Appendix 5

Forecast Supply & Demand

Appendix 5: Forecast Supply and Demand

The supply and demand forecasts presented in this Appendix have been updated from those published in the 1998 Base Plan Assumptions based on feedback received from shippers and producers during the Base Plan consultation process. The feedback is summarised in Appendix 6; there was a continued high level of supply side data received by Transco and an improvement in the quality of data concerning power generation, however almost no information was supplied regarding smaller loads.

A5.1 The Energy Market

Total UK primary energy demand has remained static over the last 25 years and therefore the main change has been one of fuel substitution and sectoral change. The gas share of UK primary energy consumption (before conversion and distribution losses) and consumption to final users (non transport energy) has increased significantly.

These forecasts assume continuing favourable prospects for gas as the preferred form of energy, both for end users and electricity generation. By the early years of the next century, the proportion of primary energy provided by gas in the UK is expected to be around 40%.

The major event that has affected all sectors of the UK energy market in the last few years has been the development of a gas bubble - an excess of supply over demand - that has resulted in a reduction in spot and contract prices to levels far below any that had previously been envisaged.

A5.2 Forecast Demand

The 1998 Base Plan describes Transco's demand forecasting methodology. Under this methodology, Transco develop demand models based on the relationship between levels of demand and Composite Weather Variables (CWV). CWVs take into account a number of factors including temperature, wind speed, effective temperature (a combination of yesterday's and today's temperature) and seasonal normal effective temperature. CWVs are derived for each LDZ on the basis of the best fit to the LDZ demand over a long period of years.

Definitions of CWVs and current parameters are provided in the Transco document "NDM Profiling and Capacity Estimation Algorithms for 1998/99". Seasonal normal CWVs (one for each day and each LDZ) are produced according to the procedure set out in paragraph H1.5.2 of the Network Code, currently using a 65 year historical weather database.

The general assumptions made by Transco for demand include the following:

- economic growth in line with historic trends of around 2.5% per annum;
- moderate inflation averaging around 3%;
- consumer spending initially supported by windfall payments before falling back to around 2.5% pa;
- no material change in crude oil prices relative to gas prices;
- no extension to the Review of Energy Sources for Power Generation (power station moratorium) beyond the original six months;
- market prices for gas influenced by gas on gas competition and the continuing annual oversupply situation in the UK; and
- competitive advantage for gas supplies in comparison with alternative fuels

Transco bases its annual demand forecasts on a wide range of factors including: historical trends, local intelligence, the nomination of major new supply points by shippers, general economic factors, comparative fuel prices, conservation and environmental measures, potential growth areas and possible taxation effects.

Once the annual demand forecasts and daily demand models have been developed, Transco applies a simulation methodology, using historical weather data for each LDZ, to determine the peak day and severe winter demand estimates.

A5.2.1 Annual Demand

The amount of gas transported on which Transco can earn income is referred to as Formula Volume, whereas the total gas transported through the system is referred to as Throughput, the difference being termed Shrinkage. Shrinkage covers gas used for transportation purposes (notably compressor usage, system leakage, theft and lost energy caused by the difference between the actual calorific value of the gas and that used for billing purposes).

The following tables show the forecast level of annual demand by calendar year for the period 1997 to 2007. The information provides an update from that presented in the 1998 Base Plan Assumptions, using 1997 actual demands, load enquiry information and feedback from the Base Plan consultation process. Table A5.2.1a shows forecast demand split between LDZ and NTS loads (used for system design purposes) and Table A5.2.1b shows the same information split by Business and Domestic User and Large User (as set out the Transco's price control).

Table A5.2.1a Annual Demand: LDZ & NTS Split (TWh)

	1997	1998	1999	2000	2001	2002	2007
0-73 MWh	361	365	368	372	372	375	385
>73 MWh Firm	202	206	212	226	233	240	250
Interruptible	123	127	132	136	136	137	140
LDZ Total	**686**	**698**	**712**	**734**	**741**	**752**	**775**
NTS Power Gen	130	137	151	170	182	198	223
NTS Industrial	27	27	26	26	26	26	26
Exports	22	41	77	73	85	88	94
NTS Total	**179**	**205**	**254**	**269**	**293**	**312**	**343**
Formula Volumes	**865**	**903**	**966**	**1,003**	**1,034**	**1,064**	**1,118**
Shrinkage	17	15	15	16	17	17	20
System Throughput	**882**	**918**	**981**	**1,019**	**1,051**	**1,081**	**1,138**

Table A5.2.1b Annual Demand: Business & Domestic User and Large User Split (TWh)

