



Gas  
Networks  
Ireland

Systems  
Performance  
Report  
2016





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# 01.

## Executive Summary

The Gas Networks Ireland Performance Report has been published annually since 2008. In 2015, the report format was changed, the original combined Performance Report has been replaced with the introduction of two specific reports:

- A Systems Performance Report; and
- A Customer Performance Report.

The Systems Performance Report provides an overview of how both the natural gas transmission and distribution networks have operated during 2016 in relation to all systems activities.

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Gas demand  
increased by  
**10% in 2016**  
compared to  
2015

In 2016 Gas Networks Ireland continued to build and operate a modern and safe gas network. The business maintained a strong safety record and successfully completed planned work programmes.

Gas demand increased by 10% in 2016 compared to 2015; this can be attributed to economic growth factors and further requirements from the power generation sector during the period. The Corrib gas field came on stream in late 2015 adding a third entry point to the system, further enhancing Ireland's energy security and providing additional capacity in the network to meet growing demand. The Corrib entry point has also changed the operation of the system, necessitating variable flows.

Natural gas is the most environmentally friendly fossil fuel; it is a clean, secure, flexible, adaptable fuel which can play a key role in the transition of the Irish economy to a low carbon future, capable of meeting Ireland's future energy needs. As the economy continues to recover, connections to the network have increased and gas demand is forecast to grow in the shorter term. However, climate change policies and technological advances in renewable technology and storage will present Gas Networks Ireland with long term demand challenges that need to be planned and prepared for in the immediate term.

Gas Networks Ireland endeavours to operate and maintain an efficient system by investing in replacement and maintenance of the pipeline assets through capital programmes and growing the network to facilitate new connections and towns, so that it can continue to deliver a safe, secure and cost effective energy and offset the market demand challenges. In 2016, the connection of Listowel to the natural gas network was announced, work continued on the connection of Nenagh and Wexford towns.

# 02.

## Introduction

The Gas Networks Ireland System Performance Report meets the licence conditions pertaining to “Overall standards and performance” of the four licences held by Gas Networks Ireland, granted by the Commission for Energy Regulation (CER);

- Distribution System Owner Licence;
- Distribution System Operator (DSO) Licence;
- Transmission System Owner Licence; and
- Transmission System Operator (TSO) Licence.

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Deliver gas  
to over **26,000**  
businesses  
and almost  
**654,000** homes  
throughout  
Ireland

Gas Networks Ireland is responsible for developing, maintaining and operating the gas transmission and distribution systems. The Gas Networks Ireland system connects the Republic of Ireland (RoI) to Scotland, Northern Ireland (NI) and the Isle of Man (IoM). Gas Networks Ireland does not purchase, trade or sell gas to customers; it transports the gas on behalf of suppliers and shippers who purchase the gas from the wholesale gas market, and in turn use the transportation services of Gas Networks Ireland to deliver gas to over 26,000 businesses and almost 654,000 homes throughout Ireland. The Gas Networks Ireland system includes infrastructure in RoI regulated by the CER, NI regulated by the Utility Regulator (UR) and South West Scotland regulated by Ofgem. The natural gas network is differentiated by prevailing pressures:

- high pressure transmission infrastructure which operates above 16 barg (the total length of transmission pipeline is 2,427km); and
- distribution infrastructure which operates below 16 barg (the total length of distribution pipeline is 11,527km)

The transmission system is detailed in Figure 2.1 overleaf.

# 02. Introduction

Figure 2.1: Overview of Gas Networks  
Ireland Transmission System





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Natural gas is actively promoted by Gas Networks Ireland as **a fuel of choice for homes, businesses and industry**

Natural gas is transported to 680,000 customers through a network of 13,954km pipelines, 24 hours a day, 365 days a year. Gas Networks Ireland is responsible for connecting all customers to the network, regardless of their supplier. The company manages a 24 hour gas emergency service, handling over 17,000 call-outs a year.

Through the Gas Networks Ireland Connections Policy, Gas Networks Ireland continually brings the benefits of natural gas to new towns. In 2016, construction work on gas to Nenagh and Wexford town continued and the network extension to include Listowel was also announced.

Natural gas is a clean, efficient and cost effective fuel. Natural gas is actively promoted by Gas Networks Ireland as a fuel of choice for homes, businesses and industry. The organisation is keen to see greater utilisation of the natural gas network and explore opportunities to expand the network where viable. There is considerable emphasis on investing in new business areas such as natural gas vehicles and renewable gas.

# 03.

## Transmission System

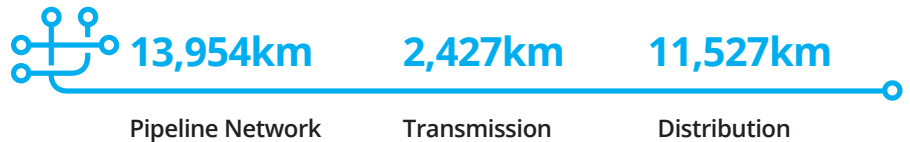
This report satisfies condition 17 of the Transmission System Operator Licence and condition 13 of the Transmission System Owner Licence. Gas Network Ireland's primary responsibility is to transport gas from entry to exit points on the network, on behalf of customers, while ensuring that the network is operated safely and efficiently.

The natural gas network is comprised of high pressure steel transmission pipes and **low pressure polyethylene distribution pipes**

The natural gas network consists of 13,954km of pipeline. Of this 2,427km is made of high pressure steel transmission pipelines. The RoI transmission system consists primarily of the high pressure (70 barg) ring-main linking Dublin, Galway, and Limerick. It also consists of a number of spur lines to Cork, Waterford and lower pressure (40 barg and 19 barg) local area (regional) networks in large urban centers. In addition, the Mayo-Galway pipeline connects the ring-main to the Bellanaboy terminal, Co. Mayo, where Corrib gas enters the Irish transmission system. The Corrib entry point became active and delivered first entry gas to RoI on 30th December 2015. The terminal is now flowing at full capacity since the end of July 2016. The addition of Corrib brings the total number of entry points on the system to three including Moffat and Inch.

The natural gas network is comprised of high pressure steel transmission pipes and low pressure polyethylene distribution pipes. The transmission pipes link Ireland’s major urban areas and also connect Ireland to the UK. Power Stations and some large Industrial customers are also directly connected to the transmission network.

Figure: 3.1 Pipeline Network



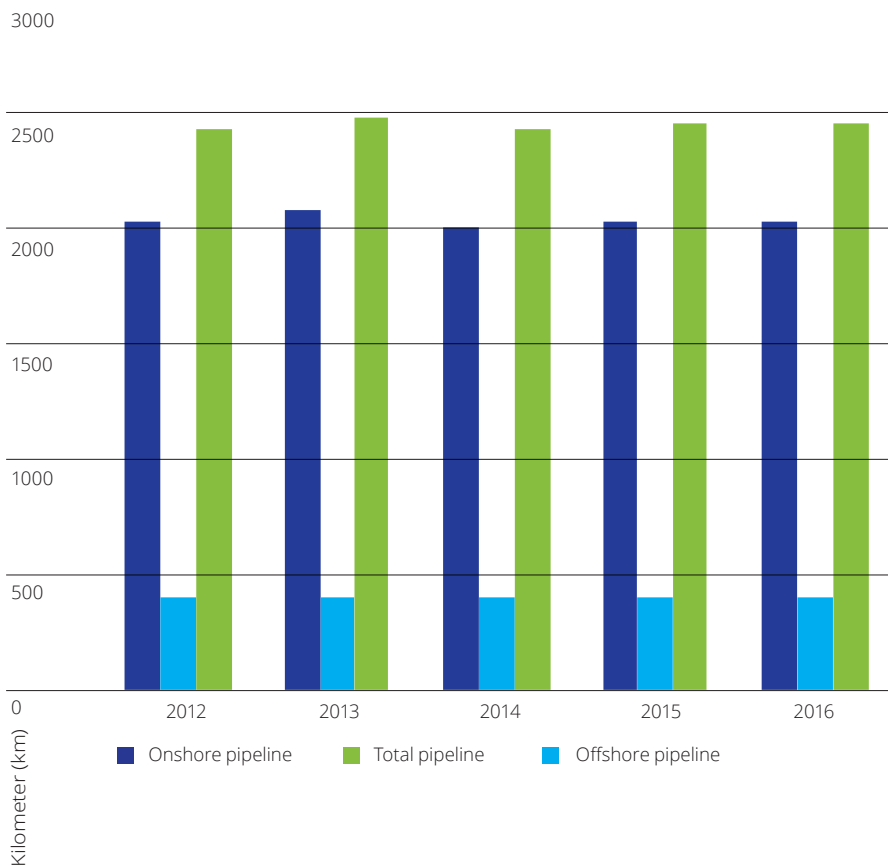
## 03. Transmission System

Transmission system pipeline at the end of 2016 was **2,427 kilometres in length**

### 3.1 Total length of pipe in transmission system

The transmission system pipeline network consists of both onshore and offshore pipes. The length of pipeline has remained consistent over the last number of years with minor variations, due to adding new transmission customers or decommissioning. At the end of 2016 the transmission network was 2,427 kilometres in length.

Figure 3.2: Transmission pipeline length

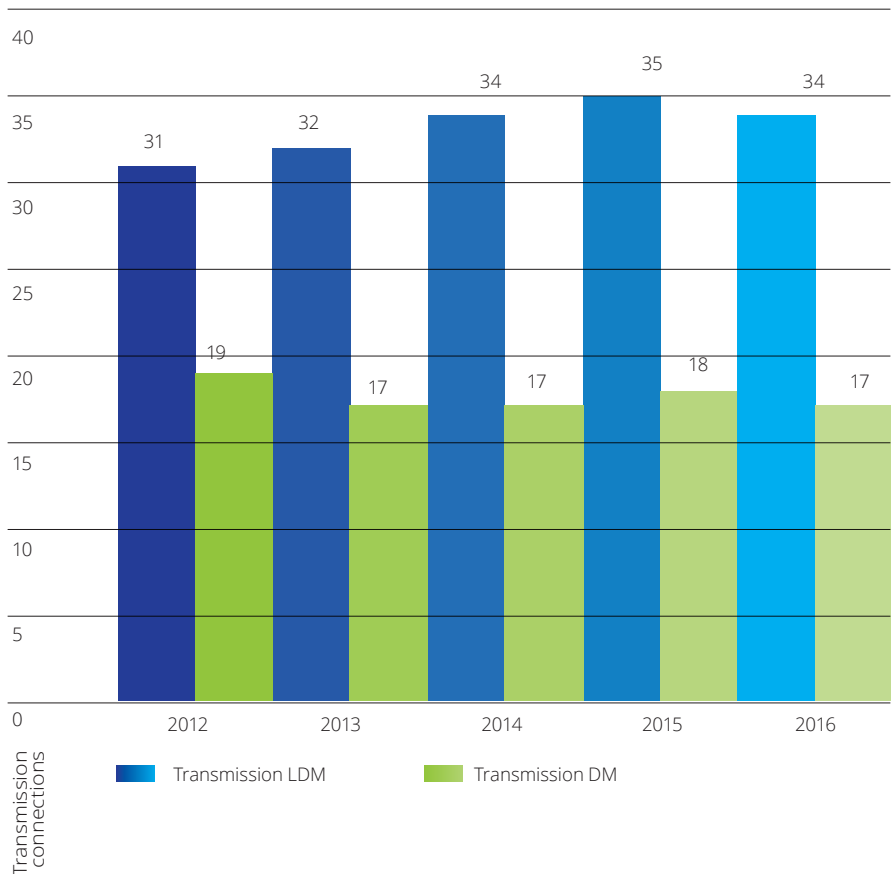


The total number of connections to the Gas Networks Ireland transmission network in 2016 was 51

### 3.2 Total number of Connections

The total number of connections to the Gas Networks Ireland transmission network in 2016 was 51; of these 34 were Large Daily Metered (LDM) and 17 were Daily Metered (DM). Transmission connections have fluctuated slightly over the past number of years, the 2016 figures are the same as they were in 2014, see Figure 3.3.

Figure 3.3: Transmission connections



# 04.

## Transmission System Data

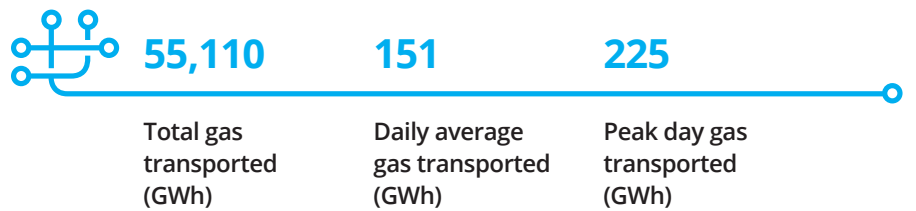
Managing the flow of gas from the entry points to the end consumer is a sophisticated 24-hour operation. It involves continuous monitoring of gas flows, temperatures and system pressures through a Supervisory Control and Data Acquisition (SCADA) system for both transmission and distribution networks. SCADA uses process data telemetered from all the operational sites and installations to monitor and operate the entire gas network. In addition to the SCADA system, Gas Networks Ireland utilises a number of additional systems to assist with the operation of both the transmission and distribution networks. These include the Geographical Information System (GIS), Maximo work management system, SafePermit for non routine operations, permits to work and on-line access to Gas Networks Ireland IT infrastructure and systems.

The transmission network is operated by Grid Control which is a 24/7 manned control room consisting of **12 Grid Controllers**

The transmission network is operated by Grid Control which is a 24/7 manned control room consisting of 12 Grid Controllers. The Grid Controllers are responsible for operational and commercial function. The operational element of the control room is facilitated by SCADA to safely and efficiently operate the network including system flows, temperatures, pressures and alarm management. The commercial aspect of gas transportation is facilitated by the Gas Transportation Management System (GTMS) through which the Grid Controllers ensure supply-demand balance. This is achieved through management of the daily nomination and allocation process, ensuring that the correct volume of gas is transported at all times to meet shipper, customer and system requirements.

#### 4.1 Throughput

System throughput is the total physical volume of natural gas transported through the Irish gas network by Gas Networks Ireland. The total gas transported in the calendar year 2016 was 55,110 GWh, which represents an increase of c.10% from 50,192 GWh in 2015. This includes 64 GWh of fuel gas transported for NI which was burned at Beattock Compressor Station. Gas transported for RoI Power-Generation in 2016 increased by 21% in comparison to 2015 figures. A summary of the gas throughput from 2012 to 2016 is illustrated in Table 4.3 and Figure 4.1.



