



**Hazardous Installations Directorate  
Gas & Pipelines Unit**

**Major Hazard Safety Performance Indicators in  
Great Britain's Onshore Gas and Pipelines  
Industry**

**Annual Report 2011/12**

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## Executive Summary

This report presents a broad range of safety performance indicators (SPIs) from across Great Britain's gas transmission, distribution and other hazardous pipelines sectors. These SPIs have been agreed jointly by HSE and leading operators in these sectors. The source data is real operational information that has been provided to HSE by these operators above and beyond their legal duties. HSE publishes this report annually in order to monitor the sector's safety performance year-on-year.

In 2011/12 the following indicators of the safety performance of Great Britain's gas and pipelines industry were reported.

- Gas Safety Management Regulations (GSMR) reportable incidents: there were increases in GSMR reportable incidents across all categories, although data capture issues may have affected the previous year's data.
- Gas in buildings: there was a significant reduction in the number of gas in buildings incidents, which was at its lowest ever recorded level.
- Third party damage: a clear increase can be seen in the number of third party damage incidents reported across all of the Gas Distribution Networks (GDNs) compared to the last two years' data. There were four incidents in the most serious category of the UKOPA third party infringement database in 2011 compared to one such incident to a pipeline in 2010. Third party damage was also the most significant cause of GSMR reportable incidents.
- Public reported gas escapes: all of the GDNs now operate prioritisation systems for gas escape repairs which actively target the higher risk escapes and lead to improved risk control. Overall, the percentage of reported gas escapes requiring repair that were dealt with by the GDNs within 12 hours has not changed significantly since 2008/09.
- Iron mains replacement: the GDNs' collective progress with the iron mains replacement programme exceeded the 2011/12 approved target by 111 km, or 3% of the overall target.
- Gas main or service failures: two events causing major injury or significant structural damage arising from fracture or corrosion were reported. Neither of these resulted in a fatality.
- National Transmission System (NTS): there were no particular trends identified from the SPIs reported for the NTS.

## 1.0 Introduction

### 1.1 Safety Performance Indicators (SPIs)

Major incidents in the gas and pipelines industry and other high hazard sectors are infrequent and do not provide meaningful safety performance data. For this reason HSE advocates the use of SPIs to operators in high-hazard industries. Setting SPIs involves identifying the risk control systems which must be effective in order to properly control the risk of a major incident, and carrying out monitoring activity to confirm the continuing 'health' of these systems. Sources of information that can be used to set SPIs include: data on near misses, low consequence incidents and major incident precursor events; reports of excursions from operating envelopes; and audits of compliance with critical safety procedures. Where common indicators are adopted by operators in an industry sector this allows safety performance across the sector to be compared and encourages sharing of good ideas and practices.

HSE's definition of a major incident and further information on HSE's response to such an event can be found at: [Operational Procedure – Major incident introduction](#)

### 1.2 This Report

HSE's Gas & Pipelines Unit has worked collaboratively with the gas transmission, distribution and other hazardous pipelines sectors to identify, agree and report performance against a suite of SPIs that are linked to potential major incident scenarios. The performance data included in this report is provided to HSE by leading operators in the sector in addition to information they provide in order to meet their legal duties. The intelligence provided is valuable and the Gas & Pipelines Unit incorporates the findings of this report into its operational strategy where appropriate. More information regarding HSE's gas and pipeline sector strategy can be found at: [HSE - Sector strategies: Gas and pipelines](#)

This annual report covers the period from 1 April 2011 to 31 March 2012 with the exception of data provided by National Grid Gas plc (NGG) for the National Transmission System (NTS) and pipeline data provided by the United Kingdom Onshore Pipeline Operators' Association (UKOPA), both of which cover the 2011 calendar year.

### 1.3 Great Britain's Gas and Pipelines Industry

Pipelines operated by the gas and pipelines industry in Great Britain are used to transport natural gas and other hazardous substances around the country. The sector is also responsible for the operation of natural gas importation and

storage facilities. In Great Britain, approximately 22 000 km of pipelines are defined as Major Accident Hazard Pipelines (MAHPs) under the Pipelines Safety Regulations 1996 (PSR). Of these, circa 21 000 km transport natural gas at pressures above 7 barg and the remainder transport ethylene and other dangerous fluids. In addition to MAHPs, the eight gas distribution networks (GDNs) also transport natural gas in pipelines operating at pressures below the MAHP threshold of 7 barg.

Prior to 1 June 2005, Transco plc operated nearly all of the natural gas MAHPs in the UK and owned all eight of the GDNs. After 1 June 2005, four of the GDNs were sold to: Southern Gas Networks plc; Scotland Gas Networks plc; Wales & West Utilities Ltd; and Northern Gas Networks Ltd respectively. NGG retained four GDNs in London, the West Midlands, the East of England and the North West. NGG also retained the NTS which delivers high pressure gas to each of the GDNs and other direct off-takes such as power stations.

#### 1.4 HSE's Gas & Pipelines Unit

HSE's Gas & Pipelines Unit regulates health and safety in Great Britain's gas and pipelines industry. The Gas & Pipelines Unit aims to improve health and safety outcomes in Great Britain through progressive improvement in the control of risk. This is achieved by ensuring that risks are properly controlled at onshore major hazards sites (including pipelines) and by working with HSE's Offshore Division (OSD) to ensure the safety of offshore installations and associated pipelines. The Gas & Pipelines Unit contributes to OSD's targets by ensuring the integrity of: emergency shutdown valves; pig traps; risers; pressure protection systems; sub-sea isolation valves; and wellhead pipework.

More information about the work of the Gas & Pipeline Unit can be found on HSE's website at: [Gas supply health and safety](#) and [Pipelines health and safety](#)

## **2.0 Gas and Pipelines Unit Safety Performance Indicators**

### 2.1 Background

HSE has held extensive discussions with dutyholders and other stakeholders in the gas and pipelines sector to ensure that the SPIs contained in this report are:

- indicative of the principal risks generated and faced by the sector;
- reasonably practicable for the dutyholders to produce; and

- where possible, utilise data already provided to other regulators, e.g. Ofgem.

Many of these SPIs are specific to the gas distribution industry, although pipeline damage and fault data collected by UKOPA is also monitored.

## 2.2 Safety Performance Indicators

The following SPIs have been selected because they are thought to be indicative of the sector's safety performance in terms of major accident risk.

- a. Pipeline SPIs
  - i. Number of pipeline infringements caused by third parties and recorded by UKOPA in their Infringement Database report
  - ii. Number of pipeline failure incidents arising from corrosion and other causes and reported by UKOPA in their Pipeline Product Loss Incidents report
- b. NTS SPIs - numbers of incidents on the NTS where:
  - i. Transportation Flow Advice (TFA) has been issued to prevent off-specification gas entering the NTS
  - ii. Gas transmission pressure has risen above 102.5% of the pipeline maximum operating pressure
  - iii. GDN offtake pressure has fallen below 38 barg
- c. Gas distribution SPIs
  - i. Numbers of incident reports submitted by GDNs under the Gas Safety (Management) Regulations 1996 (GSMR)
  - ii. Annual reports on progress with iron mains replacement made by GDNs
  - iii. Annual SPI reports are made by all five gas GDNs, these include the following information:
    - total length of iron mains remaining in each distribution network
    - number of gas in buildings incidents
    - number of mains and service related major incidents
    - total number of public reported escapes (PREs) requiring repair, and of these, the number prevented within 12 hours of the GDN being informed of the escape
    - number of third party damage incidents to pipelines and mains

These reporting categories are explained further in [Appendix 1](#).

