UNC 0116: Enduring Offtake - Information request on the availability of NTS exit flexibility capacity

Executive Summary

The following key conclusions can be drawn from the analysis undertaken by National Grid Transmission in relation to Ofgem's information request on the availability of NTS exit flexibility capacity:

- The amount of NTS exit flexibility capability, which is assessed through network analysis, varies depending on a set of key modeling assumptions relating to the supply and demand for gas. The core assumptions which influence the amount of NTS exit flexibility capability are:
    - Size of the Network
    - Geographic distribution of gas supplies
    - Delivery profile of gas supplies
    - Geographical distribution gas demand
    - Aggregate level of demand

  The impact of changing these core assumptions is covered in the documentation provided. These are summarised below:

- Based on a 2010/11 network and favourable assumptions of a balanced distribution of gas supplies, a flat delivery profile of gas supplies and a balanced distribution of gas demand: then the national network capability on a peak day is 26mcmd.

- As indicated in previous analysis provided in 2006, changing the supply assumptions has a material impact on the network capability. Considering supply scenarios where there are no gas imports into Isle of Grain reduces the national network capability to 22mcmd. The most onerous supply pattern, assuming high east coast flows, reduces the capability further to 21mcmd. These scenarios are deemed credible given National Grid's lack of control over patterns of supply. Other supply patterns can increase the level of flexibility.

- Back loading of entry flows (rather than a flat profile) can further reduce the NTS exit flexibility capability. Analysis shows that our present allocation of 17.5mcmd of flexibility capacity in 2010 to the GDNs could not be supported if back loading at Easington was to exceed 7% (around 9mcmd) on a peak day. Conversely, front loading of entry flows has a positive impact on the degree of NTS exit flexibility capability.

- The distribution of demand is also critical in determining how much flexibility is available at one time on the NTS. Enabling demand to be

loaded onto discrete geographical areas is more restrictive than management of a balanced distribution across the NTS. Analysis indicates that localized requests for NTS exit flexibility capability can lead to a national capability of 19mcmd in 2010/11 under a balanced supply assumption.

In addition to the conclusions described above, full responses are provided to the questions raised in the letter dated 1 November 2007. Responses to the questions are contained below following an introductory section highlighting the key assumptions. The documentation also contains a set of Appendices, which amongst other things, highlights the potential interactions between the recent price control proposals for GDNs and the potential future requests for flexibility of the NTS.

Introduction

Answers to the questions submitted by Ofgem on 1 November are provided below. The analysis has been conducted over a 6 week period and, given the wide scope of the questions, required around 175 man days of effort.

The analysis has helped crystallize the variables that impinge upon the determination of a baseline level of flexibility capacity. These include:

- Size of the Network
- Distribution of gas supplies
- Distribution of gas demands
- Profile of gas supplies
- Background level of demand

Size of the Network

The quantity and configuration of pipelines and compressors that make up the NTS will self evidently be a major influence on the capacity of the network. Through 2007 and 2008 a large quantity of new pipelines and compression will become available to accommodate increasing gas flows from, Milford Haven, Isle of Grain and the Easington area. This is reflected in the comparisons of flexibility capability between 2007/08 and 2010/11. It is worth noting at this stage that analysis that had been conducted during 2006 had anticipated these changes to the network because that analysis was entirely focussed on the year 2010/11. The result of that exercise was the identification of a baseline capability of 22mcmd.

Distribution of Gas Supplies

This analysis has provided further evidence of the criticality of assumptions about sources of gas supplies when calculating any baseline capabilities. Particular scrutiny has been given to the impacts of differing levels of gas flows at Isle of

Grain and at Easington. This work supplemented evidence gathered during the 2006 exercise which had been based on 3 different gas supply scenarios (Global LNG, Transit UK and Auction+). At a high level our conclusion would be that higher levels of flexibility capability can be delivered if gas supplies enter the network through the full range of UKCS and imported gas entry points at rates that do not tend towards the extremes (either high or low flow) of capability at any single entry point. The converse, such as the examples of low Isle of Grain or high Easington presented in this evidence, will lead to a reduction in system flexibility.

Distribution of Gas Demands

In a similar manner to the benefits of balanced supplies described above, the effects of balanced demands for flexibility capacity at exit will tend to increase capability. Naturally a wider distribution of demand will tend to reduce the duty placed on individual components (pipelines and compressors) in the NTS network and as such a larger aggregate demand can be supported before a 'failure condition' is recorded. The interaction between national and localised capabilities is one of the key design considerations when considering how best to manage substitutability across the network. An uncontrolled distribution of a product would lead to a reduction in flexibility capability.

Profile of Gas Supplies

Within day profiling of gas supplies at entry points is a phenomenon that is of increasing concern to National Grid Transmission. The NTS is largely designed on the assumption that, within reason, gas will be delivered from the terminals at a constant daily rate. Deviations away from that principle can impinge on the capability of the network. Of particular concern, to National Grid Transmission, is 'back loading', lower gas flow rates in the first part of a day which then necessitates higher gas flow rates towards the end of the day to achieve a daily balance. This behaviour leads to a depletion of NTS linepack during the first part of the day and adds to operational uncertainties about shipper intentions with respect to balancing their portfolios. The analysis conducted as part of this exercise has demonstrated that, in addition to the operational uncertainties, back loading can reduce the availability of flexibility capacity. The concentrated nature of gas supplies (there are relatively few entry points on the NTS and they provide large volumes of gas) adds to our concern about the effects of back loading.

Background Level of Demand

All things being equal, including balanced supplies and balanced demands, then the availability of flexibility capacity should increase as the demand for flat exit capacity reduces. Both are translated into gas flow rates through the same pipelines and compressors and as long as the aggregate flow rate (or indeed change in flow rate) does not exceed network capability at any time then the

integrity of the NTS should be assured. This assumption is broadly supported by the analysis results arising from this exercise. The tendency to increase flexibility capability as demand for flat exit capacity is reduced holds for the winter period as long as all available plant (particularly compression) is available. That is the basis upon which this analysis has been conducted.

We do not believe that the relationship described above between the availability of flat and flexibility capacity will hold outside winter periods. As demand reduces, our hope of receiving an even distribution of supplies will become less tenable as supplies are turned down in a pattern that reflects the opportunities of various delivery options for Shippers and Producers. The changing patterns of supply and aggregate reductions in delivery will necessitate reconfigurations of the NTS network and also impair our ability to operate compressors. For this reason, in the UNC transitional arrangements, flexibility capacity is only available for use by GDNs at national demand levels that are greater than 50% of Peak.

Finally it should be noted that the analysis undertaken does not take account of any reduction in capability during certain system outages (e.g. for maintenance).

How much flexibility capacity there will be on the NTS based on National Grid Transmission's current investment plans.

a) On a balanced gas supply flow assumption there could be as little as 18 mcmd of flexibility capacity available on the NTS in 2007/8. The table below indicates the level of flexibility capacity that would be available under onerous demand conditions.

Minimum Flexibility Capability

Year	Capability (mcmd)
2007/8	18
2010/11	20
2016/17	19

b) The table above, the analysis for which is described in more detail in appendix 1, reflects the limit of available flexibility capacity in circumstances where demand is not evenly distributed across the NTS. In these circumstances it is logical for localised constraints to be revealed more quickly (These figures exclude analysis of day 68 demands).

c) If a more balanced distribution of demand for incremental capacity is experienced then the following capability ranges can be expected;

Capability Range – Balanced Flex Distribution

Year	Range (mcmd)
2007/8	24 to 31
2010/11	26 to 31
2016/17	26 to 32

d) As could be expected, the availability of Flexibility Capacity can be optimised if the distribution of demand can be effectively managed by National Grid Transmission. With greater freedom for shippers/DNs to redistribute flexibility capacity comes a reduced confidence that all permutations can be delivered.

e) In the present edition of National Grid Transmission's Interim and Transitional NTS Exit Capacity Release Methodology Statement (IExCR) the allocation of flexibility capacity by NTS is predicated upon validation (through network analysis) that an allocation of flexibility capacity will not impinge on safe operation of the NTS.

f) In earlier discussions on enduring exit arrangements a national capability of 22 mcmd was identified along with a range of possibilities for substitution within areas (4 geographic areas) and across 17 zones (see appendix 1d). This system for managing both the absolute quantity allocated (previously identified as 22 mcmd) and the potential for

substitutability was intended to support the flexibility product described in UNC Modification Proposal 116V. The design of this mechanism was intended, in part, to reconcile the manifestation described above whereby the absolute quantity that can be safely allocated depends in part upon the distribution of the demand.

g) In conclusion National Grid Transmission believes that the availability of flexibility capacity is linked to the degree of substitutability that is allowed for use of flexibility capacity.

2) How this level of flexibility capacity would change if there are any changes in these plans (e.g. alternative scenarios for entry/exit flows and potential new connections in the 10-year plan).

a) During the spring of 2006, National Grid Transmission conducted substantial network analysis to consider the capability of the NTS to accommodate different levels of flexibility utilisation under a wide range of supply and demand scenarios. This work is described in a little more detail in appendix 2.

b) The major variability considered during this analysis was that of changing supply patterns. The supply patterns were described in detail in Transporting Britain's Energy 2005 and the analysis focussed on capability in the year 2010. The results of changing availability of flexibility capacity revealed by that analysis are summarised below.

Flex Availability under Differing Supply Conditions - 2006 Analysis

Gas Flow Condition	Range (mcmd)
TransitUK	26 to 31
Global LNG	18 to 22
Auctions+	17 to 34

c) Recent analysis carried out as a result of this information request has added further sensitivity analysis associated with changing supply patterns. Gas flow at the Isle of Grain Entry Point in the year 2010 has been considered in some detail. This entry point is considered by National Grid Transmission to be critical for maintaining continuity of supply in the heavily populated South East. The effects of changing supply quantities on the availability of flexibility capacity are tabulated below.