## 04. Transmission System Data

Gas transported for RoI Power-Generation in 2016 displayed an **increase of 21% in comparison to 2015 figures**

Figure 4.1: System throughput

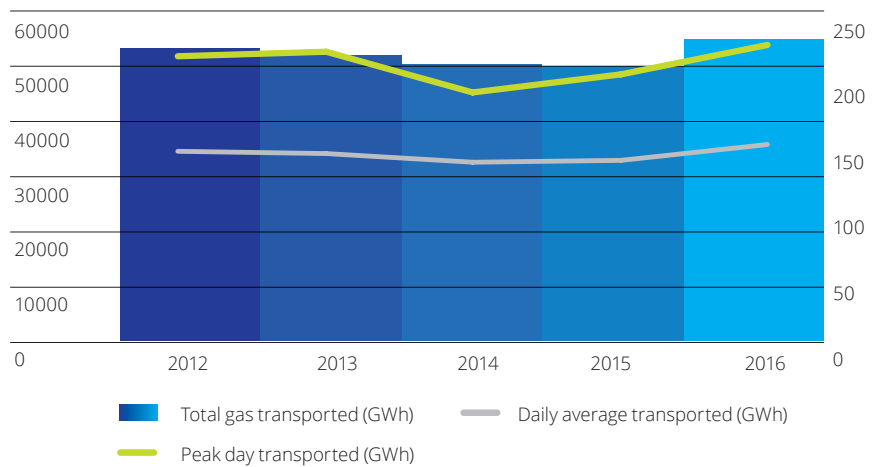
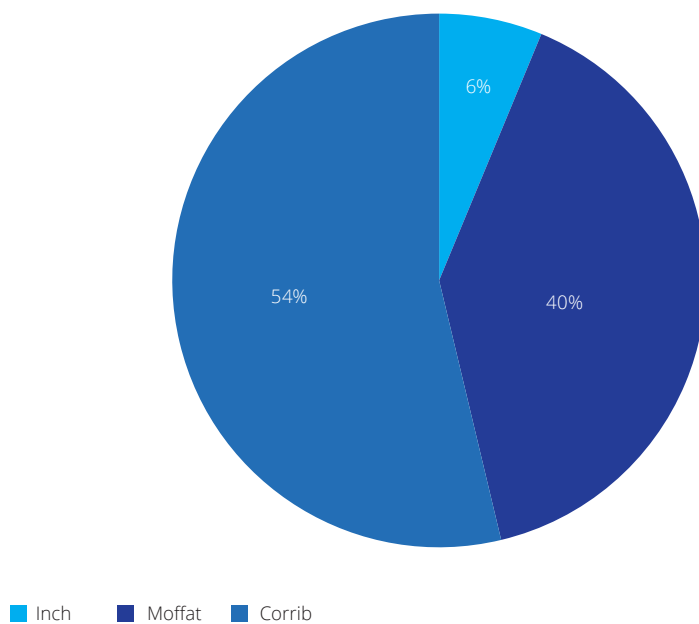


Figure 4.2: System throughput per entry point (Calendar Year 2016)





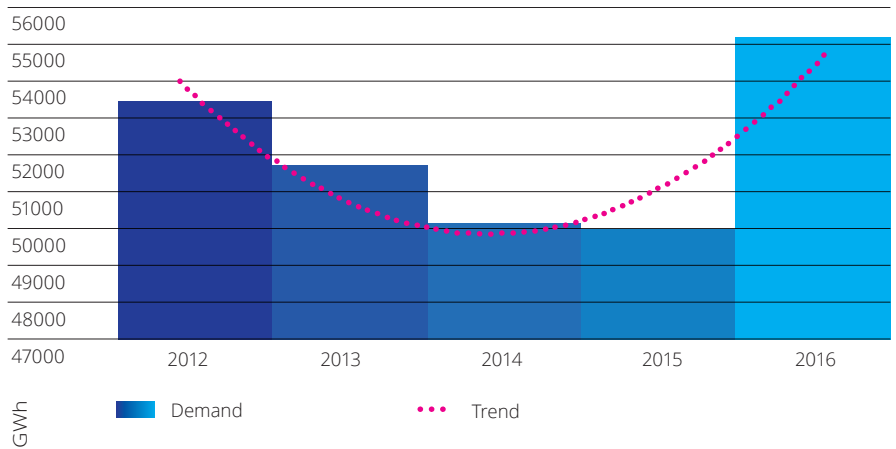
The demand for gas in 2016 increased by **10% on the 2015 demand**

### 4.2 Demand change

Demand is the total amount of gas physically off-taken from the gas network in the RoI each year. Figure 4.3 reflects the demand for gas in 2016 which has increased by 10% on the 2015 demand. The increase has been experienced across all sections of the gas market including power generation, LDM, NDM and DM:

- **Power Gen** Increase of 21% mainly due to Moyle Electricity I/C operating on reduced capacity and downtime of the East West I/C;
- **LDM & DM** Continued growth in the Industrial and Commercial (I & C) sector with a 17% increase in annual demand; and
- **NDM** Marginal increase of 3% on 2015 demand.

Figure 4.3: Demand change



## 04. Transmission System Data

Fuel usage of **576 GWh** for 2016 decreased from **648 GWh** in 2015

### 4.3 System efficiency

#### (a) Delivery

In October 2015, as part of the introduction of the EU Network Balancing Code, an Operational Balancing Account (OBA) was introduced at all Interconnection Points (IP) entry points. This is a result of allocations now being equal to nominations, as opposed to the actual metering in normal operating conditions. The OBA has added flexibility in delivering the total nominations each day. This has daily and cumulative limits for each IP as agreed by the network operators.

The amendment to the EU Network Code in October 2015 saw the removal of the requirement for shippers to maintain a Zero Imbalance Position (ZIP)<sup>1</sup>. This has resulted in higher variability in entry-exit nominations at the Moffat IP. Large upward and downward nomination movements late in the gas day are now much more frequent. The development of the enhanced functionality of Virtual Reverse Flow (VRF) as an interruptible product on GTMS has also resulted in entry nominations diverging from the physical metered volumes at IPs. This has created increased difficulty in compressor management in achieving end-of-day entry nominations at the Moffat IP. Each compressor station has a minimum required flow of gas for operation. If the required flow of gas is lower than the minimum, recycling<sup>2</sup> may be used. If the gas flow is too low to accommodate recycling, then batching<sup>3</sup> will be used. Batching of compressors in Scotland is now a daily operation which can impact balancing end of day nominated quantities. At the Inch entry point, low hourly flows have at times led to difficulties in achieving the end of day quantities nominated by shippers. Low hourly flows are a result of shipper/producer requirements. Providing entry gas at low flow at Inch, required recycling of the flow for the safe and economical running of Midleton compressors.

#### (b) Fuel Usage

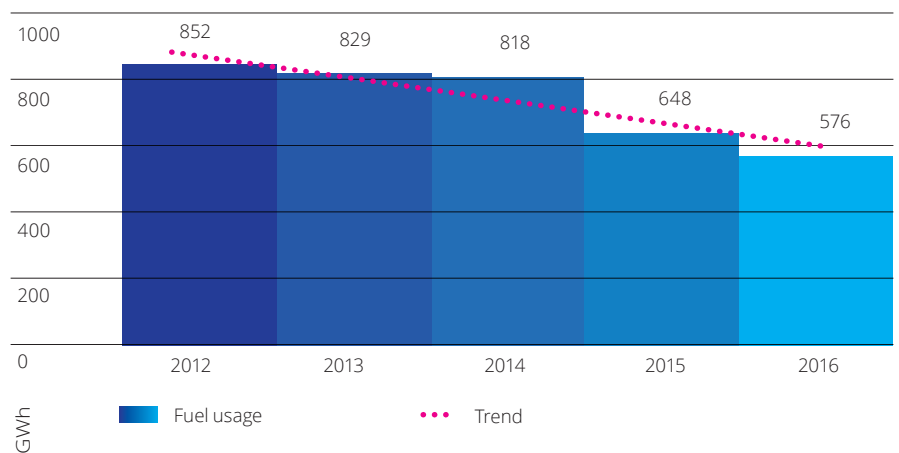
Fuel usage of 576 GWh for 2016 decreased from 648 GWh in 2015 as per Figure 4.4. This decline is a direct result of increased Corrib entry gas and reduced Moffat entry gas. Delivery of gas through Moffat requires operation of Beattock and Brighthouse Bay compressor stations; which, results in very high pressure gas being received at the two shore stations, pressure must then be reduced to enter the Rol network. This requires the use of boilers to heat the gas prior to pressure reduction. Entry gas from Corrib does not require pressure reduction and therefore has a lower fuel usage.

1 ZIP required that Total Entry Nominations = Total Exit Nominations at all times during a gas day. The requirement has now moved to an end of day requirement.

2 Recycling a proportion of the gas flows back through the compressor unit to artificially increase the flowrate. The result is lower throughput, however the compressor behaves as if there is more flow.

3 This is the process of switching off the compressor for a few hours so that the same required flow can be accommodated in lesser hours. The result is an increased flowrate above the compressor minimum.

Figure 4.4: Fuel usage



1.9% of all transmission site-metering validation checks carried out in 2016 resulted in adjustments

(c) Meter Read Verification

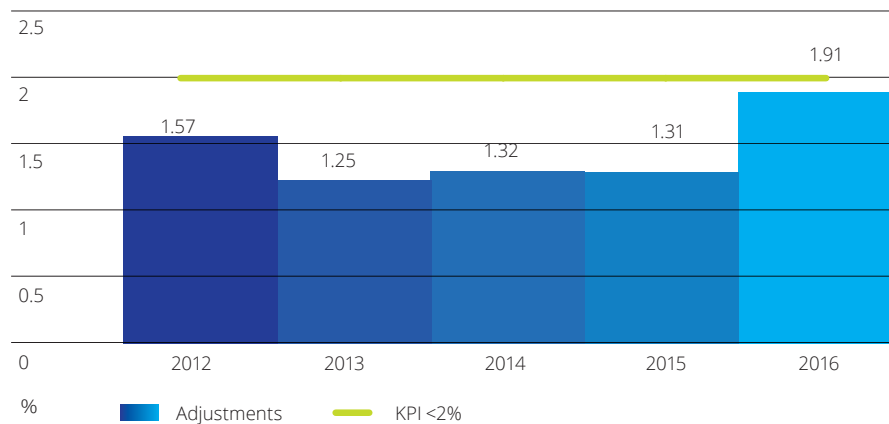
Transmission meter read verifications give an indication of the number of transmission connected gas points that require meter reading adjustments as a result of failed meter reading validation<sup>4</sup>. Figure 4.5 shows that 1.9% of all transmission site-metering validation checks carried out in 2016 resulted in adjustments (i.e. approximately 25 transmission site-metering adjustments performed out of 1,308 metering validation checks in 2016). Adjustments are required to ensure accurate reading when a meter is out of tolerance, configured incorrectly or replaced.

Adjustments increased in 2016 by 0.6% on the previous year. This resulted from a review of consumption patterns of all fiscal metering sites; both transmission and distribution. Gas Networks Ireland has increased the frequency of and introduced additional, validation checks which has resulted in an increased number of adjustments identified in 2016, ensuring more accurate end user allocations.

4 Adjustments typically arise as a result of (i) a communications failure – e.g. a site telemetry failure resulting in advances in the site meter not properly communicated to GTMS via SCADA. (ii) an issue with the meter correction equipment on site.

## 04. Transmission System Data

Figure 4.5: Meter read verification



Gas Networks Ireland has maintenance and calibration policies in place for all meters and instrumentation to **ensure the accuracy of measurement** of gas entering and exiting the system

### 4.4 Transmission unaccounted for gas

Unaccounted for Gas (UAG)<sup>5</sup> means natural gas which is lost or otherwise unaccounted for in the transportation system or any localised part thereof. Figure 4.6 relates to transmission UAG<sup>6</sup> as a percentage of the overall system throughput.

UAG is dependent on a number of factors including the following;

- **Gas Measurement** – The received gas at the three entry points differs in terms of its composition and energy value. This leads to measurement uncertainties in terms of the fixed gas component values on fiscal metering flow computers; and
- **Operations and maintenance** – venting of gas, purging of pipelines, meters, gas chromatographs and gas leakage.

Gas Networks Ireland has maintenance and calibration policies in place for all meters and instrumentation to ensure measurement accuracy of gas entering and exiting the system. Gas Networks Ireland's general pipeline and Above Ground Installation (AGI) maintenance policies seek to prevent leakage and minimise venting of gas.

<sup>5</sup> Volume as a % of total gas

<sup>6</sup> Transmission UAG is calculated as Entry (Stock Gas + Metered Entry) Minus Exit (Metered Exit + Shrinkage + Own Use Gas)

Figure 4.6: Transmission UAG (% throughput)

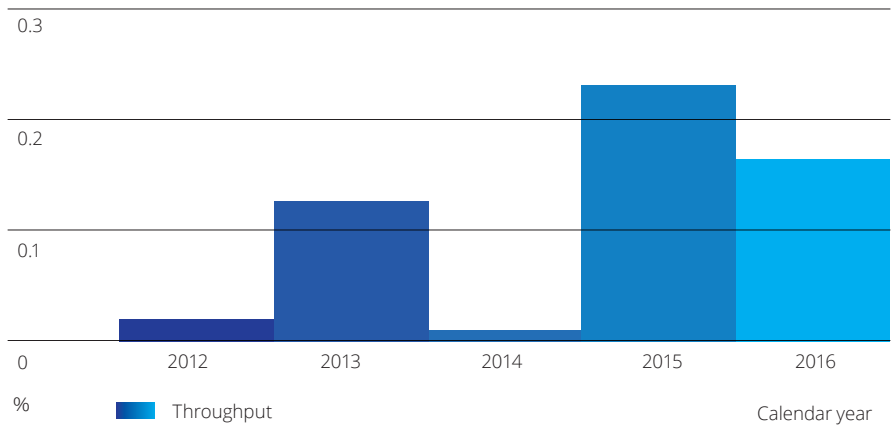
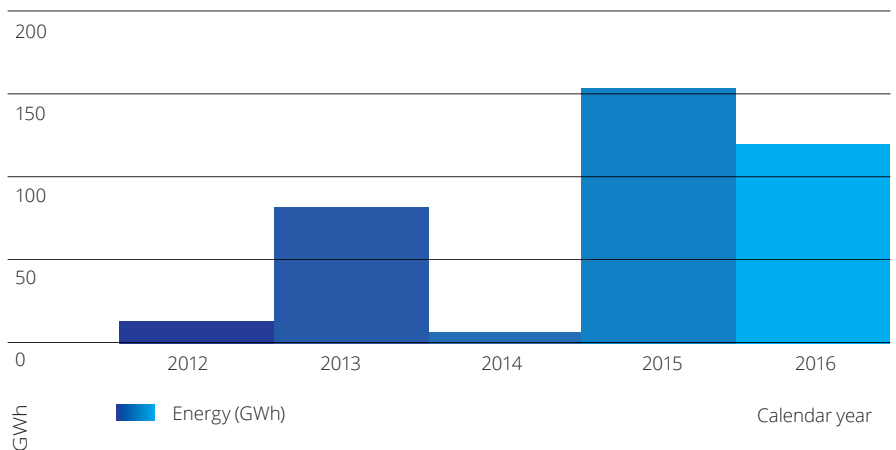


Figure 4.7: Transmission UAG (energy - GWh)



The reduction in UAG in 2016 is a result of **increased metering verification checks** being carried out to ensure more accurate gas accounting

The reduction in UAG in 2016 is a result of increased metering verification checks conducted to ensure more accurate gas accounting. UAG is measured in "Gas Year" (October-September), and therefore the calendar year value may be different.