	1997	1998	1999	2000	2001	2002	2007
0-73 MWh	361	365	368	372	372	375	385
>73 MWh Firm	198	202	207	219	223	229	238
Interruptible	109	111	115	119	120	120	124
Business & Domestic Total	**668**	**678**	**690**	**710**	**715**	**724**	**747**
LDZ Large Loads	18	20	22	24	26	28	28
NTS Power Gen	130	137	151	170	182	198	223
NTS Industrial	27	27	26	26	26	26	26
Exports	22	41	77	73	85	88	94
Large Loads Total	**197**	**225**	**276**	**293**	**319**	**340**	**371**
Formula Volumes	**865**	**903**	**966**	**1,003**	**1,034**	**1,064**	**1,118**
Shrinkage	17	15	15	16	17	17	20
System Throughput	**882**	**918**	**981**	**1,019**	**1,051**	**1,081**	**1,138**

Note:

- Volumes are based on 10 year average weather conditions.
- Exports includes both Interconnectors to Ireland and Europe.
- Calorific regime from April 1997 onwards is flow weighted average with cap.
- NTS Power Generation includes all stations connected to the NTS, but excludes consumption by stations via their own dedicated pipelines and those embedded within Transco's LDZ.

Throughput is expected to grow by nearly 30% over the next ten years, from 1997 to 2007. The majority of this growth is attributed to the European Interconnector, exports to Ireland and the additional gas fired power stations expected to be commissioned over the period.

A5.2.2 Business & Domestic

A favourable economic climate and highly competitive prices have supported strong growth in the business sector over the last two years. Although prices have started to rise in the business sector, probably as shippers endeavour to improve margins, the price differential is large enough for gas to remain competitive and support further growth in the business sector particularly from CHP.

Growth in the domestic sector has fallen behind historical rates following the curtailment of mains' extension projects. Whilst fuel substitution played an important part in growing the business sector it is unlikely to have a similar effect in the domestic sector following the liberalisation and convergence of the gas and electricity markets and the formation of "energy" companies.

The forecasts are further increased by a change in LDZ reinforcement policy implemented by Transco on i.e. from deep to shallow. That is, new loads will no longer incur charges for reinforcement within the LDZ, however they will be subject to an economic test.

Overall Business and Domestic demand is forecast to increase by 56 TWh over the next 5 years and is 5.6% up on the 1998 Base Plan forecasts by the end of the formula period (2002).

A5.2.3 Large Users

A key driver in transportation volumes is the commissioning of 12 power stations (of which 9 have Section 36 approval) between 1997 and 2002. This is in addition to the 4 power stations commissioned in 1997. Power station consumption profiles and load factors are based on an assessment of the share of the total power generation market met by gas. However, there is uncertainty with respect to power station loads and a number of issues will limit the impact of these new stations:

- any extension to the Review of Energy Sources for Power Generation;
- increased competition for the gas share of the generating market; and
- higher beach prices for gas.

These factors will result in lower load factors as more stations become mid merit. Nevertheless, the gas share of the generating market in England and Wales is forecast to grow from 30% in 1997 to around 43% by 2002, mainly at the expense of coal.

In 1996 there were five gas fired power stations with their own pipelines delivering beach gas directly to the power station and thus by-passing Transco's system. These directly supplied power stations accounted for 40% of total gas power generation demand. However, the directly supplied share of the overall market is forecast to fall as nearly all new stations are forecast to be connected to the NTS. An additional risk to Transco is the possibility that existing stations may decide to build their own pipelines to by-pass Transco's system, resulting in lost revenue and low system utilisation. However for the purposes of these forecasts, it has been assumed existing stations will continue to take gas from Transco's system.

A5.2.4 The Interconnectors

Exports to both Northern and Southern Ireland are expected to grow significantly over the forecast period as industrial and power station loads switch to gas and Ireland's indigenous supply from the Kinsale Head gas field depletes. In 1996 the gas share of primary energy consumption in Southern Ireland was 20% compared to the UK's 36%.

The European Interconnector dominates growth in demand for gas from the UKCS. However, the annual demand forecasts assume a by-pass of the NTS at Bacton from October 1999 onwards based on feedback from the Base Plan consultation process. Initially this by-pass will be 50% growing to 70% once gas is landed in October 2000 from the Shearwater, Elgin Area Pipeline (SEAL). As Transco has committed to providing peak capacity for the Interconnector consequent to the ARCA process, this by-pass is not assumed to occur at peak conditions.

In spite of this, Transco forecasts that it will still need to incur the same capital costs to reinforce the system, to bring gas south from St. Fergus to replace Bacton supplies which would be diverted directly into the Interconnector.

A5.2.5 Mild Weather Correction

Since 1987 the weather has been warmer than normal. This has equated to a loss of 25 TWh per annum against demand at seasonal normal conditions (seasonal normal weather is currently based on the average of the last 65 years).

Consequently, Transco has incorporated a Mild Weather Correction that takes account of the current series of warm weather. This correction is consistent with basing seasonal normal weather on the last 10 years, rather than the last 65 years. The consequence is to reduce LDZ demand at seasonal normal conditions by 2%, which equates to 13 TWh.

This correction only goes half way to meeting the difference between actual demand and demand at seasonal normal temperatures and therefore the forecasts remain optimistic. The effect on Transco's revenue could be significant as the most weather sensitive load is the domestic sector which has the highest transportation charges.