Percentage of Forecast Peak Day Flow from the Isle of Grain Entry Point	Actual Isle of Grain Gas Flow (mcmd)	Flexibility Available on a National Basis (mcmd)	Flexibility Available In Eastern Area[1] (mcmd)
100 %	36.7	26.47	9.0
50%	18.4	27.5	6.22
25%	9.2	25.5	5.69
0%	0	22.5	5.69

d) What this means is that the absence of any gas imports through the Isle of Grain Entry Point could reduce available national flexibility capacity by around 4 mcmd. Not all of this reduction would be limited to the immediate

[1] As shown in appendix 1c

vicinity of the entry point. The redistributive effect of reducing Isle of Grain Entry Point and increasing supplies elsewhere can exacerbate scarcity elsewhere on the network and, conversely, if a more beneficial pattern of supplies is realised, can actually improve the availability of flexibility capacity. This last observation is evidenced in the table above by the availability of flexibility capacity when Grain imports were reduced to 50% of expected Peak day gas flows.

e) The effect of changing supply patterns can be replicated at other entry points. For example, a scenario representing high levels of gas flow through East coast entry points, as presented in appendix 3, would reduce the national availability of Flexibility capacity under Peak day conditions to approximately 21 mcmd. It should be noted that the gas supply scenario presented in this analysis is not considered by National Grid Transmission to be unreasonable. The table below provides a summary of the gas supply sensitivity analysis that has been conducted for a Peak day in 2010.

Peak Day Supply Condition Year - 2010	**National Flexibility Capability (mcmd)**
Balanced supply	26.47
No Isle of Grain imports	22.5
High East Coast	21

f) Supply sensitivity analysis has not included consideration of the Fleetwood storage venture as a result of the resent Planning Permission decision.

3) National Grid Transmission's assessment of the demand for flexibility capacity from the DNs, storage sites and large Users (including power stations).

a) In July 2007 National Grid Transmission received requests from Gas Distribution Networks (GDNs) for approximately 22 mcmd of Offtake flexibility in 2007-08 rising to approximately 28 mcmd in 2011-12 The aggregate requests are tabulated below.

Flexibility Capacity Request from GDNs – 2007 OCS Process

Flex (mcmd)	2007/08	2008/09	2009/10	2010/11	2011/12
UNC Section B Request	23.17	22.53	22.45	23.54	28.22
Revised UNC Section B Request	15.88	15.63	15.74	17.47	28.49

b) The current process allows a window of opportunity for GDNs to modify their demands. During the adjustment period the GDNs modified their demands for the years 2007/08 through to 2010/11 which resulted in reduced demands for that period (also highlighted above). The indicative flexibility capacity demanded for 2011/12 remained largely unchanged. The final allocation of flexibility capacity to GDNs is tabulated below.

Final Flexibility Capacity Allocation to GDNs – 2007 OCS Process

Flex (mcmd)	2007/08	2008/09	2009/10	2010/11	2011/12
UNC Section B Request	15.88	15.63	15.74	17.47	17.47*

* The allocation for 2011/12 is indicative only and at this stage only reflects National Grid Transmission's commitment for 2010/11.

c) National Grid Transmission trusts that the requests by GDNs for flexibility capacity are efficient, economic and reflective of their actual requirement and will provide a widely accepted indication of how use of flexibility capacity by GDNs could increase over time. Following the initial application for flexibility capacity, National Grid Transmission undertook extensive network analysis to ascertain whether it could satisfy the initial requests. The result of this process was that National Grid Transmission had to indicate to a number of GDNs that it would have to curtail some of the requests that had been placed for the years 2007/08 and 2010/11. In both years, aggregate requests had been for around 23 mcmd. The analysis of these requests provided further evidence of the validity of a 22mcmd baseline. On receipt of this information a number of GDNs moderated their demands and a full allocation by National Grid Transmission of their final requests was possible for the period 2007/08 through to 2010/11.

d) The indicative increase in 2011/12 to 28 mcmd is thought to reflect an interaction with Interruptible to firm load switching within the GDNs. Through the recent application and subsequent analysis National Grid

Transmission gained further confirmation that 22 mcmd represented a reasonable reflection of national availability of flexibility capacity.

e) An analysis of requests from GDNs for flexibility capacity over recent years provides further evidence that demand is tending to increase over time. For a graphical representation of recent demands for flexibility capacity that have been placed each year through the former planning and latterly User commitment process, see appendix 4. Further, requests from GDNs can be expected to lead to an increasing need for National Grid Transmission to constrain subsequent allocations.

f) With respect to large Users, the gas-fired power generation market has stagnated over recent years as gas prices have increased and the need for new generating capacity has reduced. The last CCGT power station to connect to the NTS was in 2004, with no new connections forecast until next year. The conditions described have enabled the amount of flexibility capacity taken by CCGTs to remain manageable, in part because most plant has remained in its original base load operating mode. On this basis, the present availability of up to 22mcmd of flexibility capacity for use by GDNs has been made on an assumption that directly connected CCGTs and other Very Large Daily Metered Customers (VLDMC) will take gas of a flat daily profile.

g) However, National Grid Transmission recognises that the benign conditions of the past will not continue because gas-fired generation is forecast to increase over the next ten years as coal-fired plant is restricted by the implementation of the Large Combustion Plant Directive (LCPD) and some nuclear plant reaches the end of its lifespan.

h) Our assumptions relating to the power generation market are supported by information received from customer enquiries, journals, press releases and other sources. Our forecast assumes over 12 GW of coal and oil-fired capacity will be lost over the next ten years, with a further 4 GW of nuclear plant also lost. New CCGT plant is predicted to make up the bulk of the shortfall caused by these plant losses with 12.6 GW of new capacity forecast by 2017. Growth in the CCGT population will necessarily raise questions about the nature of their operation and in particular whether there will be a greater tendency for load following rather than base load operation, especially older gas plant. National Grid Transmission believes that this is a strong possibility and that a potential consequence will be a greater need for flexibility capability to be utilized in maintaining gas supplies to power stations. See appendix 5.

i) It is also anticipated that 11.2 GW of new renewable plant will be built over the period to 2016/17. The majority of this is wind generation. National Grid Transmission's forecast assumes that 7% of electricity supplied will be from renewable sources by 2010, against the government target of

10%. The reliability and variability of wind powered generation has been much discussed amongst industry observers, one consequence being the need to maintain a conventional generating capability for periods when wind power is not available. This intermittent kind of generation, if supplemented by CCGT operation, could place much greater demands for flexibility capacity to be supplied from the NTS.

j) Recent completion of Hole House Farm, Hatfield Moor and most recently Humbly Grove has increased UK storage capacity from approximately 3.5 bcm in 2000 to around 4.3 bcm in 2006. The majority of the operational sites continue to provide seasonal storage which has meant that their use of flexibility capacity has remained manageable.

k) There are a large number of proposed storage developments that could potentially add to the UK storage capacity however only a few are under construction or have received planning consents. If all the sites that are under construction or have planning consents are developed, the storage capacity in the UK will increase to about 6 bcm by 2013/14. If all proposed developments were to proceed then total storage volumes would be approaching 17 bcm. At this level, the UK would have comparable levels (relative to annual demand) to many other Continental countries. Once again, as with CCGT operation, one needs to consider the implications of such a large build up in capability. A proportion of the new storage sites could be expected to be developed with 'fast response' capabilities that will enable management of gas balancing positions by shippers. It is likely that any future developments of storage sites would be concentrated around the Easington and North West areas due to the geological structures in those areas. This outcome will potentially require greater use of flexibility capacity on the NTS (both for entry and exit flows). However, it should be noted that storage operations could also be a source of additional flexibility.

l) Another method of identifying changing flexibility capacity requirements is to consider recent use of flexibility and determine the trend lines of such usage. We have considered this approach and from it concluded that physical use of flexibility capacity would exceed NTS capability by 2012/13, see appendix 6 for a more details.

4) National Grid Transmission's assessment (including a view on the likelihood) of what would reduce or increase NTS flexibility capacity (e.g. new entry points, new power stations, LDZ demand growth, etc.)

a) We have addressed in section 1 of this response the criticality of demand distribution in determining how much flexibility capacity is available at the same time on the NTS. Enabling demand to be loaded onto discrete geographical areas is more restrictive than management of a balanced distribution across the NTS. In managing the transitional flexibility capacity process, National Grid Transmission has already experienced localised constraints or come close to needing to constrain demands as was the case for the initial applications for flexibility capacity during the 2007 GDN application process. On that basis we believe that a high probability should be attached to this risk.

b) In section 2 we have highlighted that patterns of gas supply into the NTS are also critical to determination of how much flexibility capacity the NTS can deliver. Reduced supplies through Isle of Grain or high gas supplies through Easington in tandem with high supplies from other East coast entry points have been highlighted as being of particular concern. Both of these conditions are viewed as high probability events. LNG is offered into a global market and depending on contractual conditions can be delivered to many locations and the Easington area is developing into a major source of future gas supplies.

c) In deriving the figures for the available flexibility capacity at Exit, it has been assumed that gas is delivered into the NTS at uniform rates and as such there is no flexibility capacity usage at Entry. In fact there are significant within day flow variations at all Entry points resulting in significant use of flexibility capacity. Analysis of aggregate flexibility usage at entry points demonstrates regular usage at Entry of between 5 and 10 mcmd.

d) Further analysis of flexibility usage at Entry, in particular back loading (flows in the period 06.00 to 22.00 below the average for the day) shows that our present allocation of around 17.5 mcmd of flexibility capacity in 2010 could not be supported if back loading at Easington was to exceed 7% (around 9 mcmd) on the Peak day. An alternative form of this analysis demonstrated a 4% threshold when back loading is experienced across all entry points. Back loading has been experienced to date, particularly at gas import locations and storage sites, and has been of growing concern to National Grid Transmission. See appendix 7.

e) A side effect of providing higher exit pressures to GDNs and directly connected loads would be that flexibility capacity would be reduced. For example a 5% increase in the pressure commitment at Lyneham in the

South West, from 31 bar to 32.5 bar would reduce available flexibility capacity in the West by 1 mcmd. Similarly a 10% increase in the pressure commitment at Great Wilbraham in the South East, from 44 bar to 48.4 bar would reduce available flexibility capacity nationally by 1.5 mcmd. Pressure commitments are binding on NTS and can be requested as part of the annual Offtake Capacity Statement update process. An increased pressure supplied from NTS to a GDN can help to offset investment within a GDN by effectively increasing the capability for flow or diurnal storage of the downstream network. It is anticipated that the NTS will continue to receive requests for increased pressure commitments. Note that currently there is no mechanism for National Grid Transmission to request reductions in pressure from the GDNs.

