
Northern Ireland Gas Transmission System



PRESSURE REPORT

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Premier Transmission Ltd

Phoenix Natural Gas Ltd

BGE (UK) Ltd

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1 INTRODUCTION

This report provides information on the capacity of the gas supply system to Northern Ireland for the years 2005/06 to 2009/10 inclusive.

The system performance has been studied under peak day conditions and also with the firm non power generation demand reduced to 75% of the peak day level.

The model used was one consisting of all of the pipelines which supply the whole of Ireland and was similar to those used to produce the 2005 Gas Capacity Statement for the Republic of Ireland. The Northern Ireland demands have been updated to reflect the latest information supplied by the Northern Ireland PS Gas Suppliers provided under their licences. The reasons for modelling the entire network were the inclusion of the South - North pipeline from 2006/07 and also to determine accurately the pressures at Twynholm which in turn determines the pressures on the SNIP and NWP.

One significant change to the assumptions adopted in this year's analysis relates the model inlet pressure. By assuming a higher network inlet pressure than previously used in modelling studies, the system experiences associated pressure benefits.

The new supply from the Corrib field is expected to be delivered in time for the 2007/08 winter. It was considered prudent to examine the case where the delivery of gas is delayed by one year.

The SNIP/NWP model has been calibrated by independent consultants and this calibration showed good agreement with actual pressures recorded on the system. The results have also been subjected to a spot check using a different analysis program which has provided additional confirmation that the predictions are reliable.

2 GAS TRANSMISSION NETWORK

2.1 Existing system

The Irish Gas Transmission System

The BGE high pressure transmission network consists of approximately 1,850km of pipe and conveys gas from two entry points (the “Inch” and “Moffat” entry points) to directly connected customers and distribution networks throughout Ireland, as well as to connected systems at exit points in Scotland (the Scotland-Northern Ireland Pipeline), and the Isle of Man. The Moffat entry point, located onshore in Scotland, connects the Irish natural gas system to that of Transco in the UK, and allows for the importation of UK gas to Ireland via two sub-sea interconnectors. The Inch entry point, located in Cork, connects the Kinsale and Seven Heads gas fields to the onshore network. The Irish system has three compressor stations, Beattock and Brighthouse Bay in southwest Scotland, and Midleton in southeast Ireland near Cork.

The Northern Ireland Gas Transmission System

The Scotland to Northern Ireland 600mm pipeline (SNIP) connects to the BGE system at Twynholm and has a maximum operating pressure of 75 barg. The pipeline is 135 km long and runs towards the coast near Stranraer and crosses the Irish Sea to terminate at Ballylumford Power Station, Island Magee. SNIP is owned and operated by Premier Transmission Ltd.

The Phoenix Transmission Pipeline (PTP) comprises a further 35kms of 600mm pipeline with a maximum operating pressure of 75 Barg and runs from Ballylumford via Carrickfergus to Belfast.

From Carrickfergus 112km of 450mm pipeline have recently been constructed to supply the power station at Coolkeeragh, Londonderry. This pipeline, the North-West Pipeline (NWP), is owned and operated by BGE (UK) Ltd. Provision has been made to supply the towns near the route of this pipeline from late 2005.

2.2 Proposed developments

A new 450mm pipeline connecting the interconnector system to the North-West pipeline has been approved and is scheduled for completion in the last quarter of 2006. This pipeline called the South-North Pipeline (SNP) is 150 km long and will extend from the IC2 landfall at Gormanston, Co. Meath in the Republic of Ireland to Ballyalbanagh on the North - West pipeline, approximately 12km west of the Carrickfergus AGI. This pipeline will facilitate supplies to towns and industries in the corridor from Newry to Belfast and in the longer term will be able to support the SNIP pipeline in meeting increased demand levels in Northern Ireland. The SNP will be developed by BGE (UK) Ltd and will be included in the NI postalised transmission system.

There is a new pipeline to be constructed in the ROI from Mayo to Galway, which will link the Corrib gas field to the Irish market. This 145 km length pipeline will connect a proposed onshore terminal in Bellanaboy Co. Mayo, into the Pipeline to the West at Cappagh South AGI in Co. Galway. The significance of this pipeline is that it reduces the volume of gas to be delivered to Ireland from Moffat and this has a considerable effect on the pressures on the onshore section of pipelines in Scotland.

The following diagrams shows the major existing pipeline systems supplying Northern Ireland together with the approved developments to the system.



3 MODEL DETAILS

3.1 Demand

The demands supplied by the SNIP system, the North - West pipeline and the South - North pipeline are tabulated in the following table. The actual flow rate will vary according to the calorific value of the gas delivered which is currently predicted to be of the order of 40 MJ/m³.