A5.2.6 Peak Demand

Whereas annual demand is the main driver of Transco income, peak day demand determines the system capacity required and is consequently one of the key drivers for Transco's capital expenditure.

Peak demand is forecast to increase by 1,619 GWh/d over the nine year period (from 1997/8 to 2006/7). The majority of this growth is attributable to power stations and the European Interconnector, but an allowance has been made for interruptible consumers switching to firm. The following table shows the peak demand forecasts.

Figure A5.2.6 Forecast 1 in 20 Peak Day Firm Demand by LDZ (GWh per day)

	1997/8	1998/9	1999/0	2000/1	2001/2	2002/3	2006/7
Scotland (SC)	308	314	323	333	342	349	367
Northern (NO)	245	248	255	261	266	270	278
North Western (NW)	544	547	555	564	573	581	591
North East (NE)	249	250	255	261	266	270	279
East Midlands (EM)	428	434	442	452	460	468	482
West Midlands (WM)	431	436	446	456	463	469	480
Wales North (WN)	49	49	50	52	53	54	56
Wales South (WS)	171	187	207	222	229	233	242
Eastern (EA)	336	340	346	354	362	368	380
North Thames (NT)	498	505	514	524	533	539	549
South Eastern (SE)	472	475	482	490	497	503	512
Southern (SO)	350	354	361	368	374	380	392
South Western (SW)	257	261	266	272	277	282	293
LDZ Total	**4,338**	**4,400**	**4,502**	**4,609**	**4,695**	**4,766**	**4,901**
NTS Power Gen	297	347	463	597	671	671	713
NTS Industrial	56	56	56	56	56	56	56
Exports	133	406	478	619	712	727	745
Shrinkage	49	53	56	58	60	63	77
NTS Total	**535**	**862**	**1,053**	**1,330**	**1,499**	**1,517**	**1,591**
System Throughput	**4,873**	**5,262**	**5,555**	**5,939**	**6,194**	**6,283**	**6,492**

Note:

- These forecasts are on a supply year basis, that is a year running from October to September
- Peak day demand growth is higher than the growth in annual system throughput because of the increase in system load factor caused by the new power stations and the European Interconnector and countered by the effect of the Interconnector By-pass which reduces annual volumes.

A5.3 Forecast Supply

The preferred source of supply information is from producers and shippers responding to the Base Plan questionnaire. This data is supplemented with information from commercially available sources and from shippers, producers and terminal operators during negotiations to deliver new supplies into the Transco network.

Supply forecasts for the later part of the nine year period are extremely difficult to develop as there is a high level of uncertainty concerning new field developments, particularly associated with timing, location, landing point and gas quality. This is reflected in the information received, where longer term demand appears to exceed supply availability. In these circumstances, a supply demand match is achieved by assuming that the market will respond with longer term supply developments, either imports through the Interconnector or from Norway or further UKCS developments.

Supplies from existing and planned onshore fields have not been included on an individual basis as their contribution to overall supplies is minimal. All fields have assumed production profiles and are classified into one of four supply categories:

- Production: fields in production
- Development: fields where producers have committed to develop and which have been approved for development by the DTI
- Appraisal: fields that producers are believed to be intending to develop within Transco's ten year planning period
- Additional supplies: assumed developments at the end of the ten year planning period to ensure an annual supply/demand match

In generating the supply forecast, Transco has included all Production and Development fields with their production profiles as provided by producers or commercial sources. Appraisal fields have also been included, however their production profiles may shift or slip if any uncertainty surrounds their developments. Additional supplies have only been assumed when necessary to achieve a supply/demand match.

The supply forecasts presented here match the demand case discussed in section A5.2. Two scenarios are presented representing the uncertainty surrounding the volume and timing of Norwegian imports. As these will be delivered at St. Fergus they have a considerable impact on Transco's investment.

A5.3.1 Terminal Developments

Gas deliveries from the ETAP group of fields to Teesside are expected to commence in October 1998 at a rate of around 13 mcm per day, at the same time flows from the Britannia field are forecast at St Fergus at a rate of around 20 mcm per day.

Transco expects new Norwegian imports from October 2001. This is later than has been published in the press due to a twelve month moratorium on offshore pipeline investment instigated by the Norwegian government. In addition new supplies via the Miller pipeline may be delivered at the same time.

Gas started to flow into the NTS at Burton Point in North West England during late 1996. However, at present, there are uncertainties regarding the precise quantities of gas that will enter the NTS in future, and consequently this terminal does not feature in the supply forecasts.

Gas deliveries from Shearwater, Puffin, Elgin and Franklin through the SEAL pipeline will be landed at Bacton in 2000. Consequently, the flow profiles for Bacton show significant increases in the early part of the next century.

At Barrow there is an increase in peak deliveries throughout the ten year period reflecting the gas actually supplied in 1997.

A5.3.2 UK-Continent Interconnector

The demand forecasts include exports through the UK-Continent Interconnector. Deliveries via the SEAL line to Bacton from 2000 onwards have been aggregated with other Bacton supplies. However, in order to match to the Bacton bypass expected from 1999, the reported annual supplies to Bacton have been reduced starting with SEAL and then on a pro-rata basis.

