

## SO Incentives 'Initial Proposals' Consultation – Gas Appendix

### Introduction

This appendix contains supporting material to the forecasts for Shrinkage contained within the main SO Incentives Initial proposals Consultation Document, issued in December 2007. We will also publish some of this data in Excel format on our website for ease of use.

### Structure

The appendix is structured as follows:

1. Compressor Fuel Forecasts
2. Electricity Compressor delivery charge forecast
3. CV Shrinkage risks

### 1. Compressor Fuel Forecasts

This analysis of compressor fuel requirements is based on the 2007 Transporting Britain's Energy (TBE) Base Scenario for average demand. Flows from St Fergus are the key driver for OUG volumes and this Base scenario has been stressed, in 12.5% steps, between an assumed minimum (65mscm/d) and maximum (122mscm/d) average flows at St Fergus, The rebalanced flows for key supply points are summarised below. More detailed monthly profiles are shown later.

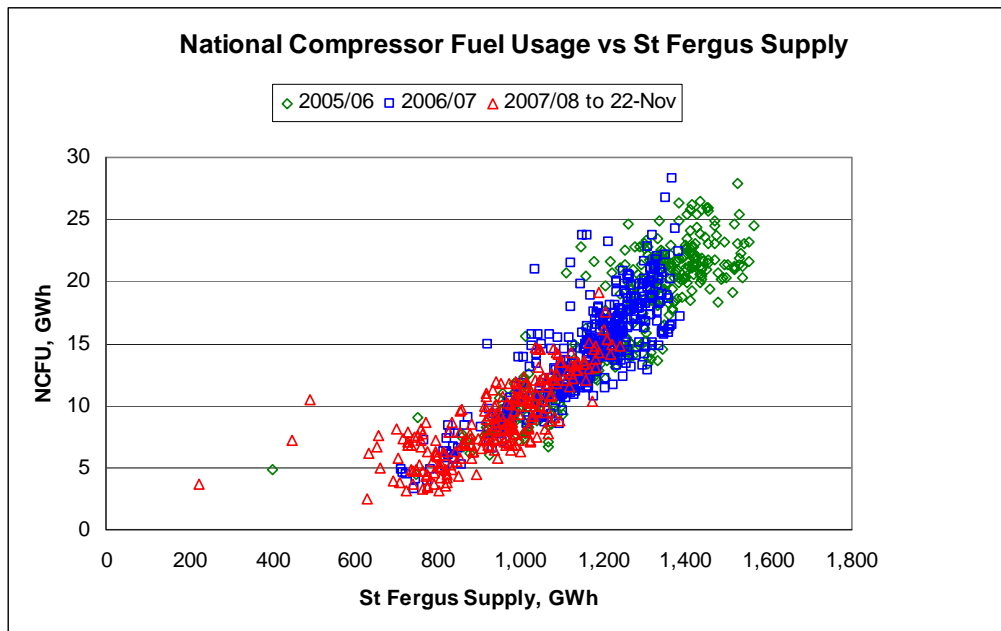
Average Supply by St Fergus Stress scenario, GWh/d

	<b>Bacton</b>	<b>Barrow</b>	<b>Easington</b>	<b>St Fergus</b>	<b>Teesside</b>	<b>eddlethorilford</b>	<b>Havi</b>	<b>IOG</b>
<b>Min SF</b>	<b>803.39</b>	<b>96.92</b>	<b>826.99</b>	<b>708.75</b>	<b>262.25</b>	<b>234.96</b>	<b>167.83</b>	<b>95.72</b>
<b>12.5%</b>	778.45	94.02	801.59	<b>785.05</b>	254.07	228.71	162.77	92.83
<b>25.0%</b>	753.81	91.18	776.59	<b>861.35</b>	245.98	221.46	157.81	89.99
<b>37.5%</b>	729.19	88.34	751.59	<b>937.65</b>	237.90	214.20	152.84	87.15
<b>50.0%</b>	704.57	85.50	726.60	<b>1013.95</b>	229.81	206.94	147.88	84.31
<b>Base</b>	<b>695.67</b>	<b>84.00</b>	<b>716.31</b>	<b>1044.07</b>	<b>227.08</b>	<b>204.42</b>	<b>145.42</b>	<b>82.92</b>
<b>62.5%</b>	679.94	82.66	701.61	<b>1090.24</b>	221.72	199.68	142.92	81.48
<b>75.0%</b>	655.32	79.82	676.61	<b>1166.54</b>	213.64	192.41	137.96	78.64
<b>87.5%</b>	630.70	76.98	651.62	<b>1242.84</b>	205.55	185.15	133.00	75.80
<b>Max SF</b>	<b>606.49</b>	<b>74.12</b>	<b>626.42</b>	<b>1319.13</b>	<b>197.38</b>	<b>177.82</b>	<b>128.01</b>	<b>72.94</b>

