in the UK, be reduced to about 50 mcm/d.

APPENDIX

SUPPLY LOSSES OF 30 MCM/D OR GREATER - 1 JANUARY 2001 TO 19 SEPTEMBER 2002 INCLUSIVE

Date	Start Time	Rate Loss (mcmd)	Duration	Cause
09-Jan-01	10:06	36.00	2hrs 30mins	Offshore Trip
27-May-01	8:57	41.00	5hrs 50mins	Information not provided
27-Jun-01	9:38	48.00	6hrs 18mins	Information not provided
13-Sep-01	12:08	30.00	1hrs 34mins	Compressor Trip - Onshore
11-Nov-01	15:17	32.00	4hrs 37mins	Compressor Trip - Offshore
16-Nov-01	11:14	30.00	3hrs 0mins	Compressor Trip - Onshore
10-Dec-01	20:33	40.00	9hrs 30mins	Compressor Trip - Offshore
26-Dec-01	10:21	35.00	7hrs 26mins	Information not provided
31-Dec-01	9:11	34.54	3hrs 0mins	Offshore Field Trip
02-Jan-02	11:11	38.00	0hrs 14mins	Onshore Problem
06-Jan-02	6:17	31.42	7hrs 21mins	Compressor Trip - Onshore
26-Jan-02	6:19	38.91	0hrs 28mins	Compressor Trip - Onshore
29-Jan-02	8:29	31.00	1hrs 52mins	Compressor Trip - Onshore
08-Feb-02	0:11	33.00	12hrs 14mins	Information not provided
08-Feb-02	0:45	35.00	0hrs 31mins	Compressor Trip - Onshore
17-Feb-02	8:32	38.40	0hrs 15mins	Compressor Trip
14-Mar-02	9:02	41.70	0hrs 29mins	Compressor Trip - Onshore
26-Apr-02	16:20	32.66	0hrs 50mins	Compressor Trip - Offshore
26-Apr-02	22:04	30.00	1hrs 10mins	Compressor Trip - Onshore
27-Apr-02	18:37	31.06	1hrs 17mins	Compressor Trip - Onshore
29-Apr-02	21:08	35.00	0hrs 20mins	Compressor Trip - Offshore
05-May-02	8:49	30.62	1hrs 27mins	Compressor Trip - Offshore
07-May-02	12:03	36.00	1hrs 0mins	Compressor Trip - Onshore
13-May-02	11:08	39.00	3hrs 21mins	Compressor Trip - Offshore
26-Jun-02	5:44	33.00	1hr 0mins	Electrical Fault