



# **Gas NIC Final Report**

## **Robotics**

**Project Reference: SGN GN 01**

REPORT from RUNE ASSOCIATES LTD

(Confidential)

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## 1. EXPLANATORY NOTES

This report is based on:

1. The Initial Screening Submission submitted on 29th April 2013.
2. The Full Submission, submitted on 9<sup>th</sup> August 2013
3. Responses to Questions
4. Dialogue between the Rune Consultant and the Project Team on 4th September 2013
5. Further information provided following the Project team meeting
6. Dialogue between the Project Team and the Expert Panel on 30th August and 23<sup>rd</sup> September 2013.
7. Dialogue between the Rune Consultants and the Expert Panel on 13<sup>th</sup> September 2013.
8. A Re-Submission of the proposal on 10<sup>th</sup> October 2013
9. The basis of the content of this report is as follows:
  - The text of Sections 2 through 11 is that in the Interim Report dated 18<sup>th</sup> September 2013.
  - The colour ratings shown in Sections 3 through 11 reflect an assessment of the Interim Report information, against the NIC Gas evaluation criteria.
  - Section 12 addresses the implications of the changes set out in the Re-Submission.
  - The colour ratings shown in Section 12 reflect an assessment of the total information provided in the Full Submission and Re-Submission, against the NIC Gas evaluation criteria.



## 2. SUMMARY OF PROJECT INFORMATION

### 2.1. SUMMARY DETAILS

Basic Project Information	
Project name	Robotics
Project Short Name	SGN GN 01
The Funding Licensee	Southern Gas Networks (SGN)
Total Project Cost (Cell I13 <sup>1</sup> )	£7,378k
External Funding. (Cell I25)	Nil
Network Licensee Compulsory Contribution. (Cell I66)	£739k
Network Licensee Extra Contribution. (Cell I37)	Nil
Gas NIC Funding Request. (Cell I85)	£6,640k
Direct Benefits.	Nil
Requested threshold for the funding of cost over-runs if different to the default.	The submission, Section 6, indicates that a threshold of 5% is required against cost over-runs. However, in response to a request for clarification (SGN Q9), SGN has confirmed that this is an error and should read 0%.
Requested protection on Direct Benefits, if different to the default.	Nil

### 2.2. SYNOPSIS

Synopsis of Project Submission	
Description of the problem	<p>The proposal is intended to address the following problems associated with iron gas distribution mains:</p> <ul style="list-style-type: none"> <li>• Gas leakage to ground/atmosphere as a result of pipe or joint failure.</li> <li>• Disruption and high levels of expenditure resulting from current maintenance practices which typically involve extensive highway excavation and traffic obstruction.</li> <li>• Management/reduction of the risk to society due to gas leakage and the potential consequences of an explosion incident.</li> <li>• Provision of accurate mains location information and interference damage.</li> <li>• Disruption and expenditure associated with the current practices for excavation and connection of services following mains</li> </ul>

<sup>1</sup> Cell references relate to the NIC Funding request tab of the Financial workbook



Synopsis of Project Submission	
	<p>replacement by insertion techniques.</p> <p><i>Note: Gas distribution iron mains within 30m of a property are categorised, in tiers, by the HSE based on the degree of risk resulting from failure. Tier 1 (high risk) comprises mains ≤ 8in diameter, Tier 2 &gt;8in &lt;18in diameter, Tier 3 ≥18in diameter.</i></p>
Description of the proposed method	<p>To address the identified problems, SGN proposes to develop robotic equipment that can be inserted into and remotely operated within a live gas distribution main in order to:</p> <ul style="list-style-type: none"> <li>• Perform maintenance operations on Tier 2 and Tier 3 mains, e.g. joint repairs to prevent leakage.</li> <li>• Acquire the data necessary for determination of Tier 2 and Tier 3 mains condition, risk assessment and risk management/reduction.</li> <li>• Provide precise mains location information.</li> <li>• Connect services to a Tier 1 inserted replacement main.</li> </ul>
Description of proposed Trial(s)	<p>The submission includes field trials to support development and testing of the robotic equipment to confirm capability to operate in live gas mains and perform the operations described above. Also, the trials will provide an indication of pricing for commercial work.</p>
Intended outcomes (solutions)	<p>Achievement of the project objectives and widespread implementation of the robotic techniques by SGN and other gas distribution network owners are intended to drive cost and environmental benefits. These potential benefits are described and quantified in the submission but further information is required to provide confidence in the assumptions and the build up.</p> <p>Acquisition of data required to determine the operational condition of mains will be utilised to assess and manage risk in terms of the consequences of gas leakage resulting from failure.</p>
Customer impact of Project implementation.	<p>SGN state that <i>'the project will impact on customers within the demonstration projects for asset replacement only. The impact will be positive as we will be field trialling on a project where we are intending to replace the asset anyway and the method proposed is designed to be less disruptive than the current method'</i>. The operations will take account of SGNs' internal obligations to their customers as well as all obligations to the guaranteed standards of service (GSOS) as specified by Ofgem. If successful, the Project should lead to reduced costs and disruption in maintaining the integrity of assets.</p>
Key strengths of the proposal	<ul style="list-style-type: none"> <li>• The robotic developments proposed to address the iron pipe problems are considered pioneering and will provide new learning that that is of high relevance to other Network Licensees.</li> </ul>
Key weaknesses of the proposal	<ul style="list-style-type: none"> <li>• The operational assumptions driving the CBA assessment of the potential financial benefits claimed are not adequately substantiated.</li> <li>• There is no detailed clarification regarding development of the proposed risk management process, incorporating pipe integrity</li> </ul>