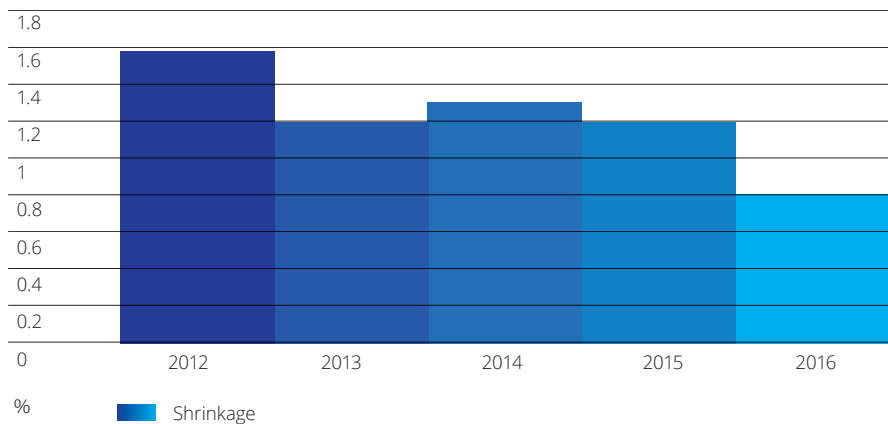
## 04. Transmission System Data

Shrinkage Gas attributed to the RoI system as a percentage of throughput stood at **0.8% in 2016**

### 4.5 Shrinkage and balancing

“Shrinkage Gas” means own use gas and/or natural gas required to replace “Unaccounted for Gas” (UAG) and gas used for fuel within the network. Table 4.9 shows Shrinkage Gas attributed to the RoI system as a percentage of throughput stood at 0.8% in 2016, this is illustrated in Figure 4.8.

Figure 4.8: Shrinkage as % of throughput



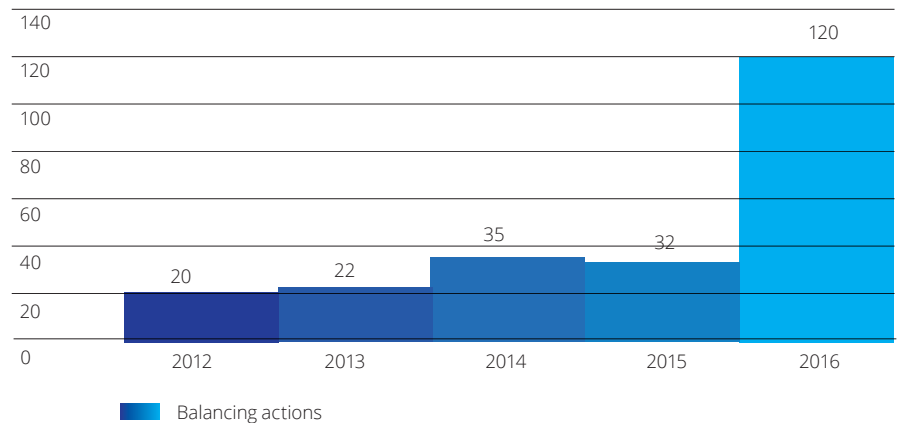
The reduction in fuel gas usage; as previously outlined, is due to the reduction in the use of the interconnectors and Scottish compressor stations since the full capacity of the Corrib entry point is being utilised. Fuel gas is used to run the compressor stations and network installations.

A balancing action means buying or selling gas as required to match the amount of gas entering and leaving the system. Smaller more frequent balancing actions are now being utilised to foster liquidity at Irish Balancing Point (IBP) market. In addition, shipper behaviour in terms of nomination imbalances has greatly contributed to the significant increase in balancing actions needed to maintain sufficient line-pack<sup>7</sup> for network service and operational safety.

**Table 4.1: System balancing actions**

Action	2012	2013	2014	2015	2016
System balancing actions	20	22	35	32	120
Shipper imbalance as % of total flow <sup>8</sup>	0.4%	0.22	0.39%	0.24%	0.54%

**Figure 4.9: System balancing actions**



Gas Networks Ireland is committed to managing its impact on the environment

**4.6 Carbon usage/emissions**

Gas Networks Ireland is committed to managing its impact on the environment. Transmission system activities such as the operation of compressors affect the environment and the organisation recognises its responsibility to manage and minimise this impact. As part of its commitment to sustainable environmental and energy practices, Gas Networks Ireland has documented environmental and energy policies<sup>9</sup>. The environmental policy addresses the key areas of climate change, biodiversity, waste, resource use and procurement. The energy policy specifically addresses issues of energy performance and energy efficiency.

Gas compressors are used by Gas Networks Ireland to move gas through and around the transmission system. As a participant in the European Emission Trading Scheme (ETS) Gas Networks Ireland has an emissions allowance for CO<sub>2</sub> emissions. Gas Networks Ireland is committed to monitoring and reducing emissions from these compressors. Gas Networks Ireland is also required to comply with environmental legislation in respect of the compressors, such as noise monitoring and mitigation. In order to meet legal obligations, it is essential to develop and maintain a

<sup>8</sup> This relates to overall system throughput, i.e. section 4 that is RoI 2016 Total Gas Transported of 55,110 GWh.

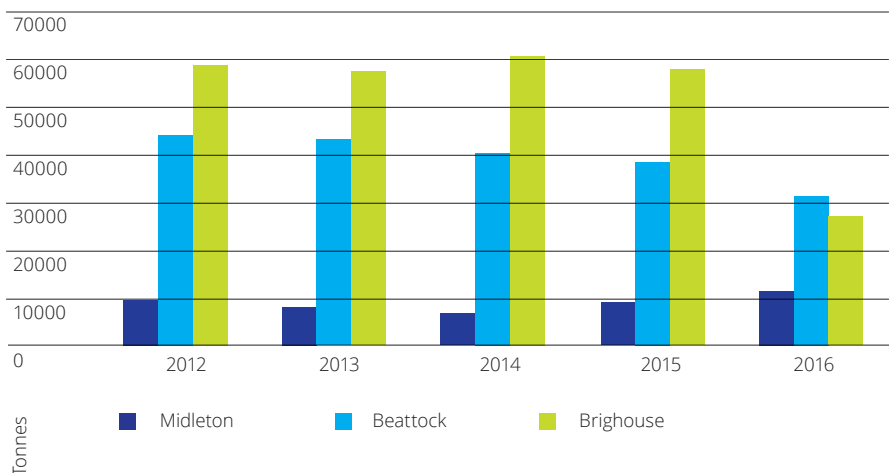
<sup>9</sup> Environment and Energy Policies

## 04. Transmission System Data

robust strategy for operations, maintenance, upgrading and replacement of the compressors. This is being achieved through the Capital Programme; further details of which is provided in section 6.

Carbon usage is a measurement of the tonnes of carbon emissions produced at each of the compressor stations based on fuel gas consumption. Emissions reduce with lower throughput but increase when subject to high flow variation (e.g. intraday peaks). This variation refers to where the compressors are forced to operate outside their most efficient operating range.

**Figure 4.10: Compressor Station carbon emissions**



There are a number of factors that influenced the emissions levels in 2016. The decrease in CO<sub>2</sub> emissions from the Gas Network Ireland compressor stations above is due to a large proportion of RGI gas coming from Corrib. Compression associated with Corrib is not operated by Gas Networks Ireland and therefore is not included above. The number of units running, power generation demand variation in the 37.5 barg network, suction and discharge pressures on the network, all contribute to the amount of CO<sub>2</sub> emitted by the stations. The demand changes for the various compressor sites is shown in Table 4.10.

### 4.7 Storage

The Kinsale storage facility is operated by PSE Kinsale Energy Limited using the depleted Southwest Kinsale gas field. The storage operations at the Kinsale facility are expected to cease in 2017 as the operator begins the extraction of 'cushion gas' prior to full decommissioning.

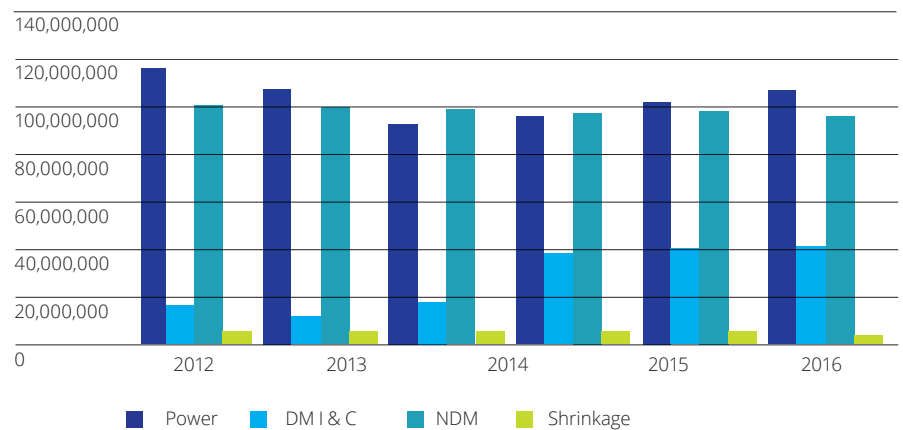


On the 31st of December 2016, **247 GWh** was the total exit capacity booked for Power, DM, I & C, NDM and Shrinkage

### 4.8 Capacity bookings

Gas Networks Ireland transports natural gas around the country on behalf of licensed natural gas shippers. These shippers are required to reserve capacity (space) in the natural gas network to guarantee a secure supply to each of their customers. Exit capacity reflects the amount of capacity booked by shippers on the transmission system. The amount of space reserved by shippers for each customer on the distribution network is referred to as the Supply Point Capacity (SPC). On the 31st of December 2016, 247 GWh was the total exit capacity booked for Power, DM, I & C, NDM and Shrinkage. This is shown in Table 4.12 and illustrated in Figure 4.11.

Figure 4.11: Exit capacity bookings

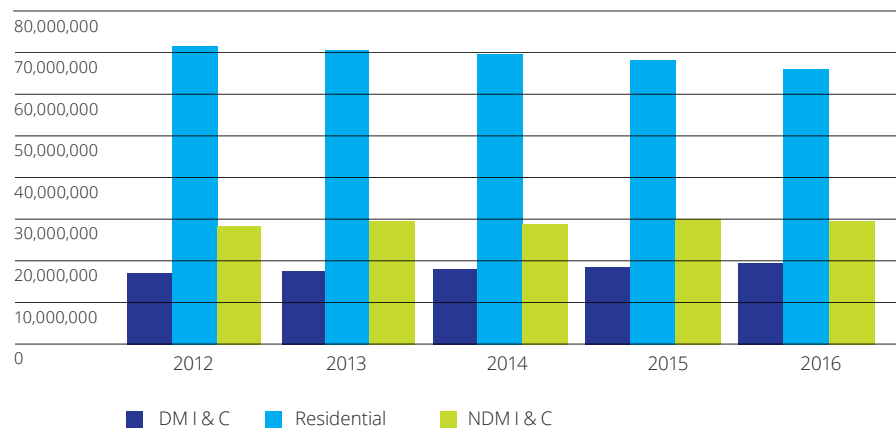


- **Power** - from 2011 to 2013, capacity bookings decreased mainly due to increased wind generation, the position of gas in the Single Electricity Market (SEM) and depressed coal prices. Since 2014, power capacity bookings have increased mainly due to increased power demand. However, bookings are still less than 2012 levels. 2016 was a strong year for power, largely due to higher electricity demand and the EWIC interconnector behaviour (moving from mostly importing to exporting).
- **LDM** - bookings have increased since 2012 due to the removal of secondary transfers (October 2013), increased load from large energy users, New Town anchor load connections and the economic recovery.
- **NDM** - bookings have decreased overall mainly due to increased energy efficiency.

On the 31st of December 2016, 114 GWh was the total SPC for Power, DM, NDM I & C and Residential customers as shown in Table 4.12 and illustrated in Figure 4.12.