Any change to the demand forecasts for the Interconnector affects the sourcing of gas for the UK. This however is largely outside Transco's sphere of influence and is determined by the Interconnector shippers.

A5.3.3 Annual Supplies

The annual supply forecasts presented here update the 1998 Base Plan Assumptions, based on information provided by producers and shippers during the annual consultation process. The first graph shows the information received by Transco compared to forecast demand, the latter graphs show two supply scenarios (High and Low St Fergus Supplies) matched to demand.

Note:

- All supply forecasts are presented on a supply year basis, that is a year running from October to September.

Fig. 5.3.3a Annual Beach Supplies by Terminal - Information Received

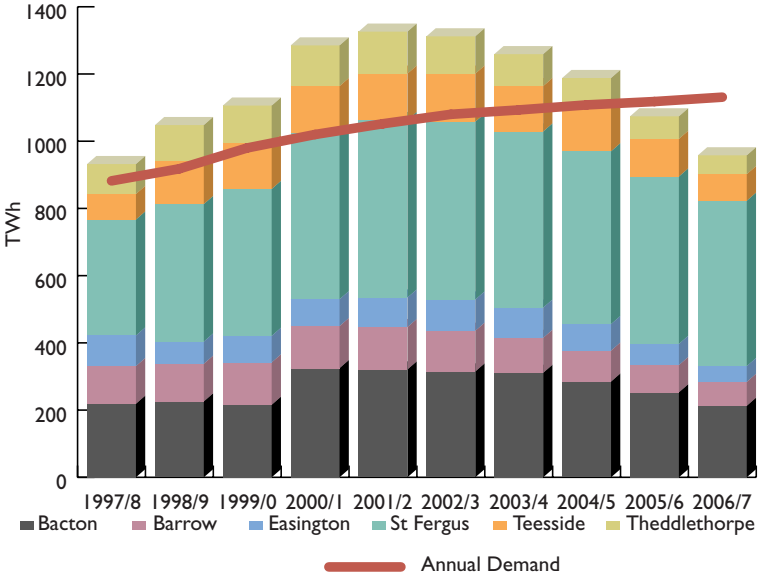
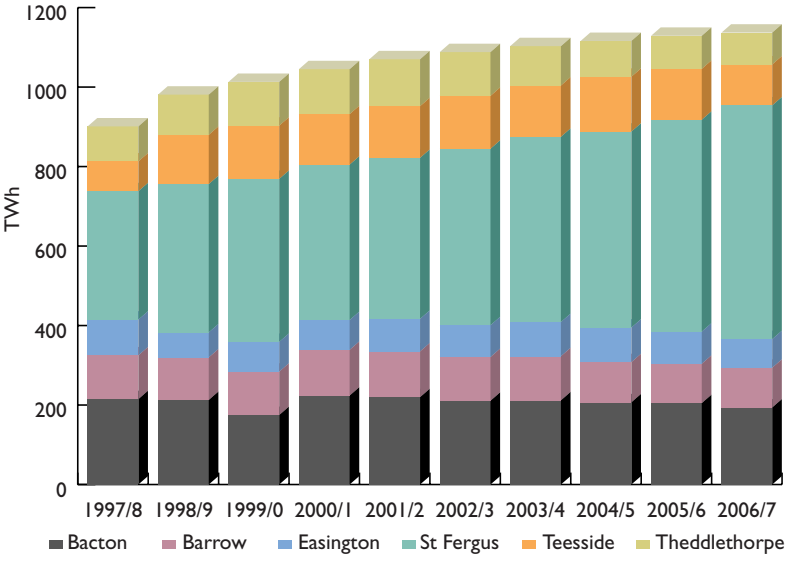
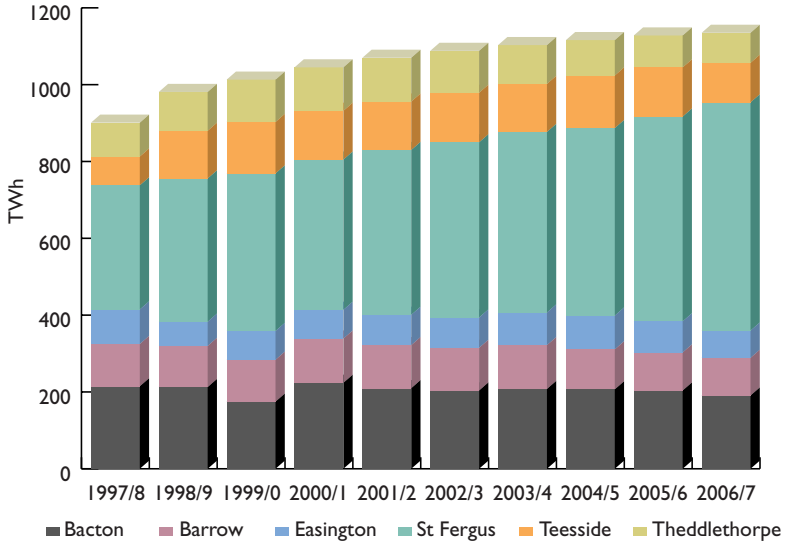


