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Transco

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Our Ref.: SG/DP/DH 138

4th March 1997

Mr. Peter Lambert,
OFGAS
Stockley House
130 Wilton Road
London
SW1V 1LQ

Dear Peter,

Pricing Consultation Paper PC9, Optional NTS Commodity Tariff

Transco previously circulated a discussion document on an optional NTS commodity tariff on 17 December 1996. Following discussion at the Ofgas Steering Committee on transportation pricing, and further work to develop the charging treatment in more detail, I now enclose a formal Consultation document on the proposed new tariff.

In accordance with Condition 4(2) of Transco's PGT Licence, you are invited to give your views on the proposals within 28 days, i.e. by 3 April 1997. Following receipt of comments, a report on the consultation will be prepared for Ofgas, who will then decide whether or not to allow this change in pricing methodology.

To facilitate discussion of the proposals, there will be a presentation of the rationale for the new charge, the method of calculation and the possible effects on system users at:

> **2.00 pm on 17 March 1997 at Transco's offices at 139 Tottenham Court Road, London** (following the morning meeting on the future of Transco's pricing and services regime).

I hope that you will be able to attend the meeting, and look forward to receiving your written comments on the proposals by 3 April. Ofgas have requested that responses should be copied to Dr. E. Marshall, Director of Regulation and Business Affairs, Ofgas, 130 Wilton Road, London, SW1V 1LQ. If you require any further information, please contact me on 0121-623-2097.

Yours sincerely,

S. Griew

Simon Griew
Manager, Pricing and Commercial Analysis

TRANSCO PRICING CONSULTATION PAPER PC9, FEBRUARY 1997

OPTIONAL NTS COMMODITY TARIFF

Summary

This paper discusses the need for, and scope of, an optional commodity tariff for transportation through the NTS.

The current NTS charging methodology applies a uniform commodity rate which is non-distance related. Although this achieves simplification in the way the NTS commodity charge is applied, it may provide some users of the system with incorrect price signals. In particular, the present charges lead to a number of large loads and potential offtakes situated near to beach terminals facing non cost reflective prices when they source gas from the adjacent terminal.

Transco has a Gas Act obligation to develop an economic and efficient system, and a PGT Licence obligation to develop cost reflective prices. Therefore Transco has proposed the introduction of a nodal pricing model for the National Transmission System, and a reduction in the relative proportion of the commodity element in NTS charges.

However there is a need for an interim solution until these or other more fundamental changes to the pricing regime can be agreed and implemented. The optional tariff discussed in this paper addresses these issues in the short term by introducing more cost reflective NTS commodity charges for transportation to loads and offtakes located near to entry terminals.

1. Introduction

The current NTS charges include a uniform NTS commodity charge which is applied to all users of the system, regardless of the location of the sites and actual usage of the NTS. Any locational charging signals are given by NTS entry and exit capacity charges. As interruptible loads do not pay NTS exit charges, and can minimise their liability to pay NTS entry charges, these loads may not see any locational pricing signals.

A consequence of this is that the NTS commodity charge appears relatively high to a small number of large loads situated close to entry terminals. This can create an artificial situation, where the tariff is not cost reflective, and building a dedicated pipeline would look economical.

This paper discusses the merits of an optional NTS commodity tariff to sit alongside the standard NTS commodity charge to make the charge more cost reflective and avoid giving such perverse economic signals. First the economic rationale for an optional tariff is outlined. Then the details of a possible charging methodology to underpin the tariff are given, and a charging function based on this methodology is derived. The following section which outlines how the service will operate and be administered. Finally there is a discussion of wider issues concerning the optional tariff, such as the effects on NTS revenues, and on prices to all users, if a number of large loads, including some flows to the Continental Interconnector, choose the optional rate.

2. Economic Rationale

The problem described above that arises from average prices was recognised by Dr Stephen Glaister in his recent paper on trading and competition in gas (*). In his paper Dr Glaister showed how this may be compounded by the regression process for generating entry and exit prices from the full matrix of prices. The process tends to produce prices to exit zones close to terminals which are relatively high, so a lower commodity price for loads close to terminals would offset this effect.

Transco has a Gas Act obligation to develop and maintain an economic and efficient system. We also have a Licence obligation to develop the pricing methodology so that it gives pricing signals which are as cost reflective as possible, so that system users make correct decisions on whether or not to use the system. In a situation where perverse incentives exist, as at present, it is possible that new or existing users could make investments under the present regime which they would later regret, following the introduction of a more cost reflective regime. Such uneconomic investments would also lead to higher prices for existing users. Conversely, attracting new loads to use our system would lead to lower prices for existing users.

The ongoing consultation process, initiated by Transco, on the development of the pricing and services regime has indicated that there is a good measure of support for Transco's proposals that prices should more accurately reflect locational factors and the physical configuration of the system. One of the key premises behind Transco's desire to make commercial arrangements better reflect physical capacity is that the improved pricing signals would enable producers, shippers and end users to make economically efficient decisions about the landing points and production profiles for gas fields, or the siting of new large gas loads. This in turn would lead both to more economically efficient utilisation of the existing system, and efficient decisions about where to invest to expand the system.