	2005/06	2006/07	2007/08	2008/09	2009/10
	kWh/day	kWh/day	kWh/day	kWh/day	kWh/day
Ballylumford	38,099,000	38,099,000	38,099,000	38,099,000	38,099,000
Phoenix Belfast	20,597,000	20,592,000	22,379,000	24,141,000	25,788,000
Stranraer	809,807	832,269	853,446	873,691	891,652
CESB	18,766,000	18,766,000	18,766,000	18,766,000	18,766,000
NWP/SNP Towns	2,362,582	4,274,704	6,750,339	7,090,826	7,363,279
Total:	80,634,389	82,563,973	86,847,785	88,970,517	90,907,931

At the time of the analysis the 2005/06 firm capacity bookings for the NWP/SNP towns is zero; however the analysis was carried out at the level shown in anticipation of likely bookings.

Details of the method that demands have been allocated to the towns are given in Appendix A.

For demands in the Republic of Ireland the values used are based on the central demand case used to produce the 2005 Gas Capacity Statement for the Republic of Ireland. This statement is available from the CER website at <http://www.cer.ie/CERDocs/cer05126.pdf>.

3.2 Supply

The peak day and 75% peak day supplies into the system are tabulated below.

Year	Peak Day Supply Flows (mscmd)						
	Inch	Corrib commencing 2007/8			Corrib commencing 2008/9		
		Moffat	Corrib	Twynholm	Moffat	Twynholm	Corrib
2005/6	4.09	27.00	0	7.31	27.00	7.31	0
2006/7	1.18	30.31	0	7.48	30.31	7.48	0
2007/8	0.92	22.71	9.89	7.87	32.04	7.87	0
2008/9	0.72	23.85	9.89	8.06	23.85	8.06	9.89
2009/10	0.59	25.87	8.87	8.08	24.91	8.08	9.89

Year	75% Day Supply Flows (mscmd)				
	Inch	Corrib commencing 2007/8		Corrib commencing 2008/9	
		Moffat	Corrib	Moffat	Corrib
2005/6	4.09	23.84	0	23.84	0
2006/7	1.18	26.96	0	26.96	0
2007/8	0.92	19.09	9.89	28.42	0
2008/9	0.72	19.99	9.89	19.99	9.89
2009/10	0.59	21.82	8.87	20.86	9.89

These clearly show that the amount of gas delivered to Ireland through Moffat increases until the Corrib field delivers gas to the ROI transmission system; it also shows that maximum use is made of the SNIP system to supply gas to Northern Ireland. These supply rates are based on the low supply scenario detailed in the 2005 Gas Capacity Statement for the Republic of Ireland and therefore this scenario represents the worst case supply position. The flows exclude compressor fuel demands which are calculated by the simulation program.

3.3 Model Assumptions

The network analysis model has been built incorporating the following features.

- All scenarios have been studied by simulating the 24-hour demand cycle over a period of 3 days to obtain repeatable results over the day.
- All demands are modelled in energy terms. Volumetric flow is calculated by the network analysis program by applying relevant gas calorific value. The ROI demands are published in the 2005 Gas Capacity statement, the Northern Ireland demands have been updated with new information received from the PS Gas Suppliers since the production of that document.
- For Ballylumford power station 4 new profiles were provided by SONI; Scenario 2 was adopted for the study as it was closest in volume to the Ballylumford booking level and was thought to give the best representation of the way Ballylumford would flow at the booked level.
- Full gas quality tracking is implemented to track changes in gas compositions throughout the network to allow computation of delivered gas calorific value.
- The South-North Pipeline is assumed to be available from 2006/7 even if no flow is required through the AGI at Gormanston
- The SNIP system, North-West and South-North Pipelines are modelled to the same level of detail as the ROI system. Flows up to 8.08 mscmd are taken at Twynholm. For Northern Ireland demand in excess of 8.08 mscmd, 8.08 mscmd is taken at Twynholm with the balance forwarded via the Interconnectors to the South-North Pipeline. Maximum discharge pressure from Twynholm into SNIP system is 75 barg; the contractual minimum pressure upstream of Twynholm is 56 barg. Pressure in SNIP system, North-West and South-North Pipelines is

controlled by the maximum pressure available in SNIP system at Twynholm as there is a contractual obligation to supply at the prevailing pressure.