5) The likely development of the availability of flexibility capacity on a regional and zonal basis.

a) Increased flexibility capacity should become available in South Wales once Milford Haven gas flows commence. Similarly increased flexibility capacity would become available in Scotland if flows at St Fergus were to become more favourable.

b) Elsewhere no appreciable increases in flexibility capacity are anticipated. Across South Western, Southern and South East England, patterns of gas flow will remain largely unchanged. There are no large scale NTS investments that are planned across these areas. In the South East, load growth has the potential to reduce the availability of flexibility capacity in that area.

c) The Midlands and North Wales are not expected to see any increases in availability of flexibility capacity because there are no significant new investments planned in those areas and the deliverability of the Compressors feeding those areas will remain largely unchanged.

d) The North and North East is a more complex picture. Scotland has potentially more capability reflecting reduced St Fergus gas flows. The North East is becoming tighter as a result of higher imports at Easington and storage developments in the area. This is because the optimum condition for bulk transmission of the new supplies is to maintain high pipeline pressures which mitigates against taking the opportunity to release flexibility capacity from the pipelines.

e) A study of our analysis, based on optimising each of the 4 geographic areas in turn, is provided in appendix 8. This largely supports the text above in that it shows the following changes in capability.

Geographic Zone	**Change in Zonal Capability from 2007/8 to 2016/17 (mcmd)**
North Zone	+2
Midlands Zone	0
Western Zone	+2
Eastern Zone	+1

f) It should be noted that the gains described above can not be realised on a coincident basis, rather they serve to indicate localised changes rather than national capability.

6) The potential causes, if any, of future scarcity of flexibility capacity

a) In its recent consultation document, “Gas Distribution Price Control Final Proposals Consultation Document 285/07” Ofgem appears, in the opinion of National Grid Transmission, to have initiated a policy that assumes an increasing amount of flexibility capacity (sometimes described as diurnal storage in the document) can be taken from the NTS. On that basis, it has proposed to remove a large number of capital investment schemes from the Gas Distribution Networks’ respective capital allowances. For detailed references to the relevant discussion and proposals in the document see appendix 9 of this document.

b) We note that in paragraph 6.46 of the Final Proposals, Ofgem reports that “One possible outcome of having the flexibility to contract for interruptible capacity only in the volumes and locations they require it, may be that the GDNs choose to reduce the overall level of interruption they contract for, and instead seek to book incremental flex from the NTS to compensate for any loss of linepack on their own network”. Ofgem qualify this statement by stating that they do not necessarily believe that this will be the case. With respect to this outcome we can only draw Ofgem’s attention to the indicative requirement of 28mcmd for the year 2011/12 that has been signalled by GDNs through the recent OCS process. This suggests that the outcome that Ofgem has described is likely to happen, we would also suggest that based on the analysis conducted as part of this exercise we would not anticipate being able to fully allocate the flexibility capacity if requested in next year’s OCS process.

c) We also note that in paragraph 6.48 of the Final Proposals, Ofgem states that “we consider that it would be appropriate for the GDNs to be required through their licence to write to Ofgem in advance of submitting an increase in their flex bookings by more than 10% per cent per annum”. National Grid Transmission can only observe that background demand in the networks is forecast to grow by around 1% to 2% per annum and as such, is inconsistent with a 10% per annum growth rate in demand by GDNs for flexibility capacity supplied from the NTS. Rapid growth in demand for flexibility capacity against a background of near static demand for flat capacity suggests that GDNs are expected to reduce the amount of flexibility provided from within their own networks. Further, a growth rate of this magnitude can only bring forward the date from which demand from GDNs for flexibility capacity will exceed the ability of National Grid Transmission to deliver.

d) We agree with Ofgem’s comment in paragraph 6.32 of the consultation document 226/07, “Gas Distribution Price Control Updated Proposals” that it should “not conclude from the current industry consensus that there is no current scarcity of flex *and* that a scarcity of the service could not and

may not develop in the future.” Indeed, we would argue that such a scarcity is more likely to develop in the future if capex restrictions are placed on the GDNs such that they are left with little alternative but to request increasing quantities of flexibility from the NTS. It should also be recognised that the flexibility product is currently offered at a zero price and that Ofgem is proposing to remove the incentive concerning flexibility usage on the GDNs which means that, in general with all other things being equal, the efficient decision for GDNs will be to take increasing quantities of the zero priced product unless they have competitively priced (zero) products of their own or the NTS offering is not in the right location. Taking these things together, capex restrictions on the GDN coupled with zero priced NTS flexibility we consider that the logical conclusion can be nothing other than to assume that more flexibility will be required by GDNs from the NTS in future.

7) The probability, location and potential timing of any such scarcity developing in practice.

a) National Grid Transmission believes that the growing demand for flexibility capacity, as described in the answer to question 3 above provides evidence that it already has to constrain requests for flexibility capacity. Further, requests for increasing quantities of flexibility capacity by GDNs provide a reliable leading indicator of their future operational requirements. Of particular concern are indicative demands for an aggregate 28 mcmd of flexibility capacity in 2011/12.

8) What Actions would National Grid Transmission take under the transitional offtake arrangements were a flexibility capacity constraint to arise and to clearly identify which parties would be affected by these actions and the potential impact. In particular, what would the magnitude of the consequences for end users (including generators, industrial and commercial and domestic customers) be should the risk(s) materialise?

National Grid Transmission has considered approaches for managing the realisation of NTS Flexibility constraints within both planning and operational timescales.

Planning Timescales

a) Under the circumstances described and during the GDN Offtake Capacity Statement (OCS) allocation process, the approach applied by National Grid Transmission would be to reduce, by an equal proportion, all flexibility demands across the constrained location until the allocation matched NTS capability.

b) For example, this event occurred under the transition arrangements in 2006. The quantity of flexibility requested and the final allocations are presented in appendix 10. In this instance the final allocation from National Grid Transmission was 88% of the original requests.

c) National Grid Transmission is aware that constraining GDN capacity requests during the constrained period (less than 3-years before intended use of the capacity) could impinge on the ability of a GDN to satisfy its security of supply obligations and has therefore developed a number of questions that would be asked of a GDN in the event that they either;
   i) Continued to request capacity after National Grid Transmission had previously turned down such a request or
   ii) Requested incremental capacity for use within the constrained period but outside of the annual OCS timetable.

d) The questions are designed to identify the cause of the requirement for increased Flex and the effect on consumers, through quantifying potential loss of consumers and deterioration of the security of supply standard (from a failure to supply on no more than a nominal 1 day in 20 years). For a list of the questions prepared by National Grid Transmission see appendix 10.

e) In the event that a GDN could demonstrate that security of supply would be unacceptably diminished if it did not receive the required incremental capacity and that it had done everything that a reasonable and prudent operator could be expected to do to avoid this situation and if National

Grid Transmission had previously satisfied itself that it could not satisfy the request without impinging on its own security of supply obligations then it would expect to report the event to the Network Emergency Controller. This has not previously happened, but we would expect that a review of the distribution of demands across the total network would be required to identify how the situation could be recovered so that all areas of the network are once more compliant with the relevant obligations. All networks would be expected to cooperate regardless of commercial positions.

f) Following the rationing of flexibility capacity in zone X during 2006, we did not receive any indications from the GDNs of the effects upon consumers of not having access to the full quantity of flexibility that they had originally requested. This puts National Grid Transmission in the position of being unable to quantify the effects on various consumer groups of not being able to fully allocate flexibility capacity to GDNs

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g) If, however, we ignore short term constraints on the allocation of flexibility capacity which in any case should only arise as a result of unexpected events such a forecast errors or unanticipated network problems, then requests for flexibility capacity outside of the constrained period should not cause any great difficulty with respect to maintaining security of supply. If National Grid Transmission cannot deliver the requested flexibility capacity then it is anticipated that the GDN will have sufficient time available to it to develop and build the appropriate investment to ensure it maintains the required security of supply on its network.

Operational Timescales

h) In the unlikely event that constraints occur because of the over-allocation and use of flexibility capacity on the NTS, then action would be taken to resolve the constraint and avoid any unplanned loss of supply to any end user. The actions available under the transitional offtake arrangements are detailed in Appendix 11. The actions taken to resolve a constraint include the following:

- Requirement on NTS offtakes to adhere to NExA notice periods. This could result in 'lost opportunity' costs for some of the affected parties; e.g this might restrict generator participation in the electricity Balancing Mechanism.

- Interruption of NTS and LDZ loads. This again could result in 'lost opportunity' costs for parties interrupted (e.g. lost production) and consequential costs for other markets e.g the electricity Balancing Mechanism.

- Acceptance of OCM Locational offers for demand turndown or supply turn up. The cost of the offers would reflect the 'lost opportunity' costs of the parties submitting the offers. Acceptance of these offers will have a cost impact on National Grid Transmission and shippers through the capacity incentive.
- Emergency actions on interruption and Firm Load shedding. These would have similar cost impacts as for 'normal' interruption plus wider indirect societal costs.

None of the above actions should have any direct cost impacts on domestic customers.