We believe that the introduction of a more cost reflective optional NTS commodity tariff is aligned with these longer term objectives, and would be a useful short term method of delivering significant benefits, with only a minor increase in administration costs. It would reduce the potential for inefficient outcomes which exists at present by eliminating the perverse incentive referred to above.

The introduction of an optional NTS commodity tariff would produce immediate benefits for large end-users and other offtakes near to terminals, and longer term benefits for all system users. It would enhance cost-reflectivity and send out better price signals, ensuring that economically efficient decisions are taken by others on whether to use the Transco system or not.

* "Trading in Gas: Market Developments and Needs", LBS/IEA Lecture on Regulation. 15 October 1996.

3. Proposed Optional NTS Commodity Tariff

Transco has therefore investigated the possibility of introducing an alternative NTS commodity tariff for transportation from a beach entry terminal to a specific offtake point, such as a daily metered load, an interconnector or connected system. The tariff would be related to the geographical distance of the load or non-Transco pipeline from the nearest terminal. It is proposed that shippers would have the option of choosing the alternative tariff, or remaining with the standard, uniform commodity charge, on a site-by-site basis, to optimise their total charges.

Recognising that such loads are connected to the integrated Transco network, the proposed service would still allow the load to be supplied from any entry point. However, the optional tariff would only be available to the extent that the relevant

shipper flowed gas at the specified terminal.

The methodology which is proposed for the new tariff is to calculate charging functions based on the estimated costs of laying a dedicated pipeline, for a range of flowrates and distances from an entry terminal. To undertake the economic analysis it is necessary to make assumptions regarding load factor, project life and project discount rate, and operating costs. A commodity charge can then be established as outlined below.

As the cost per kWh of this option is higher than the marginal cost per kWh in supplying gas through the NTS, the prices derived from the optional NTS tariff are higher than Transco's marginal costs.

4. Basis for the Service

4.1 The shipper would buy entry and exit capacity (if applicable) as normal, and would continue to receive the benefits of connection to the integrated network and access to the National Balancing Point.

4.2 The standard NTS commodity charge would be payable, except to the extent that the shipper's gas enters the system at the local terminal and leaves at the relevant supply point or interconnector on the same day. The requirement to track daily flows means that the service would only be available to Daily Metered supply points.

4.3 For these purely 'local' gas flows the optional commodity charge would be payable.

4.4 The service would be available to all combinations of Daily Metered offtakes and terminals (but in practice it will only be attractive for large loads within a relatively short distance of an entry point).

5. Administering the Service

A shipper would initially inform Transco that it wished to utilise the optional tariff for a particular combination of terminal and Daily Metered offtake. Implementation would be by means of individual Ancillary Agreements to the Network Code. The application of the optional tariff to NTS flows would then depend on confirmation that gas has been delivered at the elected (nearest) terminal and offtaken gas at the supply point on the same day.

Arrangements will be put in place to allow entry allocations to be matched against the output allocations for each gas flow day during each monthly billing period. Where the allocations do not match, the optional tariff will apply to the lesser amount, with the difference in the allocation incurring the standard NTS commodity charge. It is important to note that it is only the transportation charges which will be affected; there will be no effect on the energy balancing process.

6. Proposed Pricing Function

As noted earlier, a relationship of price per kWh against flowrate and pipeline distance has been derived based on the capital and operating costs of a notional dedicated pipeline. This relationship is based on an average load factor of 70% which is representative of the typical loads which Transco anticipates are likely to take advantage of the optional NTS tariff. The proposed price function is made up of two elements, both related to load size. The first element is based on those costs which do not vary with distance (metering, telemetry, terminal connection,

volumetric control etc.). The second element is related to the geographical distance from the local terminal to the site.

The relationship of the non-distance related and distance related costs with peak load is illustrated in Appendix 1.

Based on these principles, the following price function to calculate the optional NTS commodity charge has been determined (in p/kWh):

$$1410 \times [(SOQ)^{-0.840}] \times D + 389 \times (SOQ)^{-0.654}$$

where **SOQ** is the Registered Supply Point Capacity in kWh/day,

and **D** is the direct distance from the site boundary or non-Transco pipeline to the elected terminal in km.

Where there is an existing allocation agreement for a supply point then the individual SOQ components will be the relevant quantities in determining the optional commodity charge.

To demonstrate the levels of NTS commodity charge under the optional tariff, the table below gives the calculated prices, in p/kWh, for a range of distances and supply point capacities.

