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Managing the risk from the iron pipes within the gas distribution network

Purpose of the paper

1. The Board is asked to note HSE's revised enforcement policy on the management of risks from iron gas mains and the proposals for reviewing the regulatory framework.

Background

2. The Board was advised in 2011 of the findings of a review into the HSE approach to the risks associated with iron gas mains and proposed changes to this approach to take account of these findings (Annex A). This approach has been refined and is now set out as an enforcement policy (Annex B) to be published, as previously, on HSE's website. This is consistent with the approach being taken with the revised Ofgem funding arrangements for the networks that is due to be implemented in April 2013. The Distribution Network Operators (DNOs) accept the general approach and the documents.
3. Since 03/04 when the reporting arrangements were last reviewed, the frequency of Gas In Building (GIB) events has ranged between 700 and 1,000 per year. These are defined as events where gas escaping from the network has accumulated within a building. Events associated with leaks from appliances within premises are not included. GIB events have the potential for fire and explosion and a key risk prevention factor is the emergency response that the networks provide. The last fatality was in 07/08, but six people suffered major injuries in the explosion at Shrewsbury in January 2010 when mains gas leaked from a fractured low-pressure cast-iron gas main.
4. Reviewing the enforcement approach has highlighted the anomaly associated with the Pipelines Safety Regulations 1996 (PSR) Regulation 13A which places an absolute duty on all pipeline operators to ensure the integrity of their pipelines. The tendency for iron pipes to fail means this is, in practice, an impossible standard to meet. Under R13A, if the operator of an iron gas distribution system submits a "suitable and sufficient" programme for the decommissioning of iron pipes, HSE must accept it. Acceptance of a programme then relieves the operator of the absolute duty should there be a failure, provided the operator has fulfilled the terms of the submitted programme.
5. The Enforcement Policy Statement (Annex B) sets out what HSE accepts as a suitable and sufficient programme and sets a 'so far as reasonably practicable' standard for managing the risk from iron gas main distribution systems.
6. The current PSR R13A arrangements do not, however, encourage the DNOs to innovate and seek new ways to deal with risk from iron pipes. They also require HSE to audit the mains replacement programmes of DNOs. We intend to consult on the PSR R13A arrangements to remove the need to submit a programme for HSE approval and to set a 'so far as reasonably practicable' future standard to bring arrangements into line with the other elements of risk management associated with the iron mains distribution network.

7. This approach should also encourage the DNOs to integrate other network risk controls including how they react to publicly reported gas escapes. There should be no reduction in the protection provided to the public from any of these changes and inspectors will continue to oversee implementation of the R13A programmes.
8. We propose to start this work once the new three-tiered approach to risk management is in place so that any changes can inform the Ofgem mid term price review for implementation in 2017.

Action

9. The Board is asked to note the:
 - a) Changes to the PSR R13A enforcement policy, and
 - b) Plans to consult on the replacement of PSR R13A with a requirement to manage risk from iron mains 'so far as reasonably practicable'.

Paper clearance

10. David Snowball

Annex A

UPDATE ON CAST IRON MAINS REPLACEMENT PROGRAMME (21 June 2011)

1 In 2002 HSE, Ofgem and Transco agreed a 30-year programme to replace all iron mains within 30 meters of occupied buildings. These mains are prone to failures leading to gas escapes that can cause fires and explosions. The Pipeline Safety Regulations 1996 require the Gas Distribution Networks (GDNs) to maintain all their pipelines in good repair. However, the GDNs currently have a statutory defence to this absolute duty under Reg 13A for their iron mains provided they implement a pipeline replacement programme approved by HSE. Approved programmes are funded via Ofgem pricing arrangements.

2 In 2010, HSE and Ofgem jointly commissioned an independent review of the iron mains replacement programme. This concluded:

- The programme has been successful in removing the highest risk mains to date and iron mains replacement has kept pace with network deterioration.
- The risk from the remaining iron mains is not spread evenly across all pipeline diameters. The smaller pipes that make up the bulk of the remaining iron mains population pose the highest risk in the network.
- Wholesale removal of all diameters of iron mains means that larger diameter pipes in perfectly good condition have been replaced - with all the social disruption this creates. This is because the GDNs have had an incentive simply to replace pipework rather than manage the risk from the larger mains.
- Risk management approaches, other than replacement alone, should be considered for the larger pipe diameters
- The risk model used by the GDNs ought to reflect the frequency of events where gas releases get inside buildings.