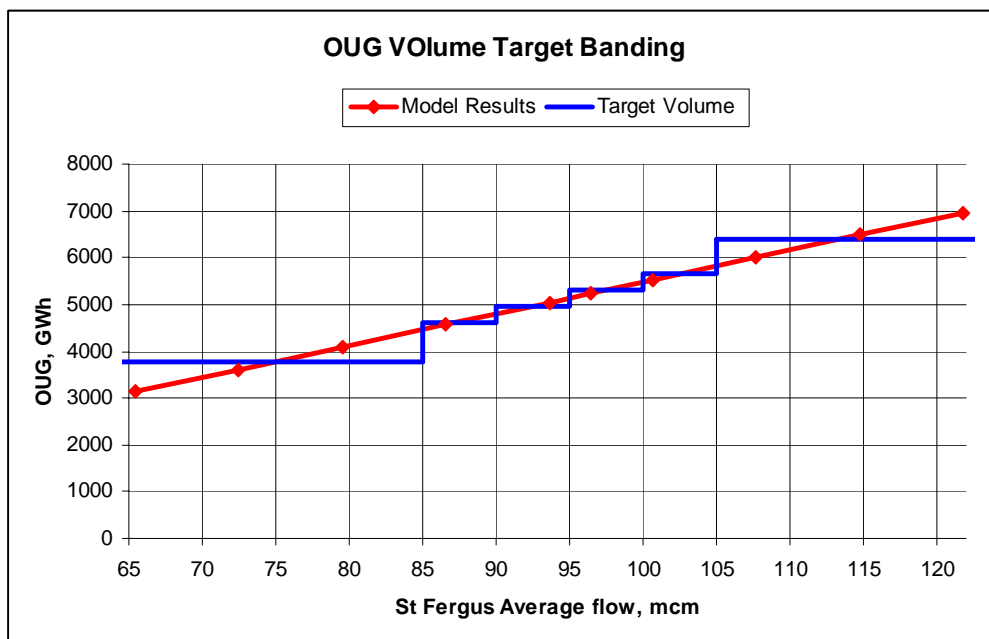
The monthly profile of expected compressor requirements (gas GWh) is shown for each supply scenario.