Figure A5.3.3b Annual Beach Supplies by Terminal - Transco Forecast, Low St. Fergus Case (TWh)



	1997/8	1998/9	1999/0	2000/1	2001/2	2002/3	2006/7
Bacton	215	213	175	224	220	211	194
Barrow	110	107	109	115	115	110	100
Easington	90	63	75	75	82	80	72
St Fergus	323	373	410	391	405	444	588
Teesside	75	124	134	127	130	133	103
Theddlethorpe	88	101	110	113	118	110	80
Total	**901**	**981**	**1,013**	**1,045**	**1,070**	**1,088**	**1,137**

Figure A5.3.3c Annual Beach Supplies by Terminal - Transco Forecast, High St. Fergus Case (TWh)

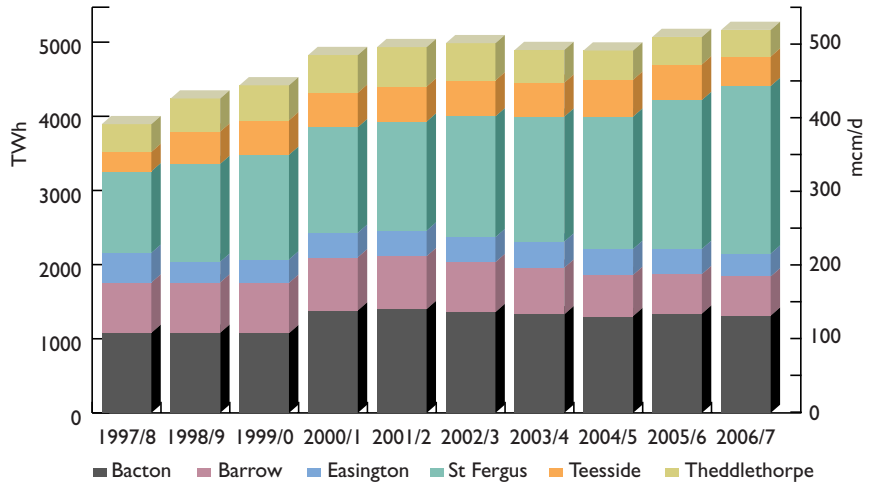


	1997/8	1998/9	1999/0	2000/1	2001/2	2002/3	2006/7
Bacton	215	213	175	224	210	204	191
Barrow	110	107	109	115	112	111	98
Easington	90	63	75	75	79	79	71
St Fergus	323	373	410	391	429	456	594
Teesside	75	124	134	127	126	129	103
Theddlethorpe	88	101	110	113	114	109	78
Total	**901**	**981**	**1,013**	**1,045**	**1,070**	**1,088**	**1,135**

A5.3.4 Maximum Beach Supplies

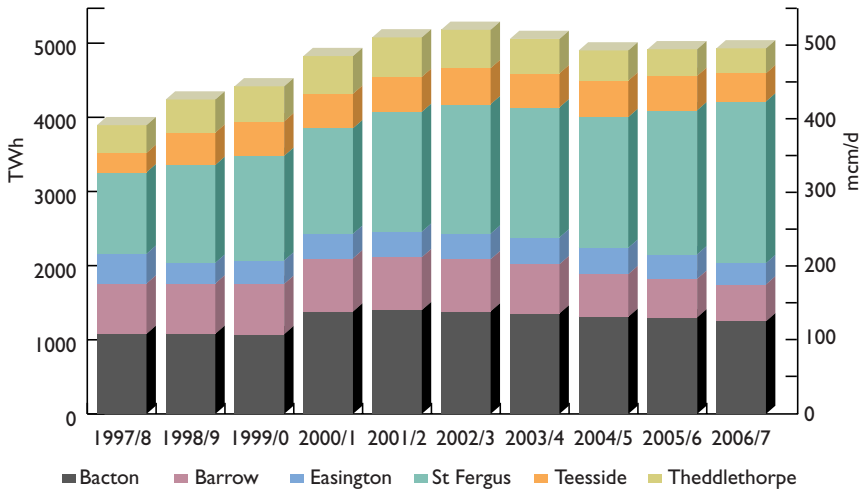
The peak supply forecasts presented here also update the 1998 Base Plan Assumptions based on feedback received from producers and shippers. The major change from the Base Plan is a significant reduction of beach gas availability in the short to medium term, as low oil and gas prices result in field developments being deferred. Lower peak flows from St. Fergus, Bacton and Easington are expected over the next 2 to 3 years.

