Appendix 11

NTS Charging Methodology

Appendix 11: NTS Charging Methodology

A11.1 Introduction

The charges for NTS capacity are informed by Long Run Marginal Cost (LRMC) calculations. The purpose of the LRMC approach is to derive forward-looking charges which provide economically efficient signals to system users. The LRMC calculations build upon a base case forecast, which is determined from the supply/demand match described in the 1998 Base Plan Assumptions and the reinforcement plans that were derived from it.

This Appendix provides a general description of the methodology used to inform the setting of NTS capacity charges. The same approach is used for all entry and exit points connected to the NTS. Included in this Appendix are the 1998 LRMC matrix and the indicative LRMC reflective capacity charges which are derived from it.

A11.2 Calculation Of Long Run Marginal Costs

Figure A11.2 presents a schematic flow diagram of the steps involved in calculating LRMC reflective NTS capacity charges.

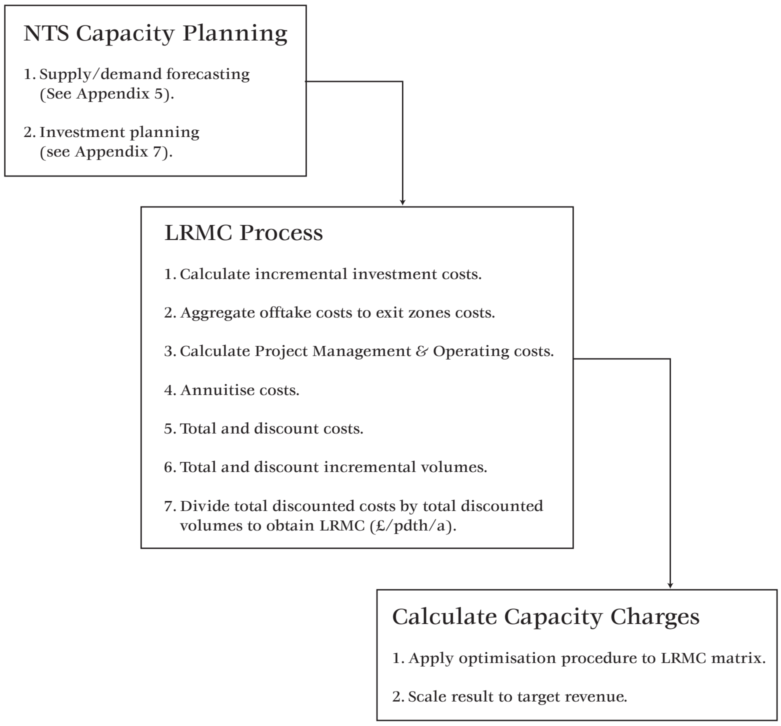
Initially, an NTS capacity plan is formed to provide an underlying basis for the LRMC calculations; this identifies the investment necessary to satisfy the forecast supply and demand over the following ten years. Details of the supply/demand forecast and the capacity development plan used as the basis of for the 1998 LRMC calculation are provided in 1998 Base Plan Assumptions and Appendix 7 respectively.

The stages of LRMC calculation are:

1. Calculate the additional investment costs required to cope with a sustained 2.834 mcm/d (100 mcfd) increase in demand for each combination of input points and NTS offtakes using Transco's network analysis programme, FALCON, which simulates gas flows on the system. This analysis is carried out using the base case network described above for three individual years of the 10 years considered in the planning process (year 1, year 3 and year 8). The investment costs for the other years are derived using interpolation.
2. Amalgamate the offtake costs into 37 Exit Zone costs. Exit zones are groupings of NTS offtakes that allow gas to be transferred into the same LDZ and have common characteristics with regard to the NTS reinforcements required for increased demand at those offtakes. Large loads supplied directly from the NTS have individual charging zones.
3. Calculate project management and operating costs, based on a fixed percentage uplift to previously identified reinforcement costs.
4. Annuitise the investment cost for each input point / exit zone combination for each year.
5. Discount the annuitised investment costs and total over the 10 years.
6. Discount the incremental volume (2.834 mcm/d) in each year and total over the 10 years.
7. Obtain the final LRMC values for each entry/exit pair by dividing total discounted annuitised costs by total discounted volumes.

Capacity charges are calculated by application of an optimisation procedure to the full matrix of LRMC values. If the LRMC reflective capacity charges do not recover the target revenue for NTS capacity charges, a common scaling factor is applied to all entry and exit charges.

Figure A11.2 LRMC Overview



The steps in this process are described in more detail in the remainder of this Appendix and are illustrated by reference to the derivation of LRMCs for one entry point / exit zone pair. The complete LRMC table is the result of repeating the derivation for all valid entry / exit pairs.

A11.2.1 Calculation of Incremental Investment Costs

The LRMC process determines capacity charges according to the available capacity on each terminal to offtake route. A notional flow or demand increment is added to each route in turn to highlight the need for additional transportation capacity. The cost of this in terms of investment in new pipelines and / or compressors is calculated as described in Section A11.2.1.2 Larger investment costs along a chosen route are indicative of greater capacity constraints driven by pipelines and compressors operating at or near their capacity limits. Similarly low investment costs for providing incremental capacity indicate fewer capacity constraints on that route.