<b>Month</b>	<b>Min SF</b>	<b>12.5%</b>	<b>25.0%</b>	<b>37.5%</b>	<b>50.0%</b>	<b>Base</b>	<b>62.5%</b>	<b>75.0%</b>	<b>87.5%</b>	<b>Max SF</b>
<b>Apr-08</b>	309.8	348.5	387.3	426.1	464.9	<b>483.5</b>	503.7	542.5	581.2	620.0
<b>May-08</b>	233.9	273.0	312.0	351.1	390.2	<b>390.7</b>	429.2	468.3	507.4	546.6
<b>Jun-08</b>	187.7	223.1	258.6	294.1	329.6	<b>329.5</b>	365.0	400.5	436.0	471.6
<b>Jul-08</b>	178.0	213.6	249.2	284.8	320.4	<b>320.4</b>	356.0	391.6	427.2	462.9
<b>Aug-08</b>	165.8	200.6	235.4	270.1	304.9	<b>304.9</b>	339.7	374.4	409.2	444.1
<b>Sep-08</b>	204.3	240.8	277.4	313.9	350.4	<b>350.4</b>	387.0	423.5	460.0	496.7
<b>Oct-08</b>	232.5	276.1	319.8	363.5	407.1	<b>413.0</b>	450.8	494.5	538.2	581.8
<b>Nov-08</b>	306.2	348.7	391.2	433.6	476.1	<b>505.5</b>	518.6	561.1	603.6	646.1
<b>Dec-08</b>	342.3	386.4	430.7	475.2	519.6	<b>556.0</b>	564.0	608.4	652.8	697.2
<b>Jan-09</b>	349.1	393.4	438.1	482.8	527.6	<b>565.1</b>	572.3	617.1	661.8	706.5
<b>Feb-09</b>	307.0	346.6	386.4	426.2	466.0	<b>497.7</b>	505.9	545.7	585.5	625.3
<b>Mar-09</b>	311.3	355.1	399.0	442.9	486.9	<b>516.5</b>	530.8	574.7	618.7	662.6
<b>2008-09</b>	<b>3127.8</b>	<b>3605.8</b>	<b>4085.1</b>	<b>4564.4</b>	<b>5043.7</b>	<b>5233.3</b>	<b>5522.9</b>	<b>6002.2</b>	<b>6481.5</b>	<b>6961.4</b>

National Compressor Fuel Usage vs St. Fergus Supply is plotted below, and the data is provided in excel format on our website. The correlation co-efficient is 90%.



The annual volume forecast is banded by St Fergus average flows for Incentive Target



Monthly profiles showing modelled flows at each major Entry Terminal. This is available in excel format from our website.

Min SF										TBE Base									
Avg. Flows	Bacton	Barrow	Easington	St Fergus	Teesside	eddllethorlifford	Hav	IOG			Avg. Flows	Bacton	Barrow	Easington	St Fergus	Teesside	eddllethorlifford	Hav	IOG
Apr-08	667.52	125.95	817.60	777.47	303.63	263.66	104.95	64.87			Apr-08	753.14	109.31	709.56	1116.43	263.51	229.08	91.10	56.30
May-08	780.63	66.55	685.42	680.04	274.92	238.59	67.10	53.84			May-08	676.95	57.63	593.52	975.34	236.06	206.60	75.44	46.62
Jun-08	728.54	39.57	636.42	635.66	280.24	227.76	60.64	49.85			Jun-08	629.99	34.20	560.33	911.24	225.04	196.95	69.75	43.10
Jul-08	705.78	34.76	616.79	617.25	253.66	222.45	78.09	48.27			Jul-08	610.15	30.05	533.21	864.76	219.23	192.31	67.53	41.73
Aug-08	687.71	50.40	607.23	604.70	266.66	232.53	83.37	51.53			Aug-08	694.51	27.46	519.21	864.76	214.86	188.84	65.78	40.65
Sep-08	751.97	70.40	657.23	654.70	266.66	232.53	83.37	51.53			Sep-08	650.69	43.62	568.72	938.76	230.74	201.21	72.16	44.59
Oct-08	782.20	77.81	797.58	667.42	233.88	216.11	202.78	112.36			Oct-08	673.87	67.05	667.13	1004.90	201.49	186.18	174.75	96.90
Nov-08	860.12	136.38	973.78	759.74	258.66	237.99	246.68	136.69			Nov-08	744.56	116.10	843.20	1144.82	223.91	206.60	213.62	118.34
Dec-08	874.10	155.18	1060.34	786.21	263.18	241.76	271.48	150.43			Dec-08	758.81	134.75	920.70	1185.78	228.47	213.39	235.77	130.61
Jan-09	878.09	160.24	1080.66	793.96	264.12	242.60	280.32	155.33			Jan-09	762.60	139.19	938.68	1197.94	229.38	215.36	243.55	134.92
Feb-09	870.43	154.37	1068.27	779.12	262.89	241.95	261.49	144.89			Feb-09	756.65	134.22	928.90	1174.46	228.36	212.21	227.38	125.96
Mar-09	859.65	132.22	944.66	757.07	258.17	237.09	245.03	135.78			Mar-09	742.84	114.27	816.39	1140.81	223.09	205.67	211.81	117.33
2008-09	803.39	96.92	826.99	708.75	262.25	234.96	167.83	95.72			2008-09	695.67	84.00	716.31	1044.07	227.08	204.42	145.42	82.92