Figure A5.3.4a Maximum Beach Supplies by Terminal - Transco Forecast, Low St. Fergus Case (GWh per day)



	1997/8	1998/9	1999/0	2000/1	2001/2	2002/3	2006/7
Bacton	1,081	1,082	1,076	1,382	1,401	1,361	1,313
Barrow	678	678	678	717	713	673	528
Easington	401	279	316	331	345	337	308
St Fergus	1,099	1,319	1,411	1,423	1,470	1,629	2,260
Teesside	261	436	465	465	472	484	397
Theddlethorpe	374	446	472	508	532	502	359
Total	**3,894**	**4,240**	**4,418**	**4,826**	**4,933**	**4,986**	**5,165**

Figure A5.3.4b Maximum Beach Supplies by Terminal - Transco Forecast, High St. Fergus Case (GWh per day)



	1997/8	1998/9	1999/0	2000/1	2001/2	2002/3	2006/7
Bacton	1,081	1,082	1,076	1,382	1,401	1,384	1,250
Barrow	678	678	678	717	713	703	497
Easington	401	279	316	331	345	345	287
St Fergus	1,099	1,319	1,411	1,423	1,615	1,745	2,180
Teesside	261	436	465	465	472	487	380
Theddlethorpe	374	446	472	508	532	516	336
Total	**3,894**	**4,240**	**4,418**	**4,826**	**5,078**	**5,180**	**4,930**

A5.4 Supply/Demand Match

Transco matches supplies to demand on an annual basis to create an exact match. Towards the end of the ten year planning period, additional supplies are needed to achieve the match and these are sourced from all terminals on a proportionate basis. When additional supplies are necessary (from 2004/05), an aggregated annual supply of 5% above annual demand is assumed.

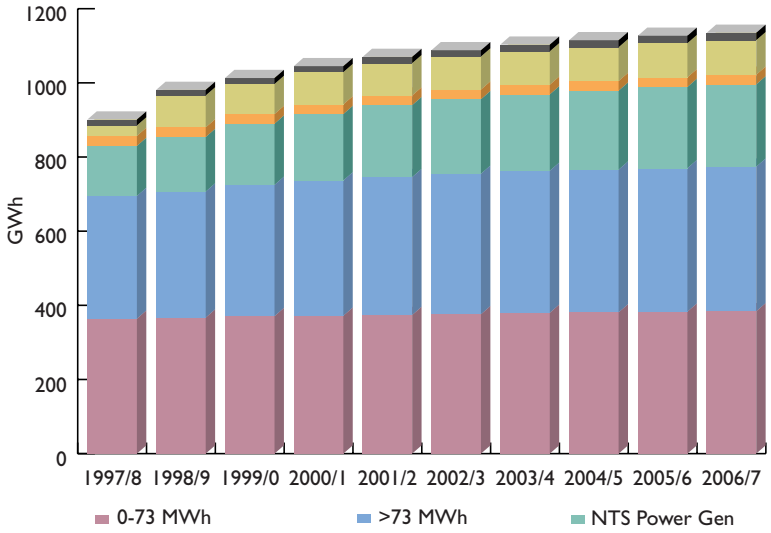
The match presented here uses the demands presented in Appendix 5.2 and the supplies from Appendix 5.3. It formed the basis of the system development plans shown in Appendix 7, however the Long Run Marginal Costs described in Chapter 3 were calculated using the supply/demand match presented in the 1998 Base Plan Assumptions.

Transco produces a supply / demand match purely for capacity planning purposes, it does not offer any guarantees that gas will be available and Transco has no obligations for security of supply.

Note:

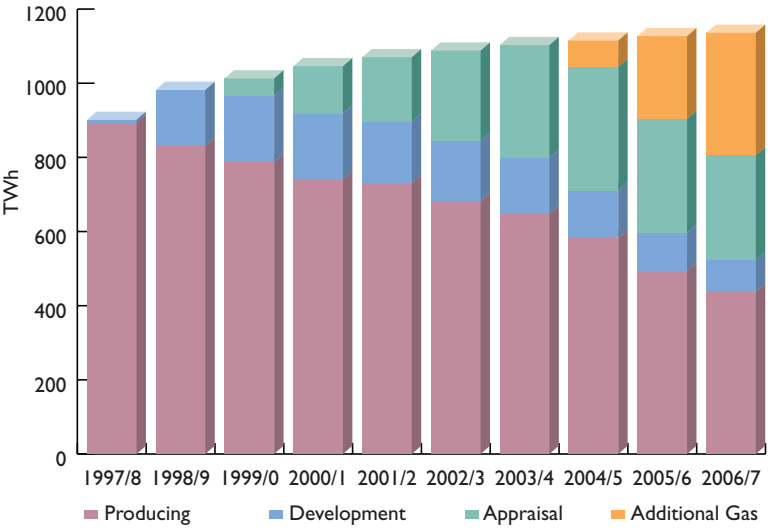
- The supply / demand match is presented on a supply year basis, that is a year running from October to September.