## 04. Transmission System Data

Figure 4.12: Distribution SPC bookings

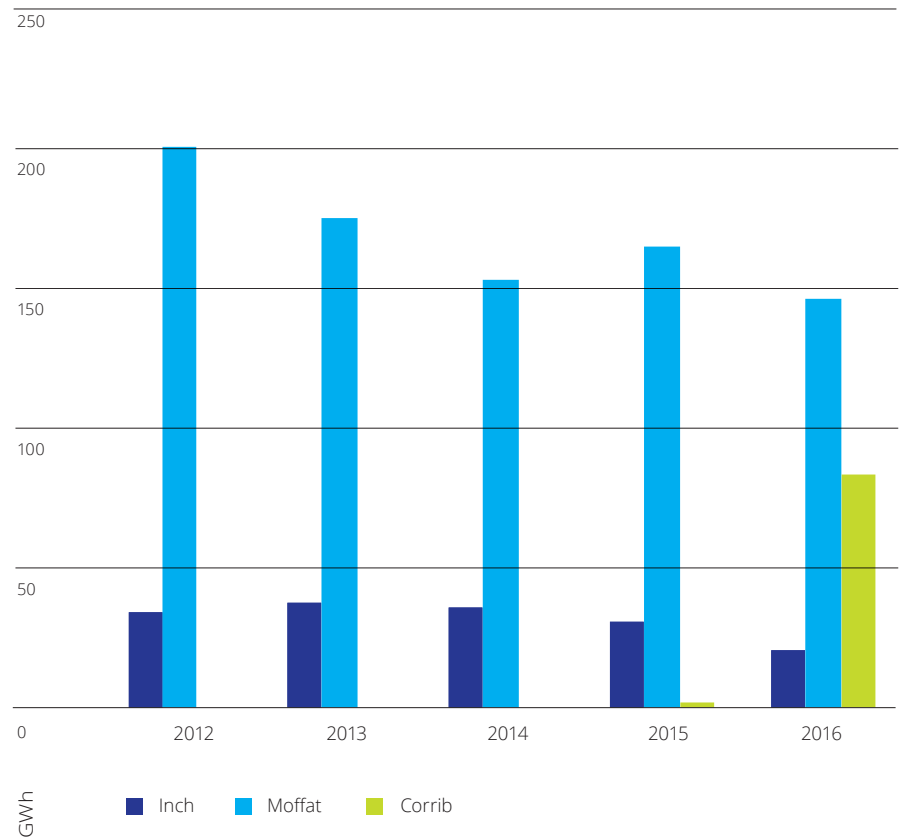


The first flow of natural gas from the **Corrib field entered the natural gas network** at the end of December 2015

### 4.9. Entry capacity booking processing

Entry capacity means capacity at an Entry Point to the transmission system required to take delivery of natural gas to the transportation system. There are various rules concerning the entry booking process outlined in the Code of Operations. The first flow of natural gas from the Corrib field entered the natural gas network at the end of December 2015, which is why there is a minimal amount exhibited in Figure 4.13 for Corrib capacity bookings in 2015. Commissioning of the field and the terminal facilities continued in the first half of 2016 before full commercial flows were declared in early Q3 2016. All Entry capacity at Corrib has been booked annually since November 2016. There was a related decrease in bookings at Moffat. However, the full extent of this reduction will only become apparent in 2017 due to the timing of the annual capacity auctions at Moffat.

Figure 4.13: Entry capacity bookings



There was **one safety incident** reported under guidelines in 2016

**4.10 Performance standards**

There was one safety incident reported under guidelines in 2016. This incident occurred in June 2016 in the Aughinish AGI communication and instrumentation kiosk involving a small electrical fire in the uninterruptible power supply apparatus. The fire was initially dealt with by the responding Gas Networks Ireland Technician. No gas was involved in the incident and the gas supply to Aughinish Alumina Plant was not interrupted.

Table 4.2: Transmission service standards 2016

Customer Commitments	KPI	2012	2013	2014	2015	2016
Safety & Quality						
Reportable safety incidents	0	0	0	0	1	1

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# 05.

## Gas Point Registration Office (GPRO)

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**9,530** Gas Points  
registered in 2016

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**680,155** Total  
Gas Points

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**93,435** Change of  
Shippers in 2016

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**1,872** Gas Points  
de-registered in 2016

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The function of the GPRO is to **maintain a register for each Gas Point** through which a natural gas customer is supplied; this includes registrations and de-registrations

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### 5.1 Overview of GPRO

The function of the GPRO is to maintain a register for each Gas Point through which a natural gas customer is supplied; this includes registrations and de-registrations.

The GPRO manages the Change of Shipper (CoS), process within Gas Networks Ireland. This process is essential in order to facilitate an open market and enable supply competition, by allowing customers to change from one shipper to another. The GPRO is responsible for all supply point ownership transfers within the Gas Point Register.

The GPRO provides information and reports to the CER and industry on historic activity; it processes corrections and amendments and it maintains the I & C listing, the vulnerable customer list and the priority customer list<sup>10</sup>.

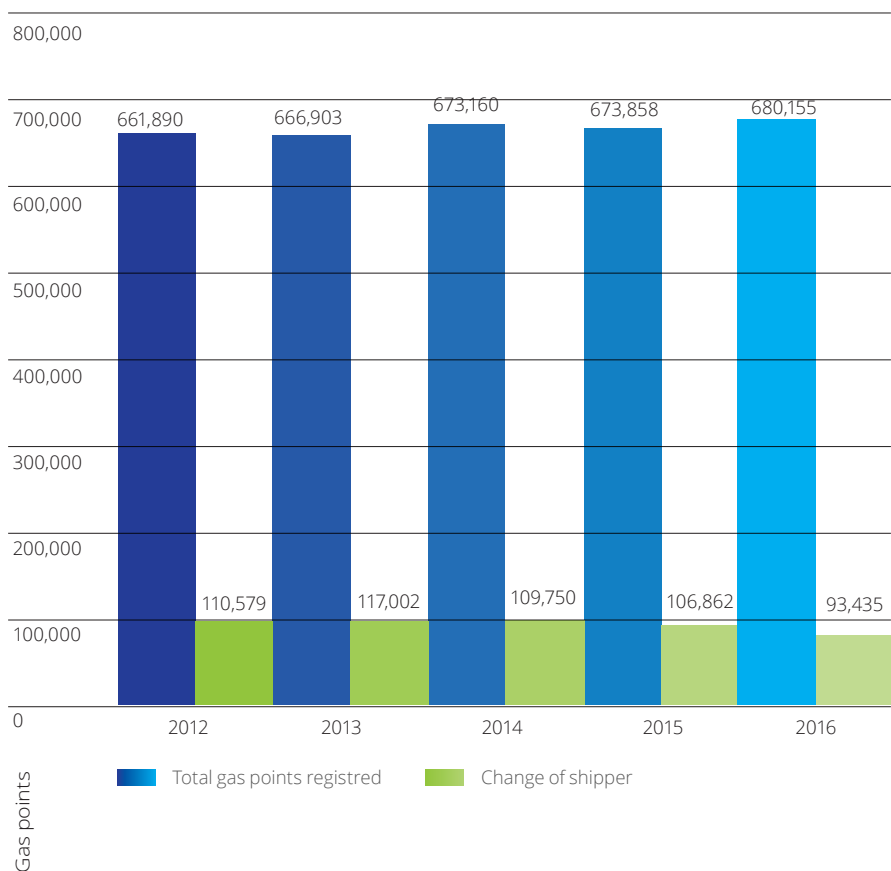
The total number of gas points registered on the 31st of December 2016 was 680,155. This was a 0.9% increase in the number registered on the same date in 2015. The total number of new Gas Points registered during the year 2016 was 9,530. There were 1,872 Gas Points deregistered during the year. The criteria for de-registration of GPRNs that were tariff exempt is that they are locked, no end-user assigned and that no consumption is recorded at the premises for 18 months. If a meter is not in use for more than two months the supplier does not pay capacity charges. Meters de-registered in 2016, had not been in use for over two months and therefore, there was no charge to suppliers.

Shippers have been focused on getting existing gas customers to switch suppliers. Ireland has one of the most active markets for customer switching in Europe. The retail energy providers invest heavily in the advertising and marketing of incentives such as cheaper rates and bundle offers. However, there was a 14% decline in this activity in 2016 when compared to 2015. Many factors can influence switching behaviour; such as consumer sentiment and inertia, points of differentiation between the suppliers, recruitment and retention campaigns.

## 05. Gas Point Registration Office (GPRO)

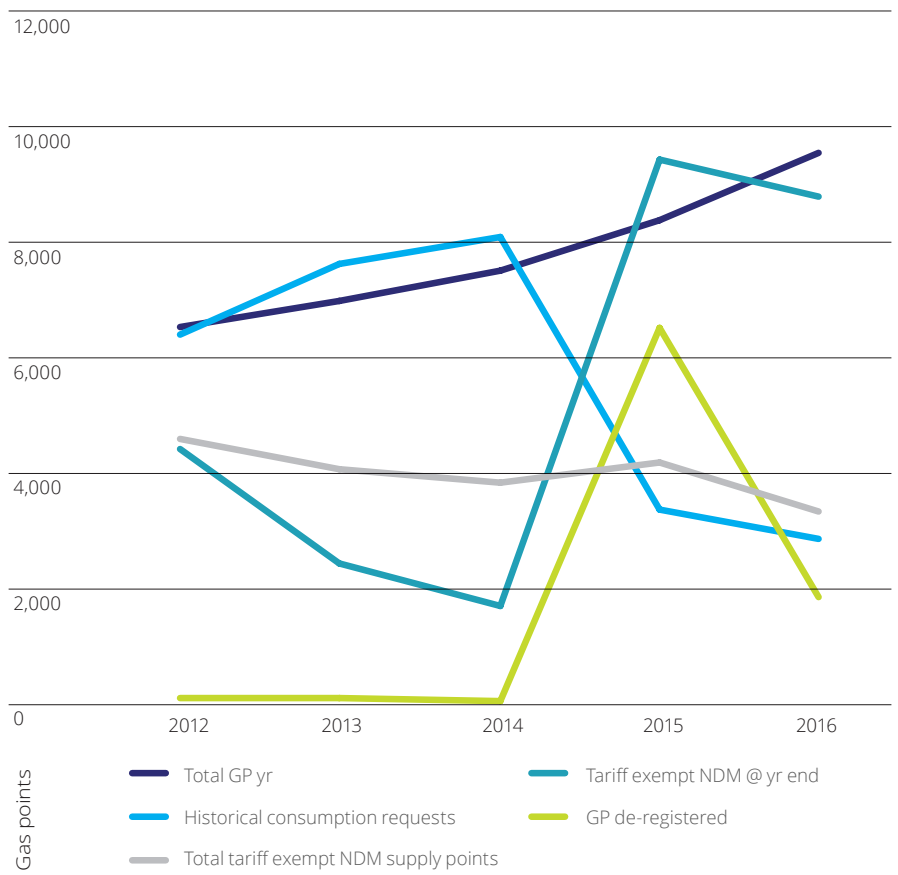
There was a slight decrease in the number of **historical consumption requests** during 2016

Figure 5.1: Total gas points and market activity



There was a slight decrease in the number of historical consumption requests during 2016, such as requests for bulk data releases for the Central Statistics Office (CSO), Sustainable Energy Authority of Ireland (SEAI) and the Office of Government Procurement (OGP). The data requests were to fulfil reporting requirements on energy consumption at various sites and for populations as a whole.

Figure 5.2: Gas point activity by year



# 06.

## Achievement of Capital Programme

As part of the Price Control (allowed revenues) process, the CER and Gas Networks Ireland agree a 5 year programme of capital works for the transmission network. Gas Networks Ireland is currently in its third regulatory Price Control Period (PC3), which runs from October 2012 to October 2017. The programme includes works relating to reinforcement, refurbishment and new supply. Additional works outside of the programme can be undertaken in the period if proposed by Gas Networks Ireland and agreed by the CER. Gas Networks Ireland continues to work with stakeholders to extend the natural gas network to new towns. Gas Networks Ireland welcomes new sources of gas supply and remains willing to discuss prospective projects with project promoters.



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Reinforcement programmes are carried out to increase the capacity of the network in **response to increased demand**

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### 6.1 Reinforcement

Reinforcement programmes are carried out to increase the capacity of the network in response to increased demand. Examples of reinforcement projects include upgrades to increase the capacity of an Above Ground Installation (AGI) or major pipeline projects, such as the Cluden to Brighthouse Bay Pipeline; where the twinning of the existing pipeline will increase overall network capacity. In 2016, there were two reinforcement projects progressed, these consisted of two AGI capacity upgrades and one pipeline project.

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### 6.2 Refurbishment

Refurbishment programmes involve the upgrading or replacing of certain network assets due to the age or condition of the existing asset. Examples of refurbishment projects include:

- replacement of inefficient and aging boilers at AGI locations with reliable and more efficient units;
- upgrading works to bring pressure reduction sites into compliance with the ATEX<sup>11</sup> directive; and
- installation of attenuation measures to limit noise emissions in the vicinity of pressure reduction sites.

There were a total of 157 refurbishment projects at various stages from design through to commissioning and operation carried out during 2016, many of these were across multiple locations.

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### 6.3 Interconnectors

This programme involves the refurbishment and upgrading of assets on the onshore Scotland network which is connected to the onshore Ireland gas network via two sub-sea interconnectors. These projects primarily involve works on the two compressor station sites at Beattock and Brighthouse Bay in Scotland. Examples of these projects include:

- upgrade works to the turbine air intake equipment at Brighthouse Bay to improve reliability and replace equipment approaching obsolescence;
- replacement of ancillary equipment, supporting turbine operation at Beattock, which was approaching end-of-life or obsolescence;
- installation of a station recycle valve at Beattock Compressor Station and connecting same to the station control system; and
- service exchange of the turbine core of a compressor unit at Beattock Compressor Station.

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### 6.4 New supply

Construction and commissioning of the Drumbannon AGI is complete.

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11 The ATEX directive consists of two EU directives describing what equipment and work environment is allowed in an environment with an explosive atmosphere

# 07.

## Transmission Gas Safety

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### 7.1 High level safety statistics

This section of the report is an extract from quarterly reports submitted to the CER under the natural gas safety regulatory framework (the 'Framework'). All information has been provided to the best ability of Gas Networks Ireland at the time of submission to the CER. The report includes Key Performance Indicator (KPI) measures and statistics that have been under continuous monitoring during 2016. The purpose of the KPIs is to identify opportunities for improvement and to ensure the network continues to be managed in a safe manner.

The reference number (ref: 1 – 5) denotes metrics grouping under the Key Safety Regulatory Objectives.