12.50%										62.50%									
Avg. Flows	Bacton	Barrow	Easington	St Fergus	Teesside	eddllethorlifford	Hav	IOG			Avg. Flows	Bacton	Barrow	Easington	St Fergus	Teesside	eddllethorlifford	Hav	IOG
Apr-08	642.12	122.25	793.45	853.11	294.64	256.16	101.95	62.96			Apr-08	739.75	107.51	697.27	1155.65	258.83	225.03	69.50	55.33
May-08	754.55	64.33	662.53	753.62	265.74	230.62	64.19	52.04			May-08	650.26	55.47	570.97	1047.93	223.01	198.74	72.55	44.65
Jun-08	703.90	38.23	614.90	704.56	251.44	220.06	77.91	49.15			Jun-08	605.39	32.88	528.84	989.19	216.25	189.26	67.01	41.43
Jul-08	681.87	33.58	595.89	684.13	245.06	214.91	75.45	46.64			Jul-08	596.24	28.87	512.32	951.64	210.70	184.78	64.87	40.10
Aug-08	664.41	32.92	580.85	668.25	240.15	211.04	73.49	45.43			Aug-08	571.21	28.31	499.37	939.45	206.46	181.44	63.18	39.05
Sep-08	726.65	49.70	635.10	725.71	257.68	224.69	80.56	49.80			Sep-08	625.38	41.93	546.59	1009.77	221.76	193.38	69.33	42.86
Oct-08	755.98	75.23	770.87	749.03	226.04	208.86	195.99	108.60			Oct-08	651.14	64.91	664.04	1075.51	194.68	179.88	168.83	93.55
Nov-08	836.33	132.47	945.81	841.83	251.21	231.68	239.59	132.76			Nov-08	736.84	116.96	834.70	1170.17	221.80	204.38	211.40	117.14
Dec-08	849.27	150.78	1030.25	869.11	255.70	238.72	263.77	146.16			Dec-08	754.46	134.01	915.58	1200.72	227.16	212.18	234.40	129.89
Jan-09	853.03	155.68	1049.82	877.48	256.58	240.83	272.36	150.92			Jan-09	758.79	138.53	934.09	1211.38	228.24	214.30	242.34	134.28
Feb-09	846.20	150.08	1038.60	861.58	255.38	237.33	254.21	140.86			Feb-09	751.79	133.37	922.98	1191.39	226.89	210.85	225.67	125.16
Mar-09	834.42	128.35	916.99	839.16	250.60	231.03	237.85	131.80			Mar-09	734.65	113.08	807.53	1167.48	220.64	203.42	209.46	116.07
2008-09	778.45	94.02	801.59	785.05	254.07	228.71	162.77	92.83			2008-09	679.94	82.66	701.61	1090.24	221.72	199.68	142.92	81.48