Figure A5.4a Summary of Annual Average Demands (TWh)



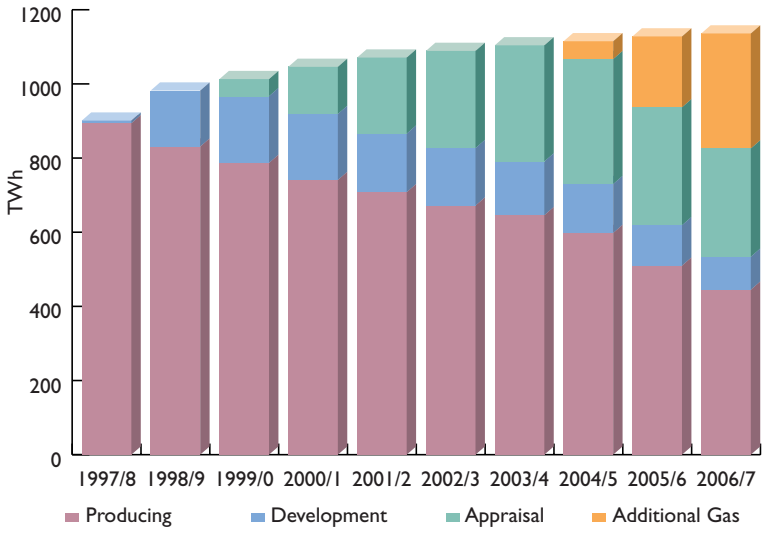
	1997/8	1998/9	1999/0	2000/1	2001/2	2002/3	2006/7
0-73 MWh	364	367	371	372	374	376	384
>73 MWh	331	340	354	365	372	379	390
NTS Power Gen	135	147	165	179	194	201	222
NTS Industrial	27	26	26	26	26	26	26
Exports	28	86	81	87	87	89	93
Shrinkage	16	15	16	16	17	17	20
Total	**901**	**981**	**1,013**	**1,045**	**1,070**	**1,088**	**1,135**

Figure A5.4bi Summary of Annual Average Supplies, Low St. Fergus Case (TWh)



	1997/8	1998/9	1999/0	2000/1	2001/2	2002/3	2006/7
Producing	894	831	787	741	731	682	438
Development	7	150	180	178	166	163	85
Appraisal	0	0	46	127	173	243	283
Additional Gas	0	0	0	0	0	0	329

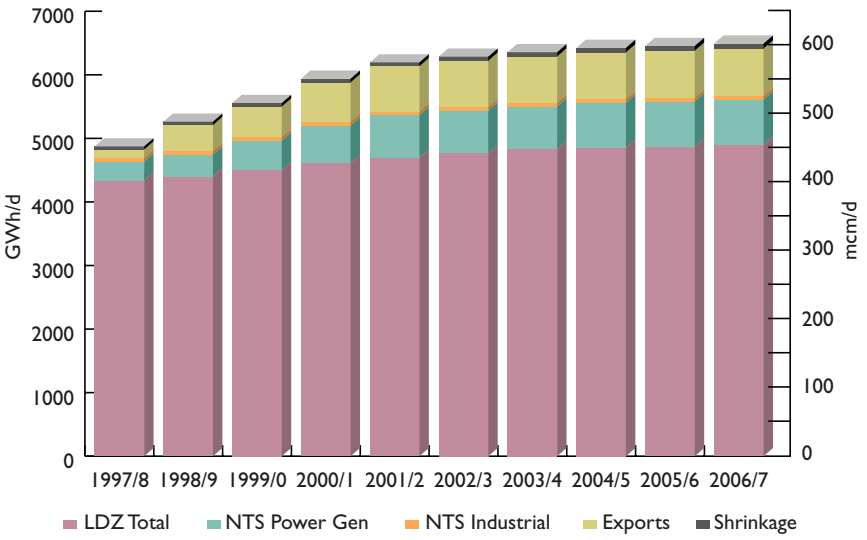
Figure A5.4bii Summary of Annual Average Supplies, High St. Fergus Case (TWh)



	1997/8	1998/9	1999/0	2000/1	2001/2	2002/3	2006/7
Producing	894	831	787	741	708	672	445
Development	7	150	180	178	158	155	89
Appraisal	0	0	46	127	204	261	292
Additional Gas	0	0	0	0	0	0	309

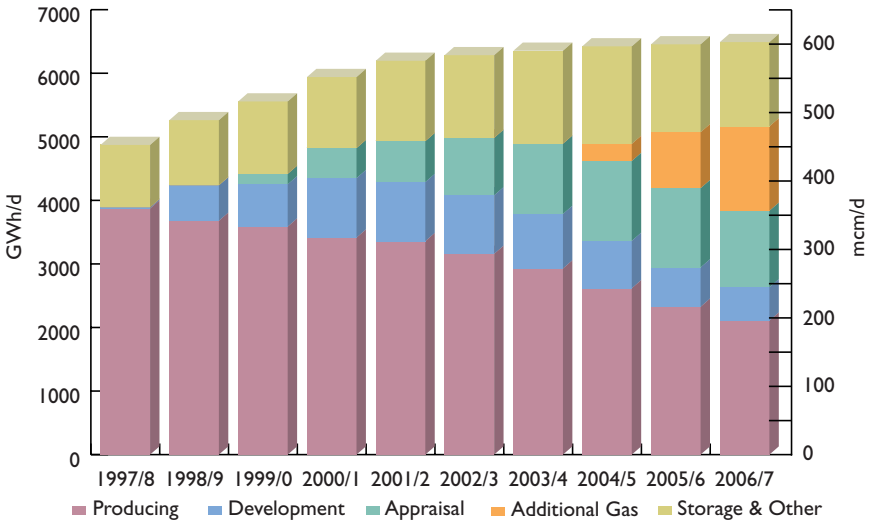
For peak demand conditions, Transco has assumed that all terminals supply at their maximum beach deliverability, with any shortfall made up through storage, interruption or other supplies. For planning purposes it is assumed that interruption will be used before gas is taken out of storage, so for peak-day demand full interruption is assumed.