3 The current programme will be revised in 2013 to take account of the findings and recommendations of the review and will coincide with revised Ofgem network pricing arrangements and the new arrangements will introduce a more sophisticated risk-based approach, where this makes sense, by:

- Giving GDNs the freedom to find alternatives to replacement, such as improved spray-lining and condition assessment techniques that will reduce the wider impact on society of digging up roads etc.
- Allowing considerations other than mains failure, such as environmental risk, gas escape management and network condition to influence mains replacement project planning and ensure greater flexibility for the GDNs and an increase in societal benefit.

4 The new programme will continue to require the replacement of all small diameter mains. These constitute the large majority of the iron mains population for which it is not possible to apply a risk-based approach based on condition assessment. For the larger iron mains the GDNs will develop a more sophisticated and evidence-based approach. To achieve this, the GDNs will be expected to gather improved network condition data and demonstrate that they are effectively managing network risk as a whole.

5 HSE will also review the appropriateness of the Reg 13A approval procedure and consider whether any changes are necessary.

Annex B

Enforcement Policy for the iron mains risk reduction programme 2013 – 2021 May 2012

Background

The Health and Safety Executive's (HSE) enforcement policy for the Iron Mains Risk Reduction Programme (IMRRP) addresses the failure of 'at risk' iron gas mains (i.e. those pipes within 30 metres of buildings) and the consequent risk of injuries, fatalities and damage to buildings. It is designed to secure public safety whilst allowing efficiency, environmental, strategic and customer service factors to contribute to driving the programme and allowing sufficient flexibility to enable the Office of the Gas and Electricity Markets (Ofgem) to incentivise innovation in risk management.

Over the last 35 years various iron mains replacement programmes have been in place. Since 2002 the programmes have been designed to decommission all 'at risk' iron pipes within a 30-year period. The order in which all 'at risk' iron pipes have been decommissioned has been determined by use of a risk prioritisation model.

In December 2010 HSE and Ofgem jointly commissioned an independent report to assess the progress made with decommissioning programmes since 2002 and to evaluate potential options for the remaining 20 years of the original programme taking into account the benefits and costs of each option. This fulfilled HSE's commitment to review its enforcement policy every five years and supported Ofgem's RIIO price control review. This report, written by Cambridge Economic Policy Associates (CEPA), working in partnership with Advanced Engineering Solutions Ltd (AESL) provides more detail on previous replacement programmes and is published on HSE's website at [RR888 - HSE/Ofgem: 10 year review of the Iron Mains Replacement Programme](#) (the CEPA/AESL report).

The '10 Year Review of the Health and Safety Executive's enforcement policy for the replacement of iron gas mains' describes how HSE has used the findings of the CEPA/AESL report to develop the enforcement policy for the IMRRP. The new enforcement policy will be applied from April 2013 to March 2021 and replaces the previous [2006 -2013 enforcement policy](#). The change in name to the 'Enforcement Policy for the iron mains risk reduction programme' reflects the shift in emphasis from the wholesale decommissioning of 'at risk' iron pipes to targeted risk management.

There are a small number of local networks using iron pipes. These are not included within this policy and are being dealt with on a case-by-case basis, for example via their operators' Gas Safety (Management) Regulations 1996 (GS(M)R) safety cases.

Legal requirements

The Health and Safety at Work etc. Act 1974 (HSWA), section 3(1), requires pipeline operators to conduct their undertakings to ensure, so far as is reasonably practicable, that persons not in their employment are not exposed to risks to their health and safety.

In addition, the Pipelines Safety Regulations 1996 (PSR), regulation 13 requires the operator to ensure that a pipeline is maintained in an efficient state, in efficient working order and in good repair. This duty is absolute, with a limited defence only if a breach is caused by a third party.

In November 2003 the Pipelines Safety (Amendment) Regulations 2003 came into force. This created a statutory defence under PSR regulation 13A to a breach of regulation 13 if the failed iron gas pipe was included in a decommissioning programme approved by HSE.

Initially decommissioning programmes were approved for a period of twelve months although longer approval periods have also been granted since 2011.

The arrangements for meeting the replacement programme form part of the GDN operators' safety cases prepared under GS(M)R. The gas distribution network (GDN) operators have a duty to follow these arrangements.

Industry structure

In June 2005 Transco completed the sale of four of its original eight gas distribution networks (GDNs). Along with National Grid Gas plc (Transco's successor), Scotland Gas Networks plc, Northern Gas Networks Ltd, Wales & West Utilities Ltd, and Southern Gas Networks plc are now responsible for complying with this enforcement policy within their respective GDNs.

HSE's Enforcement Policy for the Replacement of Iron Gas Mains 2013 – 2021: The Three Tier Approach

The three tier approach allows a greater focus on risk and larger diameter 'at risk' iron pipes will only be subject to decommissioning if either condition or risk assessment or engineering judgement indicates this is justified. There is greater flexibility to allow the GDN operators to exploit innovative solutions, where these are suitable and sufficient, such as pipe lining technologies to either replace pipes or extend pipe life. It also ensures efficiency, environmental and reliability benefits associated with the programme are accounted for.