### 2.3 Review of SPIs

The Gas & Pipelines Unit, in consultation with representatives from the GDNs and NTS, carried out a review of the SPIs included in this report during 2011/12 to ensure that they continue to be effective in contributing to the management of major hazard risks in the industry. As a result the suite of SPIs presented in this report has been revised and new metrics will be piloted with a view to future inclusion. The Gas & Pipelines Unit is also working with UKOPA to see whether further SPIs can be identified for the onshore pipeline sector.

## **3.0 UK Pipeline Operator SPIs**

### 3.1 UKOPA Infringement Database

Third party infringements are one of the largest causes of transmission pipeline damage and failure in the UK and abroad. An infringement is any activity that either causes damage to a pipeline or pipeline coating, or that has the potential to lead to such damage. The UKOPA Infringement Working Group (IWG) collects data on infringements within the legal easement around a pipeline or in the pipeline operator's declared zone of interest. Activities of interest that can damage a pipeline or pipeline coating include: excavation; ditch digging; post-hole boring; directional drilling; earth movement; and levelling.

The UKOPA infringement database has been set up to record infringements nationally. The purpose of the database is to identify trends in pipeline infringement and key factors leading to third party damage. This intelligence allows targeted action to be taken to educate potential infringers and gauge the effectiveness of steps taken by pipeline operators to reduce the risk of infringements occurring.

The UKOPA infringement database report has been compiled annually from 2004. Prior to 2005 contributions to the database were from chemical and oil sector pipeline operators only. The database content increased significantly in 2005 with the addition of data from high-pressure natural gas pipeline operators. Although not all of the data included in the database relates to MAHPs all of the transmission pipelines included have the potential to give rise to a major incident if ruptured. UKOPA IWG reports are published on the UKOPA website: [www.ukopa.co.uk](http://www.ukopa.co.uk)

Between 2009 and 2010 there was a dramatic fall in the number of infringements reported via the UKOPA database. However, this does not

reflect a true decline in the number of incidents and UKOPA attribute this decrease to changes made to the reporting mechanism for pipeline infringements. For this reason no comparison can be drawn between infringement data from previous years and 2010. The 2010 and 2011 data can be compared but limited conclusions can be drawn from such a small dataset.

UKOPA categorises the third party infringement data that it collects in order to create a more detailed picture of the pattern of infringements around pipelines. Table 3.1.1 shows the categories used to describe actual damage or potential damage to pipelines associated with the activity carried out by the infringer. Table 3.1.2 shows the categories used to describe the location relative to the pipeline.

Table 3.1.1: UKOPA Infringement Risk Categories

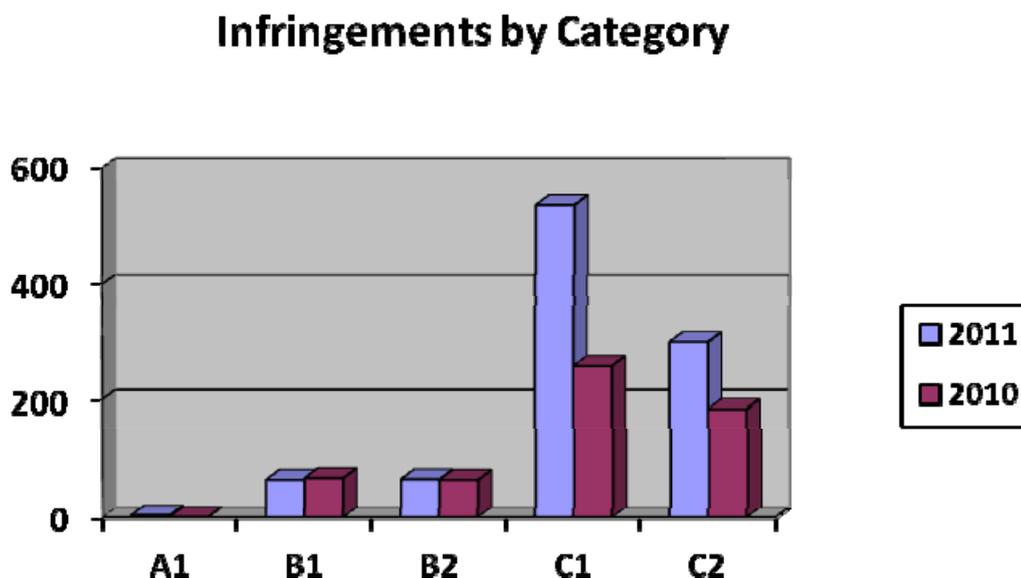
Risk	Infringement Type	Infringement Description
A	Pipeline Damage or Leak	Includes damage to wrap or protective sleeve
B	Serious Potential for Damage	Methods or equipment used could cause significant damage had excavation taken place
C	Limited Potential for Damage	Methods or equipment would not have resulted in serious damage

Table 3.1.2: UKOPA Infringement Location Categories

Location	Description
1	Within the pipeline wayleave or easement. Typically, this is the zone within which the pipeline operator has legal rights, including a requirement by the landowner to notify planned work.
2	Within the pipeline operators zone of interest, but outside the pipeline wayleave or easement. It is the area within which the operator would have reasonably expected a competent third party to have given notification in the prevailing circumstances.

The graph below shows the number of third party infringements reported in 2011 subdivided by the infringement category.

Graph 3.1.1: Third Party Infringements by Location and Risk Category in 2011



Note: the reported number of infringements does not include activities that had been notified to the pipeline operator in advance and where the operators' guidance was being followed.

The 2011 data includes four reported infringements in the highest 'A1' category. One of these related to damage to a pipeline that was discovered during routine inspection work in 2011 but which was caused at some point in the past. The other three were all caused by the activities of landowners. None of the affected pipelines were ruptured. Of the other infringement categories, C1 made the largest contribution to the number of recorded infringements and has increased significantly from 2010.