The investment required to supply an additional incremental demand is investigated for each year of the 10 year planning period. Due to the need to perform an analysis for each combination of entry / exit and the resource intensive nature of FALCON, a detailed investment analysis using FALCON is only performed in years 1, 3 and 8 of the 10 year period. FALCON is an engineering tool and takes account of 25 factors affecting gas flow including gas quality, composition and temperature, as well as pipeline characteristics such as internal surface finish, and as such is resource intensive. For each of the remaining years, linear interpolation is used to approximate incremental costs.

Table A11.2.1 Method of Estimating Incremental Investment Costs

Period	Method of Calculation
Year 1	Network Analysis
Year 2	Interpolation (50% Year 1 + 50% year 3)
Year 3	Network Analysis
Year 4	Interpolation (80% Year 3 + 20% year 8)
Year 5	Interpolation (60% Year 3 + 40% year 8)
Year 6	Interpolation (40% Year 3 + 60% year 8)
Year 7	Interpolation (20% Year 3 + 80% year 8)
Year 8	Network Analysis
Year 9	Extrapolation (100% Year 8)
Year 10	Extrapolation (100% Year 8)

It is assumed during the network analysis phase that pipeline reinforcement will be constructed using the same diameter pipe as the original and will be of sufficient length to restore the outlet pressure of the pipe to its original value before the addition of the increment of flow. The length is determined by repeated network analysis to the nearest kilometre. Where the length of reinforcement exceeds 50km a compressor is used instead of additional pipeline, as this represents the least cost means of carrying the extra flow.

A11.2.1.1 Size of Increment

The size of increment of flow applied to the Base Plan is chosen to ensure that the economic signals resulting from the LRMC process are clear. The increment chosen, 2.834 mcm/d (100 mcfd) represents, in general, 10% of the flow along a route and is sufficiently large to generate economic signals based on the availability of capacity.

The size of increment does affect the LRMC values. If the increment is sufficiently small, all routes would be able to accommodate the additional flow without reinforcement and all routes would have an LRMC of zero. If the increment is sufficiently large, all routes would require substantial reinforcement to the extent that the LRMCs would tend towards a stronger distance relationship, rather than a reflection of underlying capacity availability.

A11.2.1.2 Investment Costs

To determine the investment cost of meeting the increase in demand a set of standard reinforcement costs is used. The pipeline costs are estimates, based on a 30km pipeline length with average ground conditions. Block valves, pig traps and associated project costs are not included because these are accounted for at a later stage of the calculation. The assumed investment costs for 1998 are unchanged from the estimates used in 1997. Budget estimates are set out in the table below:

Table A11.2.1.2a Budget Investment Costs

Description	Cost
Pipeline - 300 mm dia	£220,000/km
Pipeline - 450 mm dia	£304,000/km
Pipeline - 600 mm dia	£348,000/km
Pipeline - 750 mm dia	£420,000/km
Pipeline - 900 mm dia	£493,000/km
Pipeline - 1050 mm dia	£597,000/km
Compressor - RB211 (28 MW) With standby	£30.0 million/station
Compressor - Solar Mars (11.2 MW)	£13.5 million/station
Compressor - re-Wheel	£1.0 million/unit
Regulator	£1.0 million/unit
Aftercooler	£2.0 million/unit

To illustrate the process, consider the example of an incremental increase in peak flow between Bacton (input point) and Exit Zone SW3 (which contains two offtakes, Aylesbeare and Kenn). The parameters of the FALCON programme are first set to:

- An increase of 2.834 mcm/d above the Base Plan level of demand at Kenn;
- An increase of 2.834 mcm/d above the Base Plan level of supply at Bacton.

All other input points and offtakes remain at their Base Plan levels. The FALCON programme will indicate any bottlenecks on the system. Additional pipeline, compression facilities or system re-configuration may be required to relieve capacity constraints. Standard project costs are used to quantify the least-cost investment option required to satisfy the revised supply/demand match. This analysis is carried out for three years in the plan period - year 1, year 3 and year 8. The process is then repeated for Aylesbeare.

Analysis of transmission of 2.834 mcm/d from Bacton to NTS offtakes in zone SW3 produced the following table of costs.

Table A11.2.1.2b Bacton to SW3 Costs (£ million)

Offtake	Year 1	Year 3	Year 8
Aylesbeare	£27.58	£30.21	£30.52
Kenn	£32.14	£31.60	£35.41

A11.2.2 Aggregate Offtake Costs to Exit Zone Costs

At present there are 151 NTS offtakes, including 121 offtakes which deliver gas to the Local Transmission Systems (LTS) and 30 other large load offtakes (e.g. gas-fuelled power stations). The impact of increased demand at each offtake is identified for matching increased supply from six coastal terminals, four onshore fields and seven storage sites. The 106 offtakes supplying the LTS are grouped to form 37 exit zones while the 30 large load offtakes are retained as individual exit zones. The grouping of offtakes to form exit charging zones is designed to reflect areas of common NTS reinforcement. Offtakes in a zone will often be grouped around a particular high pressure feeder main. Gas supplied to a specific area within an LDZ can often be routed through a number of different NTS offtakes, depending upon local conditions and the optimal mode of operation for the pipeline system. This flexibility is also reflected by the NTS exit charging zones.