SOQ	Distance - km							
GWh/d	0	5	10	15	20	30	40	50
5.0	0.0162	0.0328	0.0494	0.0661	0.0827	0.1160	0.1493	0.1825
10.0	0.0103	0.0196	0.0289	0.0382	0.0475	0.0660	0.0846	0.1032
20.0	0.0065	0.0117	0.0169	0.0221	0.0273	0.0377	0.0481	0.0585
40.0	0.0042	0.0071	0.0100	0.0129	0.0158	0.0216	0.0274	0.0332

For ease of comparison, 20 GWh/d is approximately equivalent to 1.86 mcmd, equivalent to 175 mth/a at 70% load factor. A typical 750 MW CCGT power station consumes of the order of 36 GWh/d (approx. 3.3 mcmd). The example charges may be compared with the standard NTS commodity charge of 0.0333 p/kWh.

Appendix 1 also shows graphs of the optional NTS commodity rate against distance and peak load, to further illustrate the values generated by the function.

NTS entry and exit capacity charges would also be payable as normal (if applicable).

The estimated costs used are standard Transco project costs used in assessing and

tendering for all large construction projects and so represent competitive rates.

The assumptions used in deriving the indicative charges are:

i) a project life of 10 years

ii) an average load factor of 70%

iii) a project pre-tax discount rate of 10% (appropriate to the competitive market)

7. Discussion

7.1 Effects on Transco Revenues

A comparison of total charges under the proposed optional NTS commodity tariff and under the standard NTS commodity tariff has been carried out to determine the particular loads which would benefit from opting for the new tariff. At present we estimate that 7 large loads connected to the NTS would benefit from switching, representing an annual throughput of 40 TWh.

Assuming all existing loads identified chose the optional NTS commodity tariff, and were able to take full advantage of it by delivering quantities of gas at the local terminal at least equivalent to offtakes on each day of the year, this would lead to a reduction in Transco's NTS commodity revenue of around £7m, approximately 0.2% of total revenues. Therefore there would be a need to rebalance tariffs to compensate for this reduction, in NTS commodity revenues. This would imply a short-term increase in the standard NTS commodity charge.

However this initial effect on NTS prices should not be viewed in isolation. The development of this tariff should maintain or improve the utilisation of the transmission system, and ultimately lead to lower prices for all users. To put this another way, Transco believes that the short term effect on NTS prices will be outweighed by the medium to long term gains brought about by larger throughput volumes, and greater efficiency in the commissioning of system expansions, leading to downward pressure on prices for all users.

A good example of this is flows to the Interconnector, where the introduction of an optional NTS rate will encourage this load to utilise the NTS, resulting in lower prices to other system users (see 7.3 below).

7.2 Effects on Existing Customers

The short-term increase in NTS charges outlined above would lead to small increases in transportation charges to all users of the Transco system. We estimate that, in the extreme case, increases for the different customer categories would be as follows:

	%
<73.2 MWh	0.1
73.2 to 732 MWh	0.2
>732 MWh firm	0.4
LDZ Interruptibles	1.0
NTS loads	2.0
Overall	0.2

From the above table it can be seen that rebalancing of NTS prices as a result of

the optional NTS tariff will have a minimal effect on domestic users and firm loads, with only the very large interruptible and NTS loads seeing any significant effect.

7.3 Effect of Interconnector Flows

Transco recently published a consultation paper on the advantages and disadvantages of including transmission system reinforcement associated with flows to the Continental Interconnector in our general regulated asset base ('UK-Continent and UK-Ireland Interconnectors - A Transco Consultation', January 1997). This paper included analyses of the effect on NTS revenues and prices from interconnector flows either utilising the Transco system or bypassing it, assuming Interconnector-associated reinforcement to be included in the regulated asset base.

There is a very high risk of by-pass if the Interconnector shippers with gas available at Bacton are required to pay the standard NTS charge. However, by-pass may be avoided if Interconnector shippers are able to take advantage of the optional NTS commodity tariff. As demonstrated at an open meeting on the Interconnector on 4th February 1997, the revenue generated by this would lead to a reduction in NTS prices of 0.5%, and hence small price reductions for existing users of the system. The calculations which support this conclusion are shown in Appendix 2.

7.4 Overall Effect of Interconnector and Existing Loads

The effect of the Interconnector would offset the implied price increases referred to in 7.2. The effect on average transportation prices to existing customers of the combination of increased revenues from interconnector flows and reductions in revenues from large NTS loads is shown in the table below. The table shows the effects with two different NTS capacity commodity splits, 55/45 (as now), and 75/25 (proposed for the future).

The effects are based on forecast Interconnector flows in 1998/9, but would not alter significantly under the higher Interconnector flowrates anticipated in future years.

1998/9 - Interconnector flow 52 TWh

	55/45	75/25
	%	%
<73.200 MWh	0.07	-0.03
73.2 to 732 MWh	0.11	-0.04
>732 MWh firm	0.20	-0.07
LDZ Interruptibles	0.60	-0.20
NTS loads	1.22	-0.41
Overall	0.12	-0.04

7.5 Effect of Unanticipated New Load

The above analysis relates to the effect on revenues and prices of the interaction of the proposed new tariff with existing or anticipated loads. It is also necessary to consider the situation where loads which have not been forecast prior to the setting of the price control formula take advantage of the new tariff. As with any other

unanticipated net additional growth, this would lead to a short-term increase in Transco's revenue entitlement at the level of the marginal formula price. However the additional volume would be taken into account at the subsequent formula review, and would be expected to lead to lower average prices in a future formula period.