Figure A5.4c Summary of Peak Demands (GWh per Day)



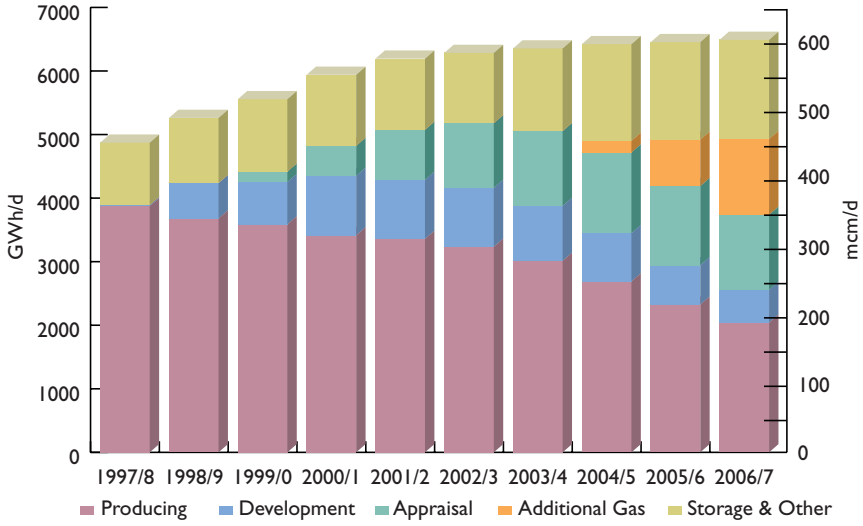
	1997/8	1998/9	1999/0	2000/1	2001/2	2002/3	2006/7
LDZ Total	4,338	4,400	4,503	4,609	4,696	4,768	4,901
NTS Power Gen	297	347	463	597	671	671	713
NTS Industrials	56	56	56	56	56	56	56
Exports	133	406	478	619	712	727	745
Shrinkage	49	53	56	58	60	63	77
Total	**4,873**	**5,262**	**5,556**	**5,939**	**6,195**	**6,285**	**6,492**

Figure A5.4di Summary of Peak Supplies, Low St. Fergus Case (GWh per Day)



	1997/8	1998/9	1999/0	2000/1	2001/2	2002/3	2006/7
Producing	3,873	3,680	3,588	3,415	3,359	3,159	2,109
Development	22	561	665	935	930	921	525
Appraisal	0	0	167	476	646	907	1,203
Additional Gas	0	0	0	0	0	0	1,328
Storage & Other	978	1,021	1,136	1,113	1,260	1,298	1,326

Figure A5.4dii Summary of Peak Supplies, High St. Fergus Case (GWh per Day)



	1997/8	1998/9	1999/0	2000/1	2001/2	2002/3	2006/7
Producing	3,873	3,680	3,588	3,415	3,358	3,236	2,042
Development	22	561	665	935	930	926	515
Appraisal	0	0	167	476	790	1,020	1,181
Additional Gas	0	0	0	0	0	0	1,192
Storage & Other	978	1,021	1,136	1,113	1,117	1,103	1,561

A5.5 Calorific Values

Supply and demand information in this document is expressed in energy terms (Terawatt hours or Gigawatt hours). Information expressed in these terms is important for balancing inputs and outputs from the system, as provided for in the Network Code.

However, for system design purposes, it is necessary for Transco to express gas flows in volume terms, such as million cubic metres per day (mcm/d). Calorific values are used to convert from energy to volume units, and vice versa. The following table shows forecasts of average calorific values at the major entry points for the next five years.

Table A5.6 Forecasts of Average Terminal Calorific Values (MJ/m^3)

	1998/9	1999/0	2000/1	2001/2	2002/3
Bacton	38.34	38.35	38.33	38.88	38.92
Barrow	37.58	37.58	37.58	37.23	37.23
Easington	38.34	38.26	38.34	38.23	38.15
St Fergus	40.57	40.71	40.58	40.42	40.27
Teesside	40.27	39.66	39.61	39.58	39.57
Theddlethorpe	38.55	38.50	38.60	38.51	38.57
Overall	**39.19**	**39.30**	**39.28**	**39.22**	**39.19**