Appendix 1 - **How much flexibility capacity there will be on the NTS based on National Grid Transmission's current investment plans.**

a) Flexibility analysis has been conducted for the years, 2007/8, 2010/11 and 2016/17.

b) Demand levels considered are Peak day (not exceeded in more than 1 day in every 20 years), day 1 and day 68 on an average weather load duration curve. These conditions are equivalent to the following demand levels.

Demand Levels Considered for Flex Analysis (mscmd)

Day	2007/08	2010/11	2016/17
Peak	562	586	703
Day 1	456	492	565
Day 68	339	366	424

c) Gas supply distribution is based on a balanced network as set out in the diagrams in appendix 1b.

d) Analysis was conducted to identify national flex capability under a number of conditions reflecting demand distribution. First, where all offtakes experience the same proportional incremental demand for flexibility capacity. Second, where demand for incremental capacity is targeted on a single geographic area. For the purposes of this second exercise, the NTS is divided into 4 sections as represented pictorially in appendix 1c.

e) When targeting a single geographic area, the demands for the remaining 3 areas are held at the level requested in the 2007 OCS process (2016/17 held to 2010/11 request levels). The target area flexibility is then increased until a network constraint is reached.

f) The flexibility for Day 68, when considering the individual geographic areas, reached the maximum flexibility value possible for the diurnal profile provided by the associated DNs before a network constraint was reached. Given this, National Grid Transmission has not undertaken any scenario analysis to assess the actual physical capability limits.

g) For the years and demand levels considered the following capability ranges were identified (looking at the capability from both a local and a national level). In addition, the capability under each test condition was recorded.

Flex Capability Range

Year	Range (mcmd)
2007/8	18 to 31
2010/11	20 to 31
2016/17	19 to 32

Comparison of National and Aggregate Areas Amounts

			National			
	Day No.	National	North	Midlands	West	East
2007/8	**PK**	24	23	18	20	19
	1	27	24	18	21	20
	68	31	23	18	19	19
2010/11	**PK**	26	29	20	21	24
	1	29	30	21	23	24
	68	31	24	19	21	20
2016/17	**PK**	26	26	19	22	23
	1	30	27	19	23	23
	68	32	26	19	22	21

Note: The Day 68 area figures have been shaded due to the reasons outlined in f) above

The results of the analysis lead to a number of observations:

h) The best possible result, from the point of view of optimising availability of flexibility capacity, is for both supplies and demand to be proportionately distributed across the NTS. In this case, availability of flexibility capacity would be in the range 24 to 32 mcmd over the period from 2007/8 to 2016/17. An annualised breakdown is provided below.

Capability Range – Balanced Distribution

Year	Range (mcmd)
2007/8	24 to 31
2010/11	26 to 31
2016/17	26 to 32

i) The location at which flexibility can be utilised is substitutable. If, the demand for flexibility is optimised in the Northern sector (broadly Scotland and Northern England) then availability of flexibility capacity would be in the range 23 to 30 mcmd. Conversely, the worst case distribution would be an optimisation of flexibility capacity in the Midlands, leading to a national capability range of 18 to 21 mcmd.

Appendix 1b - Gas Supply and Demand Conditions considered for Analysis (April 2007 Forecasts)

Year 2007/08 – Peak Day

Day	Peak
Year	2007/08
Flows by Zone	
Northern Triangle	192
North West	26
Easington	133
South East	155
East Coast	313
West UK	20
South West	14

Year 2007/08 – Day 1

Day	1A
Year	2007/08
Flows by Zone	
Northern Triangle	184
North West	10
Easington	102
South East	116
East Coast	243
West UK	16
South West	2

Year 2007/08 – Day 68

Day	68A
Year	2007/08
Flows by Zone	
Northern Triangle	148
North West	2
Easington	79
South East	78
East Coast	180
West UK	9
South West	0

Year 2010/11 – Peak Day

Day	Peak
Year	2010/11
Flows by Zone	
Northern Triangle	163
North West	22
Easington	186
South East	153
East Coast	355
West UK	44
South West	4

Year 2010/11 – Day 1

Day	1A
Year	2010/11
Flows by Zone	
Northern Triangle	167
North West	20
Easington	121
South East	123
East Coast	259
West UK	45
South West	1

Year 2010/11 – Day 68

Day	68A
Year	2010/11
Flows by Zone	
Northern Triangle	136
North West	1
Easington	86
South East	91
East Coast	191
West UK	38
South West	0

Year 2016/17 – Peak Day

Day	Peak
Year	2016/17
Flows by Zone	
Northern Triangle	122
North West	83
Easington	198
South East	194
East Coast	398
West UK	85
South West	18

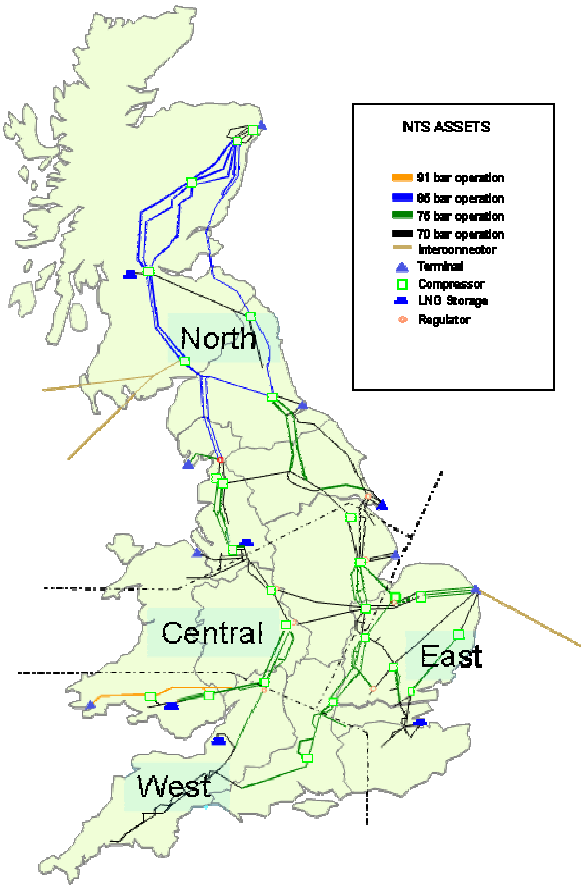
Year 2016/17 – Day 1

Day	1A
Year	2016/17
Flows by Zone	
Northern Triangle	118
North West	62
Easington	116
South East	175
East Coast	297
West UK	85
South West	3

Year 2016/17 – Day 68

Day	68A
Year	2016/17
Flows by Zone	
Northern Triangle	97
North West	22
Easington	83
South East	137
East Coast	225
West UK	77
South West	3

Appendix 1c - NTS Areas Considered for Flex Analysis



Appendix 1d - **Substitutability of 22-mcmd Flexibility Capacity**

Area	Zone	Zonal maxima	Area maxima	National Maximum
North	0	3.580	9	22
	1	4.600		
	2	0.400		
	3	3.190		
	4	5.950		
Central	5	1.540	8	
	6	0.640		
	11	2.670		
	12	2.210		
	15	1.460		
West	7	2.020	5	
	14	1.620		
East	8	2.030	8	
	9	3.010		
	10	1.290		
	13	3.260		
	16	1.210		

All units in mcmd.

Appendix 2 - Summary of Flexibility Capacity Analysis Conducted by National Grid Transmission in 2006

1) During the spring of 2006, National Grid Transmission conducted substantial network analysis to consider the capability of the NTS to accommodate different levels of flexibility utilisation (i.e. offtake flow rate variations) under a wide range of supply and demand scenarios. The analysis formed the basis for the determination of a 22 mcmd baseline quantity for flexibility capacity and was presented to an industry forum chaired by Ofgem, known as the Exit Offtake Working Group (EOWG) on 28th June 2006.

2) A baseline availability of 22 mcmd of flow flexibility was identified on the NTS for the gas year 2010/11. This is an aggregate quantity that could reasonably be expected to be supported by the NTS infrastructure (having due regard to current and envisaged infrastructure including that which would be considered necessary to satisfy any and all of the three supply side scenarios that featured in the network analysis modelling that has underpinned the 22 mcmd determination).

3) National Grid Transmission identified the quantity of Flow Flexibility that could be confidently used by customers. Confidence, in this respect, meant that National Grid Transmission believed that there was sufficient installed capacity on the NTS to ensure continuity of gas supplies when the aggregate quantity of flow flexibility is utilised on a single day. This level of confidence is intended to be consistent with ensuring that respective Safety Cases can be satisfied for the relevant Gas Transporters (DNs and National Grid Transmission).

4) The Network Analysis that had been performed was reflective of the gas flow scenarios that had been discussed in Transporting Britain's Energy 2005 as follows;

    a) TransitUK, reflective of a build up of Norwegian and LNG imports, some of which are exported to the Continent.
    b) Global LNG, reflecting low LNG imports and an aggressive build up of Norwegian imports.
    c) Auctions+, which reflected the market view of capacity requirements as signalled through long-term entry capacity auctions and existing baseline capacities at entry.

Results of 2006 Flexibility Analysis – Projection for 2010/11 Capability

Supply Case	Demand	National Flex (mcmd)
TransitUK	D1	31
	D50	30
	D150	26
GlobalLNG	D1	18
	D50	22
	D150	22
Auctions+	D1	17
	D50	32
	D150	34

5) For the purposes of deriving the likely levels of flow flexibility, the results derived from the Auctions+ scenario was not used. The rationale for this was that the Auctions+ scenario was regarded as a very low probability outcome for gas supply in 2010. This scenario was based on an assumption that gas flow would not exceed the prevailing baseline level (including previously released incremental capacity). The scenario therefore did not reflect the potential pattern of gas supply that would occur, particularly on the East Coast at Isle of Grain, Bacton and Easington.

6) Of the remaining national demand conditions modelled, 18 mcmd could be confidently provided across all scenarios.