### 3.2 UKOPA Pipeline Product Loss Incidents Report

One of UKOPA's objectives is to provide authoritative intelligence to inform risk assessments and aid decision making in the context of land use planning in the vicinity of high hazard pipelines. To help meet this objective UKOPA has compiled a pipeline fault database, the purpose of which is to:

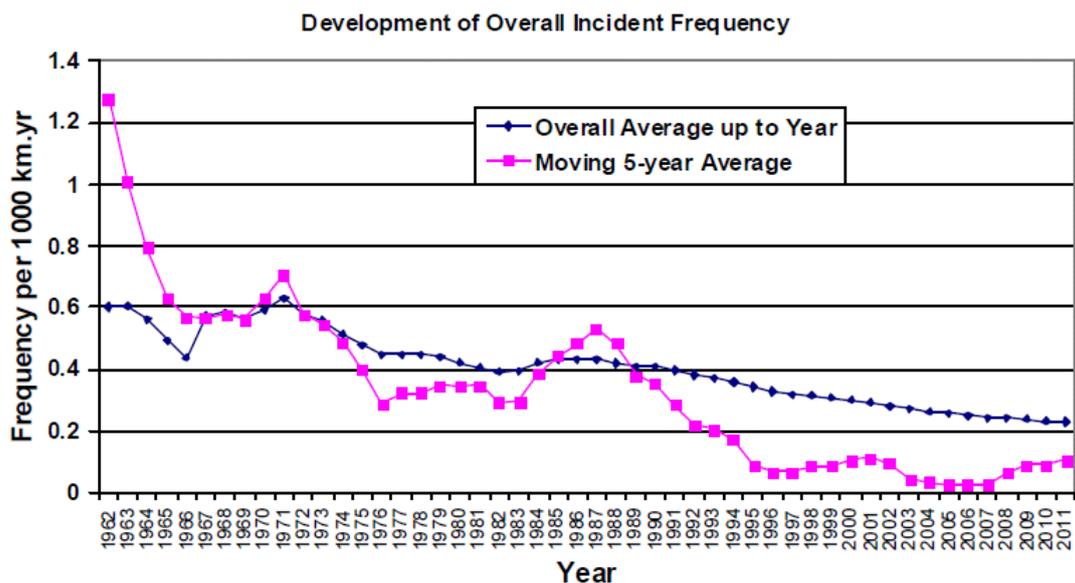
- estimate leak and pipeline rupture frequencies for UK pipelines based directly on historical failure rate data for UK pipelines;
- provide the means to estimate failure rates for UK pipelines for risk assessment purposes based on analysis of actual damage data for UK pipelines;
- provide a more realistic and rigorous approach to pipeline design and routing;

- provide the means to test design intentions and determine the effect of engineering changes (e.g. to wall thickness of pipe, depth of cover, diameter, protection measures, inspection methods and frequencies, design factor etc.).

UKOPA define a product loss incident as:

- an unintentional loss of product from the pipeline;
- within the public domain and outside the fences of installations;
- excluding associated equipment (e.g. valves, compressors) or parts other than the pipeline itself.

The data shown below is an extract from the most recent pipeline fault report published by UKOPA and covers the period 1962 to 2011.



Graph 3.2.1: UK Pipeline Product Loss Incidents 1962 to 2011

The full UKOPA pipeline product loss and fault data report is published on the UKOPA website.

## 4.0 Gas National Transmission System SPIs

### 4.1 Gas Quality

If gas supplied to the NTS has the potential to fall outside the normal specification required by GSMR, a transportation flow advice (TFA) communication is issued by the NTS control centre requesting the delivery facility to reduce or cease supply. Data for the number of TFAs issued

annually since 2005, and the gas quality characteristic of concern in each case, is presented in Table 4.1 below.

Table 4.1: Summary of TFAs issued for gas quality reasons

Gas Characteristic	Number of TFAs Issued						
	2005	2006	2007	2008	2009	2010	2011
Hydrocarbon dewpoint	13	17	6	17	13	9	12
Hydrogen sulphide	7	4	3	8	5	6	2
Carbon dioxide *	3	4	0	0	0	0	0
Incomplete combustion factor	7	4	16	14	11	5	4
Wobbe number	5	2	3	0	15	39	27
Calorific value **	1	3	0	0	0	0	0
Water dewpoint	1	2	3	1	0	0	2
<b>TOTAL</b>	<b>37</b>	<b>36</b>	<b>31</b>	<b>40</b>	<b>44</b>	<b>59</b>	<b>47</b>

\* not required under GSMR Schedule 3.

\*\* not required under GSMR Schedule 3 but used to calculate Wobbe number.

In 2010 the number of TFAs issued for Wobbe number increased significantly. This was attributed to operational and commissioning issues at certain terminals. Steps were taken to address these issues and the number of TFAs for Wobbe excursions has fallen in 2011 compared to 2010. The overall number of TFAs issued in 2011 was 47, a reduction from 2010, but still the second highest annual number of TFAs recorded to date.

The suitability of the number of TFAs issued per year as a gas quality SPI was considered during the review of SPIs that took place in 2012. Under the current NTS management arrangements, TFAs can be issued where no foreseeable risk of a major accident exists. Furthermore there are other systems in place to ensure that out-of-specification gas does not enter the network. This means that an increase in the number of TFAs issued does not necessarily reflect an increased risk of an emergency arising from out-of-specification gas being conveyed in the network. The review concluded that a more robust SPI should be sought for network gas quality and work is currently underway to identify a suitable indicator.

#### 4.2 Pipeline Operating Pressures

The Institution of Gas Engineers and Managers (IGEM) publication TD/1 'Recommendations on Transmission and Distribution Practice for Steel Pipelines for High Pressure Gas Transmission' states: 'the sustained operating pressure for a pipeline system should not exceed Maximum Operating Pressure (MOP)'. The sustained operating pressure is the maximum set pressure for the pressure regulating devices on the pipeline.

When operating at or near the MOP, TD/1 states that this pressure may be exceeded by no more than 2.5% of its value to allow for inevitable variations in the performance of pressure regulating devices and instruments. The current edition of TD/1 also allows for an incidental pressure rise of 2.5% above the MOP provided the Maximum Incidental Pressure (MIP) of the pipeline is not reached (TD/1 considers that the MIP is 10% above the MOP). When an incidental pressure rise occurs, the pressure should not exceed the MOP for more than 5 hours at any one time, or for more than a cumulative total of 20 hours per year.

The table below shows the number of events where pipeline pressure has risen above the MOP by no more than 2.5% on the NTS and the number of pipelines affected. In 2011, there were no events on the NTS where the operating pressure reached the MIP or where it exceeded the MOP by more than 2.5%.

Table 4.2: Summary of Pipeline MOP Events

Operating Pressure Level	Number of Events (Number of Pipelines Affected)				
	2007	2008	2009	2010	2011
Operating pressure exceeded MOP but was less than MOP + 2.5%	7 (10)	4 (5)	3 (3)	3 (4)	2 (4)

Note: this data does not include events where instruments were found to be faulty or where the pipeline pressure was deliberately increased as part of a planned test.

In 2007 NGG implemented a process to monitor and review all MOP excursion events and ensure that appropriate action is taken where such events occur. Since 2007, the number of events where the operating pressure on NTS pipelines rose above the MOP but by less than 2.5% has decreased substantially and remains at a low level year-on-year.

#### 4.3 GDN Entry Pressure

In 2011 there were two events where the pressure at the inlet to GDN offtakes fell below 38 barg. These did not cause failures in supply at the offtakes. There is no particular trend in GDN entry pressure excursions year-on-year.

This SPI was originally selected because 38 barg is the recognised normal design operating pressure at the GDN offtakes and data regarding compliance with this SPI is routinely collected. However, under the current NTS operational arrangements, the GDN entry pressure does not need to be

maintained above 38 barg in every case, and it is possible for the pressure to fall below this level without any foreseeable downstream consequences. One of the actions arising from the review of SPIs was therefore to identify a metric where there is explicit 'line of sight' to the possibility of a network pressure emergency developing and efforts are being made to identify such an indicator.

## **5.0 Gas Distribution Networks SPIs**

Full definitions for the terms and reporting categories used in this section of the report are given in Appendix 1.