Table 7.1 Safety statistics

	Items	Compliance Monitor	2012	2013	2014	2015	2016
1A	Public Reported Escapes (PREs) (Reported Leaks)	Total Reported Escapes	9	13	6	11	6
1B	Third Party Damage	Development enquiries requiring action	875	990	816	824	952
	Third Party Damage Prevention Detected	Category A - Pipeline Damage or Leak	1	0	0	0	0 <sup>12</sup>
	Encroachment Events	Category B - Serious Potential for Damage	19	29	20	21	12
		Category C - Limited Potential for Damage	22	16	19	23	39
		Total detected encroachment	42	45	39	44	51
1C	Transmission Pipelines	Line breaks (major leakage)	0	0	0	0	0
		Line damaged (sustainable level of leakage)	1	0	2	0	0
		Line damaged (no leakage)	1	0	0	0	1
2A	Pressure Control	Occasions where pressure drops below minimum design pressure	0	0	0	0	0
		Occasions where pressure is greater than 1.1 x Maximum Operating Pressure	0	0	0	0	0
2B	Gas Outages	Number of Unplanned Outages	0	0	0	0	0
3A	Gas Quality	Number of non-compliant events (constituent parts outside criteria)	0	1	0	0	4
3B	Gas Quality	% Availability of the gas measurement equipment	100%	100%	100%	100%	100%
4A	Gas Supply Emergencies	Local Gas Supply Emergencies 1,000 - 9,999 customers affected	0	0	0	0	0
		NGEM Emergencies > 10,000 customers affected	0	0	0	0	0
4B	Gas Emergency Exercises	Emergency Exercises planned per annum (Minimum)	2	2	2	2	2
		Emergency Exercises undertaken	5	3	2	5	3
5A	Incidents	Gas Related Incidents	0	0	0	0	0

12 Damage was discovered in 2016 to the Cork-Dublin pipeline by routine inspection. The damage was caused by third party interference, which occurred prior to 2014. The pipeline has since been repaired.

## 07. Transmission Gas Safety

### 952

Development enquiries

### 51

Detected encroachments

### 7.2 Third party damage

Third Party Development works enquiries which potentially impacted on the transmission network and required intervention from Gas Networks Ireland, increased slightly from 824 in 2015, to 952 in 2016.

There were 51 encroachments (instances of unauthorised excavation in the pipeline wayleave) detected in 2016, which is an increase on the 44 detected in 2015 and an increase on the 39 detected in 2014. The increase in the 2016 figures were largely due to the reclassification of unsupervised ditch cleaning activities. Since 2011, Gas Networks Ireland has classified transmission pipeline encroachments in line with the United Kingdom Onshore Pipeline-Operators Association (UKOPA) model, these include:

- **Category A:** Pipeline leak or damage;
- **Category B:** Potential for damage; and
- **Category C:** Limited or minimal potential for damage.

Category A is the most severe and includes actual damage to a transmission pipeline, wrap or sleeve. There were no Category A encroachments in 2016, 2015 or 2014, however, one instance of damage was discovered in 2016 to the Cork-Dublin pipeline by routine inspection. The damage was caused by third party interference, which occurred prior to 2014. The pipeline has since been repaired. Categories B and C relate to a level of potential damage and are differentiated by the actual activity and method carried out in the vicinity of the pipeline. Category B encroachments are deemed to have serious potential for damage while Category C have limited potential for damage. Gas Networks Ireland reviews each encroachment and monitors trends closely.

### 7.3 Update on the Safety Case

Gas Networks Ireland fully complies with the Gas Safety Framework. The Gas Networks Ireland Transmission System Safety Case demonstrates the safety management arrangements in place for the network.

Within the Safety Case Framework a quarterly KPI report is submitted to the CER for review (see section 7.1). A number of updates to the Safety Case have been made since 2009 and have been accepted by the CER. The CER accepted the Gas Networks Ireland Transmission System Safety Case on the 1st August, 2015, which remains the current accepted Safety Case as of 31st December 2016. The Safety Case demonstrates the arrangements that are in place for:

- the safe control and operation of the transmission system;
- the management of the life cycle of the assets including design, construction, commissioning, maintenance and repair, reinforcement and renewal, and decommissioning and abandonment;
- ensuring that staff meet the required standards of qualification and competence;
- emergency preparedness;
- ensuring that gas transported in the network meets required standards for gas composition and quality;

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## Gas Networks Ireland is the **National Gas Emergency Manager**

- hazard assessment and mitigation of the risks to a level that is as low as is reasonably practicable associated with the transportation of gas;
- compliance with relevant standards and codes of practice; and
- cooperation with third parties.

The primary change to the Transmission Safety Case in 2015 was Gas Networks Ireland becoming a legal entity. Under the Framework, Gas Networks Ireland is required to conduct a full independent audit of its Safety Case every five years to ensure that the safety case remains a 'living document' within the organisation and fully reflects the current safety operating measures and practices. This review will be due in 2020.

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### **7.4 Update on Natural Gas Emergency Manager Activities**

The CER is responsible for the appointment of the National Gas Emergency Manager (NGEM) in accordance with the Gas (Interim) (Regulation) Act 2002, as amended. Gas Networks Ireland is the NGEM as per the appointment by the CER in 2008. The Natural Gas Emergency Plan (NGEP) is the industry procedure for managing a network gas emergency and provides details on the role of the NGEM. The NGEP is prepared by Gas Networks Ireland pursuant to the direction of the CER and is subject to approval by the CER in accordance with its statutory functions. Revision 4 of the NGEP was approved by the CER on 19th February 2016. The NGEP is tested on an annual basis and the 2016 emergency exercise was carried out on 7th December 2016.

# 08.

## Code of Operations Obligations

The Code of Operations governs the relationship between the Transporter and the shippers on the transportation (transmission and distribution) network. By signing Framework Agreements, shippers accept the terms of the Code of Operations. In February 2005, the CER approved the implementation of a new Code of Operations (the Code) which governs the rules for both the transmission and the distribution network. These rules became effective on 1st April 2005. The latest version of the Code (Version 5.01) was published in March 2017<sup>13</sup>. The Code is comprised of sections outlining the general principles of the Code, regulatory compliance, the capacity arrangements (both entry and exit), the nomination and allocation arrangements, balancing, shipper registration, gas specification and quality, as well as the various sections on congestion management, legal and general.

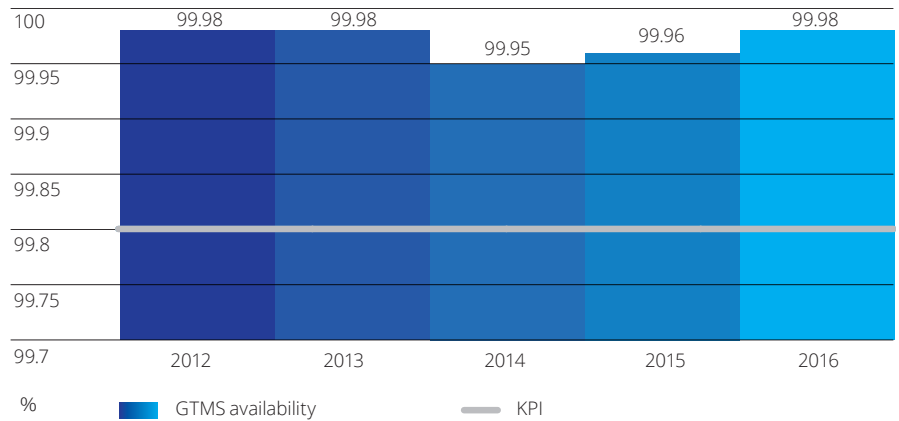
13 <http://www.gasnetworks.ie/en-IE/Gas-Industry/Services-for-Suppliers/codeofoperations/>

The performance standard for the GTMS system availability is **99.8%**

**8.1 Systems availability**

Grid Control is responsible for monitoring the GTMS and managing the daily nomination and allocation process, ensuring that the correct volume of gas is being transported at all times to meet shippers' and customers' requirements. The performance standard for the GTMS system availability is 99.8%, this target has been consistently achieved over the years and in 2016 the system was available 99.98% of the time.

**Figure 8.1: System availability**



**8.2 NDM Change of Shipper (CoS) processing**

The CoS process governs the recording of a change of registration of NDM Supply Points between shippers on the Gas Point Register. A number of performance targets have been set in terms of processing requests for change of shipper and entry and exit capacity booking requests. These are outlined in Table 8.3. The performance target has been consistently achieved over the past five years.

## 08. Code of Operations Obligations

The meter reading access rate in 2016 for both credit and Pre-Payment Meters (PPM) was **84%**

### 8.3 Invoice circulation

The trading and settlements team in Gas Networks Ireland generates and issues transportation invoices for all shippers on a monthly basis. The invoices are for transmission and distribution capacity and commodity charges. The team also issue shippers a letter each year regarding the pricing mechanism on the shrinkage contract and is responsible for the disbursement of account invoices and credit notes. The performance targets for invoices is to issue by the 12th day of the month, this has been achieved 100% of the time. The KPI for providing shippers with the shrinkage pricing mechanism is prior to the October billing date. This too has been at 100% as illustrated in Table 8.5.

### 8.4 Meter reading access rates

This process governs the receipt and validation of all meter read information for generic and volume corrected NDM gas points. The access rate in 2016 for both credit and Pre-Payment Meters (PPM) was 84%, this is above the KPI of 80% which has been consistently achieved by Gas Networks Ireland over the past five years. This has increased from the 2015 figure of 83% and is the first increase in read access levels since 2011. Increased number of call-backs to sites and variation of start times in certain areas has helped to achieve this improvement in access levels. The read rate per site in 2016 was 3.41 times; the KPI for how often a meter is read per calendar year is 3.2 times. The performance has remained steady at circa 3.4 times over the past three years, this is illustrated in Figure 8.3.

Figure 8.2: Meter read access rates

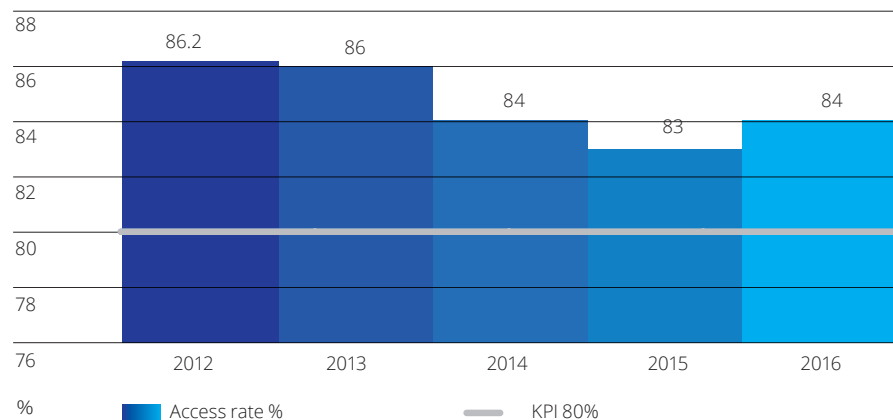
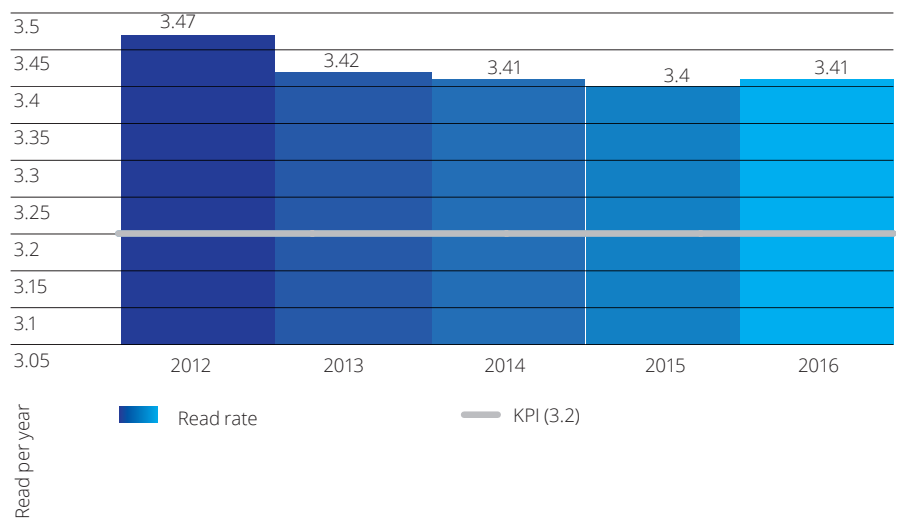




Figure 8.3: Meter read rate



8.5 Meter data services

In conjunction with the Code of Operations, procedures are in place that govern forecasting of demand at gas points and determining allocations by the transporter for the reconciliation process. The KPI for accuracy of forecasting, allocation and reconciliation is 80% accuracy depending on the kWh. The accuracy rate has steadily improved for PPM meters in 2016.

Table 8.1: Meter data services

Meter data services	KPI	2012	2013	2014	2015	2016
Forecasting, Allocation and Reconciliation (FAR) <sup>13</sup> – Domestic Reconciliation (PPM <sup>14</sup> Meters - 12 month Rolling)	80% within accuracy of 1,250 kWh	N/A	N/A	99.37%	94.58%	99.39%
Forecasting, Allocation and Reconciliation (FAR) – Domestic Reconciliation (Credit Meters - 12 month Rolling)	80% within accuracy of 1,250 kWh	92.43%	94%	89.54%	99.56%	91.25%
Forecasting, Allocation and Reconciliation (FAR) – I & C Reconciliation <sup>15</sup>	80% within accuracy of 4,500 kWh	74.54%	74%	74.98%	76.51%	75.76%

13 <http://www.gasnetworks.ie/en-IE/Gas-Industry/Services-for-Suppliers/Capacity-registerFAR/>

14 PPM figures were not reported from 2011-2013

15 The I & C band ranges between 73,000 kWh and 5,500,000 kWh so range of reconciliation accuracy can vary significantly given the wide range of annual volumes consumed at these sites.

## 08. Code of Operations Obligations

Gas Networks Ireland operates, **maintains and repairs the transportation system** in accordance with the provisions of the Code of Operations

### 8.6 Provision of shrinkage gas quantity/costs estimates

“Shrinkage gas” is used to operate the system (own use gas) and to replace gas which is lost or unaccounted for. The Transporter buys shrinkage gas to ensure the safe and efficient operation of the system and enters into one or more contracts for shrinkage gas.

The transporter recovers the cost of shrinkage gas for the transmission system from shippers (by reference to throughput). For distribution shippers that are not subject to an additional Network Code charge for shrinkage, there is a distribution shrinkage factor included in the tariff. Shrinkage charges are paid by shippers based on throughput (their entry and exit allocations).

Imbalance charges are paid to or by shippers depending on whether they have positive or negative imbalances. Overrun charges are charges payable by shippers where their allocations exceed their relevant active capacity on a day. Similar to transmission, distribution shrinkage charges are paid by shippers based on throughput (their entry and exit allocations).