- The design pressure of the South-North Pipeline is 85 barg via the appropriate facilities at Gormanston.
- For flows of greater than 26 mscmd through Moffat, the Beattock Station discharge pressure will be based on a report previously commissioned from PLE to determine Beattock compressor station handling capabilities with flows greater than the design flow.
- Pressure losses of 2 barg have been adopted for modelling purposes across Carrickfergus and Ballyalbanagh and 2.5 barg has been adopted at Twynholm.

4 RESULTS OF NETWORK MODELLING

4.1 Scenarios

The work was carried out for two levels of demand. The first was with all demands at their forecast peak day demand level, the second had all non power station loads turned down to 75% of the peak day demand level.

4.1.1 Peak day analysis

For Peak Day, four station loading scenarios for the regulators supplying or being supplied from the SNIP system are considered for Northern Ireland.

1. Case D - Flat flow through Twynholm, Carrickfergus is front loaded.
2. Case E – Flat flow through Twynholm, flat flow through Carrickfergus.
3. Case F – Flat flow through Twynholm, Carrickfergus is back loaded.
4. Case G – Flat flow through Twynholm, free flow through Carrickfergus.

Cases A, B and C relate to the way Twynholm is operated and on a peak day it is assumed that flows will be flat through the station.

Flat flow is maintained through the Gormanston regulator into the South-North Pipeline in the years that the Northern Ireland balance, i.e., > 8.08 mscmd, is routed via Brighthouse Bay, IC2, and Gormanston.

Front loading means the station flows at a rate of +20% of the average rate for 12 hours and then at -20% for the rest of the day. Back loading is this case with the flow profile reversed (i.e. -20% flow rate then +20%). In the free flow case the Carrickfergus regulator is not controlled except that a minimum pressure differential of 2 barg is used within the model.

The following table gives the predicted pressures for the SNIP system with the Carrickfergus regulator allowed to flow freely. The results assume that Corrib will be delayed by one year to 2008/09; clearly if it arrives as planned in 2007/08 the pressures predicted for that year will be higher.

Year	Twynholm		Gormanston (South-North)		C'fergus	B'lumford	Coolkeeragh
	Pressure (Max) (barg)	Flow (mscmd)	Pressure (Max) / (Min) (barg)	Flow (mscmd)	Flow (mscmd)	Pressure (Min) (barg)	Pressure (Min) (barg)
Design limits	75 (Max)	8.08	30 (Min)			27 (Min)	27 (Min)
2005/6	70.4	7.31	-	0	1.91	49.6	43.3
2006/7	66.6	7.48	51.3 / 44.6	0	2.09	45.9	39.1
2007/8	63.3	7.87	44.4 / 36.9	0	2.31	38.8	30.1
2008/9	73.6	8.06	57.6 / 50.5	0	2.34	52.0	45.2
2009/10	72.6	8.08	56.5 / 49.1	0.15	2.21	50.5	43.6

4.1.2 Off peak analysis

The system was analysed with the non power generation demand in the ROI and Northern Ireland reduced to 75% of the peak day level, power station demands were left unchanged. Six variations on the way the pressure reductions stations supplying or being supplied from the SNIP system were considered.

Case A – Twynholm front loaded, Carrickfergus is front loaded.

Case B – Twynholm front loaded, flat flow through Carrickfergus.

Case C – Twynholm front loaded, Carrickfergus is back loaded.

Case D - Flat flow through Twynholm, Carrickfergus is front loaded.

Case E – Flat flow through Twynholm, flat flow through Carrickfergus.

Case F – Flat flow through Twynholm, Carrickfergus is back loaded.

Case G – Flat flow through Twynholm, free flow through Carrickfergus.

The following table gives the predicted pressures for the SNIP system with the Carrickfergus regulator allowed to flow freely. The results assume that Corrib will be delayed by one year to 2008/09; clearly if it arrives as planned in 2007/08 the pressures predicted for that year will be higher.

Year	Twynholm		Gormanston (South-North)		C'fergus Flow (mscmd)	B'lumford Pressure (Min) (barg)	C'keeragh Pressure (Min) (barg)
	Pressure (Max) (barg)	Flow (mscmd)	Pressure (Max) / (Min) (barg)	Flow (mscmd)			
Limits	75 (Max)	8.08	30 (Min)			27 (Min)	27 (Min)
2005/6	73.6	6.77	-	0	1.86	56.4	51.0
2006/7	70.5	6.90	53.2 / 58.9	0	1.99	54.0	48.4
2007/8	68.8	7.19	49.4 / 55.6	0	2.16	50.5	44.2
2008/9	75.0	7.33	51.6 / 56.6	0	2.18	54.7	46.3
2009/10	75.0	7.46	50.8 / 55.9	0	2.20	54.0	45.6

5 DISCUSSION AND CONCLUSIONS

The main result from this report is that the pressure service available in Northern Ireland is sufficient to meet the shipper's requirements as analysed. This conclusion applies even if the delivery of the Corrib field is delayed by one year to 2008/09. It also shows that flows through the interconnector and the South – North Pipeline may not be required for Northern Ireland until 2009/10.