### **5.1 GSMR Reports**

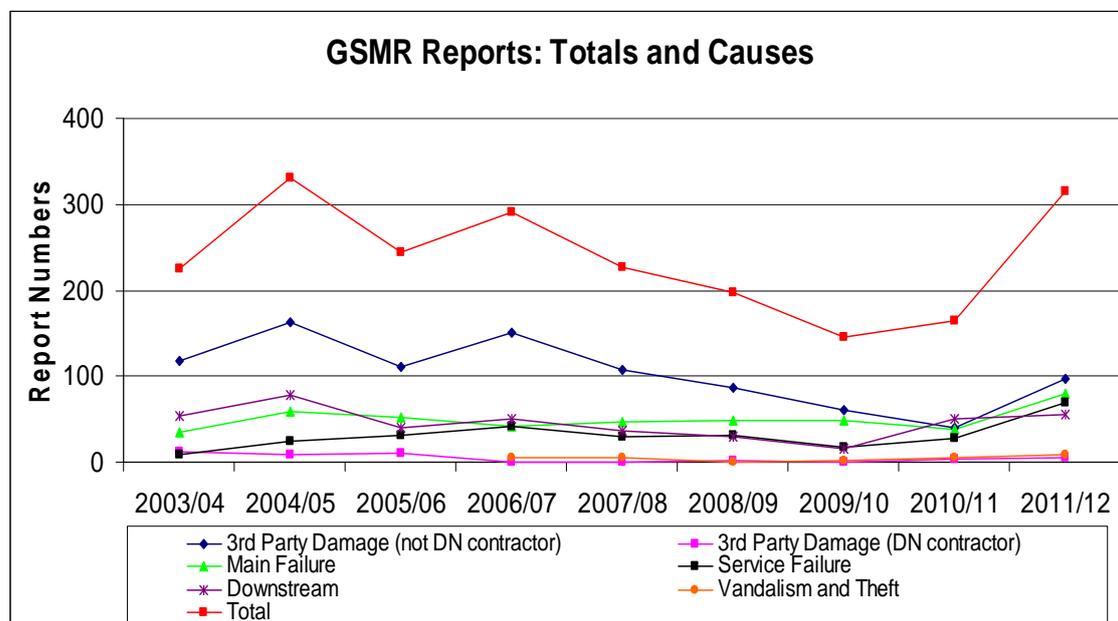
Gas conveyors have a duty under Regulation 7(13) of GSMR to investigate and report gas escapes on their network that have, or are likely to have, resulted in a fire or explosion. The investigation should establish the source of the escape and, so far as is reasonably practicable, the reason for it. Gas conveyors should make a GSMR report for the following:

- i. a gas in buildings event where the gas concentration has exceeded 20% of the lower explosive limit (LEL) or where more than 10kg of gas has been released; or
- ii. an external release exceeding 500kg of gas; or
- iii. an escape of gas, either within a building or on a network, which has resulted in a fire or explosion.

Problems in the data capture system for GSMR reports were known to have existed between 2007 and 2009 and may have persisted in 2010/11, resulting in under-reporting for that year. The apparent upward trend in the number of GSMR reports received between 2010/11 and 2011/12 should therefore be interpreted with caution.

The following graph shows the annual total of GSMR reports made from 2003/04 to 2011/12.

Graph 5.1: Annual number of GSMR Reports

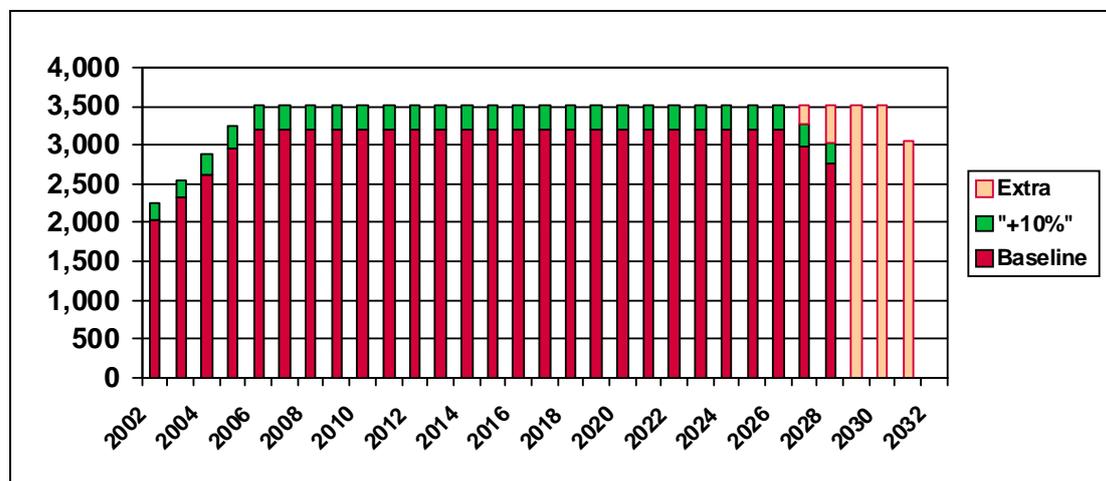


The 2011/12 total of 288 GSMR reports is a significant increase compared to 2010/11 when a total of 164 were received. There were rises in the number of reports submitted across every incident category and in the number of reports made by each of the GDNs compared to the previous year. Third party damage was the most significant cause of GSMR reportable incidents in 2011/12 and its prevention is a Gas & Pipelines Unit strategic priority.

## 5.2 Iron Mains Replacement Programme

In September 2001 HSE published its enforcement policy for the replacement of iron gas mains for the 30-year period between 2002 and 2032. This followed concern about the potentially catastrophic consequences of a gas main failure. At that time, records showed that there were about 91,000km of iron mains within 30 metres of property. In 2004 this figure was revised up to 101,000km. Since June 2005 the responsibility for meeting the requirements of the iron mains replacement programme has rested with the GDNs.

Graph 5.2: Profile for the decommissioning of iron gas mains 2002 - 2032



In 2011 HSE, in partnership with Ofgem, carried out a review of the regulatory approach to the risks associated with iron gas mains. Changes to the approach agreed with Ofgem take account of the findings of this review and a new enforcement policy has been published. This will remain in place until the end of the current Ofgem price review period in 2021. Further details of the review and the new policy are available on the HSE Website at: [10-year review of the iron mains replacement programme](#), and [Enforcement Policy for the iron mains risk reduction programme 2013 - 2021](#)

Table 5.2.1 shows the 30/30 iron mains decommissioning performance (so-called because it relates to the replacement of iron mains within 30 metres of buildings over a 30 year period) from 1 January 2002 for all networks. The iron mains decommissioned during the period 1 January 2002 to 31 May 2005 were owned by Transco plc. Subsequently they have been under the ownership of the GDNs.

Table 5.2.1: Mains Decommissioning Performance from January 2002

Year	Target (km)	Actual (km)	Variance (km)
Jan 02 -Mar 03	2575	2846	271
03/04	2549	2673	124
04/05	2882	2847	-35
05/06	3286	3287	1
06/07	3514	3562	48
07/08	3600	3639	39
08/09	3678	3819	141
09/10	3728	3865	137
10/11	3720	3622	-98*
11/12	3690	3801	111

(\* the period of severe weather during the winter of 2010/11 caused significant disruption to iron mains decommissioning delivery of some GDNs)

Table 5.2.2 shows the 30/30 iron mains decommissioning performance by each GDN from 1 April 2011 to 31 March 2012.