### 8.7 Maintenance days interruptions

Gas Networks Ireland operates, maintains and repairs the transportation system in accordance with the provisions of the Code<sup>16</sup>. Maintenance days are days nominated by Gas Networks Ireland where part of the transportation system may be subject to maintenance. During maintenance days, natural gas available for offtake from that part of the transportation system may be reduced. The maintenance programme is planned in advance with the input of shippers. From time to time additional unscheduled maintenance may need to be conducted due to unforeseen circumstances as considered necessary in order to ensure the operational integrity and security of the transportation system. Notice will be given to each affected shipper as soon as is reasonably practicable, recognising that such maintenance is unscheduled.

In 2016, the Corrib entry point was commissioned and during this period a number of constraints (Gas Networks Ireland determined) and curtailments (Shell E & P Ireland Limited (SEPIL) determined) occurred. These were implemented by both SEPIL and Gas Networks Ireland as illustrated in the Table 8.7.

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## The **Moffat** **entry point** was available throughout all of 2016

Gas Networks Ireland constrained the Corrib flow the most in June 2016, this was during the period when the flows and pressure were being brought up to the system's capacity. The constraint was imposed as increased gas flow was causing specialist commissioning filters to block, which was the main reason for imposing the constraint. The constraint was lifted when a steady state was achieved.

In 2016 gas injection into Kinsale Energy Limited wells reduced dramatically in line with their programme to cease gas production. In previous years the summer injection period had been used to carry out key maintenance and upgrade works at Middleton compressor station. However, in Quarter 3, 2016, the entry point at Inch was constrained to facilitate the installation of a new station control system for approximately 2 weeks.

The 2016 in-line inspection programme was extensive and the Loughcarrig Lodge to Middleton pipeline section required a short period (approx. 8 hours) of flow control through the Inch Entry point. This work was coordinated to coincide with the station control system upgrade work.

The Moffat entry point was available throughout all of 2016.

# 09.

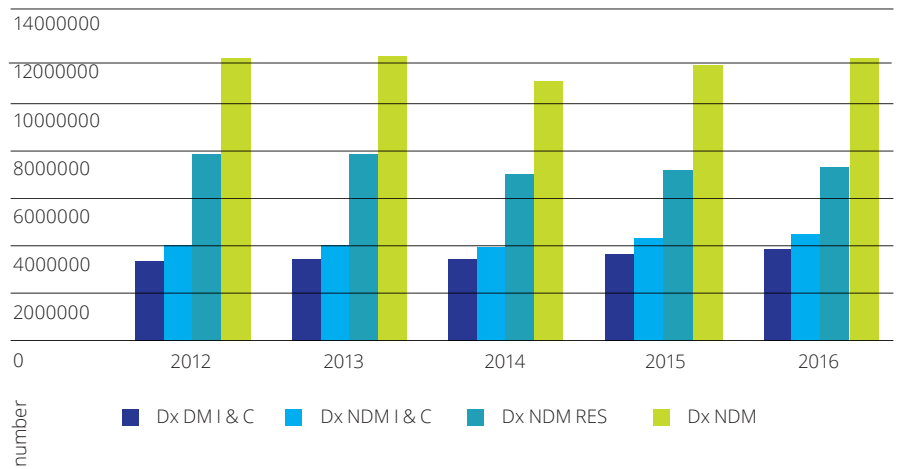
## Distribution System

### 9.1 Distribution system data

In the DM (I & C) sector gas demand was up by circa 5.8%, compared to 2015. The key factor in terms of increased gas demand within the DM (I & C) sector is economic growth; an increase in new connections is also having an impact. The DM (I & C) sector as a whole witnessed an increase of 1.0% in connections.

In the NDM sector gas demand is sensitive to weather and demand. However despite the fact that 2016 was about 3% warmer than 2015, on a Degree Day (DD) basis, gas demand in 2016 was up by approximately 2.4% on the previous year. In the NDM (I & C) sub-sector, growth was driven by the increase in economic activity. In the Residential NDM sub-sector, there was growth of 1.1% in gas demand, due to an increase in new connections. Table 9.1 illustrates the distribution system data.

Figure 9.1: Distribution system data



Unaccounted for Gas (UAG) on the distribution network represents **total unaccounted or unallocated distribution gas**

9.2 Distribution UAG

Unaccounted for Gas (UAG) on the distribution network represents total unaccounted or unallocated distribution gas. Distribution UAG causes include network leakage, gas escapes, theft of gas, gas quality variation, long-term no access and unregistered consumption. Distribution UAG is calculated, as agreed with the CER, using a metering by difference formula<sup>17</sup> on a rolling 12 month basis. Distribution UAG as percentage of total distribution throughput in 2016 was 1.12%<sup>18</sup>.

17 Distribution UAG formula:  $UAG = \frac{\text{distribution throughput} - \text{LDM \& DM consumption} - \text{read NDM consumption} - \text{un-reconciled NDM allocations}}{\text{total distribution throughput}}$

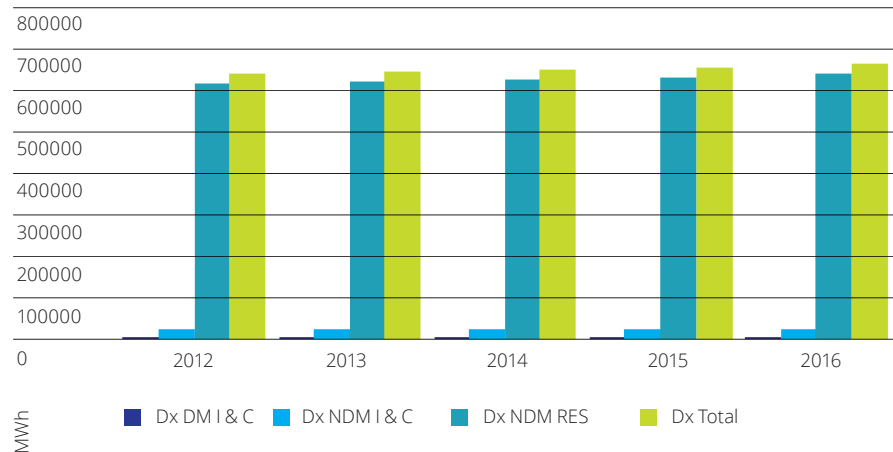
18 12 month Rolling Average as of end of December 2016.

## 09. Distribution System

### 9.3 Total number of connections (by category)

The total number of distribution connections in 2016, stands at 675,228. This is up by 1.1% on 2015. The largest increase was in the DM (I & C) sector experiencing a rise of 2.8% from 2015, see Table 9.2.

Figure 9.2: Connections by category

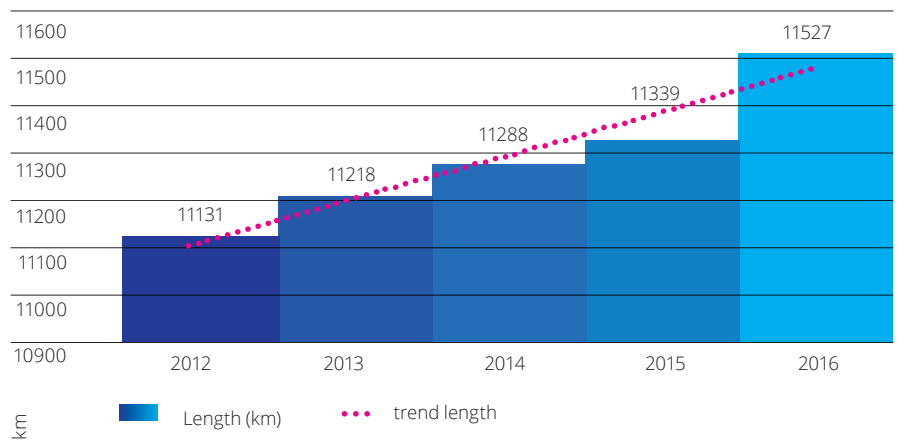


The length of the distribution network at the end of 2016 is measured at **11,527 km**

### 9.4 Total length of pipe in the distribution system

The distribution network operates in two tiers; a medium pressure and a low pressure. The distribution network is predominantly polyethylene distribution pipelines. As residents and business premises are added to the network, the length of pipe in the distribution network grows. The length of the distribution network at the end of 2016 is measured at 11,527 km. This has been growing incrementally in the last five years.

Figure 9.3: Distribution system length (km)



As part of the Price Control process, the CER and Gas Networks Ireland agree **a 5 year programme of capital works** for the distribution network

### 9.5 Achievement of distribution capital programme

As part of the Price Control process, the CER and Gas Networks Ireland agree a 5 year programme of capital works for the distribution network. Gas Networks Ireland is currently in its third regulatory Price Control Period (PC3), from October 2012 to October 2017. The programme includes works relating to reinforcement, refurbishment and new supply. This includes new connections and servicing increased demand at existing connections. Additional works outside of the programme can be undertaken in the period if proposed by Gas Networks Ireland and agreed by the CER, e.g. the connection of a new town.

Examples of projects undertaken as part of the distribution capital programme are:

- replacement of meters at domestic locations and I & C locations, which are 20 years old or older;
- remediation works required at bridge crossings over watercourses on the distribution network;
- removal of metallic mains from the distribution network and replacement with polyethylene mains; and
- upgrading works to bring distribution installations sites into compliance with the ATEX Directive.

Illustrated overleaf are some 2016 high volume programmes; the percentage of completion represents the percentage scope completed for the project versus the target for PC3.

## 09. Distribution System

Figure 9.4: Distribution capital programmes

<b>Distribution capital programmes</b>  Status as of end of 2016	<b>G4 Domestic Meter Replacement</b>  Replacement ongoing 86% Complete Programme to run to end of PC3 in 2017	<b>I &amp; C Meter Replacement PC2</b>  Replacement ongoing 99% complete Finish date Q3 2017	<b>PE in Porches</b>  Design and construction ongoing 93% complete To run until the end of PC3
<b>I &amp; C Meter Replacement</b>  Replacement ongoing 96% complete Finish date Q3 2017	<b>Dx bridge crossings</b>  Design and construction ongoing 88% complete	<b>Dublin metallic mains</b>  Complete - all known metallic mains and services removed	<b>Dx ATEX Compliance</b>  Design and construction ongoing 55% complete To run until the end of PC3 in 2017

### 9.6 Reinforcement

The reinforcement works completed in 2016 are listed below:

- Barrow Street;
- Kincora Avenue;
- Ormond Road;
- Willie Nolan Road;
- Phoenix Park Phase 2;
- Wolfe Tone Street, Kilkenny;
- Shangan Gardens, Ballymun;
- Dublin Road, Maynooth;
- Green Road, Blackrock;
- Newbridge;
- Dublin Road, Bray;
- Bellevue Park;
- Woodhazel Terrace, Ballymun; and
- Thormanby Road, Howth.



Design work has commenced on the following projects which are scheduled for construction in 2017:

- Catherine Street, Waterford (construction commenced);
- Gracedieu Road / Summerhill, Waterford (construction commenced);
- Brackenstown, Swords (construction commenced);
- Cleaboy/Hazelbourne, DRI Waterford (construction commenced);
- Jamestown Business Park, Kylemore;
- Leopardstown Grove, Stillorgan;
- Carlow IT;
- Ludford Drive, Ballinteer;
- Prosperous, Clane;
- Lennox Street, Portobello;
- Annamoe Park, Cabra;
- Ballincollig, Cork;
- Kingscourt, Cavan;
- Carpenterstown Road;
- Kimmage Road Lower;
- Priors Avenue, Stillorgan;
- James St, Dublin 8; and
- Grange Castle Business Park.

Gas Networks Ireland has seen an **upward trajectory in connection numbers** since 2012

### 9.7 New connections during year (by category)

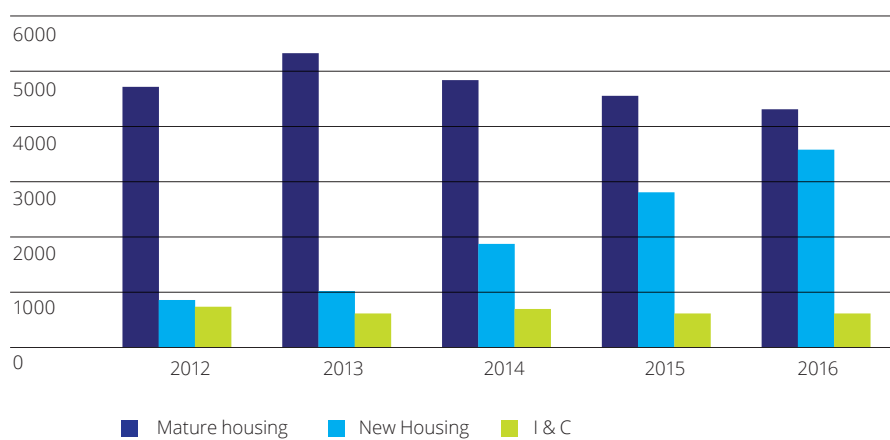
Gas Networks Ireland has seen an upward trajectory in connection numbers since 2012 as shown in Figure 9.5. The focus for Gas Networks Ireland in 2015 and 2016 has been to regain market share and focus sales and marketing activities on the sectors showing strongest recovery. As a result, new housing and large I & C sectors have increased in connection numbers and gas volumes, while mature housing and Small and Medium Enterprises (SMEs) have largely remained flat.

Over the last few years gas has seen increased competition from solar, electric heat pumps, biomass and Liquefied Petroleum Gas (LPG). Gas Networks Ireland has sought to preserve the utilisation of its network in the face of competition from these technologies. Sales and marketing activity has increased significantly relative to growth in each sector. The sales team interact with industry, architects and consultants to illustrate the benefits of gas and its applications and to promote natural gas as part of the solution in meeting Part L of the building regulations.

As a result Gas Networks Ireland has been positioning gas to take advantage of increased activity in new housing and improved economic growth which was confirmed recently with the publication of recent CSO figures<sup>19</sup>. This shows planning permissions granted for dwelling units in 2016 was up 26% compared with 2015. Increased activity in the I & C sector is evidenced by the level of Gross Domestic Product (GDP) growth and the significant increase in manufacturing exports.