Although a free flow regime at the Carrickfergus regulator is a change in the way the station was planned to be operated the commercial implications of this change are being investigated.

This conclusion is based on the following assumptions:

- The supply pressure at Beattock to the inlet of the compressor station is 45barg.
- Carrickfergus regulator is allowed to flow freely with a minimum differential pressure across the station of 2 barg.

IMPORTANT NOTICE

Whilst every effort has been made to ensure the accuracy of the information contained in this report, neither Premier Transmission Limited, BGE & BGE (UK) Limited or Phoenix Natural Gas Limited nor any of their respective employees, officers, directors, agents, advisers or other representatives make any representation, as to fact or law, express or implied in connection with this report. No responsibility or liability is or will be accepted by any such persons in connection with the accuracy, completeness or sufficiency of this report (whether or not any error or mis-statement is negligent or otherwise) or the information contained in it.

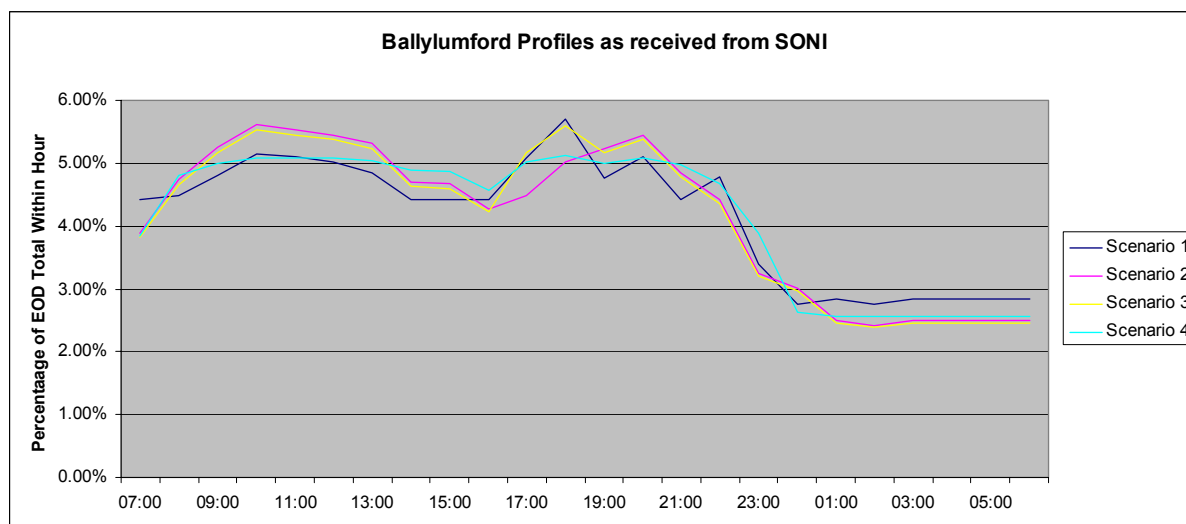
6 APPENDICES

6.1 Appendix A – Demand profiles

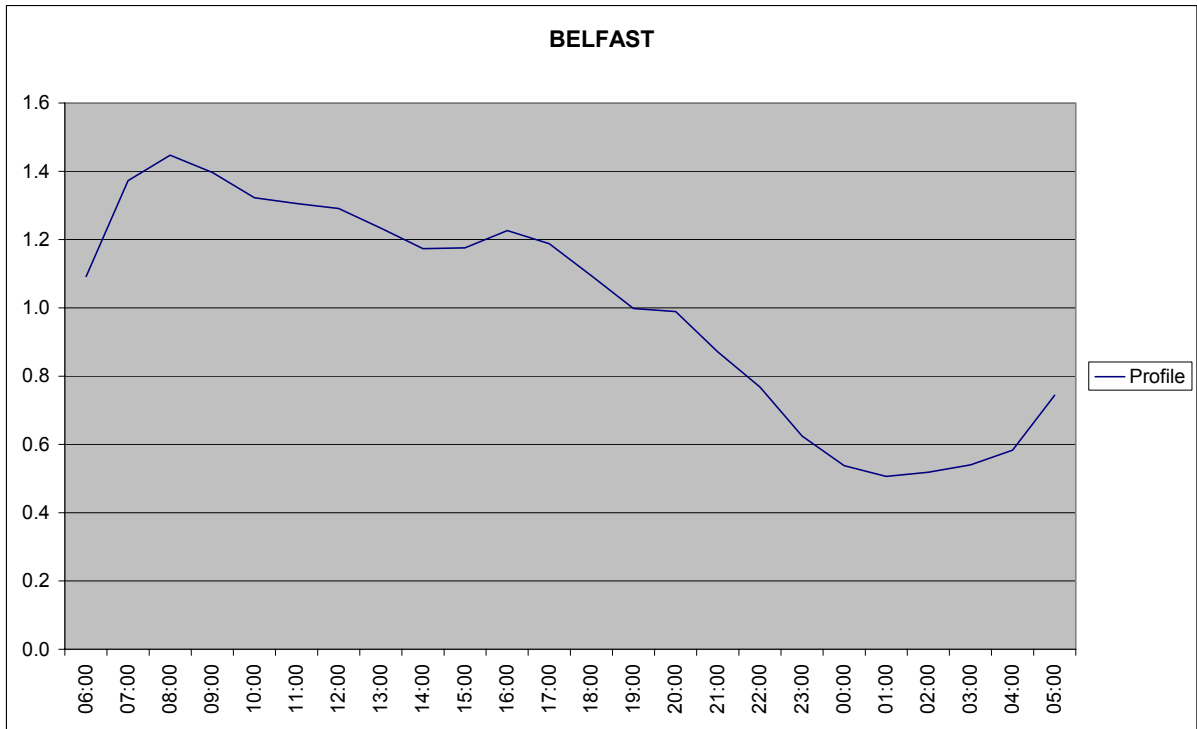
There are two main demand profiles in use which show the variation in the hourly demand over the day. These profiles are for the Ballylumford Power Station and for the city of Belfast. These profiles are displayed graphically below and overleaf.

SONI provided PTL with four profiles for the Ballylumford Power Station, scenario 2 was adopted in this analysis as it was closest in volume to the booking level of 3.43 scmd.

Coolkeeragh power station was assumed to be operating as a base load station to a flat profile (the hourly demand is 1/24th of the daily demand).