Investment costs to a zone are calculated by means of a flow weighted average of all the individual investment costs to offtakes within that zone. Flow weighting is based upon the projected peak day delivery volumes that will flow through each offtake. Average investment costs for the whole zone are therefore weighted to closely reflect the costs to the largest offtakes (by volume) within that zone. The forecast flows to the offtakes in zone SW3 for each of the three years analysed in detail are shown for each year in the following table:

Table A11.2.2 Forecast Flows to Offtakes in Zone SW3

Offtake	Year 1	Year 3	Year 8
Kenn	77%	77%	77%
Aylesbeare	23%	23%	23%
Total Flow	100%	100%	100%

Aggregate zone costs are calculated as follows:

$$\frac{(\text{Flow to offtake 1 x Cost to offtake 1}) + \ldots + (\text{Flow to offtake n x Cost to offtake n})}{\text{Total flow to zone}}$$

Taking the previous investment examples to offtakes in zone SW3:

Year 1	23% x 27.58 + 77% x 32.14 = £31.11m
Year 3	23% x 30.21 + 77% x 31.60 = £31.29m
Year 8	23% x 30.52 + 77% x 35.41 = £34.30m

A11.2.3 Project Management & Operating Costs.

Design and project management costs are variable costs that are dependent upon many factors including location, timing, type and size of investment. Size of investment is the main indicator of the scale of expected design and project management costs. In the LRMC process all design and project management costs are calculated at 15% of the previously identified investment costs. Similarly, the change in operating costs associated with the increased throughput of the increment, are assumed to be 1.5% of investment costs.

Taking the example of investment costs to zone SW3 the incremental project management and operating costs are:

Table A11.2.3 Project Management & Operating Costs (£ million)

	Year 1	Year 3	Year 8
Investment costs	£31.11	£31.29	£34.30
Project Management costs @15 %	£4.67	£4.69	£5.15
Operating costs @1.5 %	£0.47	£0.47	£0.51

A11.2.4 Calculation of Annuitised Costs

The capital cost is annuitised since the investment provides a sustained capacity increase for a number of years. Annuitised costs represent an even level of annual expenditure spread over a period of time that is equivalent to a capital investment. The annuity period considered appropriate for LRMCs is 20 years; following the assumption of average economic life of new NTS pipeline assets made in the BG / Ofgas Joint Consultation Document of February 1993. The annuity discount factor is 7% per annum as this is consistent with Transco's allowed rate of return. Calculations for LRMCs in previous years had used an 8% discount factor. To obtain the annuitised present value of the average investment and project management cost to each zone, the average zone cost is divided by 11.3356 (sum of discount factors over 20 years).

Table A11.2.4 Annuitised Costs (£ million)

	Year 1	Year 3	Year 8
Investment & Project Management capital cost	£35.78	£35.98	£39.45
Equivalent annuitised cost	£3.16	£3.17	£3.48

A11.2.5 Calculation Of Discounted Costs

After determination of the annuitised capital costs the total annual equivalent cost is calculated by adding the annual operating cost, as described in Section A11.2.3.

The LRMC is calculated by determining an average cost across the ten years. In order to provide appropriate weighting the costs for future years are discounted at 7% per annum. The total discounted cost over the ten years is then calculated.

Table A11.2.5a Discount Factor

Year	Factor	Year	Factor
Year 1	1.00	Year 6	0.71
Year 2	0.94	Year 7	0.67
Year 3	0.87	Year 8	0.62
Year 4	0.82	Year 9	0.58
Year 5	0.76	Year 10	0.54

Table A11.2.5b Discounted Annual Cost including Operating Costs (£ million)

	Year 1	Year 3	Year 8
Operating costs	£0.47	£0.47	£0.51
Annuitised costs	£3.16	£3.17	£3.48
Total costs	£3.63	£3.64	£3.99
Discount Factor	£1.00	£0.87	£0.62
Discounted Annual costs	£3.63	£3.18	£2.49

A11.2.6 Discounted Incremental Volumes

The incremental volume used to calculate the capital cost for each of the 10 years is discounted at 7% per annum in the same manner as the costs. Since the incremental volume is the same in each year this is achieved by multiplying the incremental volume by the discount factor appropriate for each year. This step provides a stream of incremental volumes, weighted in the same manner as the costs.

Capacity charges are expressed in pence per peak day therms and pence per peak day Kilowatt hours (both therms and Kilowatt hours are units of energy). The incremental volumes used for measurement of capacity constraints on the pipeline system are expressed in millions of cubic metres, volume being more appropriate for the measurement of capacity constraints within a pipeline. At this stage in the process the incremental volumes are converted to energy units so that the LRMC is expressed in £/peak day therm per annum.

Table A11.2.6 Discounted Volume In Therms

	Year 1	Year 3	Year 8
Incremental Volume (MTh)	1.03	1.03	1.03
Discount Factor	1.00	0.87	0.62
Discounted Volume (MTh)	1.03	0.90	0.64

A11.2.7 Calculation of LRMC

The discounted annual costs and volumes are calculated for each year as described above, then total discounted costs and total volumes are calculated by summation. The LRMC cost in £ per peak day therm is then calculated by dividing total annual cost by total discounted volume. In the example provided below, the LRMC is £3.68/pdth/a.