## 09. Distribution System

Figure 9.5: New connections by category<sup>20</sup>



Gas Networks Ireland continually brings **the benefits of natural gas** to new customers and new towns

### 9.8 Update on new towns receiving gas

Gas Networks Ireland continually brings the benefits of natural gas to new customers and new towns. The Connections Policy is a Gas Networks Ireland document and is approved by the CER. The Connections Policy facilitates high level objectives that encourage the connection of new customers, offers transparency around charges, treats connections consistently and minimises the impact on tariffs. The more customers that are connected to the gas network, the more throughput on the system, which in turn reduces the tariffs for the benefit of all gas customers.

Gas Networks Ireland actively promotes natural gas as a fuel of choice for homes, businesses and industry, encourages greater utilisation of the natural gas network and looks for opportunities to expand the network where economically viable. Construction on connecting Nenagh town to the natural gas network commenced in October 2015. Water and waste water infrastructure are being delivered as part of the Ervia multi-utility project in Nenagh town centre; a collaboration between Irish Water and Gas Networks Ireland. Developing water and gas infrastructures as one project reduces costs and minimises disruption, avoiding the need for a second major construction project in the town at a later date. On completion, which is expected to be late 2017, Nenagh will have a future-proofed infrastructure that will benefit the town, its people and its businesses for many decades to come.

<sup>20</sup> There is often a time lag from when a new connection order is received to when it is installed. To ensure that the numbers reported are for connections only rather than a mix of orders and connections there was an adjustment to new connections reporting in 2015. This is to ensure consistency across the business units that record connections. Note: there is a variation in reported figures in pre-2015 performance reports.

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The clear benefits of natural gas for the customer are that it is **cheaper, cleaner and more reliable** than other fossil fuels

The first phase to extend the network from Great Island, Co. Wexford commenced in July 2015. The 40km feeder main bringing natural gas to Wexford town became operational early in 2016, with the major anchor loads commencing gas off-take by mid-year. The initial town network development, which is also a multi-utility project, commenced on the 19th October 2016. This stage also involves the site investigations required for the planning of subsequent expansion, which is expected to commence in late 2017, or early 2018.

Towns connected to the gas network have a significant competitive advantage compared to those that are not. The benefits include economic opportunities, efficiencies and lower emissions that are associated with gas. It was announced in October 2016 that Listowel in Co. Kerry will be the latest town to be connected to the natural gas network. Construction work on the feeder main to Listowel will commence in summer 2017.

As a low carbon fuel with low energy costs, natural gas is appealing to multi-national organisations. Cities and towns that have natural gas infrastructure are attractive for Foreign Direct Investment (FDI), and can benefit through direct employment and investment in the local economy. The natural gas network developed by Gas Networks Ireland has sufficient capacity to meet the gas demands of a modern Ireland competing in the global economy, contributing to Ireland's social and economic progress.

The clear benefits of natural gas for the customer are that it is cheaper, cleaner and more reliable than other fossil fuels. It is a versatile energy source that can play a significant role in decarbonising the nation's energy consumption. Natural gas already contributes to competitiveness being at a lower cost than oil for domestic consumers. It produces approximately 22% less CO<sub>2</sub> than oil and 40% less than coal<sup>21</sup>. Natural gas provides energy security for Ireland through existing infrastructure; indigenous sources at Corrib will meet over 50% of RoI total gas requirement for a period of time. The network is connected to the UK market which has diverse gas sources, thus ensuring a robust supply of gas and liquid pricing.

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21 The Irish Academy of Engineering Policy Advisory The Future of Oil and Gas, published February 2013

# 10.

## Distribution Gas Safety

### 10.1 Overview of gas safety

Safety performance is a core value and top priority for Gas Networks Ireland. It underpins the company brand and its reputation of being a trusted and responsible gas infrastructure company. The network is constructed, operated and maintained to the highest international safety standards, in line with the CER policies. The primary function of the network is to transport gas from entry to exit, on behalf of all customers, while ensuring the network is operated safely and efficiently. This is achieved by the use of sophisticated information systems and Grid Controllers monitoring the system 24/7. The structure ensures that pressure is maintained within the system, alarms are responded to and escalated in a timely manner, the quality of the gas meets regulated requirements and that processes and procedures are in place to manage a natural gas emergency, should it occur.

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## “A Safety Regulatory Framework for Natural Gas”

is core to the operation of the business

Compliance with national safety legislation including implementation of “a Safety Regulatory Framework for Natural Gas” is core to the operation of the business. The Gas Networks Ireland Distribution Safety Case was accepted by the CER on the 1st August 2015 and remains the current accepted Safety Case as of 31st December 2016. It demonstrates the Gas Networks Ireland arrangements for managing the distribution network. This is delivered through adherence to well established Irish and International codes and standards, reflected through internal processes and procedures, which are detailed below:

- Gas Networks Ireland’s management systems are accredited as follows:
- OHSAS 18001 for safety management;
- ISO 14001 for environmental management;
- ISO 9001 for quality management;
- ISO 55001 for asset management; and
- ISO 50001 for energy management.

The safety and asset management systems received their accreditation in 2015.

- Gas Networks Ireland has an excellent record in meeting all its safety statutory and regulatory obligations. Its average response time to 17,428 gas public reported escapes (PREs) in 2016 was 28 minutes, well within its target of 1 hour.
- Gas Networks Ireland is committed to ensuring that all gas technical and operational personnel have the necessary levels of experience, knowledge and skills appropriate to their range of duties.

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### 10.2 High level safety objectives

The key safety regulatory objectives are outlined below:

#### 1. Minimising the Risk of Loss of Containment

Gas undertakings are required to demonstrate that they have suitable management systems and procedures in place for managing the risks that lead to, and arise from, loss of gas containment events.

#### 2. Maintaining Safe System Operating Pressure

Gas undertakings are required to demonstrate that they have suitable management systems in place; for managing the risks that can result in dangerously high, or low gas operating pressure in the pipeline system(s).

#### 3. Minimising the Risk of Injecting Gas of Non-Conforming Quality

Gas emergency incidents can arise due to gas of inappropriate quality being injected into the system. Gas undertakings are required to demonstrate that they have suitable management systems in place; for gas quality monitoring and managing the risks associated with the quality of gas that is injected into the system.

## 10. Distribution Gas Safety

The Framework provides for a comprehensive regime relating to the **regulation of gas installers**

### 4. Providing an Efficient and Coordinated Response to Gas Emergencies

Gas emergency events can and do occur for a variety of reasons including the actions of third parties. For example, Gas Networks Ireland is required to demonstrate that it has suitable arrangements in place for: (i) managing the response to 'localised' gas emergencies; and (ii) undertaking the role of National Gas Emergency Manager (NGEM) during 'network' gas emergencies. Additionally, all natural gas undertakings are required to demonstrate that they have suitable arrangements in place for responding to the requirements of the NGEM, in the event of large-scale 'network' gas emergencies being declared by the NGEM.

### 5. Minimising the Safety Risks Associated with the Utilisation of Gas

The Framework provides for a comprehensive regime relating to the regulation of gas installers. The key aim of this regime is that all categories of 'gas works' designated by the CER are only undertaken by competent gas installers, who are registered, and subject to ongoing regulation and inspection, by the Gas Safety Supervisory Body appointed by the CER.

### 6. Promoting Public Awareness of Gas Safety

The Framework places duties and obligations on both individual gas undertakings and the industry generally for the promotion of gas safety awareness. This involves a combination of both individual and co-ordinated safety promotional activities by undertakings.

Gas Networks Ireland submits quarterly reports to the CER under the gas safety regulatory framework. The report includes measures and statistics that have been under continuous monitoring and improvement during the reported period of 2016.

### 10.3 High level distribution safety statistics

Table 10.1: High level gas safety statistics

Ref	Subject	High Level KPI	2012	2013	2014	2015	2016
1A	Public Reported Escapes <sup>22</sup>	Number of External Leaks Detected	2605	2797	3538	3811	3691
		Number of Internal Leaks Detected	4660	4806	4480	5007	4214
1C	Third Party Damage	No. of Main Damages	48	59	68	84	93
		No. of Service Damages	404	408	457	395	426
1D	Gas in Buildings	Number of 'Gas in Buildings' events (i.e. all gas ingress from external infrastructure)	2	1	3	0	1
	Evacuations	No. of Gas Networks Ireland initiated evacuations	0	1	5	2	1
2B	Gas Outages	> 15 Customer affected	1	1	0	1	1
		> 100 Customer affected	1	1	0	2	2
4A	Gas Supply Emergencies	Local Gas Supply Emergencies 1,000 - 9,999 customers affected	0	0	0	0	0
		NGEM Emergencies - >10,000 customers affected	0	0	0	0	0
4B	Public Reported Escapes	% attended within one hour	99.90	99.90	99.88	99.90	99.89
5A	Incidents (Occurring on Gas Network)	Reportable under Gas Legislation	1	1	0	0	0
	Incidents (Occurring on Gas Network)	Reportable under CER Guidelines	1	2	3	6	4
5B	Incidents (Occurring on Customer installations)	Reportable under Gas Legislation	0	2	2	0	0
	Incidents (Occurring on Customer installations)	Reportable under CER Guidelines	1	3	6	7	3
5C	Non Gas related incidents	Number of Non Gas related incidents attended by Gas Networks Ireland	1	0	2	3	3
6A	Emergency Reports	Total no. of calls received via the 24-hour emergency telephone number (1800 20 50 50)	29504	30672	30519	19198	23919
6B	Third Party Damage	<b>Total enquiries to 1800 427 747 (inward communication)</b>	3442	3437	2706	2106	1772
		Total enquiries to distribution DBYD <sup>23</sup> email/post/fax/calls (inward communication)	4533	4631	4700	5029	5723
		Total inward enquiries	7975	8068	7406	7135	7495
6C	Carbon Monoxide Helpline	No. of Carbon Monoxide (CO) related calls received via the CO Helpline (1800 89 89 89)	1845	1792	1718	1294	1158

22 In 2016 Gas Networks Ireland responded to 17,428 PREs. In many cases there is no trace of gas. The figures illustrated in Table 10.1 are the actual number of leaks detected.

23 Dial before your dig

## 10. Distribution Gas Safety

There were **17,428 Public Reported Escapes** (PREs) related to leaks on the Gas Networks Ireland distribution network in 2016

### 10.4 Public reported escapes

There were 17,428 Public Reported Escapes (PREs) related to leaks on the Gas Networks Ireland distribution network in 2016. This is a decrease from the 19,449 PREs reported in 2015. In approximately 54% of these cases, no trace of gas was found. In the vast majority of cases where gas was detected, the leaks were minor in nature and were repaired by Gas Networks Ireland technicians using standard reactive maintenance and repair methods.

### 10.5 Distribution safety performance

There was a consistently high safety distribution performance over the year 2016, a brief summary is outlined below:

- 1 gas in building events;
- 3 unplanned outages in 2016; and
- 0 gas supply emergencies.

### 10.6 Promoting public awareness of gas safety

The total number of calls received via the 24-hour emergency telephone number (1800 20 50 50) in 2016 was 23,919 which was an increase on the 2015 figure of 19,198. The number of incoming enquiries received for "Dial-Before-You-Dig" enquiry phone line has decreased from 2,106 in 2015, to 1,772 in 2016, as enquiries increasingly arrive by email.

Gas Networks Ireland launched a new carbon monoxide campaign in the latter quarter of 2014, this continued into 2015 and 2016. Other initiatives include Carbon Monoxide Awareness Week in September of each year.

### 10.7 Addressing gas meter tampering

Established in 2013/14, Gas Networks Ireland's Revenue Protection Unit is tasked with the detection and prevention of gas theft and unauthorised interference with gas metering equipment and pipework. The Revenue Protection Unit also raises awareness of the dangers of gas meter tampering and the associated risk to life through targeted media campaigns, including radio, print media, bill inserts, and door drops.

The Revenue Protection Unit investigated 714 suspected cases of meter tampering in 2016, of which 393 were confirmed as tampered. In each of these cases, the meters were exchanged and made safe.



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During 2016, the CER approved a new process whereby Gas Networks Ireland can disconnect customers where a tampered meter has been confirmed and the customer fails to take the required steps to resolve the issue (i.e. reimburse Gas Networks Ireland for the cost of a damaged meter and provide a Registered Gas Installer (RGI) cert). This process commenced in August 2016 and is being monitored for 12 months to determine its effectiveness. Gas Networks Ireland also has powers under the Energy (Miscellaneous Provisions) Act 1995, to prosecute individuals in the District Courts for unlawful interference with a gas meter. 14 prosecutions were initiated during 2016 with various penalties imposed. Successful prosecutions are publicised to highlight the dangers of gas meter tampering and the potential consequences for the individual i.e. a criminal conviction. Criminal convictions of this sort are intended to act as a deterrent to others who may be considering tampering with their gas meter.

# 11.

## Conclusion

Gas Networks Ireland continued to deliver on key asset programmes and essential services to shippers and customers in 2016. There was growth experienced in distribution connections and in overall gas demand across the various sectors. While Corrib gas was commissioned the end of 2015, it did not become fully operational until July 2016.

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The **safety, integrity and performance** of the network remained the focus of Gas Networks Ireland in 2016

The introduction of a new entry point at Corrib, enhanced VRF and the introduction of EU network code updates has increased the complexity of the operation of the natural gas system, resulting in higher variability in entry-exit nominations in 2016. Forecasts such as the Network Development Plan are used by Gas Networks Ireland to prepare and respond to variations, which may be environmental, policy, market or system related.

The safety, integrity and performance of the network remained the focus of Gas Networks Ireland in 2016. Gas Networks Ireland has achieved its targets across all measures. Gas Networks Ireland remains committed to delivering to the highest standards, ensuring that gas is used to power homes, businesses and essential services throughout Ireland, 365 days a year, regardless of the weather and demand challenges that are placed on the system.