The Belfast demand profile has a distinct morning peak which reflects the fact that a larger proportion of the demand comes from the commercial and industrial market reflecting the way the load has built up in the city. As the domestic load increases this profile would be expected to move towards a more typical temperature sensitive di-urnal with an evening peak. This profile is shown overleaf.



6.2 Appendix B – Full analysis results peak day

All on-shore Ireland delivery pressure requirements are achieved. In all cases limits means the appropriate design limit

The following table summarises the on-shore Scotland conditions for these cases.

Corrib commencing 2008/9

Year	Moffat Flow ⁽¹⁾ (mscmd)	Beattock Discharge Pressure (barg)	Twynholm		Brighthouse Bay		Reinforcement ⁽¹⁾
			Upstream Pressure (barg)	Flow ⁽²⁾ (mscmd)	Flow (mscmd)	Inlet Pressure (barg)	
Limits		85	56 (Min)	8.08	18.3	52 (Min)	
2005/6	27.00	85.0	73.1	7.31	19.69	70.6	-
2006/7	30.31	85.0	69.2	7.48	22.83	65.8	-
2007/8	32.04	84.3	63.8	7.87	24.17	59.7	-
2008/9	23.85	85.0	76.1	8.06	15.79	74.5	-
2009/10	24.91	85.0	75.2	8.08	16.83	73.3	-

Notes:

1. The Moffat flow excludes Beattock and Brighthouse Bay fuel gas
2. Present maximum contractual flow is 8.08 mscmd

The following tables summarize the conditions in SNIP, North-West and South-North Pipelines.

Case D Carrickfergus flow front loaded (+20% for 12 Hours then -20% for the rest of the day)

Year	Twynholm Pressure (Max) (barg)	Gormanston (South-North)		C'fergus Flow (mscmd)	B'lumford Pressure ⁽¹⁾ (Min) (barg)	C'keeragh Pressure ⁽²⁾ (Min) (barg)	Reinforce- ment
		Pressure (Max) / (Min) (barg)	Flow (mscmd)				
Limits	75 (Max)	30 (Min)			27 (Min)	27 (Min)	
2005/6	70.5	-	0	1.91	44.3	29.2	-
2006/7	66.5	35.8 / 32.7	0	2.09	37.6	25.4 ⁽³⁾	-
2007/8	63.2	25.6 / 22.5	0	2.31	29.2	9.9 ⁽³⁾	-
2008/9	73.5	41.4 / 38.6	0	2.34	43.7	31.9	-
2009/10	72.5	39.9 / 37.3	0.15	2.21	41.9	30.2	-