Table A11.2.7a LRMC Calculation Bacton To SW3 (£ million)

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total
Analysis method	*FALCON*	*INTERP*	*FALCON*	*INTERP*	*INTERP*	*INTERP*	*INTERP*	*FALCON*	*EXTRAP*	*EXTRAP*	
Capital Cost	£31.11	£31.20	£31.29	£31.89	£32.49	£33.10	£33.70	£34.30	£34.30	£34.30	
Project Management Cost	£4.67	£4.68	£4.69	£4.78	£4.87	£4.96	£5.05	£5.15	£5.15	£5.15	
Capital incl. Project Management	£35.78	£35.88	£35.98	£36.68	£37.37	£38.06	£38.75	£39.45	£39.45	£39.45	
Annual Equivalent of capital spread over 20 years	£3.16	£3.17	£3.17	£3.24	£3.30	£3.36	£3.42	£3.48	£3.48	£3.48	
Annual Operating cost	£0.47	£0.47	£0.47	£0.48	£0.49	£0.50	£0.51	£0.51	£0.51	£0.51	
Total Annual Cost incl. Opex	£3.62	£3.63	£3.64	£3.71	£3.78	£3.85	£3.92	£3.99	£3.99	£3.99	
Discount Factor	1.00	0.93	0.87	0.82	0.76	0.71	0.67	0.62	0.58	0.54	
Discounted Annual Cost incl. Opex	£3.62	£3.40	£3.18	£3.03	£2.89	£2.75	£2.61	£2.49	£2.32	£2.17	£28.47
Reinforcement Volume million therms	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	
Discounted Volume million therms	1.03	0.96	0.90	0.84	0.79	0.73	0.69	0.64	0.60	0.56	7.74
							LRMC Cost £/pdth/a				**£3.68**

The following table shows levelised costs for the 1998 Base Plan supply / demand match for each route.

Table A11.2.7b Levelised Cost Table (£ per peak day therm per annum)

	Bacton	Easington	Theddlthrp	St Fergus	Barrow	Teesside
SC1	0.00	0.00	0.00	0.71	0.00	0.04
SC2	0.93	0.93	0.93	1.71	0.93	0.97
SC3	0.00	0.11	0.11	2.21	0.26	0.16
SC4	0.00	0.11	0.11	2.28	0.00	0.15
NO1	0.01	0.01	0.01	2.42	0.16	0.06
NO2	0.00	0.15	0.15	2.56	0.00	0.19
NW1	0.42	0.71	0.71	2.98	0.42	0.61
NW2	0.28	0.87	0.90	3.53	1.12	1.16
NE1	0.00	0.00	0.00	2.75	0.62	0.51
NE2	0.00	0.00	0.00	2.88	0.62	0.51
NE3	0.00	0.00	0.00	2.88	0.62	0.51
EM1	0.35	0.35	0.35	3.23	0.97	0.87
EM2	0.00	0.01	0.01	2.89	0.62	0.52
EM3	0.32	1.08	1.08	3.82	1.40	1.45
EM4	1.06	1.64	1.64	4.40	1.98	2.03
WM1	0.05	0.68	0.68	3.42	1.01	1.05
WM2	0.64	1.26	1.26	4.00	1.59	1.63
WM3	1.08	1.75	1.79	4.49	1.95	2.12
WA1	1.19	1.77	1.88	4.49	2.03	2.12
WA2	2.22	2.91	2.96	5.65	3.24	3.28
EA1	0.00	0.62	0.62	3.36	0.95	0.99
EA2	1.39	2.02	2.02	4.76	2.35	2.39
EA3	0.00	0.62	0.62	3.36	0.95	0.99
EA4	1.53	2.12	2.12	4.86	2.45	2.50
EA5	0.00	0.62	0.62	3.36	0.95	0.99
EA6	0.00	0.62	0.62	3.36	0.95	0.99
EA7	0.00	0.62	0.62	3.36	0.95	0.99
NT1	2.03	2.98	3.00	5.72	3.31	3.35
NT2	1.45	1.98	1.98	4.73	2.31	2.36
NT3	1.32	2.26	2.26	5.01	2.59	2.64
SE1	0.42	1.00	1.00	3.96	1.56	1.59
SE2	2.03	2.98	3.00	5.72	3.31	3.35
SO1	1.21	2.15	2.15	4.89	2.48	2.52
SO2	2.69	3.63	3.63	6.37	3.95	4.00
SW1	1.31	1.98	2.02	4.53	2.12	2.16
SW2	2.10	2.93	2.93	5.53	3.38	3.16
SW3	3.68	4.86	4.84	7.60	5.18	5.23

A11.3 Calculation OF NTS Capacity Charges

A11.3.1 Calculation of Unscaled LRMC-reflective Entry / Exit Charges

Under the Network Code there is no linkage between entry and exit points. It is not, therefore, possible at present to apply the table of LRMCs shown above directly as charges. Instead, LRMC reflective entry and exit capacity charges are determined such that, when combined for any particular route, they replicate as closely as possible the charges shown in the above table.

A proprietary solver is used to determine the entry and exit charges. For each combination of entry and exit, the solver uses the cost figure as the dependent variable in an equation that represents the sum of one entry charge and one exit charge. Each valid combination of entry to exit can be represented by the following equation:

$$y_{ij} = x_i + x_j + e_{ij}$$

Where y_{ij} is the LRMC for the route from Entry point, i, to Exit point, j;
x_i is the Entry charge at point, i;
x_j is the Exit charge at point, j; and,
e_{ij} is the absolute error.