7) The 18 mcmd threshold is set on day 1 of the Global LNG scenario analysis and on such a demand level, the winter conditions would tend to develop and be reliably predicted by meteorologists. As such National Grid Transmission should be in a position of preparing in advance for such conditions by preparing its plant and equipment as well as increasing linepack in critical areas amongst other things. Based on the predictability of such a demand level, and through optimisation of operational configurations against the supply/demand flow patterns actually seen on the day, more than 18 mcmd of flow flexibility should be capable of being accommodated.

8) If the 18 mcmd analysis is discarded, the next threshold is 22 mcmd, which would apply on both day 50 and day 150 of the Global LNG scenario. The logic of predictability for demand conditions could not be applied on days 50 and 150. A cold snap could easily occur and therefore it would not be prudent to expect that prior preparation could enable this threshold to be increased.

9) On the basis of the 2006 analysis described the level of flow flexibility that could be confidently utilised was suggested to be 22 mcmd.

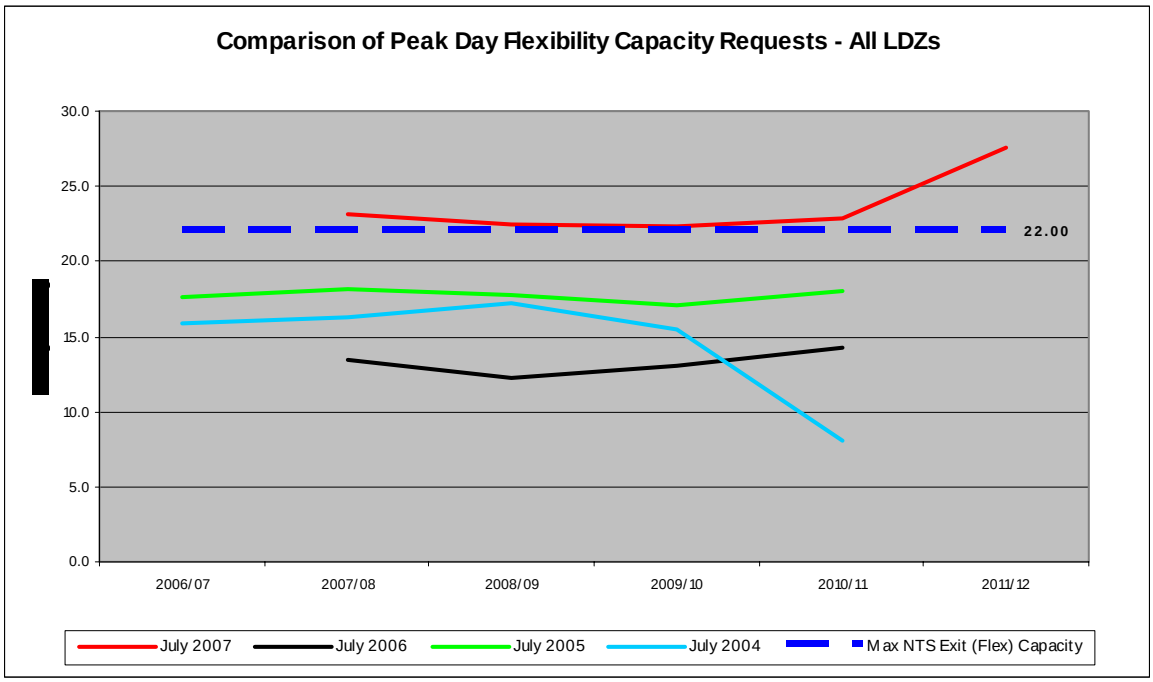
Appendix 3 - High East coast Gas Flow Condition – Year 2010

Day	Peak
Year	2010/11
Flows by Zone	
Northern Triangle	170
North West	22
Easington	190
South East	167
East Coast	372
West UK	19
South West	4

Appendix 4 - Comparison of Flexibility Requests

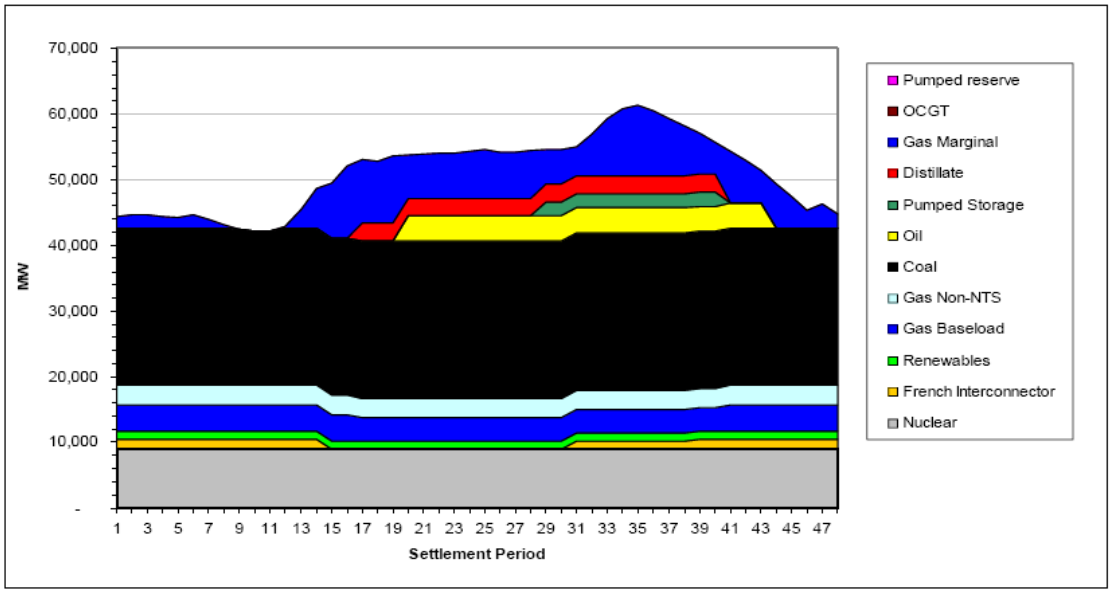
1) The chart below reflects the aggregate position for OCS requests received by National Grid Transmission in July 2007. It also provides a comparison of changing quantities of flexibility capacity that have been requested in aggregate by GDNs over a number of years.

2) The quantities initially requested are around 22 mcmd rising to around 28 mcmd in 2011-12. The increase in the final year is thought, by National Grid Transmission, to partially reflect the effects of interruptible to firm switching in the GDNs as a result of implementation of UNC Modification 090.



Appendix 5 – Potential Generation Profile (National Grid Transmission Winter Outlook Report Sep 07)

Figure 19 – Potential generation profile - cold winter weekday



Flex usage by Gas fired power stations is demonstrated on the above graph below by the 'Gas Marginal' load between the 12th and 44nd half hour settlement periods.

Appendix 6 - Recent Use of System Flexibility

1) This analysis has been carried out to derive the actual flexibility capacity usage at Zonal, Area and NTS level, and on the basis of this actual usage, to determine the likelihood, if any, of a future scarcity of flexibility capacity and the probability, location and timing of any such scarcity developing. The information contained in this Appendix covers system flexibility in relation to exit before also providing some analysis in relation to entry.

2) The analysis undertaken is based on actual flexibility capacity usage, in each demand sector, in the period 2001 to 2007.

3) The analysis indicates that, based on a forward projection of actual flexibility capacity usage to date, the current National Maximum Flexibility Capacity of 22mcmd is likely to be exceeded by Winter 2012/13.

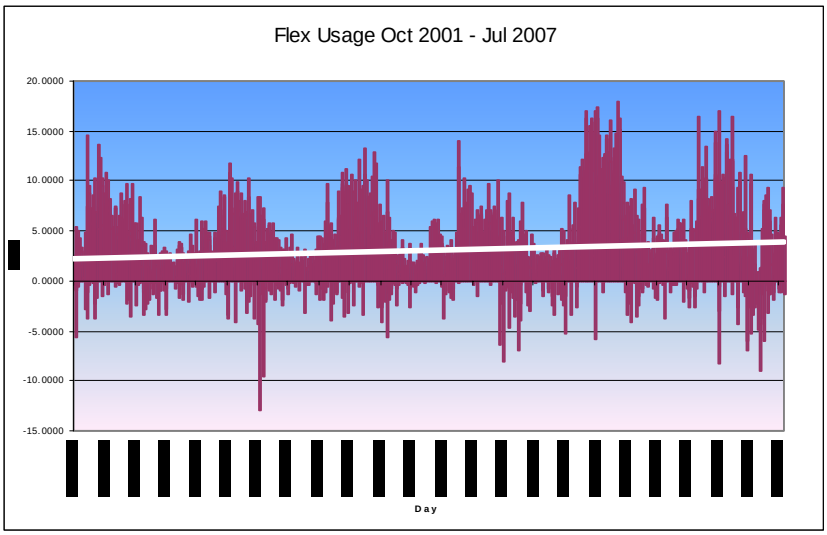
4) The projected exit flexibility capacity usage does not take account of the following sensitivities:

    a) The much higher level of flexibility capacity usage in a cold or even average winter. All the winters in the period 2001 to 2007 were warmer than average with Winter 2006/07 being the warmest on record.
    b) The analysis of the sensitivity of DN flexibility capacity usage to weather shows that in a 1:50 Winter the DN peak flexibility capacity usage could be as high as 18 mcmd compared with the high of 14 mcmd seen to date. (See section 4)
    c) Increased DN requirements for Flexibility capacity – the latest OCS statements show an aggregate DN flexibility capacity requirement of 15.87 mcm for 2007/08 rising to 17.46 for 2010/11. This is a significant increase on the aggregate requirement of 12.7 mcmd for 2006/07. (See section 5)
    d) Increased Flexibility Capacity usage by CCGTs. There could be increased flexibility capacity usage by CCGTs as a result of increased installed power. In the period to 2015, the installed power is expected to increase by 20%. (See Section 6)
    e) Flexibility Capacity usage at Entry. In addition to flexibility capacity usage at Exit, there is significant flexibility capacity usage at Entry terminals. The highest aggregate flexibility capacity usage at the six main beach terminals was 10.0 mcmd. (See Section 7)

5) When the above sensitivities are taken into account, it is highly likely that the projected flexibility capacity usage has been understated, and therefore, the National Maximum Flexibility Capacity of 22 mcmd could be exceeded earlier than 2012/13.