Under a single average price cap, the effect of unanticipated additional volumes on prices would be very similar, whether or not the new tariff applied. There would be a significant 'power station effect' corresponding to the difference between the maximum average price and the NTS commodity tariff (at present in round terms between 13 p/th and either 1 p/th, with the standard rate, or say 0.3 p/th, at the optional rate).

Under a split price cap, there would still be a differential effect on prices , but as the marginal formula price for Large Loads would be closer to the standard NTS commodity price under a 55/45 capacity commodity split, the scale of the effect would be greatly reduced. The precise effects on overall and NTS prices as a result of additional large loads will depend on the final level of the proposed price cap for large loads.

For example, using Ofgas' formula proposals, with a marginal formula price for Large Loads of 1.80 p/th, a new large load which chooses the optional NTS commodity rate will result in a small under recovery of revenue and a corresponding small increase in NTS prices.

To quantify this, if a 10 TWh/a new power station situated 15 km from a local terminal took advantage of the optional tariff, it could generate a differential of 0.05 p/kWh between the optional tariff price and the formula marginal price. This would lead to an increase in NTS prices of only 0.8%. The resulting price increases for existing users of this 'mini power station effect' would therefore be very small.

This can be compared to the effect of the same new power station under the current formula, which would result in an increase in NTS prices to all users of around 6.5%.

7.6 Relationship with Longer-term Initiatives

It is recognised that it would be preferable to deal with a particular issue by a fundamental revision to the pricing and services regime rather than by a short-term measure such as this. However, as outlined above, this proposal seeks to deal with an immediate problem where inappropriate economic signals may affect decisions by others on major investments.

Fundamental changes to the pricing and services regime are being proposed by Transco (e.g. pricing nodes and changes to the capacity commodity split) which, if agreed and implemented, would reduce the scale of the problem, or eliminate it altogether. However such major changes will take time to implement, even assuming that agreement to make them can be reached. Therefore we believe that the problem is too urgent to wait for solution involving fundamental changes. If future methodology changes remove the requirement for this service, it would naturally fall away.

In addition, we believe that this 'short-haul' issue is an example of the type of boundary problem which will always arise when, for transaction costs reasons, it is not feasible to extend the cost-reflectivity principle to cover every particular case. In other words, anomalies will arise with a practical charging system where there are trade-offs between complexity and accuracy. Therefore there may still be a need for a specific optional NTS commodity tariff, even after changes to the regime to improve cost reflectivity.

7.7 Rationale for addressing Short-haul Issue only

It could be argued that if it is economically justifiable to introduce an optional tariff which delivers reduced commodity charges for short NTS distances, it would also be appropriate to have higher charges in the case of 'long-haul', or higher than average distances. This is basically an argument for zonal commodity charges throughout the system. However the problem identified relates very much to short distances. We do not rule out the possibility of moving to zonal commodity charges in the longer term, although this could lead to a significant increase in complexity in invoicing of transportation charges (and may be a de minimis issue in the future if the commodity proportion of NTS revenues reduces to 10%). Addressing the problem of short-haul now would not form a barrier to a more wide-ranging solution in the future.

8. Question for Consultation

Shippers are invited to give their views on whether an optional NTS commodity tariff should be introduced by Transco, and on the structure and level of charges proposed for this service.

9. Next Steps

Following receipt of responses to this consultation, Transco will prepare a report for Ofgas in line with our Licence obligations. Assuming that the proposals find favour with the industry, Transco will arrange for a draft Ancillary Agreement to the Network Code to be prepared, and sent to Ofgas/circulated at the same time as the consultation report. Following consideration of the report, if the Director General does not disallow the tariff, implementation would take place later this year.

Appendix 1

Derivation of Price Function to determine Optional NTS Commodity Rate

The methodology adopted to derive the price function is based on an assessment of the costs involved in building and maintaining a dedicated pipeline to supply gas for a range of flowrates and distances.

Figure 1 shows the pipe diameters required to meet typical peak day flowrates for a range of pipeline distances, and pipeline costs per unit length, based on Transco planning and design specifications. In addition there are a number of non-distance related costs, e.g. connection, metering, volumetric control, etc. The total capital costs for a range of pipeline diameters and lengths may then be calculated by adding the distance related and non-distance related costs. This process is also shown in Figure 1.

The ongoing costs of the hypothetical pipeline comprise costs for maintenance of the plant facilities and the pipeline, and formula rates. Again, these comprise distance related and non-distance related costs. The total project costs over a ten year period are then calculated, for each combination of pipeline diameter and length, by assuming a project life of 10 years and a pre-tax discount rate of 10 %. The project costs are annuitised to establish annual costs as shown in Figure 2.