The optimisation procedure calculates the best fit by minimising the sum of the squared error terms, e_{ij}, for all entry and exit combinations. As there is an infinite number of solutions to the procedure, it is necessary to fix at least one point. The Bacton entry charge is therefore set to 10 pence per therm before carrying out the optimisation. The optimisation is constrained further to ensure that only positive charges are produced. A positive charge constraint is set prior to optimisation so that the constraint is taken into account during the optimisation. A minimum charge of 1 penny per therm has been set for all LDZ exit zones as indicated in the pricing discussion document, PD2.

This optimisation process results in a charge for each entry and exit point. The unscaled entry / exit charges relating to the LRMC matrix shown in table A11.2.6b are shown below. To determine the expected recovery from a set of charges, the charge for each point is multiplied by the relevant forecast peak day flow for that point. Peak day flow forecasts are based on expectations for the next winter, 1998/99. The sum of these amounts, including that from NTS connected large firm loads, is the total expected recovery. When applied to the 1998 peak day flows they would generate £362m revenue. Since the entry and exit charges determined by this process reflect the long run marginal costs, when they are applied to all forecast capacity bookings they may not generate the target revenue for NTS capacity charges.

Table A11.3.1 Unscaled Capacity Charges

Unscaled charges Reflective of 1998 LRMCs		
Entry Point	**p/pdth/a**	**p/pdkWh/a**
Bacton	10	0.34
Easington	24	0.82
Rough	24	0.82
Hornsea	24	0.82
Theddlethorpe	24	0.82
St. Fergus	282	9.62
Barrow	54	1.84
Teesside	56	1.91
Wytch Farm	0	0.00
Caythorpe	21	0.72
Isle of Grain	-6	-0.21
Avonmouth	-12	-0.41
Dynevor Arms	-10	-0.34
Glenmavis	115	3.92
Partington	18	0.61
Burton Point	4	0.14
Hatfield Moor	22	0.75
Exit Zone	**p/pdth/a**	**p/pdkWh/a**
SC1	1	0.34
SC2	31	1.06
SC4	1	0.34
NO1	1	0.34
NO2	1	0.34
NW1	22	0.75
NW2	56	1.91
NE1	1	0.34
NE2	1	0.34
NE3	1	0.34
EM1	27	0.92
EM2	1	0.34
EM3	77	2.63
EM4	137	4.68
WM1	39	1.33
WM2	98	3.34
WM3	144	4.91
WA1	149	5.08
WA2	262	8.94
EA1	34	1.16
EA2	173	5.90
EA3	34	1.16
EA4	184	6.28
NT1	264	9.01
NT2	172	5.87
NT3	193	6.59
SE1	83	2.83
SE2	264	9.01
SO1	181	6.18
SO2	329	11.23
SW1	160	5.46
SW2	258	8.80
SW3	448	15.29
Single Sites	**p/pdth/a**	**p/pdkWh/a**
AM Paper	27	0.92
Avonmouth PS	234	7.98
Barking PS	172	5.87
BASF/Teesside	1	0.03
BP Saltend	1	0.03
Bridgewater Paper	125	4.27
Brigg PS	1	0.03

Single Sites	p/pdth/a	p/pdkWh/a
Brunner Mond	27	0.92
Burton Point (Connah's Quay)	125	4.27
Corby PS	140	4.78
Cottam PS	1	0.03
Deeside PS	125	4.27
Didcot PS	204	6.96
Enfield Energy	187	6.38
Hays Chemicals	27	0.92
ICI Runcorn	125	4.27
Keadby PS	1	0.03
Kemira Ince	125	4.27
Kings Lynn PS	34	1.16
Little Barford PS	34	1.16
Longannet PS	1	0.03
Medway PS	45	1.54
Peterborough PS	34	1.16
Peterhead PS	1	0.03
Rocksavage PS	125	4.27
Roosecote PS	1	0.03
Rye House PS	187	6.38
Sellafield PS	1	0.03
Sutton Bridge	1	0.03
S Humber Bank PS	1	0.03
Teesside PS	1	0.03
Terra Billingham	1	0.03
Terra Severnside	278	9.49
Zeneca/Teesside	1	0.03
NTS CSEPs	**p/pdth/a**	**p/pdkWh/a**
Bacton Interconnector	34	1.16
Moffat Interconnector	1	0.03
Thornton Curtis	1	0.03

A11.3.2 Calculation of Scaled Entry / Exit Charges

The revenue target for all NTS charges is £537m. Around £9m is estimated to be recovered directly from the St Fergus compression charge, leaving £528m to be recovered from other NTS charges. Based on the 65/35 capacity / commodity split, the revenue target for capacity charges is £343m. As stated previously, the unscaled capacity charges would generate expected revenue of £362m. In order to determine charges which will generate the target revenue of £343m, all the charges are scaled by 0.95 (343/362). The scaled indicative capacity charges on this basis are shown in the table below.