25.00%										75%									
Avg. Flows	Bacton	Barrow	Easington	St Fergus	Teesside	eddllethorlifford	Hav	IOG			Avg. Flows	Bacton	Barrow	Easington	St Fergus	Teesside	eddllethorlifford	Hav	IOG
Apr-08	616.53	118.56	769.40	826.74	285.69	248.37	98.78	61.05			Apr-08	714.15	103.63	673.22	1231.29	249.87	217.25	86.42	53.42
May-08	726.47	62.12	639.54	627.20	256.55	222.65	61.28	50.24			May-08	624.78	53.26	548.08	1121.51	219.82	190.77	69.65	43.05
Jun-08	678.37	36.89	593.39	773.47	242.64	212.36	75.19	46.49			Jun-08	590.75	31.55	507.32	1049.08	207.45	181.56	64.28	39.74
Jul-08	657.96	32.40	575.00	761.00	236.47	207.36	72.80	45.00			Jul-08	562.34	27.69	491.43	1018.52	202.10	177.64	62.22	38.46
Aug-08	641.11	31.77	560.48	733.55	231.72	203.64	70.91	43.83			Aug-08	547.91	27.15	479.00	994.75	198.04	174.04	60.60	37.46
Sep-08	701.33	47.01	612.97	796.73	248.70	216.96	77.75	48.06			Sep-08	600.06	40.29	524.46	1080.78	212.79	185.55	66.53	41.12
Oct-08	729.76	72.65	744.15	830.65	218.20	201.62	189.20	104.84			Oct-08	624.93	62.33	637.34	1157.13	186.84	172.64	162.05	89.79
Nov-08	810.70	128.59	918.03	923.91	243.81	224.85	232.54	128.85			Nov-08	712.22	113.08	806.93	1252.25	214.20	197.65	204.36	113.24
Dec-08	825.54	146.58	1001.54	952.01	248.56	232.16	256.42	142.08			Dec-08	730.77	129.82	886.92	1283.62	220.02	205.62	227.06	125.82
Jan-09	829.44	151.39	1020.85	960.96	249.49	234.25	264.85	146.76			Jan-09	735.24	134.24	905.16	1294.86	221.15	207.65	234.83	130.12
Feb-09	822.59	145.90	1009.69	944.03	248.26	230.71	247.12	136.94			Feb-09	728.18	129.19	894.07	1273.84	217.99	204.23	218.78	121.23
Mar-09	809.47	124.53	899.62	921.24	243.11	224.13	230.75	127.86			Mar-09	709.71	109.26	780.17	1249.57	213.16	196.62	202.37	112.14
2008-09	753.81	91.18	776.59	861.35	245.98	221.46	157.81	89.99			2008-09	655.32	79.82	676.61	1166.54	213.64	192.41	137.96	78.64

37.50%										87.50%									
Avg. Flows	Bacton	Barrow	Easington	St Fergus	Teesside	eddllethorlifford	Hav	IOG			Avg. Flows	Bacton	Barrow	Easington	St Fergus	Teesside	eddllethorlifford	Hav	IOG
Apr-08	790.93	114.88	745.36	1004.38	276.73	240.59	95.88	59.14			Apr-08	688.58	100.15	649.18	1308.92	240.92	209.47	83.33	51.51
May-08	702.40	69.90	616.75	900.78	247.37	214.68	78.37	48.45			May-08	606.12	51.04	525.19	1195.08	210.64	182.80	66.74	41.25
Jun-08	654.64	35.56	571.87	642.37	233.84	204.66	72.46	44.79			Jun-08	556.12	30.21	485.81	1117.99	198.65	173.86	61.56	38.05
Jul-08	634.05	31.23	554.11	617.88	227.88	199.84	70.16	43.37			Jul-08	538.43	26.52	470.54	1085.40	193.51	169.71	59.58	36.83
Aug-08	617.81	30.62	540.11	598.85	223.30	196.24	68.33	42.24			Aug-08	524.61	26.00	458.63	1060.05	189.62	166.64	58.03	35.87
Sep-08	676.01	45.31	590.84	667.74	239.72	209.03	74.95	46.33			Sep-08	574.74	38.54	502.33	1151.80	203.81	177.72	63.72	39.39
Oct-08	703.55	70.07	717.45	912.27	210.36	194.37	182.41	101.08			Oct-08	598.72	69.75	610.63	1238.75	179.09	165.40	155.26	86.03
Nov-08	786.08	124.71	890.25	1006.00	236.40	218.02	225.49	124.95			Nov-08	687.60	109.20	779.15	1334.34	206.80	190.73	197.31	109.33
Dec-08	801.85	142.39	972.89	1034.91	241.43	225.50	249.08	138.02			Dec-08	707.08	125.63	858.26	1366.52	212.89	198.86	219.73	121.75
Jan-09	805.89	147.10	991.93	1044.43	242.40	227.60	257.35	142.60			Jan-09	711.69	129.96	876.24	1378.33	214.07	201.00	227.33	125.97
Feb-09	798.99	141.72	980.78	1026.48	241.14	224.09	240.04	133.01			Feb-09	704.58	125.01	865.17	1356.29	212.64	197.61	211	