The next step is to divide the annuitised costs by the annual quantities (corresponding to the supply point capacities using an average load factor of 70%) to generate a matrix of unit costs, expressed in p/kWh, for a range of supply point capacities and distances.

Separate functions relating non-distance related and distance related unit costs and supply point capacities may then be obtained by means of regression analysis on the data. These functions are best expressed as power relationships and are illustrated in Figure 3.

The two elements can be combined to generate an overall commodity charge function in p/kWh as follows :-

$$1410 \times [(SOQ)^{-0.840}] \times D + 389 \times (SOQ)^{-0.654}$$

where SOQ is the Registered Supply Point Capacity in kWh/day,

and D is the direct distance from the site boundary or non-Transco pipeline to the elected terminal in km.

The form of the optional NTS commodity tariff is further illustrated in Figure 4, which shows how the charge varies with peak day capacity for a range of distances, and how it varies with distance for a range of supply point capacities.

Figure 1

1) Pipeline Diameters, in mm, for a range of distances and peak-day flowrates

	Pipeline Length, km							
SOQ mcmd	SOQ (GWh	5	10	15	20	25	30	40	50
15	162.45	450	450	450	600	600	600	600	600
12	129.96	450	450	450	450	600	600	600	600
10	108.30	300	450	450	450	450	450	450	600
7	75.81	300	450	450	450	450	450	450	450
5	54.15	300	300	450	450	450	450	450	450
3	32.49	300	300	300	300	300	300	300	300
1	10.83	150	150	150	200	200	200	200	200
0.5	5.42	100	150	150	150	150	150	150	150
0.4	4.33	100	150	150	150	150	150	150	150
0.3	3.25	100	100	150	150	150	150	150	150
0.2	2.17	100	100	100	100	100	100	100	150
0.1	1.08	50	100	100	100	100	100	100	100

2) Pipelaying Unit Costs

Diam./mm	£/km
50	125,000
100	150,000
150	187,500
200	202,500
300	238,750
450	355,000
600	414,000

3) Total Capital Costs (Unit Length Costs & Fixed Costs, £'000's) for a range of distances and peak-day flowrates

	Pipeline Length, km								
SOQ mcmd	0	5	10	15	20	25	30	40	50
15	£3,525	£5,300	£7,075	£8,850	£11,805	£13,975	£16,045	£20,185	£24,425
12	£3,130	£4,905	£6,680	£8,455	£10,230	£13,580	£15,650	£19,690	£24,030
10	£2,930	£4,705	£6,480	£8,255	£10,030	£11,905	£13,680	£17,230	£23,830
7	£2,630	£3,824	£6,180	£7,955	£9,730	£11,605	£13,380	£16,830	£20,580
5	£2,630	£3,824	£5,018	£7,955	£9,730	£11,605	£13,380	£16,830	£20,580
3	£1,940	£3,134	£4,328	£5,521	£6,715	£8,009	£9,203	£11,590	£14,078
1	£1,505	£2,443	£3,380	£4,318	£5,555	£6,668	£7,680	£9,705	£11,830
0.5	£1,095	£1,845	£2,970	£3,908	£4,845	£5,883	£6,820	£8,695	£10,670
0.4	£1,095	£1,845	£2,970	£3,908	£4,845	£5,883	£6,820	£8,695	£10,670
0.3	£915	£1,665	£2,790	£3,728	£4,665	£5,703	£6,640	£8,515	£10,490
0.2	£915	£1,665	£2,415	£3,165	£3,915	£4,765	£5,515	£7,015	£10,490
0.1	£770	£1,395	£2,270	£3,020	£3,770	£4,620	£5,370	£6,870	£8,470

The capital costs for a pipeline distance of 0 km are equal to the Fixed Costs.

Figure 2

1) Total Capital Costs (£'000's), annuitised over a 10 year period

	Pipeline Length, km								
SOQ mcmd	0	5	10	15	20	25	30	40	50
15	£521	£784	£1,047	£1,309	£1,746	£2,067	£2,374	£2,986	£3,613
12	£463	£726	£988	£1,251	£1,513	£2,009	£2,315	£2,913	£3,555
10	£433	£696	£959	£1,221	£1,484	£1,761	£2,024	£2,549	£3,525
7	£389	£566	£914	£1,177	£1,439	£1,717	£1,979	£2,490	£3,044
5	£389	£566	£742	£1,177	£1,439	£1,717	£1,979	£2,490	£3,044
3	£287	£464	£640	£817	£993	£1,185	£1,361	£1,714	£2,082
1	£223	£361	£500	£639	£822	£986	£1,136	£1,436	£1,750
0.5	£162	£273	£439	£578	£717	£870	£1,009	£1,286	£1,578
0.4	£162	£273	£439	£578	£717	£870	£1,009	£1,286	£1,578
0.3	£135	£246	£413	£551	£690	£844	£982	£1,260	£1,552
0.2	£135	£246	£357	£468	£579	£705	£816	£1,038	£1,552
0.1	£114	£206	£336	£447	£558	£683	£794	£1,016	£1,253