# 12.

# Appendices

## 12.1 Glossary of Terms

AGI	Above Ground Installation	N/A	Not Applicable
ALARP	As Low as Reasonably Practical	NDM	Non-Daily Metered
CER	Commission for Energy Regulation	NGEM	Natural Gas Emergency Manager
CES	Customer Effort Score	NGEP	Natural Gas Emergency Plan
CO	Carbon Monoxide	No.	Number
CSO	Central Statistics Office	OBA	Operational Balancing Account
DBYD	Dial Before You Dig	OGP	Office of Government Procurement
DM	Daily Metered	PPL	Planned Performance Level
DSO	Distribution System Operator	PPM	Pre-Payment Meters
Dx	Distribution	PREs	Public Reported Escapes
FAR	Forecasting, Allocation and Reconciliation	RES	Residential
IBP	Irish Balancing Point	RGI	Registered Gas Installer
I & C	Industrial & Commercial	Rol	Republic of Ireland
I/C	Interconnector	RuG	Reportable under Guidelines
km	Kilometre	SCADA	Supervisory Control and Data Acquisition
KPI	Key Performance Indicator	SEAI	Sustainable Energy Authority of Ireland
kWh	Kilowatt hour	TPD	Third Party Damage
GDP	Gross Domestic Product	TSO	Transmission System Operator
GIS	Geographical Information System	UAG	Unaccounted for Gas
GMARG	Gas Market Arrangements Retail Group	UKOPA	United Kingdom Onshore Pipeline-operators Association
GP	Gas Point	ZIP	Zero Imbalance Position
GPRO	Gas Point Registration Office		
GTMS	Gas Transportation Management System		
GWh	Gigawatt hour		
LDM	Large Daily Metered		
LEL	Lower Explosive Limit		
LPG	Liquefied Petroleum Gas		
MWh	Megawatt hour		
MOP	Maximum Operating Pressure		

## 12. Appendices

### 12.2 Tables used for Chart Graphics

Table 3.1: Transmission pipeline length (km)

	2012	2013	2014	2015	2016
Length of Onshore Pipeline	2005	2055	2000	2021	2015
Decommissioned	25	25	30	32	32
Length of Offshore Pipeline	412	412	412	412	412
Decommissioned	0	0	0	0	0
Total Length of Pipeline	2417	2467	2412	2433	2,427
Total Decommissioned	25	25	30	32	32

Table 3.2: Transmission connections

Category	31/12/12	31/12/13	31/12/14	31/12/15	31/16
Transmission LDM	31	32	34	35	34
Transmission DM	19	17	17	18	17

Table 4.3: System throughput

	2012	2013	2014	2015	2016
Total Gas Transported (GWh)	53,541	51,922	50,163	50,192	55,109
Daily Average Transported (GWh)	146	144	137	138	151
Peak Day Transported (GWh)	217	221	189	204	225

Table 4.4: System throughput per entry point (Calendar Year 2016)

	2016	%
Inch (GWh)	3434.5	6
Moffat (GWh)	21942.6	40
Corrib (GWh)	29476.4	54

**Table 4.5: Demand change**

	2012	2013	2014	2015	2016
Demand (GWh)	53,453	51,763	50,151	50,025	55,180
Change (GWh)	-1,286	-1,690	-1,612	-126	5,155
Change (%)	-2.38	-3.3	-3.2	-0.3	9.3

**Table 4.6: Fuel usage**

	2012	2013	2014	2015	2016
Fuel usage	852GWh	829 GWh	818 GWh	648 GWh	576 GWh

**Table 4.7: Meter read verification**

	KPI	2012 Actual	2013 Actual	2014 Actual	2015 Actual	2016 Actual
Metering Data Validation	<2% of sites	1.57%	1.25%	1.32%	1.31%	1.91%

**Table 4.8: Transmission Unaccounted for gas (UAG)**

UAG	2012	2013	2014	2015	2016
Throughput %	+0.020	+0.123	+0.009	+0.229	+0.16
Energy (GWh)	+12.4	+82.3	+6.1	+153.2	+121

**Table 4.9: Shrinkage**

	2012	2013	2014	2015	2016
Shrinkage as a % of throughput	1.58	1.2	1.3	1.2	0.8

**Table 4.10: Compressor stations carbon emissions**

Compression Site	2012 (tonnes)	2013 (tonnes)	2014 (tonnes)	2015 (tonnes)	2016 (tonnes)
Middleton	9,707	8,116	6,536	9,204	11,534
Beattock	44,012	43,186	40,257	38,269	31,321
Brighouse	58,896	57,302	60,783	57,740	27,114

## 12. Appendices

**Table 4.11: Demand change for the year (kWh)**

Compression site	2012 (GWh)	2013 (GWh)	2014 (GWh)	2015 (GWh)	2016 (GWh)
IC Inventory Space Utilised <sup>24</sup>	106	91 injection 91 withdrawal	9 injection 9 withdrawal	No longer offered as a product	No longer offered as a product
Inch Export to Storage <sup>25</sup>	1,670	2,122	2,179	1,804	505

**Table 4.12: Exit capacity bookings (kWh)**

	31/12/12	31/12/13	31/12/14	31/12/15	31/12/16
Power	107,200,391	92,616,149	95,862,000	101,872,899	106,324,361
DM I & C	11,485,874	17,441,235	37,692,205	40,652,518	41,108,477
NDM	99,602,449	98,419,126	97,127,877	97,543,678	95,157,457
Shrinkage	5,050,172	5,226,501	5,004,800	4,969,000	4,092,500
Total	223,338,886	207,325,745	235,730,081	245,038,095	246,682,795
Distribution SPC (kWh)	31/12/12	31/12/13	31/12/14	31/12/15	31/12/16
DM I & C	17,209,269	17,524,068	17,838,242	18,249,319	19,320,029
Residential	71,245,185	70,036,711	68,891,063	67,646,657	65,450,119
NDM I & C	28,389,133	29,309,426	28,903,865	29,811,248	29,476,324
Total	116,843,587	115,870,205	115,633,170	115,707,224	114,246,471

Note: in recent years the annualised bookings (which includes short-term) are reported on.

**Table 4.13: Entry capacity bookings (GWh)**

	2012	2013	2014	2015	2016
Inch	34.3	37.65	35.7	31.1	20.6
Moffat	199.5	173.9	153.1	165.1	145.5
Corrib	0	0	0	0.1	83 <sup>26</sup>
Total	231.5	233.8	211.55	196.2	249.1

<sup>24</sup> "IC Inventory Space" related to the IC interconnector with GB

<sup>25</sup> "Inch" relates to gas that is stored in the depleted Kinsale Gas Field.

<sup>26</sup> Yearly Average - Corrib Entry Capacity is fully booked since November 2016 (103.87 GWh)



**Table 5.1: Gas Point activity by category**

Category	Type	2012	2013	2014	2015	2016
Gas points registered	LDM	42	45	48	50	48
	DM	220	217	213	215	221
	NDM I & C	26,014	26,200	26,737	25,798	26,048
	NDM Domestic	635,614	640,441	646,162	647,795	653,838
	<b>Total</b>	<b>661,890</b>	<b>666,903</b>	<b>673,160</b>	<b>673,858</b>	<b>680,155</b>
Total gas points registered during the year	LDM	0	1	1	0	0
	DM	7	3	7	8	7
	NDM I & C	746	611	696	665	732
	NDM Domestic	5,779	6,392	6,797	7,719	8,791
	<b>Total</b>	<b>6,532</b>	<b>7,007</b>	<b>7,501</b>	<b>8,392</b>	<b>9,530</b>
Gas points deregistered <sup>27</sup>	LDM	-	-	-	-	-
	DM	-	-	-	-	-
	NDM I & C	18	23	33	1,404	205
	NDM Domestic	123	153	65	5,110	1,667
	<b>Total</b>	<b>141</b>	<b>176</b>	<b>98</b>	<b>6,514</b>	<b>1,872</b>
Tariff exempt NDM supply points @ 31st December <sup>28</sup>	LDM	-	-	-	-	-
	DM	-	-	-	-	-
	NDM I & C	1,334	1,518	1,566	297	286
	NDM Domestic	5,085	6,113	6,511	3,076	2,602
	<b>Total</b>	<b>6,419</b>	<b>7,631</b>	<b>8,077</b>	<b>3,373</b>	<b>2,888</b>
Total tariff exempt NDM supply points during year	LDM	-	-	-	-	-
	DM	-	-	-	-	-
	NDM I & C	666	496	394	373	320
	NDM Domestic	3,961	3,565	3,434	3,803	3,039
	<b>Total</b>	<b>4,627</b>	<b>4,061</b>	<b>3,828</b>	<b>4,176</b>	<b>3,359</b>
CoS Jan-Dec	LDM	6	6	3	7	6
	DM	42	82	110	129	114
	NDM I & C	3,819	4,698	3,513	5,456	3,392
	NDM Domestic	106,712	112,216	106,124	101,270	89,923
	<b>Total</b>	<b>110,579</b>	<b>117,002</b>	<b>109,750</b>	<b>106,862</b>	<b>93,435</b>
Historical consumption requests Jan-Dec <sup>29</sup>	LDM	11	7	12	11	9
	DM	73	114	60	112	77
	NDM I & C	4,364	2,361	1,662	9,311	8,688
	NDM Domestic	-	-	-	-	-
	<b>Total</b>	<b>4,448</b>	<b>2,482</b>	<b>1,734</b>	<b>9,434</b>	<b>8,774</b>

27 Data cleansing exercise resulted in de-registration of a large number of GPRNs

28 Decrease in tariff exempt GPRN following data cleanse

29 Increase in historic consumption reports due to bulk release requests from CSO, SEAI &amp; OGP

## 12. Appendices

Table 6.1: Achievement of capital programme

	Design	Construction ongoing	Construction Complete	Commissioned and in operation
<b>Reinforcement</b>				
AGI Capacity Upgrades	1			
Cluden to Brighthouse Bay Pipeline	●			
<b>Refurbishment</b>				
Ballough bypass	●			
AGI boiler replacement	1			4
AGI water bath replacement	0	1	1	1
AGI site instrumentation	20	2		6
ATEX Compliance	79		9	
Noise Attenuation	0		3	
Pipe Support Remediation	11	0	18	
<b>Interconnectors</b>				
Brighthouse Bay turbine air intakes		●		
Brighthouse Bay fuel gas skid upgrade				●
Beattock turbine ancillary equipment upgrade				●
Beattock volume control		●		
Beattock odorant plant upgrade				●
Beattock Unit C Service Exchange				●
<b>New Supply</b>				
Drumbannon AGI				●
Maydown AGI				●

Table 8.2: Systems availability

Communications & instrumentation	KPI	2012	2013	2014	2015	2016
GTMS System availability	99.8%	99.98%	99.98%	99.95%	99.96%	99.98%

**Table 8.3: Shipper operations**

Customer Commitment	KPI	2012	2013	2014	2015	2016
CoS (NDM)	Process CoS Requests- 100% <=5 business days	100%	100%	100%	100%	100%
CoS (DM)	Outgoing shipper notified with >=10 business days' notice	100%	100%	100%	100%	100%
Entry Capacity Booking Requests	Process <=20 days – 100%	100%	100%	100%	100%	100%
Exit Capacity Booking Requests	Process <=20 days – 100%	100%	100%	100%	100%	100%

**Table 8.4: Meter reading**

Customer Commitment	KPI	2012	2013	2014	2015	2016
Access Rate	80%	86.2%	86%	84%	83%	84%
Read Rate	Average 3.2 reads per site per calendar year	3.47	3.42	3.41	3.40	3.41

**Table 8.5: Trading and settlements**

Customer Commitment	KPI	2012	2013	2014	2015	2016
Invoice circulation	By 12th day of month	100%	100%	100%	100%	100%
Provision of shrinkage Pricing mechanism	Prior to October billing	100%	100%	100%	100%	100%

**Table 8.6: Maintenance days**

	KPI	2012	2013	2014	2015	2016
Maintenance days						
Unscheduled maintenance/Interruptions	0	0	0	0	0	0
Interruptions due to maintenance	0	0	0	0	0	3.15

**Table 8.7: Corrib Entry Point Constraint/ Curtailment 2016**

Month	Number of Constraints	Number of curtailments	Average Duration of Curtailments (hours)
January 2016	3	4	2.25
February 2016	7	1	4
March 2016	1	0	0
April 2016	0	5	5
May 2016	2	2	5
June 2016	16	0	0
July 2016	2	2	9
August 2016	2	0	0
September 2016	0	9	10
October 2016	1	0	0
November 2016	2	1	6
December 2016	0	1	12

## 12. Appendices

**Table 9.1: Distribution gas flows**

<b>Dx* DM I &amp; C</b>		<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>% Change</b>
Annual Total	MWh	3,312,979	3,407,738	3,460,876	3,629,253	3,838,030	5.8%
Annual Daily Average	MWh	9,052	8,412	9,482	9,943	10,486	5.5%
Peak Day Flow	MWh	12,668	12,541	12,785	13,737	14,091	2.6%
<b>Dx NDM I &amp; C</b>							
Annual Total	MWh	3,990,528	4,030,462	3,916,686	4,315,443	4,508,467	4.5%
Annual Daily Average	MWh	10,903	11,025	10,731	11,823	12,318	4.2%
Peak Day Flow	MWh						
<b>Dx NDM RES</b>							
Annual Total	MWh	7,744,001	7,817,915	6,908,094	7,158,766	7,237,864	1.1%
Annual Daily Average	MWh	21,158	21,438	18,926	19,613	19,776	0.8%
Peak Day Flow	MWh						
<b>Dx NDM Total</b>							
Annual Total	MWh	11,734,529	11,848,376	10,824,780	11,474,209	11,746,331	2.4%
Annual Daily Average	MWh	32,062	32,464	29,657	31,436	32,094	2.1%
Peak Day Flow	MWh	71,705	75,507	65,821	73,463	71,453	-2.7%
<b>Dx Total</b>							
Annual Total	MWh	15,047,508	15,256,114	14,285,656	15,103,462	15,584,361	3.2%
Annual Daily Average	MWh	41,113	40,875	39,139	41,379	42,580	2.9%
Peak Day Flow	MWh	84,373	87,913	78,393	86,402	84,630	-2.1%

**Table 9.2: Distribution connections by category**

<b>Connections</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>% Change from 2015</b>
Dx DM I & C	207	203	200	212	218	2.8%
Dx NDM I & C	23,967	24,054	24,548	25,111	25,565	1.8%
Dx NDM RES	626,791	630,921	636,012	642,836	649,445	1.0%
Dx Total	650,965	655,178	660,760	668,159	675,228	1.1%

**Table 9.3: Distribution Network Lengths - Systems Length at end 2015**

	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>
Total Length (km)	11,131	11,218	11,288	11,339	11,527

**Table 9.4: New Connections by category**

<b>Meters</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>
Mature Housing	4,722	5,321	4,841	4,544	4,314
New Housing <sup>30</sup>	874	1,003	1,878	2,804	3,588
I & C	724	610	681	607	630

30 New housing connection records do not currently differentiate between houses and apartments.

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