Apr-06 to Mar-07	
Compressor	Reduction
Wormington	0.72%
Kirriemuir	12.03%
Churchover	2.13%
St Fergus	21.36%
Hatton	9.69%
Peterborough	6.73%

## 2. Electric Compressor Delivery Charges

The forecast delivery charges are dominated by TNUoS and DUoS charges. Based on current published rates and design and/or contracted connection parameters we estimate charges as follows (~£3.2m for 2008/9)

Compressor	Due Date	KW	KVA	TNUoS £/KW Zone (PT)	DUoS Fixed £/month	DUoS Capacity £/kVa/month	Potential TNUoS	Months of DNUoS	Potential DUoS
Lockerley	NOW	8000	8500	21.100281	95.38	0.84	168,802	12	86,825
Peterstow	NOW	7289	11664	17.807318	114.14	0.73	129,798	12	103,190
Wormington	01 February 2008	15000	18900	17.807318	114.14	1.29	267,110	12	294,757
Churchover	01 May 2008	15000	18900	16.370802	131.19	1.24	245,562	11	260,256
Felindre	01 May 2008	30000	40000	21.53741	0.00	1.08	646,122	11	476,773
St.Fergus	01 January 2009	48000	64400	1.445659	26.35	0.86	69,392	3	0
Kirriemuir	01 April 2008	35000	40000	1.445659	26.35	0.86	50,598	12	413,116
							1,577,384		1,634,917

## 3. CV Shrinkage Risks

Two CV Shrinkage issues have been highlighted as being relevant for particular analysis as to their respective effects on annual NTS CV Shrinkage totals:

- The operation of the Milford Haven LNG facility.
- The potential for low CV flows at Teesside

The Milford Haven risk presents a potential 'top and tail' CV exposure of 707 GWh when the site flows at 37 MJ/m<sup>3</sup> and 356 GWh at a flow CV of 42 MJ/m<sup>3</sup>. The CV pinch point is a single off take (ROSS OT) where the LNG terminal gas cannot be blended with the NTS gas. This causes Flow Weighted Average CV (FWACV) capping.

For PX Teesside, the maximum CV shrinkage exposure (858 GWh) would be if both terminals flowed at the 36.9 MJ/m<sup>3</sup> for the whole period. The current CV risk is solely due to the 'Cowpen Bewley OT' effect where there is no possibility for CV mitigation if the commingled Teesside terminal flowing CV begins to drop below 39.1 MJ/m<sup>3</sup>.

### Assumptions

The following assumptions have been made:

- Base Demand Scenarios have been analysed at five points along the demand curve using the Graphical Falcon network modelling tool.
- The five gas days through the year were determined by the available models, but were a reasonable spread across the period.
  1. PX Teesside
    - For each Gas Day, the entry CVs at PX Enron has been held at 36.9 MJ/m<sup>3</sup> with the BP Amoco CV's being modelled across a 36.9 to 42 MJ/m<sup>3</sup> range in 1 MJ/m<sup>3</sup> increments.
  2. Milford Haven LND