Table 5.2.2: GDNs' Mains Decommissioning Performance in 2011/12

Gas Distribution Network	Target (km)	Decommissioning Actual (km)	Variance (km)
National Grid Gas plc – North West	521	528	+7
National Grid Gas plc – East of England	599	607	+8
National Grid Gas plc – West Midlands	340	300	-40
National Grid Gas plc – London	360	373	+13
<i>(National Grid Gas plc – Total)</i>	<i>1820</i>	<i>1808</i>	<i>-12</i>
Northern Gas Networks Ltd	528	527	-1
Scotland Gas Networks plc	269*	272	+3
Southern Gas Networks plc	712*	811	+99
<i>(Scotia Gas Networks – Total)</i>	<i>981</i>	<i>1084</i>	<i>+102</i>
Wales & West Utilities Ltd	361*	383	+22
<b>Total of all Distribution Networks</b>	<b>3690</b>	<b>3801</b>	<b>+111</b>

Nationally 3801 km of iron mains were decommissioned in 2011/12 against the approved target of 3690 km, an excess delivery of 111 km.

National Grid Gas plc and Northern Gas Networks Ltd reported decommissioning shortfalls of 12 km (0.7% of their target) and 1.5 km (0.3%

of their target) respectively. HSE will ensure that these shortfalls are addressed in 2012/13 to make certain that the approved replacement commitments are met.

As part of its [monitoring strategy](#) and five year intervention plans for the GDNs, HSE continues to carry out mains replacement audits to check that qualifying mains are decommissioned in accordance with the policies and procedures in the GDNs' GSMR safety cases.

### 5.3 Iron Mains Remaining

The table below shows the length of all iron mains remaining within each GDN (regardless of proximity to an occupied building) on 31 March for the year reported. It includes iron mains removed due their condition or as part of other network maintenance or upgrading activities, as well as those decommissioned as part of the iron mains replacement programme. This SPI is widely reported and has significant strategic importance for the GDNs.

Table 5.3: Total Iron Mains Remaining in each GDN from 2006

<b>Gas Distribution Network</b>	<b>2006 (km)</b>	<b>2007 (km)</b>	<b>2008 (km)</b>	<b>2009 (km)</b>	<b>2010 (km)</b>	<b>2011 (km)</b>	<b>2012 (km)</b>
National Grid Gas plc North West	13,241	12,681	12,208	11,567	11,047	10,468	9,811
National Grid Gas plc East of England	17,000	16,363	15,772	15,086	14,405	13,785	13,097
National Grid Gas plc West Midlands	10,337	9,890	9,534	9,141	8,785	8,383	8,007
National Grid Gas plc London	10,713	10,400	10,102	9,739	9,391	8,962	8,472
<i>(National Grid Gas plc – Total)</i>	<i>51,291</i>	<i>49,334</i>	<i>47,616</i>	<i>45,533</i>	<i>43,628</i>	<i>41,598</i>	<i>39,387</i>
Northern Gas Networks Ltd	14,571	14,085	13,603	12,907	12,355	11,818	11,361
Scotland Gas Networks plc	7,599	7,238	6,934	6,608	6,291	6,023	5,732
Southern Gas Networks plc	19,695	18,941	18,297	17,601	16,867	16,225	15,424
<i>(Scotia Gas Networks - Total)</i>	<i>27,294</i>	<i>26,179</i>	<i>25,231</i>	<i>24,209</i>	<i>23,158</i>	<i>22,248</i>	<i>21,156</i>
Wales & West Utilities Ltd	10,471	10,174	9,805	9,381	8,977	8,620	8,247
<b>Total of all Distribution Networks</b>	<b>103,627</b>	<b>99,772</b>	<b>96,255</b>	<b>92,030</b>	<b>88,118</b>	<b>84,284</b>	<b>80,151</b>
(Mains removed since previous year)		3,855	3,517	4,225	3,912	3,834	4,133

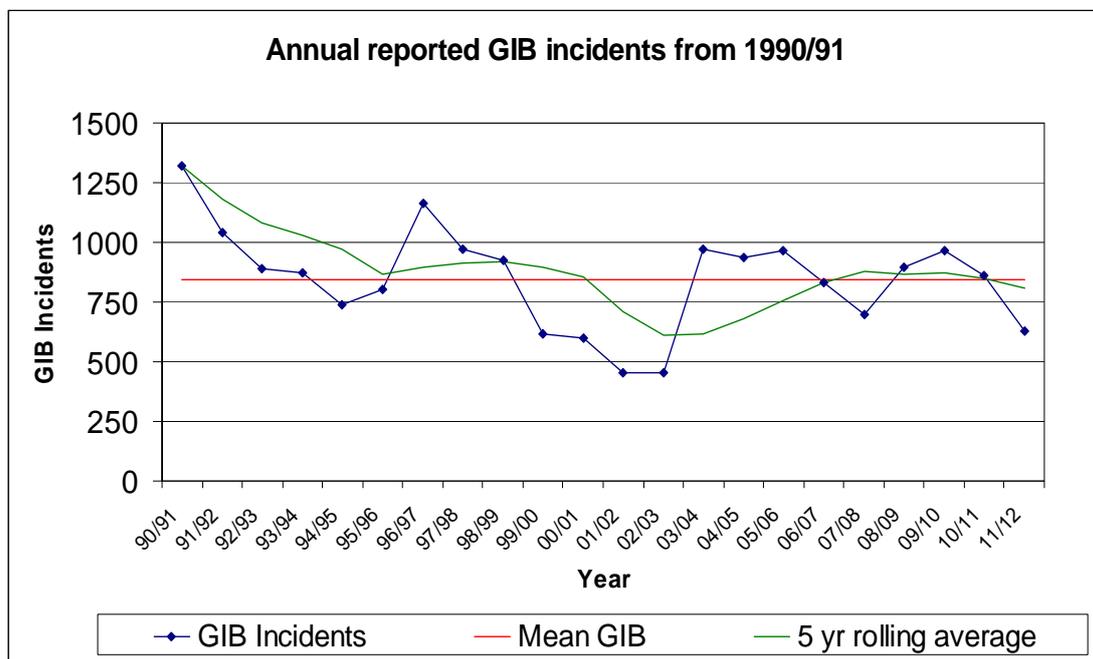
## 5.4 Gas in Buildings (GIB) Incidents

A GIB incident occurs when gas escaping from an outside gas main enters a building (see [Appendix 1](#) for how this is categorised). The risk of leaking gas causing a fire or explosion is significantly higher if gas enters a building than if it occurs outside. GIB events are regarded as a strong indicator of the risk of major injury or fatality associated with the gas supply network.

A GIB event can only occur where a gas leak arises from a source close enough to a building for the gas to track inside. For this reason, GDNs give priority to replacing iron gas mains near to buildings. They also prioritise their available resource to prevent leaking gas entering a building rather than repairing those escapes where gas is released into the open.