Table A11.3.2 Scaled Capacity Charges

Scaled Charges Reflective of 1998 LRMCs		
Entry Point	**p/pdth/a**	**p/pdkWh/a**
Bacton	9	0.32
Easington	23	0.78
Rough	23	0.78
Hornsea	23	0.78
Theddlethorpe	23	0.78
St. Fergus	267	9.11
Barrow	51	1.74
Teesside	53	1.81
Wytch Farm	0	0 00
Caythorpe	20	0.68
Isle of Grain	-6	-0.21
Avonmouth	-12	-0.41
Dynevor Arms	-10	-0.34
Glenmavis	109	3.71
Partington	17	0.58
Burton Point	4	0.13
Hatfield Moor	21	0.71

Exit Zone	p/pdth/a	p/pdkWh/a
SC1	1	0.03
SC2	29	1
SC4	1	0.03
NO1	1	0.03
NO2	1	0.03
NW1	21	0.71
NW2	53	1.81
NE1	1	0.03
NE2	1	0.03
NE3	1	0.03
EM1	26	0.87
EM2	1	0.03
EM3	73	2.49
EM4	130	4.42
WM1	37	1.26
WM2	93	3.16
WM3	136	4.65
WA1	141	4.81
WA2	248	8.46
EA1	32	1.1
EA2	164	5.59
EA3	32	1.1
EA4	174	5.94
NT1	250	8.52
NT2	163	5.55
NT3	183	6.23
SE1	79	2.68
SE2	250	8.52
SO1	171	5.84
SO2	311	10.62
SW1	151	5.17
SW2	244	8.33
SW3	424	14.47
Single Sites	**p/pdth/a**	**p/pdkWh/a**
AM Papaer	26	0.87
Avonmouth PS	221	7.56
Barking PS	163	5.55
BASF/Teesside	1	0.03
BP Saltend	1	0.03
Bridgewater Paper	118	4.04
Brigg PS	1	0.03
Brunner Mond	26	0.87
Burton Point (Connah's Quay)	118	4.04
Corby PS	132	4.52
Cottam PS	1	0.03
Deeside PS	118	4.04
Didcot PS	193	6.59
Enfield Energy	177	6.04
Hays Chemicals	26	0.87
ICI Runcorn	118	4.04
Keadby PS	1	0.03
Kemira Ince	118	4.04
Kings Lynn PS	32	1.1
Little Barford PS	32	1.1
Longannet PS	1	0.03
Medway PS	43	1.45
Peterborough PS	32	1.1
Peterhead PS	1	0.03
Rocksavage PS	118	4.04
Roosecote PS	1	0.03

Single Sites	p/pdth/a	p/pdkWh/a
Rye House PS	177	6.04
Sellafield PS	1	0.03
Sutton Bridge	1	0.03
S Humber Bank PS	1	0.03
Teesside PS	1	0.03
Terra Billingham	1	0.03
Terra Severnside	263	8.98
Zeneca/Teesside	1	0.03
NTS CSEP's	**p/pdth/a**	**p/pdkWh/a**
Bacton I/C	32	1.1
Moffat I/C	1	0.03
Thornton Curtis	1	0.03

A11.3.3 Charges for Individual NTS Loads

The process of calculating the levelised cost for an individual NTS load is the same as that described in this Appendix for exit zones. A single point load will not be subject to the averaging effect of amalgamating costs to a number of offtakes that is evident when calculating charges applicable to exit zones. The absence of this averaging means that the charge to a single NTS load may differ from the surrounding NTS exit charge. The difference in charges depends on the location of the individual large load in relation to any capacity constraints within the charging zone and the primary offtake used to supply the local distribution zone.

The example in this Appendix described the stages of calculating a levelised cost from Bacton to SW3. The levelised cost is £3.68 per peak day therm per annum. If a new NTS load was identified at Aylesbeare, then the levelised cost can be calculated based upon the reinforcement costs previously identified from Bacton to Aylesbeare. The worked example below shows that the levelised cost from Bacton to Aylesbeare will be £3.37 per peak day therm per annum.

Table A11.3.3 Bacton to Aylesbeare LRMC

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total
Analysis method	*FALCON*	*INTERP*	*FALCON*	*INTERP*	*INTERP*	*INTERP*	*INTERP*	*FALCON*	*EXTRAP*	*EXTRA*	
Capital Cost	£27.58	£28.89	£30.21	£30.27	£30.33	£30.39	£30.45	£30.52	£30.52	£30.52	
Project Management Cost	£4.14	£4.33	£4.53	£4.54	£4.55	£4.56	£4.57	£4.58	£4.58	£4.58	
Capital incl. Project Management	£31.71	£33.23	£334.74	£34.81	£34.88	£34.95	£335.02	£35.09	£35.09	£35.09	
Annual Equivalent of capital spread over 20 years	£2.80	£2.93	£3.06	£3.07	£3.08	£3.08	£3.09	£3.10	£3.10	£3.10	
Annual Operating cost	£0.41	£0.43	£0.45	£0.45	£0.45	£0.46	£0.46	£0.46	£0.46	£0.46	
Total Annual Cost incl. Opex	£3.21	£3.36	£3.52	£3.52	£3.53	£3.54	£3.55	£3.55	£3.55	£3.55	
Discount Factor	1.00	0.93	0.87	0.82	0.76	0.71	0.67	0.62	0.58	0.54	
Discounted Annual Cost incl. Opex	£3.21	£3.14	£3.07	£2.88	£2.69	£2.52	£2.36	£2.21	£2.07	£1.93	£26.10
Reinforcement Volume million therms	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	
Discounted Volume million therms	1.03	0.96	0.90	0.84	0.79	0.73	0.69	0.64	0.60	0.56	7.74
							LRMC Cost £/pdth/a				**£3.37**

A11.3.4 Entry Charges for Constrained LNG

Shippers who book the constrained LNG storage service agree to provide transmission support gas to Transco on days of very high demand. They must also ensure the continuing availability of transmission support gas throughout the winter period. This can be achieved through the maintenance of minimum inventory levels. The storage sites providing constrained LNG services are the three southern LNG sites, Avonmouth, Dynevor Arms, Isle of Grain and Partington in the North West.