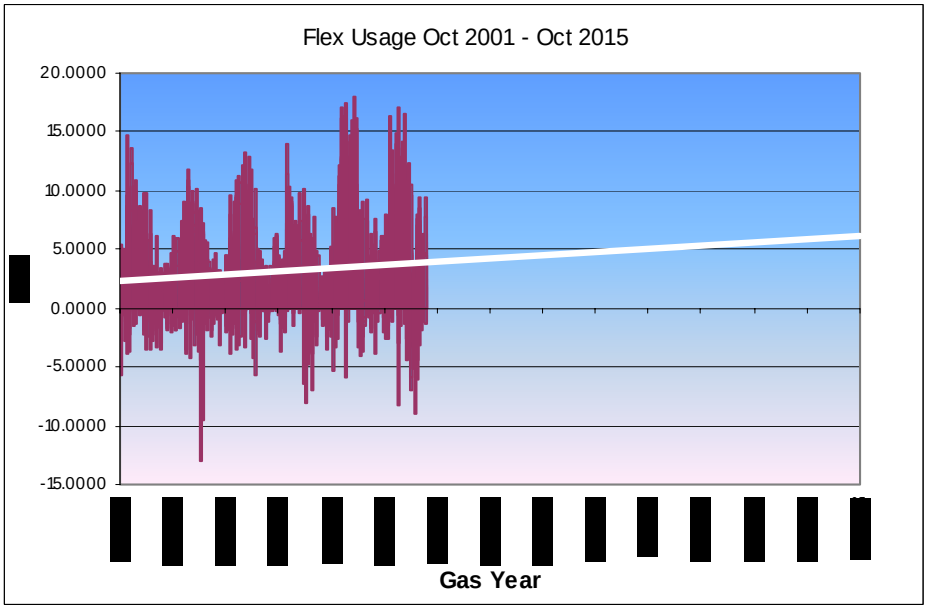
Aggregate NTS Daily Exit Flexibility capacity Usage

6) Aggregate NTS daily flexibility utilisation is shown in the graph below. The historic peak utilisation has been 17.9 mcmd and the trend of utilisation has been steadily increasing.

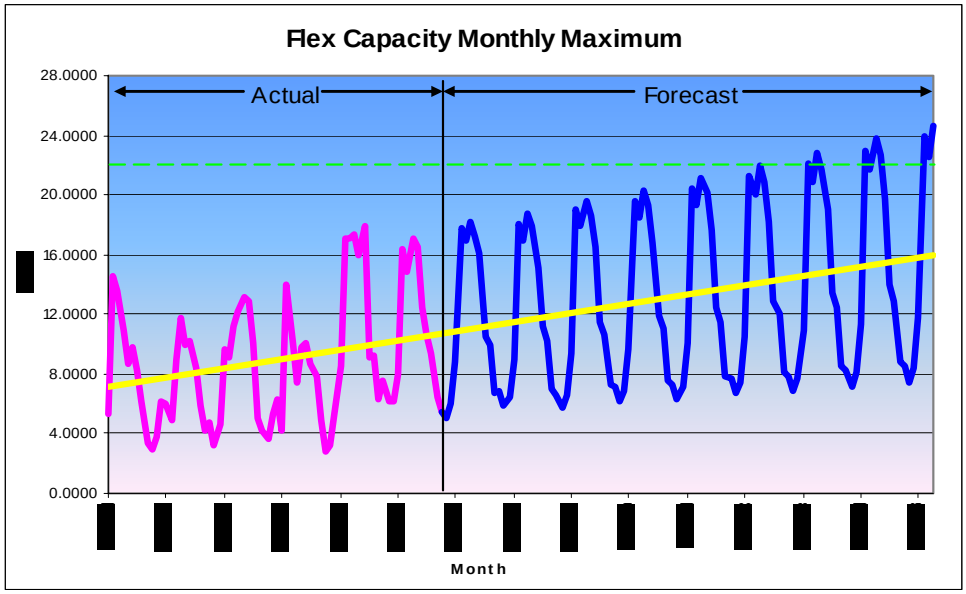


Forward Projection of Flexibility Capacity Usage

7) In order to forecast the peak daily flex requirement, extrapolation of the historic daily trend has been used to provide a base case on which to determine peak requirement in future years. Initially, the historic daily trend was extrapolated to 2015 as shown below.



8) The maximum daily flex in each calendar month was then plotted and extrapolated using the historic trend extrapolation as a basis. The result can be seen below.



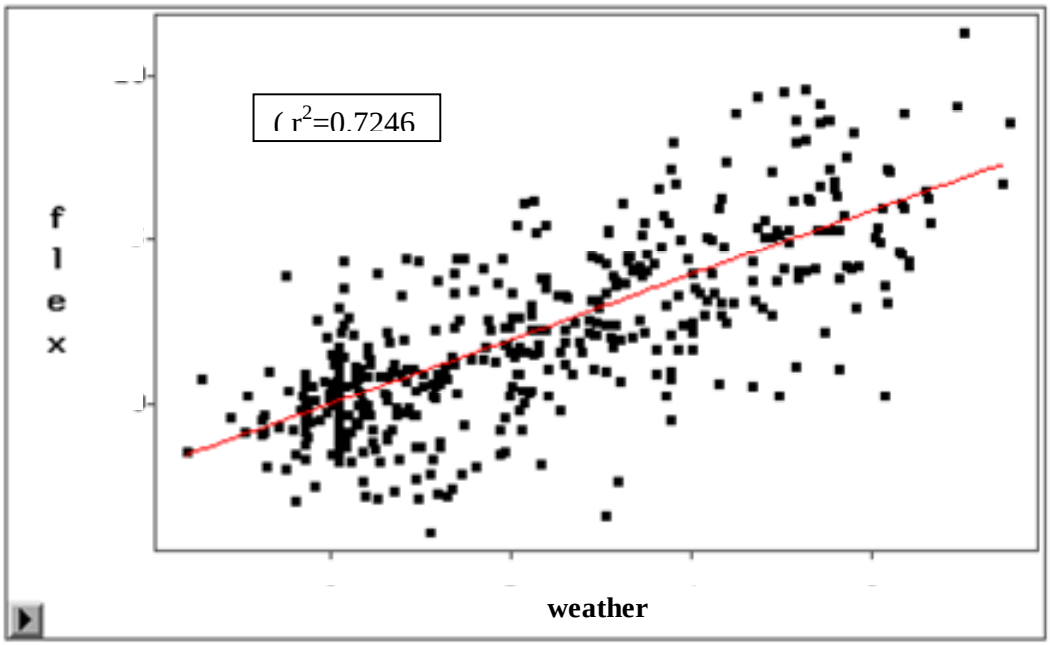
9) On this basis, of an extrapolation of the actual monthly maximum flexibility capacity usage, it can be seen that the current maximum flexibility capacity of 22 mcmd is likely to be exceeded in winter 2012/13.

10) The above analysis assumes that the historic trend rate of growth continues and takes no account of the sensitivity of colder weather on flex usage or of entry flex usage. These are considered below.

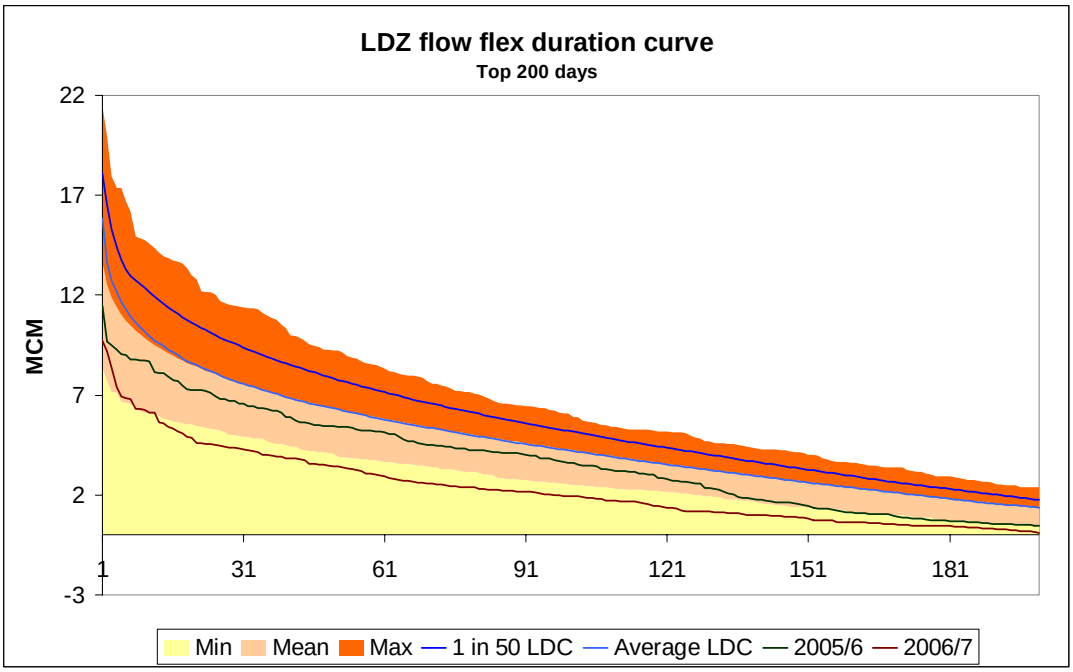
Impact of Weather on LDZ Flexibility Capacity Usage

11) The trend of DNO flexibility capacity utilisation has been generally flat in the period 2001 to 2007. In the analysis above, this flat trend has been assumed when forecasting aggregate flex usage in future years. However, it should be noted that the period analysed has coincided with a series of historically warm winters – all the winters analysed, have been warmer than average with Winter 2006/07 being the warmest on record (> 1: 79 Warm). Further analysis was therefore carried out to assess the impact of a very cold weather or even average weather conditions on LDZ flexibility capacity usage.