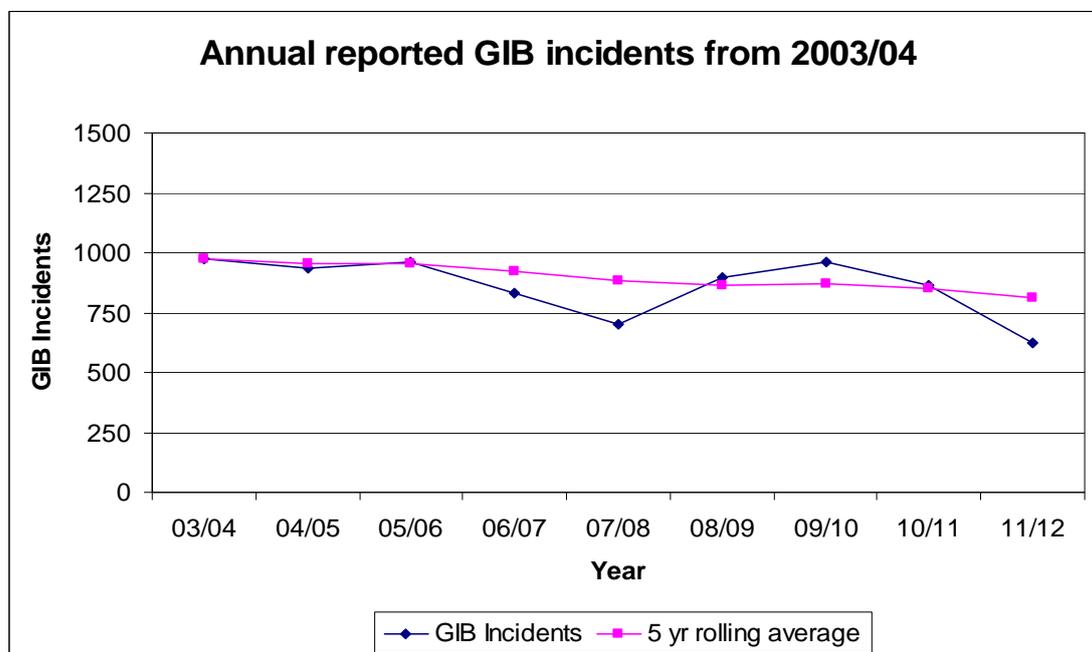
The graph below shows the annual number of GIB incidents reported since 1990/91. The mean value for the entire period is also shown, along with the five year 'rolling' average which can show trends more clearly.

Graph 5.4.1: Annual reported GIB incidents from 1990/91



It should be noted that the sharp increase in reported GIB incidents in 2003 was due to data capture improvements and does not indicate general system deterioration. For this reason, the data is also presented from 2003/04 onwards in Graph 5.4.2 below.

Graph 5.4.2: Annual reported GIB incidents from 2003/04



In 2011/12 the number of GIB incidents was 626, the lowest recorded level. The five year rolling average since 2003/04 also shows a general downwards trend. This SPI suggests that improvements in performance are being achieved by the GDNs through risk-based prioritisation for both iron mains replacement and prioritising the repair of gas escapes near buildings.

The table below shows the number of GIB incidents reported annually by each GDN since 2005/06. A year-on-year comparison can be made for the same GDN but since each distribution network is comprised of varying mixtures of urban and rural pipelines, it is unfair to compare the different networks.

Table 5.4: Number of GIB incidents across the GDNs

<b>Gas Distribution Network</b>	<b>05/06</b>	<b>06/07</b>	<b>07/08</b>	<b>08/09</b>	<b>09/10</b>	<b>10/11</b>	<b>11/12</b>
National Grid Gas plc North West	143	104	96	150	184	169	<b>89</b>
National Grid Gas plc East of England	198	149	133	215	183	139	<b>106</b>
National Grid Gas plc West Midlands	68	97	72	115	138	99	<b>102</b>
National Grid Gas plc London	56	72	53	73	72	53	<b>34</b>
<i>(National Grid Gas plc – Total)</i>	<b>465</b>	<b>422</b>	<b>354</b>	<b>553</b>	<b>577</b>	<b>460</b>	<b>331</b>
Northern Gas Networks Ltd	207	173	97	90	120	135	<b>74</b>
Scotland Gas Networks plc	67	62	67	54	86	89	<b>43</b>
Southern Gas Networks plc	105	99	121	127	108	99	<b>108</b>
<i>(Scotia Gas Networks - Total)</i>	<b>172</b>	<b>161</b>	<b>188</b>	<b>181</b>	<b>194</b>	<b>188</b>	<b>151</b>
Wales & West Utilities Ltd	119	74	61	73	72	80	<b>70</b>
<b>Total of all Distribution Networks</b>	<b>963</b>	<b>830</b>	<b>700</b>	<b>897</b>	<b>963</b>	<b>863</b>	<b>626</b>

Note: **Green** numbers indicate a decrease from the previous year, **amber** indicates an increase on the previous year and **red** indicates a sequential increase over two years (there are no instances of this in the 2011/12 reporting period).

In 2011/12 GIB reports fell in all but two of the GDNs. In the two instances where there was a rise in the number of reports, the increase was small.

### 5.5 Public Reported Escapes Requiring Repair Prevented Within 12 hours

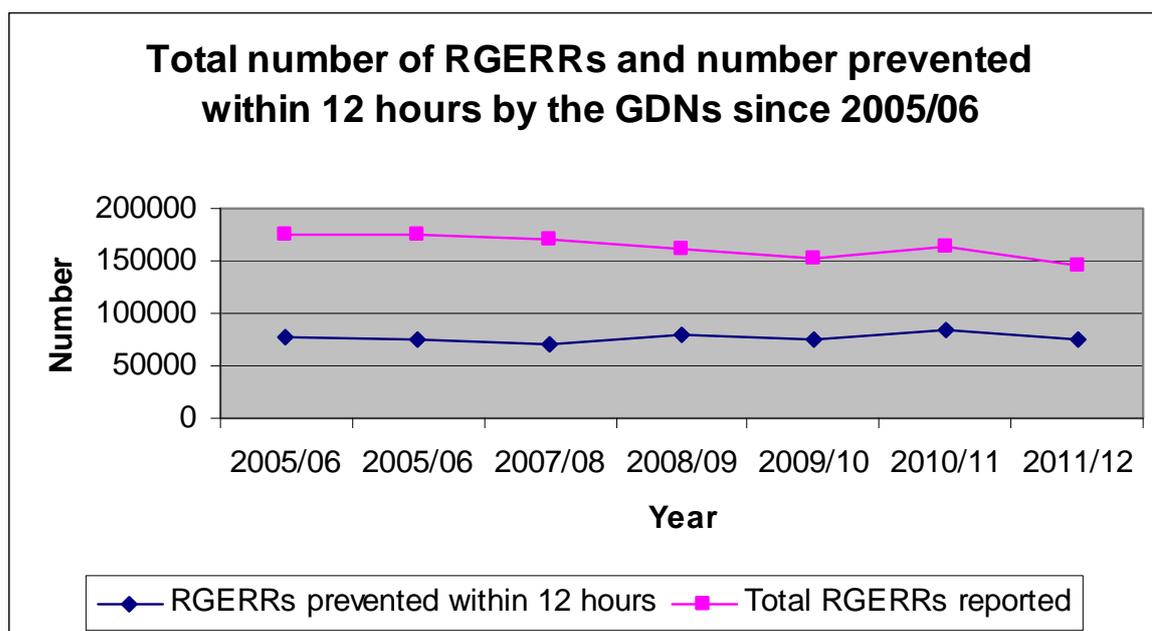
When a member of the public makes an emergency call to report a gas escape the relevant GDN records a public reported escape (PRE). The GDN then dispatches a first call operative (FCO) to investigate. If the FCO finds a gas escape from a main, service or emergency control valve, a reported gas escape requiring repair (RGERR) will be logged by the GDN.