All constrained LNG sites provide a transmission benefit that is effectively in lieu of further investment on the pipeline system. It is therefore appropriate that a reduced charge is offered to reflect the benefit obtained. For the three southern LNG sites this benefit has been calculated using the LRMC process. During the LRMC analysis each storage site is treated in the same manner as other system entry points. Analysis is then carried out on the LRMC matrix of route costs to ascertain the LRMC reflective prices from each storage site to each exit point. If the resulting entry charge for an LNG site is determined to be a negative value, then the magnitude of the negative charge is deemed to be the constrained benefit. This method of calculating a constrained benefit does not require a measurement of the constrained volumes desired at each affected storage site. Standard (unconstrained) charges for LNG entry services are maintained at a positive or zero value in keeping with all other entry and exit charges.

The benefit for the three constrained LNG sites in Southern England and South Wales was originally set at its present level for the transportation charges effective from October 1995. In each year the take up of constrained services is monitored to gauge shipper participation in this service. The continuing interest demonstrated by shippers indicates that there is not a need to increase the benefit levels at each of the Southern constrained sites and therefore they remain unchanged at the present levels for 1998/9.

The transmission benefit for Partington, which was initially constrained in 1997/8, was set at 6p/pdth, identical to that for Isle of Grain in recognition of the topographical similarities. The final entry charge for Partington, after taking account of this benefit is still positive.

A11.3.5 Capacity Charge Rebalancing

LRMC reflective capacity charges are not automatically applied in Transco's annual transportation charging statement. Charges may also be partially rebalanced or changed by a common factor. The manner by which charges may be changed is decided after discussion of the options and impacts with the industry.

This year, in the light of comments from respondents, following publication of pricing discussion document PD2 in May 1998, Transco have fully rebalanced NTS entry capacity charges and capped increases to exit charges at 10%. The rebalanced charges are effective from October 1998. NTS capacity charges have been rebalanced only if both the 1998 and 1997 LRMC reflective charges have provided a consistent signal as to the direction a particular charge should be moved. If both LRMC's are at a higher level than the existing capacity charge, then the charge has been rebalanced to a level no greater than the minimum LRMC value. In the event of both LRMC's being lower than the 1997 charge, then the charge is rebalanced to a level no lower than the maximum of the two LRMC values. A number of exit charges have been reduced by 9%. Capacity charges that are already positioned between the two LRMC's remained unchanged.

Table A11.4 - Rebalanced Capacity Charges

	Bronze Book Charges	Rebalanced Charges effective Oct 1998	98 LRMC	97 LRMC
Capacity:Commodity Split	**65:35**	**65:35**	**65:35**	**65:35**
Total cost recovery (£m)	**£335.8**	**£343.0**	**£343.0**	**343.00**
Entry Point	**p/pdth/a**	**p/pdth/a**	**p/pdth/a**	**p/pdth/a**
Bacton	11	10	9	7
Easington	26	26	23	28
Rough	26	26	23	28
Hornsea	26	26	23	28
Theddlethorpe	26	26	23	28
St. Fergus	212	243	267	243
Barrow	82	51	51	33
Teesside	44	53	53	64
Wytch Farm	0	0	0	0
Caythorpe	24	21	20	21
Isle of Grain	-6	-6	-6	-6
Avonmouth	-12	-12	-12	-12
Dynevor Arms	-10	-10	-10	-10
Glenmavis	124	109	109	71
Partington	57	17	17	7
Burton Point	72	7	4	7
Hatfield Moor	26	26	21	28
Exit Zone	**p/pdth/a**	**pdth/a**	**pdth/a**	**pdth/a**
SC1	7	7	1	1
SC2	7	7	29	1
SC4	10	9	1	1
NO1	36	33	1	1
NO2	65	60	1	1
NW1	93	85	21	28
NW2	112	103	53	43
NE1	47	43	1	1
NE2	31	28	1	1

