

# *Network Innovation Competition Full Submission*

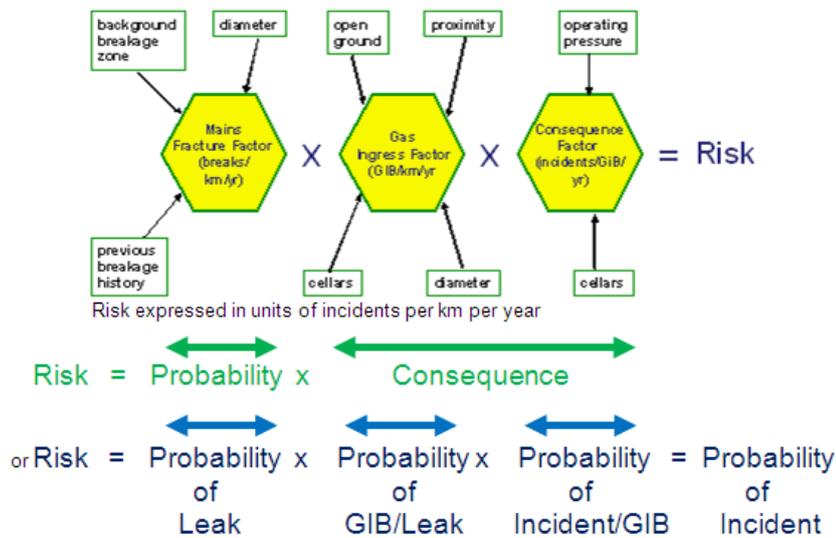
## *Supplementary Answer Form*

Tick if this answer is Confidential:

Tick if this answer has been provided verbally:

Project code:	SGN_GN_01	Question Number	4
Question date	27 <sup>th</sup> August 2013	Answer date	29 <sup>th</sup> August 2013
Submission section question relates to	Section 2 (page 7)		
Topic	Project Description (& Appendix D)		
Question	Re: Expected outcomes of the trials - 4, ' Identification of critical locations at high risk of leak or rupture' - Please specify and justify the pipe integrity parameters that will result in a classification of high risk and how the MRPS risk assessment process is applied to confirm this determination.		
Notes on question			
Answer	<p>The development of robotics technology in terms of iron and steel distribution gas mains has the potential to inform improved future industry pipe risk models and to identify, down to individual pipe length, where local factors exist which will influence decisions on remediation action and remediation methods to reduce on a prioritised basis the associated societal and individual risk.</p> <p>Despite development over a number of years current risk models are limited in that we do not have a capability to physically examine buried distribution mains to assess pipe condition without involving considerable expenditure and distribution to the public. Even where using excavation it is generally only practicable to access parts of a pipeline rather expose it in full. Robotics potentially provide a means of assessing pipeline condition without incurring such cost or disruption but identifying factor which may exist and increase the risk of pipe failure.</p> <p>At present our industry risk models (illustration below) consider the previous fracture/ corrosion history of a pipe unit together with the background fracture/corrosion rates of pipes in the locus but not other factors which increase the probability of pipe failure/leakage or influence potential failure mode.</p>		

## MRPS Calculation of risk value for individual pipes



Most serious incidents arising from gas main leakage relate to gas pipe fractures and corrosion events rather than joint leakage. Failure modes are well documented and relate to pipe corrosion, pipe loading, pipe defects and indeed human factors particular associated with pipe construction and third party interference. Often it is a combination of factors which lead to corrosion blowout, circumferential or longitudinal stress cracking in an individual pipe or pipeline.

It is hoped that this project can lead to the utilisation of robotics to provide useful data on physical pipe condition and be used to minimise future pipeline failures by enabling targeted action to be prioritised. By determining pipe stresses, corrosion, wall thickness, pipe inclination, cracks and other pipe defects and damage it is hoped that future remediation can be targeted more efficiently to those pipes more likely to fail through pipe corrosion and fracture, in addition to addressing issues surrounding joint leakage etc.. This is most likely to be of assistance when considering larger diameter mains which are less prone to in fracture but none the less when failures occur often produce significant emergencies.

It is not considered that this proposal on its own will on its own establish fitness for purpose criteria in terms of asset integrity for legacy pipelines, some of which were constructed predating recognised UK pipe standards being established. It is hoped that the project will be able to demonstrate use of this technology and identify situations and establish criteria that would trigger action - be it in terms of increased monitoring or physical remediation or pipe replacement for pipes identified at being of high risk .

It is not expected that the MRPS risk assessment process would be applied, as it currently to confirm the determination of pipes identified at higher risk based on internal inspection findings. It is more likely that additional physical condition information will allow a better informed assessment of the probability and consequence of pipe fracture/ corrosion, than those used the current risk model in situations where inspection exceptions to the norm are identified. The basic principles of our risk models would however be applied.

It is hoped that information in terms of the knowledge gained from this project and other work in this area will when shared and lead in improved industry pipe risk models and risk management techniques.

Attachments	
Verbal Clarifications (Consultants )	