Each GDN has to comply with regulation 7(4) of GSMR. This requires that after a PRE has been reported, the GDN should attend the leak as soon as is reasonably practicable and prevent it within 12 hours of being informed of the escape, unless it is not reasonably practicable to do so. Occasionally no trace of escaping gas is found and sometimes a number of PREs are found to relate to a single gas leak. The PRE repair performance of each GDN is therefore based only on RGERRs. In this context repair means:

- i) a permanent repair;
- ii) a temporary repair where the gas escape has been prevented; or
- iii) isolation of the gas supply.

The number of RGERRs reported each year across all the DNs and, of those, the number prevented within 12 hours is shown in the graph below.

Graph 5.5: total number of reported gas escapes requiring repair and number prevented within 12 hours of receipt of a PRE from 1 April 2005



All GDNs have implemented risk-based prioritisation systems which focus the available resource on preventing those gas escapes which present the greatest risk to members of the public. As a result, sometimes the prevention of relatively low risk and straightforward gas escapes may be deferred beyond 12 hours to allow the repair of those that are higher risk and potentially more difficult to address. This approach reduces the overall risk to the public and can lead to a fall in the percentage of RGERRs prevented within 12 hours by each of the GDNs.

The table below shows the percentage of the RGERRs received that were prevented within 12 hours of receipt of a PRE by each GDN since 2005/06.

Table 5.5: percentage of reported gas escapes requiring repair prevented within 12 hours of receipt of a PRE in the GDNs from 1 April 2005

<b>Gas Distribution Network</b>	<b>05/06 (%)</b>	<b>06/07 (%)</b>	<b>07/08 (%)</b>	<b>08/09 (%)</b>	<b>09/10 (%)</b>	<b>10/11 (%)</b>	<b>11/12 (%)</b>
National Grid Gas plc North West	36.7	40.3	44.9	48.7	44.8	42.2	41.7
National Grid Gas plc East of England	43.2	53.4	49.0	50.1	52.2	48.3	58.8
National Grid Gas plc West Midlands	37.0	39.8	41.9	42.7	36.4	34.4	37.0
National Grid Gas plc London	34.8	38.9	41.8	42.9	44.6	40.5	52.5
<i>(National Grid Gas plc – Total)</i>	<i>38.3</i>	<i>43.6</i>	<i>44.7</i>	<i>46.4</i>	<i>45.4</i>	<i>42.2</i>	<i>48.1</i>
Northern Gas Networks Ltd	56.5	50.3	50.4	55.6	57.9	59.1	61.9
Scotland Gas Networks plc	64.3	57.6	37.3	54.9	62.3	66.0	66.5
Southern Gas Networks plc	41.0	35.9	31.9	53.0	54.1	62.3	52.7
<i>(Scotia Gas Networks - Total)</i>	<i>46.6</i>	<i>41.2</i>	<i>33.2</i>	<i>54.0</i>	<i>58.2</i>	<i>63.2</i>	<i>55.8</i>
Wales & West Utilities Ltd	43.4	34.5	40.7	47.2	45.4	43.8	41.7
<b>Mean of all GDNs</b>	<b>43.8</b>	<b>43.0</b>	<b>42.0</b>	<b>49.6</b>	<b>50.1</b>	<b>50.5</b>	<b>51.0</b>

Since 2008/09 the mean of all the GDNs' 12-hour RGERR performance has not changed significantly. However, there is significant variation in the percentage of RGERRs prevented within 12 hours across the GDNs. The differences in the risk-based prioritisation systems used by the GDNs may account for some of this variability. HSE and the GDNs have attempted to identify a metric that will allow comparisons to be made between the GDNs, although at present no such metric has been found.

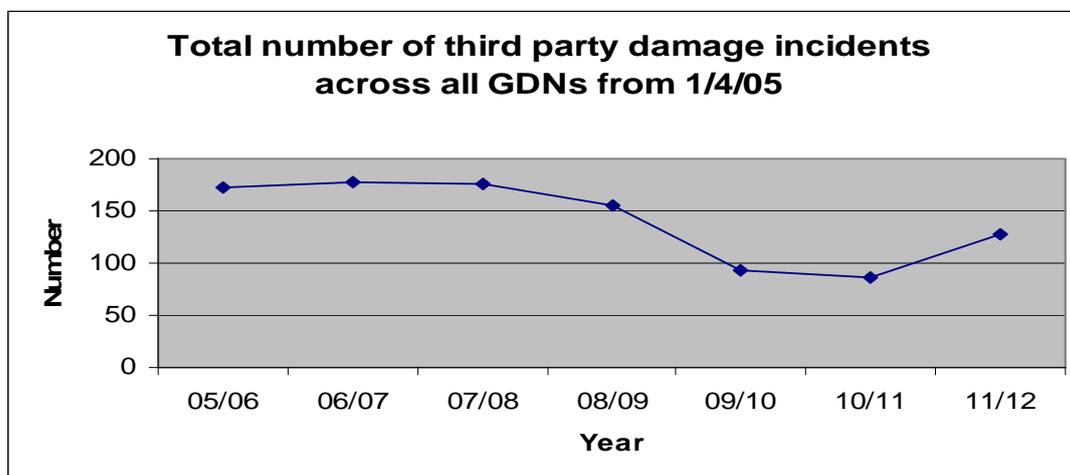
## 5.6 Third Party Damage Incidents

The table and graphs below show the number incidents of third party damage to distribution mains in each GDN.

Table 5.6: Number of damage incidents caused by all third parties across the GDNs from 1 April 2005

<b>Gas Distribution Network</b>	<b>05/06</b>	<b>06/07</b>	<b>07/08</b>	<b>08/09</b>	<b>09/10</b>	<b>10/11</b>	<b>11/12</b>
National Grid Gas plc North West	39	24	18	20	5	11	11
National Grid Gas plc East of England	29	33	31	29	15	17	17
National Grid Gas plc West Midlands	11	7	14	8	8	7	7
National Grid Gas plc London	9	26	20	20	12	5	44
<i>(National Grid Gas plc - Total)</i>	<i>88</i>	<i>90</i>	<i>83</i>	<i>77</i>	<i>40</i>	<i>40</i>	<i>79</i>
Northern Gas Networks Ltd	24	23	10	15	8	4	4
Scotland Gas Networks plc	18	20	30	10	12	13	14
Southern Gas Networks plc	15	24	34	35	16	21	17
<i>(Scotia Gas Networks - Total)</i>	<i>33</i>	<i>44</i>	<i>64</i>	<i>45</i>	<i>28</i>	<i>34</i>	<i>31</i>
Wales & West Utilities Ltd	28	21	19	19	17	9	14
<b>Mean of all Distribution Networks</b>	<b>173</b>	<b>178</b>	<b>176</b>	<b>156</b>	<b>93</b>	<b>97</b>	<b>128</b>