Exit Zone	p/pdth/a	pdth/a	pdth/a	pdth/a
NE3	31	28	1	1
EM1	27	26	26	9
EM2	31	28	1	1
EM3	70	70	73	59
EM4	71	71	130	67
WM1	101	92	37	45
WM2	101	93	93	49
WM3	164	150	136	101
WA1	133	133	141	60
WA2	291	266	248	185
EA1	46	46	32	61
EA2	111	120	164	120
EA3	81	74	32	67
EA4	111	122	174	153
NT1	145	160	250	348
NT2	181	169	163	169
NT3	122	134	183	208
SE1	205	188	79	94
SE2	145	160	250	357
SO1	140	154	171	247
SO2	194	213	311	377
SW1	177	162	151	139
SW2	225	244	244	305
SW3	275	302	424	389
Single Sites	**p/pdth/a**	**pdth/a**	**pdth/a**	**pdth/a**
AM Paper	27	27	26	56
Avonmouth PS	209	221	221	303
Barking PS	112	112	163	94
BASF/Teesside	1	1	1	1
BP Saltend	13	12	1	1
Bridgewater Paper	133	122	118	56
Brigg PS	12	11	1	1
Brunner Mond	27	27	26	56
Burton Point (Connah's Quay)	133	122	118	56
Cottam PS	12	11	1	1
Corby PS	41	45	132	67
Deeside PS	133	122	118	56
Didcot PS	120	132	193	308
Enfield Energy	109	120	177	203
Hays Chemicals	27	27	26	56
ICI Runcorn	133	122	118	56
Keadby PS	11	10	1	1
Kemira Ince	133	122	118	51
Kings Lynn PS	41	41	32	61
Little Barford PS	55	55	32	114
Longannet PS	1	1	1	1
Medway PS	165	151	43	94
Peterborough PS	41	41	32	61
Peterhead PS	1	1	1	1
Rocksavage PS	133	122	118	56
Roosecote PS	35	32	1	1
Rye House PS	109	120	177	203
Sellafield PS	35	32	1	1
S Humber Bank PS	22	20	1	1
Sutton Bridge	43	39	1	34
Teesside PS	1	1	1	1
Terra Billingham	1	1	1	1
Terra Severnside	292	292	263	309
Zeneca/Teesside	1	1	1	1

NTS CSEPs	p/pdth/a	p/pdth/a	p/pdth/a	p/pdth/a
Bacton I/C	46	46	32	61
Moffat I/C	1	1	1	1
Thornton Curtis	5	5	1	1

A11.4 Optional NTS Commodity Tariff

In June 1998 Transco introduced an optional NTS commodity tariff as an alternative to the standard NTS commodity charge. Shippers may elect to pay commodity charges on the basis of the new tariff in place of the standard tariff. The tariff more accurately reflects the costs of gas transportation from a terminal to a large supply point located nearby. It is derived from the estimated cost of laying a dedicated pipeline from a terminal to an exit point. A charging function has been calculated based on a range of flow rates and pipeline distances. The tariff is available to all daily metered supply points or offtakes. However in practice it is only attractive for large supply points/offtakes situated close to terminals.

Figure A11.4 Optional NTS Commodity Tariff, Charging Function

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

SOQ = Registered Supply Point Capacity (kWh/day)

D = Direct distance from terminal to offtake (km)

Users of the tariff will continue to be liable for entry and exit charges as normal, and will continue to receive the benefits of connection to Transco's integrated network and access to the National Balancing Point (NBP).

A11.5 Compression charge

An additional charge is payable where gas is delivered into the Transco system at a lower pressure than that required, reflecting the need for additional compression. For gas delivered at the Total Oil Marine sub-terminal at St Fergus, a compression charge of 0.0062 pence per kWh (0.182 pence per therm) is payable.

The compression charge is derived from Activity Based Cost analysis of costs at a compressor site and the annual throughput at that site. St Fergus compressor 1997 ABC costs consist of the following elements.

Total Direct Costs		£1.37m
Compressor Fuel		£3.18m
Support and sustaining costs		£3.58m
Total 1997 ABC costs	=	£8.13m

Throughput at St Fergus Total Oil Marine terminal in the gas year for 1997 was 131 TWh. Unit costs are calculated by dividing the total ABC costs by the throughput for that year.

$$\frac{\text{Total Cost (pence)}}{\text{Throughput (kWh)}} = 0.0062 \text{ p/kWh}$$

A11.6 Transcost

Transco are developing Transcost, an automated model for calculating LRMC reflective NTS capacity charges. The purpose of developing Transcost is to improve the transparency and stability of the LRMC process described in this Appendix. The underlying process of calculating the LRMC and capacity charges will remain unchanged in the Transcost model. However, by simplifying the present engineering assumptions underlying the calculations, Transco are able to develop a PC based model. The shorter processing time required in Transcost relative to the present Falcon based approach will allow LRMC analysis of all ten years of the plan period. It is anticipated that this should lend further stability to the LRMC process.

Transcost is designed to increase transparency enabling a thorough analysis of the published charges including their sensitivity to changes in key assumptions. It will also facilitate further refinement of the LRMC process should that prove desirable. It is planned to release the PC based Transcost model in 1998.

A11.7 NTS Pricing Developments.

Transco have initiated a debate regarding possible developments to the NTS charging structure. In particular this debate has been stimulated by Transco's proposal for a three node charging model. During 1997 both the three node and a modified entry/exit model have been the subject of consideration by a sub-group of the Ofgas Transportation Charges Methodology Steering Group.

The terms of reference agreed by the sub-group were to consider the proposals in the light of four criteria:

- Capacity definition - the quantity and type of capacity available to the market.
- Cost reflectivity - the extent to which a closer relationship between NTS capacity charges and the underlying costs of the system (as defined by LRMC) can be established.
- Gas trading - the impact of new models upon the development of physical and financial markets in gas.
- Administrative costs - the total costs to the industry of adapting systems and procedures.

The sub-group report concludes that there are benefits to be gained from updating the present model. The members of the sub-group did not agree that it would be desirable to move to a three node model in the short term. Of particular concern was the impact upon market liquidity of fragmenting NBP trading. The sub-group did agree that improved capacity definition should improve trading conditions and therefore should be the priority area for further consideration. To this end Transco are giving further consideration to the possibility of developing a more robust definition of service levels within the confines of the existing entry/exit model.