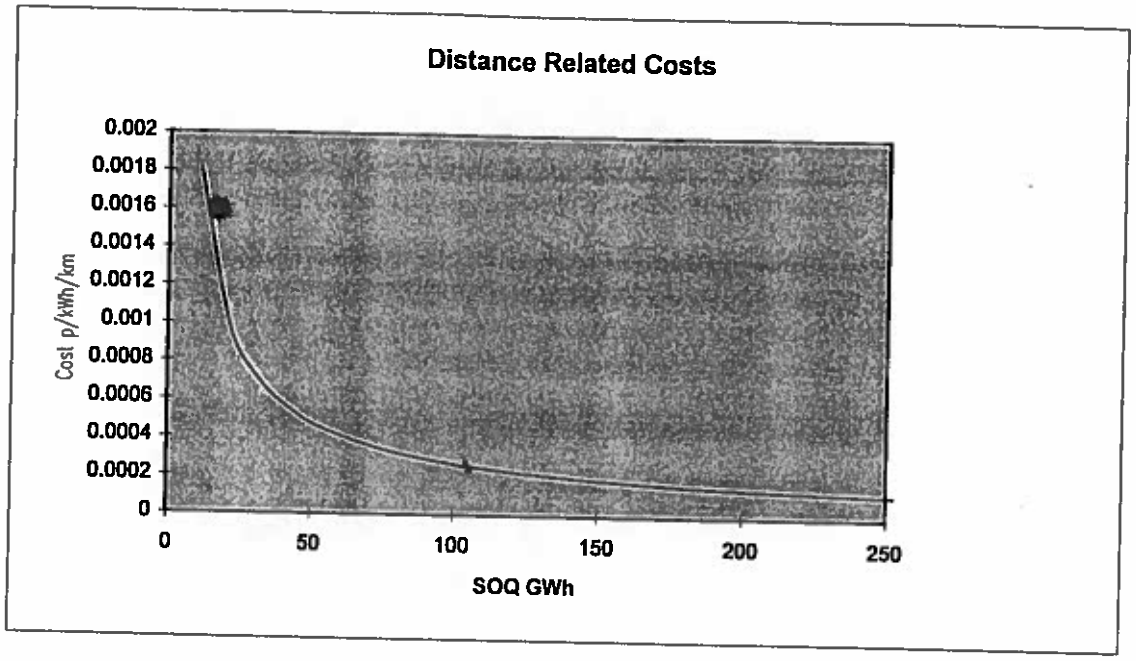
2) Annual Costs (£'000's), summated from annuitised costs and maintenance and ongoing costs

	Pipeline Length, km								
SOQ mcmd	0	5	10	15	20	25	30	40	50
15	£690	£1,055	£1,385	£1,716	£2,232	£2,625	£3,002	£3,756	£4,525
12	£621	£987	£1,317	£1,647	£1,978	£2,557	£2,934	£3,672	£4,457
10	£587	£952	£1,282	£1,613	£1,943	£2,289	£2,619	£3,280	£4,422
7	£535	£808	£1,230	£1,561	£1,891	£2,237	£2,568	£3,212	£3,905
5	£495	£768	£1,007	£1,521	£1,851	£2,197	£2,528	£3,172	£3,865
3	£433	£707	£945	£1,184	£1,423	£1,677	£2,466	£3,127	£3,803
1	£375	£649	£888	£1,126	£1,365	£1,619	£1,857	£2,334	£2,827
0.5	£369	£614	£824	£1,034	£1,359	£1,613	£1,851	£2,328	£2,821
0.4	£300	£533	£731	£929	£1,175	£1,401	£1,610	£2,030	£2,466
0.3	£189	£393	£620	£819	£1,017	£1,230	£1,429	£1,825	£2,237
0.2	£189	£393	£620	£819	£1,017	£1,230	£1,429	£1,825	£2,237
0.1	£158	£362	£589	£787	£985	£1,199	£1,397	£1,793	£2,205