The three tiers of pipe diameter are:

Tier 1: 8 inches and below (approximately 80% of all 'at risk' iron pipes)

Tier 2: above 8 inches and below 18 inches (approximately 15% of all 'at risk' iron pipes)

Tier 3: 18 inches and above (approximately 5% of all 'at risk' iron pipes).

At risk pipes in Tier 1

The CEPA/AESL report concluded that the 'at risk' iron pipe population at 8" diameter and below represents the most significant risk to the public. However, there is still no effective alternative to decommissioning for pipes in this diameter range.

As in the 2006 – 2013 enforcement policy each GDN operator will set a length of Tier 1 pipes to be decommissioned over the period of their approved programmes. This should be sufficient to ensure that all Tier 1 pipes are removed by the end of 2032 or earlier. For approved programmes lasting longer than one year the GDN operators will be allowed to adopt a flexible approach to their annual delivery so long as arrangements are in place to ensure that their approved target is met. This will facilitate the delivery of large or complex decommissioning projects which require significant preparation and will also allow the GDN operators to take remedial action should their progress with decommissioning fall short in a particular year.

The approach to decommissioning Tier 1 pipes will continue to be prioritised on the basis of the risk of an incident presented by each pipe. This will be calculated using the existing risk model, although this will continue to be subject to improvements by the GDN operators. Twenty percent of the Tier 1 set length of pipes to be decommissioned will be drawn from the highest risk pipes identified by the risk model. The remaining 80% of the set of pipes to be decommissioned will be drawn from any part of the remaining Tier 1 population. This will ensure the delivery of an efficient programme and reflects the overall reduction and flattening of risk scores within the Tier 1 pipe population.

In contrast to the 2006 – 2013 enforcement policy, any pipes decommissioned on the basis of their condition, or those selected for reasons of reliability or joint leakage, may be counted towards the approved programme target.

As in the 2006 – 2013 enforcement policy, the GDN operators will be able to ‘profile’ their work to take account of the scaling down of workload towards the end of 2032.

At risk pipes in Tier 2

Tier 2 pipes scoring above a risk-action threshold, set by the GDN operator, will be selected to receive appropriate attention over the period of the approved PSR regulation 13A programme. Appropriate attention means that Tier 2 pipes scoring above the risk-action threshold will either be decommissioned or, where a suitable and sufficient technique exists, assessed for continued use if found to be in good condition or remediated to allow for lifetime extension. In addition, those Tier 2 pipes scoring above the risk-action threshold will be subject to the condition monitoring arrangements described below.

Since the onus is on the GDN operators to demonstrate that they control the risks in their network they have developed proposals to determine a risk-action threshold. These proposals have been reviewed by HSE and are considered appropriate. Each GDN operator’s PSR regulation 13A programme submission will contain a detailed description of the method used to set the risk-action threshold.

No annual decommissioning length target will be set for Tier 2 pipes scoring above the risk-action threshold as part of their approved PSR regulation 13A programme. This is because the Tier 2 pipes selected by the GDN operators within their networks to receive appropriate attention may not be decommissioned if a suitable and sufficient alternative to decommissioning is applied instead. However, at this time no suitable and sufficient alternatives to decommissioning have been proposed by the GDN operators. In the absence of such proposals HSE expects that the GDN operators will decommission these pipes. However, it is anticipated that Ofgem funding incentives will drive innovation in this area.

As part of their approved programme submissions the GDN operators will be required to provide details of their arrangements for managing the risk from those Tier 2 pipes that have migrated to above the risk-action threshold during the course of the approved programme period and cannot reasonably be subjected to appropriate attention during that same period.

Pipes in Tier 2 scoring below the risk-action threshold may still be subject to decommissioning where a cost benefit analysis agreed with Ofgem is justified. Examples of this might include the decommissioning and replacement of pipes that enable greater efficiencies in Tier 1 decommissioning projects.

At risk pipes in Tier 3

The CEPA/AESL report concluded that iron pipes of 18" a diameter and above are the least likely to fail of all those within 30 meters of buildings. As such Tier 3 pipes will be subject to the condition monitoring arrangements described below. In addition, Tier 3 pipes may still be subject to decommissioning where a cost benefit analysis agreed with Ofgem is justified.

Condition Monitoring

As part of their approved programmes the GDN operators should establish suitable condition monitoring regimes, using leakage surveys, for pipes in Tier 2 scoring above the risk-action threshold and all for pipes in Tier 3 throughout the approval period. Details of these regimes should be provided by the GDN operators as part of their approved programme submissions.