Case E Carrickfergus at constant flow rate (hourly rate 1/24th of the daily rate)

Year	Twynholm Pressure (Max) (barg)	Gormanston (South-North)		C'fergus Flow (mscmd)	B'lumford Pressure ⁽¹⁾ (Min) (barg)	C'keeragh Pressure ⁽²⁾ (Min) (barg)	Reinforce- ment
		Pressure (Max) / (Min) (barg)	Flow (mscmd)				
Limits	75 (Max)	30 (Min)			27 (Min)	27 (Min)	
2005/6	70.4	-	0	1.91	46.2	39.1	-
2006/7	66.6	39.3 / 38.2	0	2.09	40.0	31.8	-
2007/8	63.3	31.2 / 29.5	0	2.31	32.5	20.6 ⁽³⁾	-
2008/9	73.6	46.1 / 44.4	0	2.34	46.5	38.3	-
2009/10	72.6	44.2 / 42.4	0.15	2.21	44.5	36.0	-

Case F Carrickfergus regulator back-loaded (-20% for 12 hours then +20% for 12 Hours)

Year	Twynholm Pressure (Max) (barg)	Gormanston (South-North)		C'fergus Flow (mscmd)	B'lumford Pressure ⁽¹⁾ (Min) (barg)	C'keeragh Pressure ⁽²⁾ (Min) (barg)	Reinforce- ment
		Pressure (Max) / (Min) (barg)	Flow (mscmd)				
Limits	75 (Max)	30 (Min)			27 (Min)	27 (Min)	
2005/6	70.4	-	0	1.91	48.0	37.2	-
2006/7	66.6	43.5 / 38.6	0	2.09	42.2	32.2	-
2007/8	63.3	35.8 / 29.7	0	2.31	34.7	21.0 ⁽³⁾	-
2008/9	73.6	50.6 / 44.8	0	2.34	48.7	38.8	-
2009/10	72.6	48.6 / 42.9	0.15	2.21	46.7	36.5	-

Case G Carrickfergus regulator flows freely

Year	Twynholm Pressure (Max) (barg)	Gormanston (South-North)		C'fergus Flow (mscmd)	B'lumford Pressure ⁽¹⁾ (Min) (barg)	C'keeragh Pressure ⁽²⁾ (Min) (barg)	Reinforce- ment
		Pressure (Max) / (Min) (barg)	Flow (mscmd)				
Limits	75 (Max)	30 (Min)			27 (Min)	27 (Min)	
2005/6	70.4	-	0	1.91	49.6	43.3	-
2006/7	66.6	51.3 / 44.6	0	2.09	45.9	39.1	-
2007/8	63.3	44.4 / 36.9	0	2.31	38.8	30.1	-
2008/9	73.5	57.6 / 50.5	0	2.34	52.0	45.2	-
2009/10	72.6	56.5 / 49.1	0.15	2.21	50.5	43.6	-

Notes:

1. Ballylumford pressure is that in the mainline.
2. Coolkeeragh pressure is that in the pipeline upstream of the AGI
3. Pressure upstream of Coolkeeragh is below 27 barg.

6.3 Appendix C – Full analysis results at 75% of peak day

All on-shore Ireland delivery pressure requirements are achieved.

The following tables summarise the on-shore Scotland conditions for these cases:

Corrib commencing 2008/9

Cases A, B and C

Pressures and flows in the table below represent the minimum and maximum values caused by the profiling of the Twynholm flow through Moffat.

Year	Moffat Flow ⁽¹⁾ (mscmd)	Beattock Discharge Pressure (barg)	Twynholm		Brighthouse Bay		Reinforce-ment
			Upstream Pressure (barg)	Flow ⁽²⁾ (mscmd)	Flow (mscmd)	Inlet Pressure (barg)	
Limits		85	56 (Min)	8.08	18.3	52 (Min)	
2005/6	22.49 /25.20 ⁽³⁾	85.0	72.3 / 74.9	5.42 / 8.13	17.07	73.0 / 75.5	-
2006/7	25.57 /28.34 ⁽³⁾	85.0	71.6 / 74.5	5.52 / 8.28	20.06	69.0 / 72.0	-
	26.96 ⁽⁴⁾	85.0	73.1	5.52 / 8.28	21.44 /18.67	70.6	-
2007/8	26.98 /29.86 ⁽³⁾	85.0	69.8 / 73.1	5.75 / 8.63	21.23	66.9 / 70.3	-
	28.42 ⁽⁴⁾	85.0	71.6	5.75 / 8.63	22.67 /19.79	68.6	-
2008/9	18.53 /21.46 ⁽³⁾	85.0	78.1 / 80.2	5.87 /8.80	12.66	77.0 / 79.1	-
2009/10	19.37 /22.36 ⁽³⁾	85.0	77.4 / 79.7	5.97 /8.96	13.40	76.2 / 78.5	-