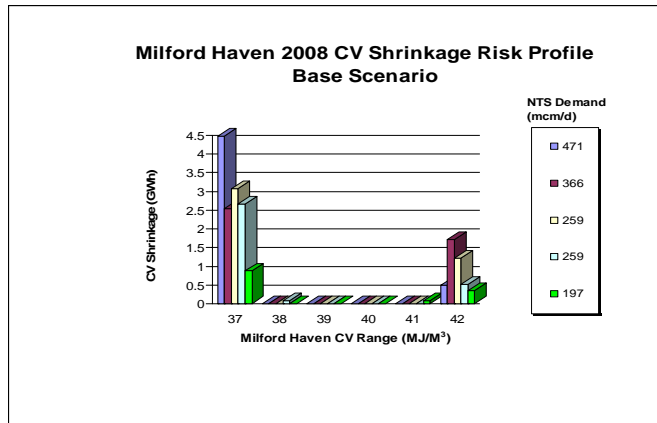
- For each gas day the CV from the terminal is set across the 37 to 42 MJ/m<sup>3</sup> range incremented by 1 MJ/m<sup>3</sup>.
- Each analysis is a steady state estimate of the system and has been balanced but not CV matched so as to determine the zonal CV Shrinkage.
- The CV shrinkage energies are calculated by multiplying the number of days within a flow range by the daily calculated CV energy at each terminal entry CV.

**Results**

The Milford Haven CV shrinkage energies are presented in Table 2.

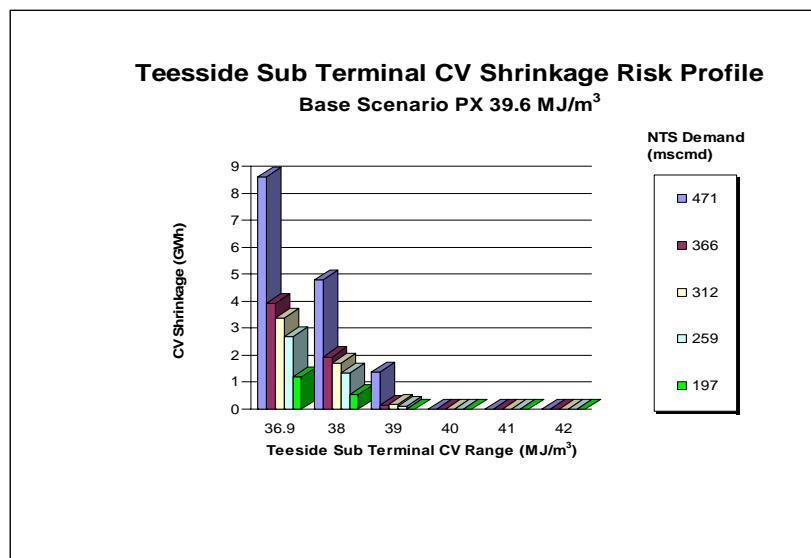
	<b>2008/09</b>					
Milford Haven CV (MJ/m <sup>3</sup> )	Annual CV Shrinkage Energies (GWh)	Peak Day @ (GWh)	49 Days @ (GWh)	73 Days @ (GWh)	77 Days @ (GWh)	165 Days @ (GWh)
37	707	4.474	2.532	3.082	2.698	0.901
38	6	0	0	0	0.081	0
39	0	0	0	0	0	0
40	0	0	0	0	0	0
41	10	0	0	0	0	0.058
42	357	0.487	1.710	2.619	0.517	0.309

Annual NTS CV Shrinkage Energies resulting from the variation of Milford Haven LNG entry CV.



The potential daily CV shrinkage energies for Teesside are shown below:

	2008/09					
BP Amoco CV (MJ/m <sup>3</sup> )	Annual CV Shrinkage Energies (GWh)	Peak Day @ (GWh)	49 Days @ (GWh)	73 Days @ (GWh)	77 Days @ (GWh)	165 Days @ (GWh)
36.9	858	8.598	3.913	3.376	2.698	1.235
38	389	4.793	1.938	1.696	1.326	0.385
39	31	1.387	0.141	0.193	0.120	0
40	0	0	0	0	0	0
41	0	0	0	0	0	0
42	0	0	0	0	0	0



Daily NTS CV Shrinkage Energies resulting from CV variation from the BP Amoco (Teesside) when PX Enron flows at 36.9 MJ/m<sup>3</sup>.