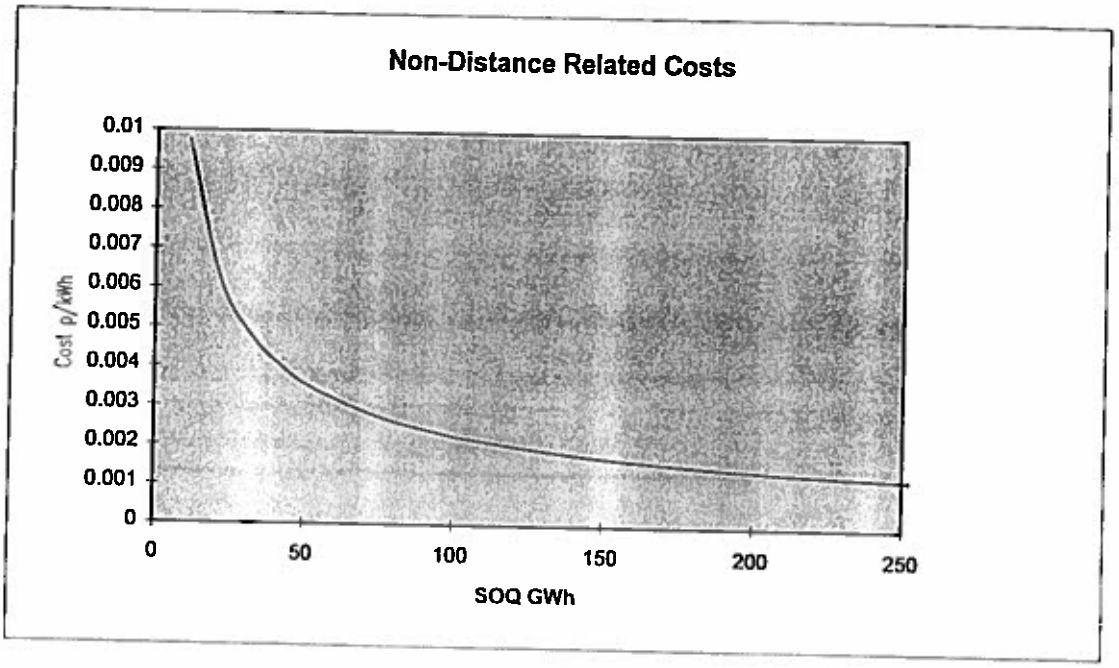
3) Unit Costs, in p/kWh, derived from Annual Costs and Annual Throughputs assuming a load factor of 70%

	Pipeline Length, km								
SOQ mcmd	0	5	10	15	20	25	30	40	50
15	0.0017	0.0025	0.0033	0.0041	0.0054	0.0063	0.0072	0.0090	0.0109
12	0.0019	0.0030	0.0040	0.0050	0.0060	0.0077	0.0088	0.0111	0.0134
10	0.0021	0.0034	0.0046	0.0058	0.0070	0.0083	0.0095	0.0119	0.0160
7	0.0028	0.0042	0.0064	0.0081	0.0098	0.0116	0.0133	0.0166	0.0202
5	0.0036	0.0056	0.0073	0.0110	0.0134	0.0159	0.0183	0.0229	0.0279
3	0.0045	0.0078	0.0107	0.0136	0.0164	0.0195	0.0224	0.0281	0.0341
1	0.0109	0.0193	0.0264	0.0336	0.0425	0.0506	0.0582	0.0734	0.0891
0.5	0.0137	0.0284	0.0448	0.0592	0.0735	0.0889	0.1033	0.1319	0.1617
0.4	0.0171	0.0355	0.0561	0.0740	0.0918	0.1112	0.1291	0.1649	0.2021
0.3	0.0191	0.0436	0.0710	0.0949	0.1187	0.1445	0.1683	0.2161	0.2657
0.2	0.0286	0.0654	0.0958	0.1262	0.1567	0.1900	0.2204	0.2813	0.3985
0.1	0.0481	0.1145	0.1825	0.2434	0.3043	0.3709	0.4317	0.5535	0.6809