The GDN operators will continue to respond to all publically reported gas escapes from all pipes as required by GS(M)R regulation 7(4), the procedures for which are detailed in their GS(M)R safety cases.

HSE expects the GDN operators to systematically analyse the outputs from these activities in order to pinpoint any pipe failure ‘hotspots’. Where pipes are found not to comply with Regulation 13 of PSR the GDN operators should take suitable and sufficient action to

remedy this, including decommissioning where the pipe is judged to have deteriorated beyond safe or effective repair.

In addition, HSE expects the GDN operators to take advantage of innovative techniques that may allow them to pro-actively monitor the condition of pipes in Tier 2 scoring above the risk-action threshold and pipes in Tier 3 to predict the likelihood of failure and to improve asset integrity data.

Decommissioning of Iron Mains

Any iron pipe should be decommissioned when it can no longer be effectively repaired or remediated and becomes unsafe for use. As structured above, the three-tiered approach requires that all Tier 1 pipes will be decommissioned by the end of 2032 or earlier. Pipes in Tiers 2 and 3 will be decommissioned on the basis of asset integrity assessment processes covered by supporting documentation to be provided by the GDN operators with their PSR regulation 13A programme submissions.

Within a GDN operator's approved programme there may be Tiers 2 and 3 pipes that, if subject to appropriate condition monitoring and/or remediation, will remain suitable for continued use. These pipes are included within the population of iron pipes benefiting from the statutory defence provided by PSR regulation 13A providing that the approved programme has been followed by the GDN operator.

HSE will consider an iron pipe to be decommissioned when it is no longer used to carry gas. Where a polyethylene (PE), or other pipe, has been inserted into an iron pipe, or effectively a new pipe has been constructed using a spray-lining technology that uses an existing pipe as a mould for a new pipe, the existing iron pipe will be considered to be decommissioned. Iron pipes will only be considered to be decommissioned where the internal pipe is itself capable of meeting the requirements of PSR regulation 5 without any contribution from the external iron structure.

Approval of Iron Mains Risk Reduction Programmes from 1st April 2013

HSE will modify the way in which iron mains risk reduction programmes are approved in response to the three tier approach. From 1st April 2013 each PSR regulation 13A approval granted by HSE will specify only the length of Tier 1 pipes to be decommissioned and the time period over which this will be achieved. However, the GDN operators should provide additional information in their submission regarding the length of Tier 2 pipes above the risk action threshold that will receive appropriate attention over the period of the approved programme. Each GDN operator should also provide details of how pipes in Tier 2 that score above the risk action threshold and pipes in Tier 3 will be monitored.

From 1st April 2013 HSE will grant PSR regulation 13A approvals to the GDN operators for periods of up to eight years.

Monitoring of Iron Mains Risk Reduction Programmes from 1st April 2013

Over the period of each approved programme HSE will require the GDN operators to provide the following information on a quarterly and annual basis:

- I. Length of 'at risk' Tier 1 pipes decommissioned
- II. Length of 'at risk' Tier 2 pipes scoring above the risk action threshold subjected appropriate attention
- III. Length of 'at risk' Tier 2 pipes scoring above the risk action threshold and decommissioned
- IV. Length of 'at risk' Tier 2 pipes scoring below the risk action threshold decommissioned
- V. Length of all 'at risk' Tier 3 pipes decommissioned.

Only the length of 'at risk' pipes decommissioned in Tier 1 will contribute to the GDN operators approved programme target. Lengths of pipes subjected to leakage surveys need not be provided to HSE as part of the IMRRP monitoring arrangements although this may be sought by Inspectors during verification inspections.

Medium pressure ductile iron (MPDI) mains

HSE required Transco to decommission all MPDI mains within 30m of property by 30 April 2003, resulting in excess of 2800 km being decommissioned. Serious concerns remain about the integrity of MPDI mains and any additional lengths which are found or become 'at risk' must be decommissioned as soon as reasonably practicable and in any case within 12 months.

GSMR safety cases and the network safety

GDN operators should set out their policy and procedures in their GSMR safety cases for implementing and managing their iron mains risk reduction programmes to meet the objectives of this policy.

Approvals granted by HSE under PSR regulation 13A and affected by this policy relate only to the risk from the failure of 'at risk' iron mains. Other GDN duties to ensuring the safety of the public from the gas distribution network, such as:

- Emergency response to gas escapes
- Network pressure management
- Network gas odourisation
- Up-to-date and accurate asset record keeping
- Repair and maintenance of assets other than iron mains within 30m of occupied buildings remain unaffected by the PSR regulation 13A approval. These duties are addressed in each GDN operator's intervention strategy and will be examined in the event of any gas escape subject to an HSE investigation.