12) The LDZ flex usage against weather (in the form of the composite weather variables) for the period 2005 to 2007 was plotted (below) and the best-fit line used as the basis for the development of the model. It can be seen that, although there is considerable scatter, there is a definite correlation between weather and flex usage.



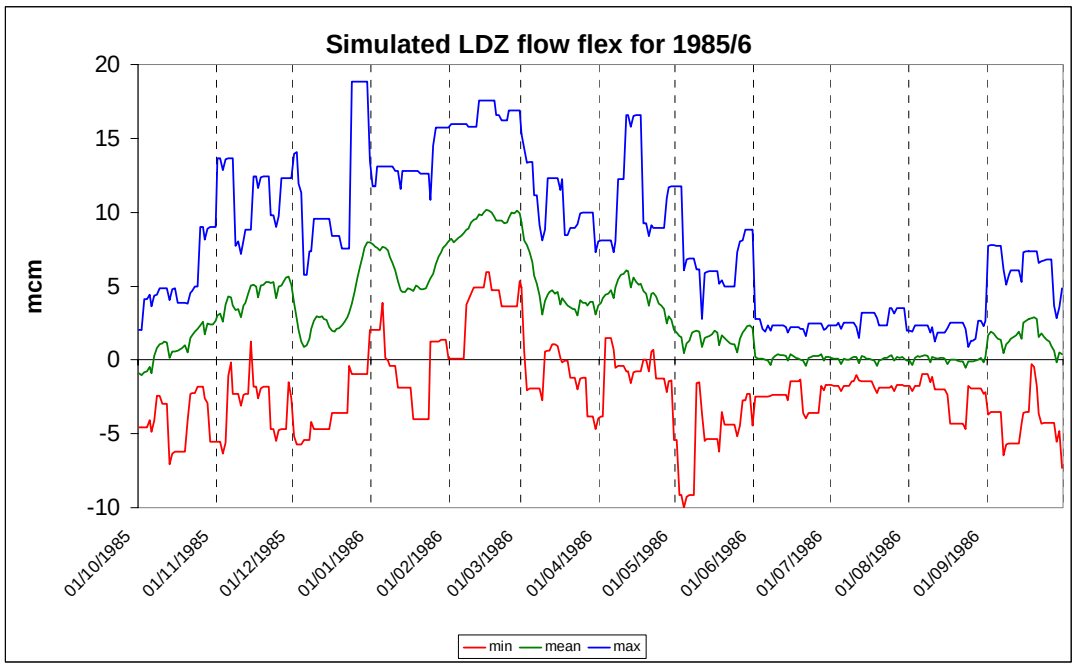
13) The model was used to predict flexibility usage under 'Average' weather conditions and 1 in 50 weather conditions. The results are expressed in the form of a duration curve below.



14) The min/mean/max coloured bands indicate the level of tolerance around the predicted results that can be expected from the model. In addition, the actual flex usage in years 2005/06 and 2006/07 is shown.

15) The model predicts a 1 in 50 peak LDZ flex requirement of 18 mcm. Under 'Average' weather conditions, the model predicts a LDZ flex requirement of 15.8 mcm.

16) Further analysis was carried out to simulate LDZ flex usage in Winter 1985/86. Winter 1985/86 is the coldest winter experienced in the last 20 years (a 1:11 cold winter), and was the last time we experienced a 1:20 peak demand day. The results of the analysis can be seen below.The model prediction was a peak LDZ flex requirement of 18mcm.



The minimum, mean and maximum in the graph above indicate the tolerance of the models' results i.e. the 'scatter' around the best-fit line in the scatter graph on the previous page.

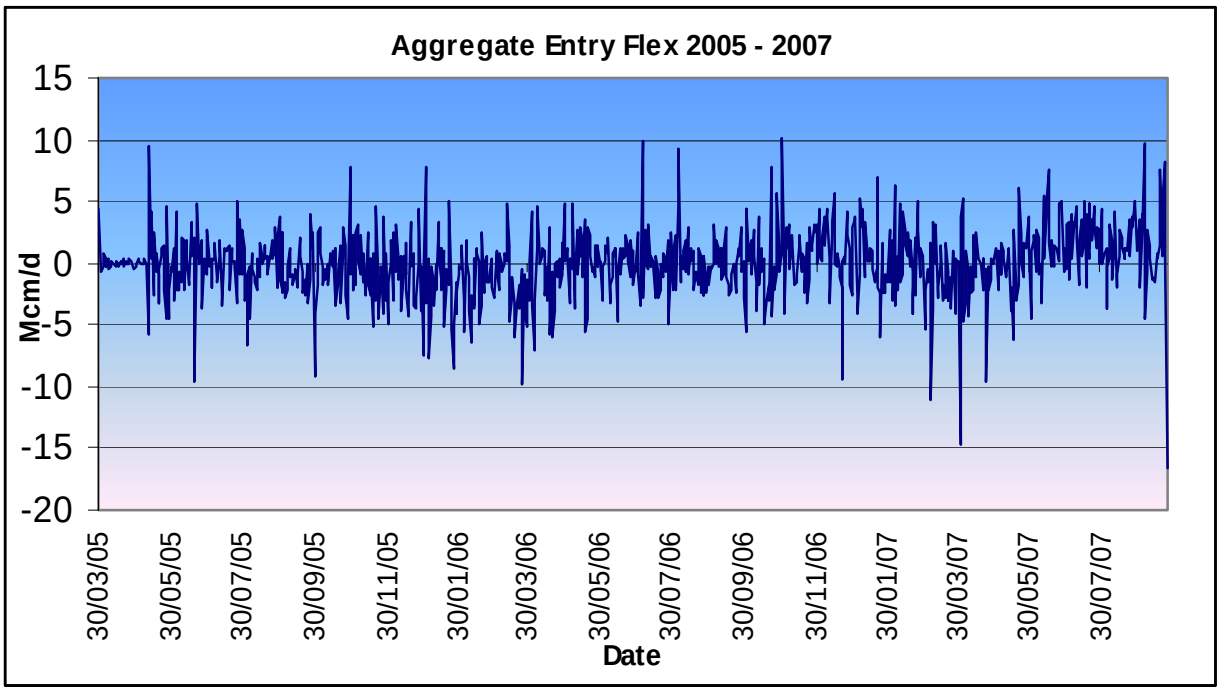
Entry Flex Usage

17) In deriving the figures for the available flexibility capacity at Exit, it has been assumed that gas is delivered into the NTS at uniform rates and as such there is no flexibility capacity usage at Entry. In fact, as shown in the Figure below, there are significant within day flow variations at Entry points resulting in significant flexibility capacity usage at Entry up to a maximum of 10 mcmd.

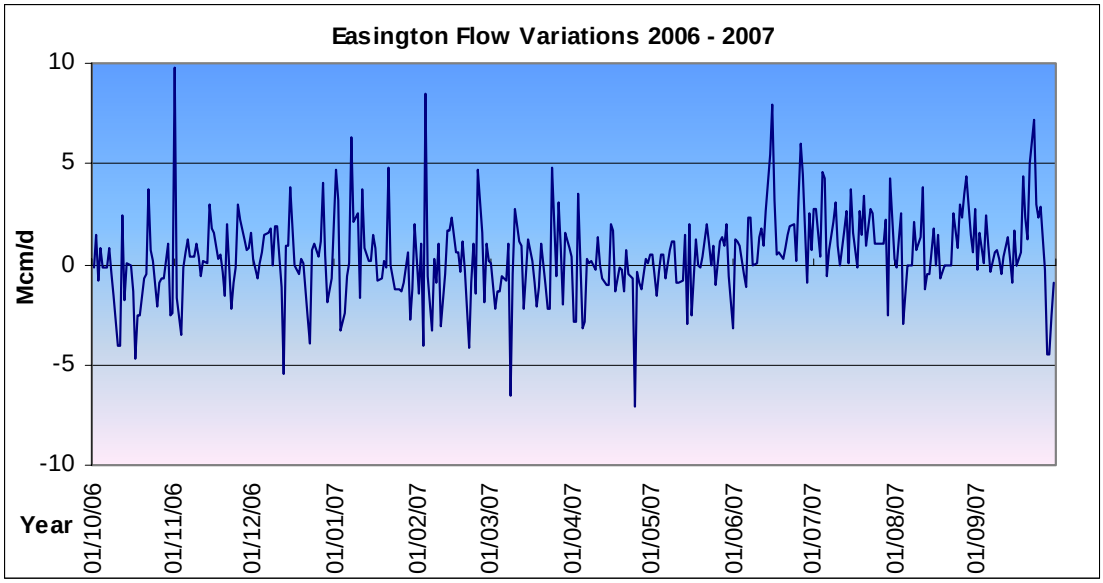
18) The figure below shows the aggregate within day flow variations at the six main Beach terminals – St Fergus, Teesside, Barrow, Easington, Theddlethorpe and Bacton – in the period March 2005 to September 2007. The positive values indicate the extent of 'backloading' (flows in the period 06.00 to 22.00 below the average for the day), and the negative values indicate the extent of 'frontloading' (flows in the period 06.00 to 22.00 above the average for the day).

19) There are a large number of days when the positive Entry flexibility capacity usage is up to 5 mcmd, and some 20 days when the usage is in excess of 5 mcmd.

20) Based on the experience to date of profiling seen on gas imports and storage, the Entry flexibility capacity usage is expected to increase with the increased reliance on gas imports and increased use of storage gas.