Graph 5.6: Total number of third party damage incidents across all GDNs from 1 April 2005

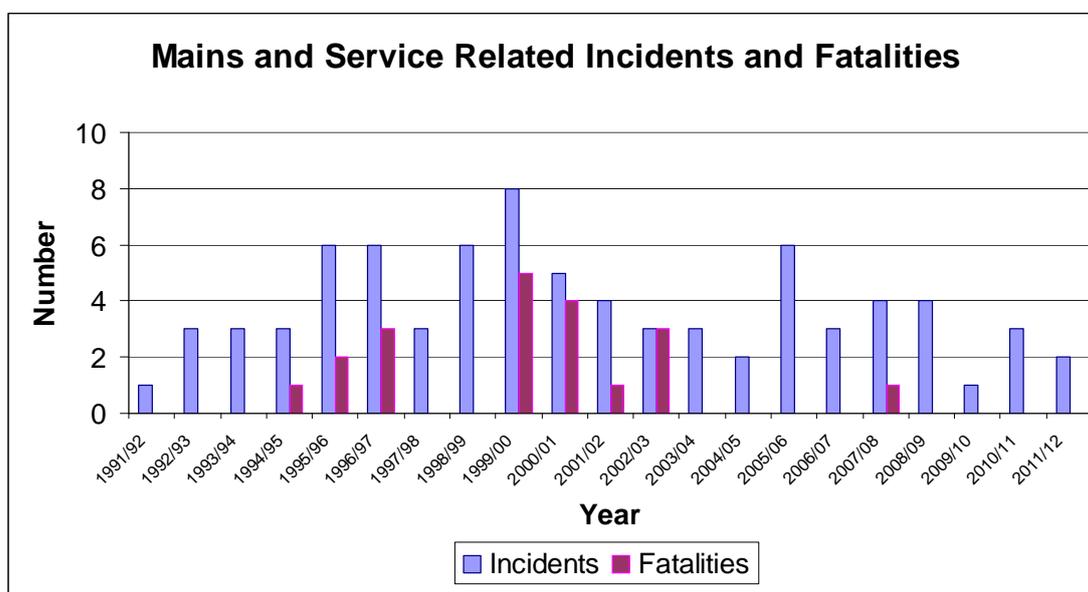


The total number of third party damage incidents reported by the GDNs has increased from 87 in 2010/11 to 128 in 2011/12. The Gas & Pipelines Unit has identified the prevention of third party damage to pipelines as a priority within its strategy.

### 5.7 Mains and Service Related Major Incidents

The graph below shows the numbers of mains and service related incidents causing death, major injury or significant structural damage from 1 April 1990. This is the total number reported by all of the GDNs.

Graph 3.3.7: Number of Mains and Service Related Major Incidents and Resulting Fatalities from April 1990



This metric is an outcome measure of the consequences of failure to control risk, and the numbers reported are low. In the 12 years prior to the start of the iron mains replacement programme in 2002, there were, on average, 4.6 mains and service related incidents per year and 1.4 fatalities per year. Since the start of the iron mains replacement programme in 2002 there have been, on average, 3.1 mains and service related incidents per year and 0.4 fatalities per year. In 2011/12 there were two mains and service related incidents and no fatalities.

Good performance against this outcome measure reflects success in three areas:

- i. managing the physical condition of the network;
- ii. making appropriate plans to prepare for emergencies; and

- iii. responding effectively to emergencies and potential emergencies (e.g. public reported gas escapes) when they arise.

Recent performance has been strong with low numbers of incidents reported. However, the statistical variation from year to year means that an increase in the number of reported incidents cannot always be interpreted as a meaningful trend. This is why 'upstream' measures of performance, such as the SPIs presented in this report, can give a better insight into safety performance than outcome measures.

## **Appendix 1 - GDN Annual SPI Reporting Definitions**

### **IRON MAINS REMAINING**

GDNs report the total iron mains population (in km) for each network regardless of proximity to a building.

This information should be useful in allowing HSE to compare safety performance across each DN. However, since the ratio of the iron pipeline population that is within 30 metres of a building will vary across GDNs, this will not provide the basis for a precise measure of residual risk.

### **GAS IN BUILDINGS**

GDNs report the number of 'Gas in Buildings' (GIB) events where any gas readings have been detected within a building as a result of an iron distribution mains pipe failure, specifically:

- i. a fracture or corrosion of a cast/spun iron main
- ii. corrosion of a ductile iron main

Reportable GIB events will exclude incidents arising from:

- iii. non-iron materials (polyethylene, steel, etc)
- iv. non-pipe specific components (e.g. joints, clamps, encapsulations, internal appliances, etc.)
- v. service pipes
- vi. other failure causes such as third party interference

Note: to be consistent with the data already reported to Ofgem, GIB events will be reported regardless of the concentration of gas relative to the LEL.

### **MAINS & SERVICE RELATED INCIDENTS**

GDNs report the number of failures upstream of the emergency control valve (ECV) leading to gas entering a building, where subsequent ignition causes death, major injury (as defined by RIDDOR 1995) or significant structural damage. This category covers only those incidents arising from fractures and corrosion and does not include third party damage.

Note: National Grid Gas has previously defined significant structure damage as being where the estimated cost of repair is in excess of £10,000. Incidents not meeting this criterion but where the concentration of gas is  $\geq 20\%$  LEL inside buildings (when evacuation is required) or where 500kg of gas has

been released externally will continue to be reportable under RIDDOR and GSMR.

## PUBLIC REPORTED ESCAPES

a) GDNs report the number of 'reported gas escapes requiring repair' made on their networks as an SPI instead of the number of 'escapes on the network'. The reason for this is to remove any inflation of numbers caused by multiple 0800 111 999 calls for the same gas escape. This also removes any need for the GDNs to report on "No Trace" incidents.

A 'reported gas escape requiring repair' is a repair made to a distribution main or service pipe following a gas escape. This includes third party damage but excludes leaks and repairs downstream of the ECV. In this context repair means:

- i. a permanent repair
- ii. a temporary repair where the gas escape has been prevented
- iii. isolation of the gas supply

b) GDNs report the number of escapes on their Networks and prevented within 12 hours from receipt of the first emergency call.

Note: since this data will be extracted from the emergency call centres it may include situations where multiple calls have been received for a single gas escape.

## THIRD PARTY DAMAGE

GDNs report the number of third party damage incidents on their networks. In this case, "third party" excludes the GDN's own employees but includes the GDN's contractors and any other unrelated parties. Only the following categories will be reported:

- a) incidents on mains operating below 7 bar g; and
- b) incidents where a report of a dangerous occurrence has (or should) have been made under RIDDOR Schedule 2, paragraph 14, parts (a), (b) and (c), specifically where, using GSMR criteria:
  - i. damage resulting in a GIB event where > 20% LEL gas in air concentration or >10Kg gas escape has occurred; or
  - ii. damage resulting in an external release > 500Kg; or
  - iii. damage and release leading to the ignition of gas.

Note: the GDN should follow a gas measurement procedure which provides the best indication of the risk of ignition in GIB events where > 20% LEL concentration or a >10Kg gas escape has occurred.