Cases D, E, F and G

Year	Moffat Flow ⁽¹⁾ (mscmd)	Beattock Discharge Pressure (barg)	Twynholm		Brighthouse Bay		Reinforce-ment
			Upstream Pressure (barg)	Flow ⁽²⁾ (mscmd)	Flow (mscmd)	Inlet Pressure (barg)	
Limits		85	56 (Min)	8.08	18.3	52 (Min)	
2005/6	23.84	85.0	76.1	6.77	17.07	74.3	-
2006/7	26.96	85.0	73.1	6.90	20.06	70.6	-
2007/8	28.42	85.0	71.6	7.19	21.23	68.8	-
2008/9	19.99	85.0	79.2	7.33	12.66	78.1	-
2009/10	20.86	85.0	78.6	7.46	13.40	77.4	-

Notes:

1. Moffat flow excludes Beattock & Brighthouse Bay fuel gas.
2. Present maximum contractual flow is 8.08 mscmd.
3. For Cases A, B & C flow is profiled through Moffat with corresponding changes in the Beattock Compressor Station discharge pressure to mimic the operating curves.
4. For Cases A, B & C Brighthouse Bay flow is reverse profiled against Twynholm flow to give flat flow through Moffat.

The following tables summarize the conditions in SNIP, North-West and South-North Pipelines.

Corrib commencing 2008/9

Case A

Year	Twynholm Pressure (Max) (barg)	Gormanston (South-North)		C'fergus Flow (mscmd)	B'lumford Pressure ⁽¹⁾ (Min) (barg)	C'keeragh Pressure ⁽²⁾ (Min) (barg)	Reinforce- ment
		Pressure (Min) / (Max) (barg)	Flow (mscmd)				
Limits	75 (Max)	30 (Min)			27 (Min)	27 (Min)	
2005/6	72.2	-	0	1.86	54.2	43.3	-
2006/7	68.9 ⁽³⁾	46.5 / 49.4	0	1.99	49.3	41.2	-
	70.3 ⁽⁴⁾	48.5 / 51.4	0	1.99	51.2	43.4	-
2007/8	67.1 ⁽³⁾	41.2 / 44.1	0	2.16	45.1	35.2	-
	68.9 ⁽⁴⁾	44.2 / 47.0	0	2.16	47.8	38.4	-
2008/9	75.0	52.2 / 54.9	0	2.18	55.0	47.1	-
2009/10	74.9	51.1 / 53.8	0	2.20	54.2	45.9	-

Case B

Year	Twynholm Pressure (Max) (barg)	Gormanston (South-North)		C'fergus Flow (mscmd)	B'lumford Pressure ⁽¹⁾ (Min) (barg)	C'keeragh Pressure ⁽²⁾ (Min) (barg)	Reinforce- ment
		Pressure (Min) / (Max) (barg)	Flow (mscmd)				
Limits	75 (Max)	30 (Min)			27 (Min)	27 (Min)	
2005/6	72.4	-	0	1.86	54.4	48.6	-
2006/7	69.0 ⁽³⁾	48.2 / 48.9	0	1.99	49.4	42.9	-
	70.6 ⁽⁴⁾	50.3 / 51.0	0	1.99	51.4	45.2	-
2007/8	67.1 ⁽³⁾	43.5 / 44.7	0	2.16	45.0	37.6	-
	68.9 ⁽⁴⁾	46.1 / 47.3	0	2.16	47.6	40.5	-
2008/9	75.0	53.8 / 55.0	0	2.18	55.0	48.8	-
2009/10	74.9	53.0 / 54.2	0	2.20	54.2	47.8	-