Appendix 7 – Graph of historical within day supply flow profiling at Easington



Appendix 8 - Representation of Local Capability Associated with Optimisation of a Single Zone

The column highlighted by a green background represents the target or optimised zone. The columns highlighted by the yellow background are the remaining areas, where the flex has been held at the levels from the 2007 allocation process, to enable optimisation of the target zone. The flex figures stated are in mcmd.

Northern Area Maximised

Year	Day No.	North	Midlands	West	East
2007/8	PK	**16**	2.8	1.51	2.62
	1	**17**	2.79	1.51	2.62
	68	**16**	2.79	1.61	2.62
2010/11	PK	**20**	3.28	2.97	2.69
	1	**21**	3.28	2.96	2.69
	68	**15**	3.28	3.02	2.69
2016/17	PK	**17**	3.29	2.96	2.69
	1	**18**	3.28	2.97	2.42
	68	**17**	3	3.28	2.32

Midlands Area Maximised

Year	Day No.	North	Midlands	West	East
2007/8	PK	8.96	**5**	1.51	2.62
	1	8.95	**5**	1.51	2.62
	68	8.94	**5**	1.61	2.62
2010/11	PK	8.53	**6**	2.97	2.69
	1	8.52	**7**	2.96	2.69
	68	8.52	**5**	3.02	2.69
2016/17	PK	8.53	**5**	2.96	2.69
	1	8.53	**5**	2.97	2.42
	68	8.52	**5**	3	2.32

West Area Maximised

Year	Day No.	North	Midlands	West	East
2007/8	PK	8.96	2.8	**6**	2.62
	1	8.95	2.79	**7**	2.62
	68	8.94	2.79	**5**	2.62
2010/11	PK	8.53	3.3	**7**	2.7
	1	8.52	3.28	**9**	2.69
	68	8.52	3.28	**7**	2.69
2016/17	PK	8.53	3.29	**8**	2.69
	1	8.53	3.28	**9**	2.42
	68	8.52	3.28	**8**	2.32

East Area Maximised

Year	Day No.	North	Midlands	West	East
2007/8	PK	8.96	2.8	1.51	**6**
	1	8.95	2.79	1.51	**7**
	68	8.94	2.79	1.61	**6**
2010/11	PK	8.53	3.28	2.97	**9**
	1	8.52	3.28	2.98	**9**
	68	8.52	3.28	3.02	**6**
2016/17	PK	8.53	3.29	2.96	**8**
	1	8.53	3.28	2.97	**8**
	68	8.52	3.28	3	**7**

Appendix 9 – Ofgem's Proposals to restrict development of Flexibility within GDNs

1) Ofgem, within its document entitled "Gas Distribution Price Control Updated Proposals Consultation Document 226/07", sets out a policy of encouraging Distribution Network Operators to demand increasing quantities of diurnal storage from the National Transmission System (NTS). In its "Gas Distribution Price Control Final Proposals Consultation Document 285/07 it largely confirmed the policy and outcomes originally set out in the updated proposals. In the Final Proposals document, paragraph 4.25 Ofgem stated that "The OCS returns suggest that there are no significant capacity constraints in other area up to 2010/11 although there is still significant uncertainty beyond this. As such we consider that it is still appropriate to defer the following pipe-line projects for National Grid Transmission, NGN and SGN as set out in the updated proposals". The Ofgem policy with respect to these pipelines is set out in a number of sections of the Updated Proposals document such as;
   a) In paragraph 4.13 Ofgem describes how it will restrict the level of capex available to GDNs on the assumption that the GDN's can instead get the incremental diurnal storage that they require from the NTS. Ofgem states "We have proposed a deferral of a number of projects taking into account GDN capacity requirements, diurnal storage requirements, local constraints on the network and the interactions with new arrangements for purchasing interruption. One of the key issues is the interaction with and implication of the NTS and the use of the NTS for diurnal storage."
   b) With respect to investment proposed by Southern GDN, in paragraph 4.18 Ofgem states, "These three projects are all part of one large scheme which provides storage to Southern GDN. Our latest view based on detailed work carried out by PB Power is that all three of these projects can be deferred by two years to 2011-12 based on the increased use of diurnal storage via the NTS. While SGN has stated that the projects are not driven by an NTS constraint, their data refers back to an Advantica report written in 2004 which was prior to some additional LTS work that has been carried out in Southern. PB power considers that some additional capacity has been released back to the NTS following work in the South East LDZ and this could now support South LDZ via an NTS transfer. We will need to undertake further discussions with NTS and SGN to discuss the capacity transfer and may need to amend our allowances in final proposals in light of this."
   c) With respect to investment in the North West, Ofgem state in paragraph 4.19, "National Grid Transmission have included £40m to cover alternative storage provisions for the North West GDN. North West GDN has flagged the large percentage of storage they currently take from the NTS with increasing proportions through the plan. The provisions provide storage at a relatively low cost and provide further flexibility to the Network in terms of meeting demand requirements. However, having reviewed the current

diurnal storage requirements within North West we are of the view that the proposed investment is not required in the current price control period and hence propose to defer the investment post 2012-13. We will be considering this issue further in discussion with National Grid Transmission, following completion of the OCS in October, by which time NTS will have provided National Grid Transmission with further indications of available capacity. We will also discuss the ability to control increasing volumes of storage being taken from the NTS for this GDN. This may lead to changes in the capex allowance."

d) Similarly in the East Midlands, Ofgem has deferred capex that was intended to provide diurnal storage and has stated in paragraph 4.20 that "National Grid Transmission has included one LTS project for East Midlands LDZ to provide diurnal storage in 2012-13. There is no evidence of constraints on the provision of NTS flex capacity to East Midlands and as such we are proposing to defer this project by one year based on the continued use of NTS storage".
e) In paragraph 4.22 Ofgem provides reasons for deferring a number of pipelines in the South West as follows. "Five of the LTS capex projects for WWU in South West LDZ are designed primarily to provide diurnal storage capacity rather than to meet the need for transmission capacity. WWU has also indicated that if NTS storage is available then none of these named projects are required in the period up to 2012-13. Based on the revised view of demand and the availability of NTS storage we consider that all five projects should be deferred. This results in £36.1m of expenditure being deferred into the next price control period.

Appendix 10 - Allocation of Flexibility under constrained conditions following OCS requests of 2006.

1) During the OCS request process that was conducted in July to September 2006 all requests for flexibility capacity were fully allocated except for Zone X. The constraint within that zone was limited to requests for capacity in the gas year 2006/07.

2) Zone X is broadly represented by a pipeline spur on the NTS and as such it was considered that previous analysis conducted by National Grid Transmission to quantify baseline flexibility was sufficient to understand capability in the affected locality.

3) All flexibility capacity requests were reduced to 88.1% of the original request to enable the final allocation to match NTS capability.

4) In the event that a GDN maintains that it requires additional flexibility capacity then National Grid Transmission would expect to send the following text and questions to the GDN.
   a) In order to consider your request for the coming winter period we would appreciate additional information in order that, in accordance with the agreement relating to the allocation and surrender of NTS Offtake (Flexibility) capacity, the NTS operator can be satisfied that (a) the increase in capacity is required in order to enable you to comply with your obligations in SSC A9 of your GT licence and (b) the requirement results from unanticipated load growth and not from any changes in the manner of your system configuration, operation or maintenance or from any failure to develop your system consistently with their Long Term Development Statement. In particular we are therefore interested in understanding the following:
      i) What are the consequences for consumers if the capacity is not available (please include numbers to be potentially disconnected if applicable)?
      ii) What security of supply level (if not 1 in 20) would ‘nnnn’ GDN declare if the capacity shortfall remains?
      iii) Has use of the forecast error provision within your flow margin been considered?
      iv) What contractual alternatives have been examined by ‘nnnn’ GDN?
      v) What is the physical change on your network that has driven an xx% increase in requirements?
      vi) Why have your forecasting activities failed to ‘pick up’ this changed requirement more than 1-year ahead?

Appendix 11 - Actions to resolve a Transportation Constraint under Transitional Offtake Arrangements

The requirement to constrain flexibility capacity would arise in the event of a Transportation Constraint on the NTS.

A Transportation Constraint may arise as a result of, but not necessarily limited to, a supply loss and/or a large increase in demand (more particularly a large increase in offtake rate) and/or a plant failure.

In the event of a Transportation Constraint or the strong likelihood of a Transportation Constraint, National Grid Transmission will take the following actions:

(*The following actions would be taken in whatever order best suited the requirement to ensure the safe operation of the system and is most cost effective. This may include taking a combination of two or more actions at once).*

- Request DNs to flow swap between offtakes, (DNs under reasonable endeavours to comply with such requests as per UNC OAD Section I 2.4)

- Implement the 'System Flexibility Restriction Notice' (SFRN) process in the affected Zones.

  The implementation of the SFRN process would result in all OPNs relating to DN and DC Offtakes in the affected Zones being required to comply with the OAD/NExA Notice Period/Ramp Rate provisions.

- Instigate interruption of NTS and LDZ Interruptible supply points. (Given the 5 hours notice period required for interruption, use of interruption would depend on what time in the day the constraint occurred).

- National Grid Transmission nominate Constrained LNG. Currently this would only apply to the use of Avonmouth LNG to resolve a constraint in the South West when the demand downstream of the constraint point exceeded the "Constrained Threshold Demand Flow".

- Use of the OCM Locational Market. National Grid Transmission would issue an ANS to Users requesting that they post OCM Locational Offers for specified Entry Points (if there are Entry Points downstream of the constraint), and Offtakes downstream of the constraint.

  National Grid Transmission will accept Locational Offers for Supply

turn-up (if applicable) and Demand turn-down.

- If none of the above actions resolved the problem, or were not capable of doing so in a timely manner, National Grid Transmission would resort to using Operating Margins gas (OMG)

  OMG would only be used to the extent required to maintain pressures at at least the minimum required level, and only until other actions ('Normal' or Emergency) took effect.

- In the event that the above actions are insufficient to resolve the Transportation Constraint, National Grid Transmission will invoke the Network Gas Supply Emergency Procedures.