Figure 3

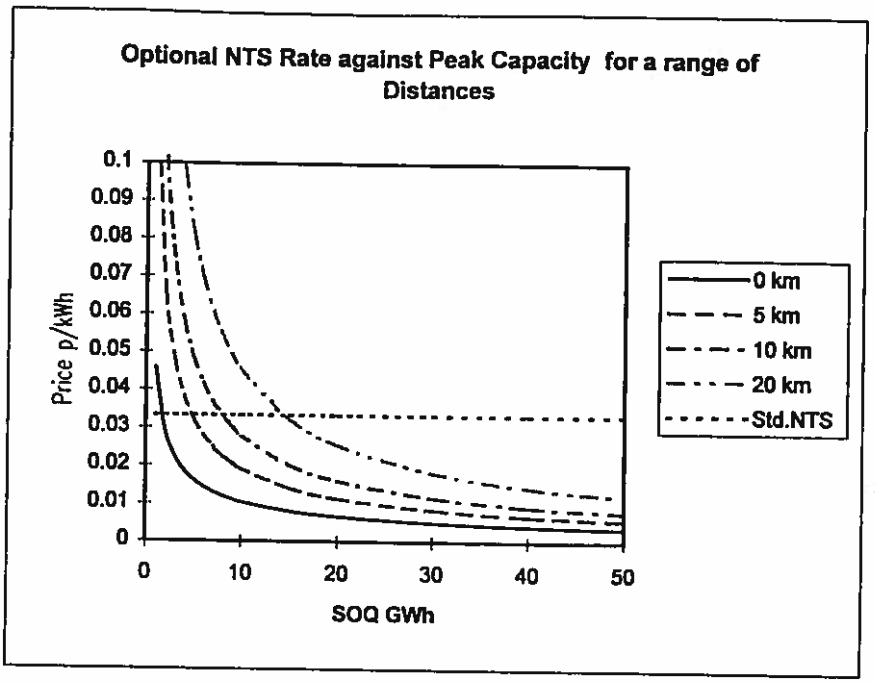


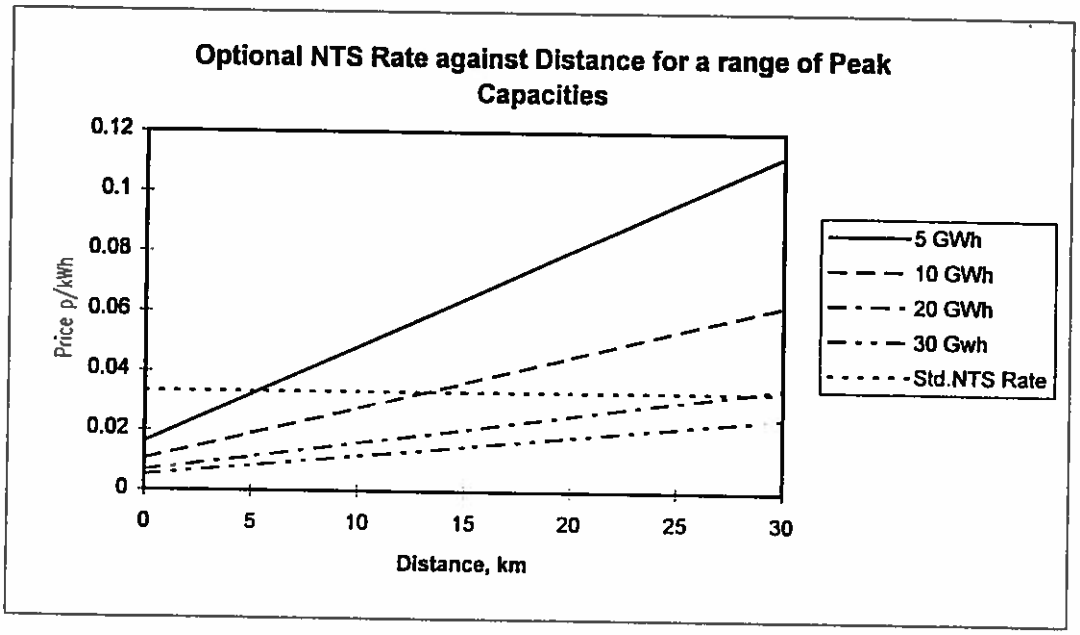
$$y = 1410 \times (SOQ)^{0.840}$$



$$y = 389x (SOQ)^{-0.654}$$

Figure 4


Optional NTS Rate against Peak Capacity for a range of Distances
Price p/kWh
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0
10
20
30
40
50
SOQ GWh
0 km
5 km
10 km
20 km
Std.NTS


Optional NTS Rate against Distance for a range of Peak Capacities
Price p/kWh
0.12
0.1
0.08
0.06
0.04
0.02
0
0
5
10
15
20
25
30
Distance, km
5 GWh
10 GWh
20 GWh
30 Gwh
Std.NTS Rate

Appendix 2

ECONOMIC EFFECTS OF UK-CONTINENT INTERCONNECTOR

Effect of Optional Commodity Tariff

The effect of the Interconnector volumes on the current shippers transporting through TransCo's system has been modelled to provide an indication of possible impacts on the NTS charges for all current Shippers.

Forecast volumes for 1998/9 are based upon the 1997 Base Plan. Allowable revenues are based upon 1996/7 figures as stated in the 1996 Ten Year Statement.

Prior to Interconnector Volumes

Using forecasts consistent with 96/7 prices (as stated in 1996 Ten Year Statement)

Total forecast volumes 1996/7	26,348 mth
Allowable NTS Revenue (less balancing margins)	£559m
Average NTS charge	2.12 p/th

Assuming same average NTS charge for 1998/9 before Interconnector

Total forecast volumes 1998/99	28,549 mth
Allowable NTS Revenue (less balancing margins)	£605m
Average NTS charge (as above)	2.12 p/th

Interconnector Flow of 19 mcmd at cost of £99.0 million at Optional Commodity Tariff

Allowable NTS Revenue (increased by 11.6m*)	£616.6m
Total forecast volumes (incl. 19 mcmd)	30,324 m/th
Revised average NTS charge	2.03 p/th
NTS Revenue with actual income (£14.4m**)	£619.4m
Over-recovery	£2.8m
Reduction in all NTS prices	0.5%

Therefore, this indicates the Interconnector would reduce all NTS prices by 0.5%.

* Calculated by:

Investment	£99.0m
40 Year depreciation	£2.4m per year
8%(*) return on net assets	£7.7m per year
1.5% Opex	£1.5m per year
Total	£11.6m

(* Note: 8% used for indicative purposes and chosen because it falls within the range submitted for the formula review).

** Assuming Optional Commodity Tariff = 0.05 pence per therm
Uniform Commodity Tariff = 0.976 pence per therm

i.e. Reduction in commodity income = £16.4m