Case C

Year	Twynholm Pressure (Max) (barg)	Gormanston (South-North)		C'fergus Flow (mscmd)	B'lumford Pressure ⁽¹⁾ (Min) (barg)	C'keeragh Pressure ⁽²⁾ (Min) (barg)	Reinforce- ment
		Pressure (Min) / (Max) (barg)	Flow (mscmd)				
Limits	75 (Max)	30 (Min)			27 (Min)	27 (Min)	
2005/6	72.2	-	0	1.86	53.1	39.1	-
2006/7	68.9 ⁽³⁾	43.3 / 47.6	0	1.99	47.9	37.6	-
	70.4 ⁽⁴⁾	45.5 / 42.8	0	1.99	49.9	40.0	-
2007/8	67.1 ⁽³⁾	37.6 / 42.8	0	2.16	43.6	30.9	-
	68.9 ⁽⁴⁾	40.6 / 45.7	0	2.16	46.4	34.3	-
2008/9	75.0	48.1 / 53.1	0	2.18	53.7	42.6	-
2009/10	74.9	47.1 / 52.2	0	2.20	52.9	41.5	-

Case D

Year	Twynholm Pressure (Max) (barg)	Gormanston (South-North)		C'fergus Flow (mscmd)	B'lumford Pressure ⁽¹⁾ (Min) (barg)	C'keeragh Pressure ⁽²⁾ (Min) (barg)	Reinforce- ment ¹
		Pressure (Min) / (Max) (barg)	Flow (mscmd)				
Limits	75 (Max)	30 (Min)			27 (Min)	27 (Min)	
2005/6	73.6	-	0	1.86	51.8	38.8	-
2006/7	70.5	43.4 / 46.4	0	1.99	47.1	37.9	-
2007/8	69.0	39.0 / 41.9	0	2.16	43.4	32.7	-
2008/9	74.9	46.6 / 49.3	0	2.18	50.5	41.0	-
2009/10	75.0	45.6 / 48.4	0	2.20	49.8	40.0	-

Case E

Year	Twynholm Pressure (Max) (barg)	Gormanston (South-North)		C'fergus Flow (mscmd)	B'lumford Pressure ⁽¹⁾ (Min) (barg)	C'keeragh Pressure ⁽²⁾ (Min) (barg)	Reinforce- ment
		Pressure (Min) / (Max) (barg)	Flow (mscmd)				
Limits	75 (Max)	30 (Min)			27 (Min)	27 (Min)	
2005/6	73.6	-	0	1.86	53.6	47.7	-
2006/7	70.6	48.0 / 48.8	0	1.99	49.3	42.8	-
2007/8	68.9	44.0 / 45.2	0	2.16	45.5	38.1	-
2008/9	75.0	51.5 / 52.7	0	2.18	52.8	46.3	-
2009/10	75.0	50.6 / 51.9	0	2.20	52.0	45.3	-

Case F

Year	Twynholm Pressure (Max) (barg)	Gormanston (South-North)		C'fergus Flow (mscmd)	B'lumford Pressure ⁽¹⁾ (Min) (barg)	C'keeragh Pressure ⁽²⁾ (Min) (barg)	Reinforce- ment
		Pressure (Min) / (Max) (barg)	Flow (mscmd)				
Limits	75 (Max)	30 (Min)			27 (Min)	27 (Min)	
2005/6	73.6	-	0	1.86	55.2	45.8	-
2006/7	70.5	48.0 / 52.3	0	1.99	50.9	42.8	-
2007/8	68.8	44.0 / 49.1	0	2.16	47.4	38.2	-
2008/9	75.0	51.6 / 56.6	0	2.18	54.7	46.3	-
2009/10	75.0	50.8 / 55.9	0	2.20	54.0	45.6	-

Case G

Year	Twynholm Pressure (Max) (barg)	Gormanston (South-North)		C'fergus Flow (mscmd)	B'lumford Pressure ⁽¹⁾ (Min) (barg)	C'keeragh Pressure ⁽²⁾ (Min) (barg)	Reinforce- ment
		Pressure (Min) / (Max) (barg)	Flow (mscmd)				
Limits	75 (Max)	30 (Min)			27 (Min)	27 (Min)	
2005/6	73.6	-	0	1.86	56.4	51.0	-
2006/7	70.5	53.2 / 58.9	0	1.99	54.0	48.4	-
2007/8	68.9	49.4 / 55.6	0	2.16	50.5	44.2	-
2008/9	75.0	51.6 / 56.6	0	2.18	54.7	46.3	-
2009/10	75.0	50.8 / 55.9	0	2.20	54.0	45.6	-

Notes:

1. Ballylumford pressure is that in the mainline.
2. Coolkeeragh pressure is that in the pipeline upstream of the AGI
3. For Cases A, B & C flow is profiled through Moffat with corresponding changes in the Beattock Compressor Station discharge pressure to mimic the operating curves.
4. For Cases A, B & C Brighthouse Bay flow is reverse profiled against Twynholm flow to give flat flow through Moffat.