Synopsis of Project Submission	
	<p>data gathered robotically, that will address the principle of iron mains condition assessment/remediation versus replacement. This issue has a significant bearing on the financial benefit claimed.</p> <ul style="list-style-type: none"> <li>• The proposed Successful Delivery Reward Criteria do not include any reference to achievement of the potential project outputs that drive the financial and environmental benefits claimed.</li> <li>• The technical challenges and risks associated with development of the robotic operations capabilities are not adequately addressed.</li> </ul>
Project management structure and related information.	Project management arrangements in terms of project team structure and resources are clear. Governance arrangements are described at high level and the submission states that the project will employ the standard programme management and governance approach used by SGN as described in their Project Management Procedures. No information has been provided to provide assurance that this approach is effective.
Derogations/ Exemptions that the Project would/may require.	The submission, Section 7, confirms that no derogations/exemptions are required.
Proposed Successful Delivery Reward Criteria for the Project.	The SDRC categories/stages specified, and the details provided in the submission, do not include any reference to achievement of the potential project outputs that drive the financial and environmental benefits claimed.
The key learning outcomes which the Project aims to deliver.	<p>The submission provides details of the plan and process for internal and external dissemination of learning to all stakeholders.</p> <p>If the project objectives are achieved there is considerable scope for adoption of the robotic techniques by all gas distribution network owners to drive potential cost and environmental benefits.</p>



### 3. SUMMARY OF ASSESSMENT - INTERIM REPORT

#### 3.1. OVERALL ASSESSMENT

##### Overall summary

The project addresses several problems associated with maintenance and operation of gas distribution system Tier 2 and Tier 3 iron pipes. The problems specified are significant in terms of operational costs and environmental impact, and are common to all gas distribution networks. The project will, therefore, provide new learning that is of high relevance not only to SGN but to other Network Licensees also.

Current operations to maintain and replace Tier2 and Tier3 iron gas mains invariably involve excavation in the highway and are high cost. The primary objective of the project is to develop new robotic technologies which operate inside the live gas mains to perform pipe inspection and remediation operations. Development of the proposed robotic capabilities is considered pioneering work which presents significant technical challenges that are not clearly specified and assessed in terms of risk to the success of the project.

Whilst the Project Plan and Project Team structure/resources are sufficiently detailed to provide confidence that the project is feasible, we consider that the lead time for effective applications will be longer than stated. Governance and project management arrangements are described at high level and refer to SGN's Project Management Procedures. However, no information has been provided about the successful application of this approach for other strategic projects that provides assurance that the approach is effective.

The project has the potential to deliver substantial financial and environmental benefits. However the underlying assumptions and build up of the benefits claimed are not adequately substantiated in terms of quantification and timing of effect. As a consequence we regard the benefits claimed as lacking the necessary credibility, potentially unrealistic in terms of scale and, therefore, tenuous.



### 3.2. SUMMARY OF ASSESSMENT AGAINST INDIVIDUAL EVALUATION CRITERIA

Key to ratings		<ul style="list-style-type: none"> <li>Seems to be generally in line with the objectives and requirements of the NIC Gas evaluation criteria,</li> <li>Whilst there are some areas where additional information would be useful, that provided is generally comprehensive and provides no immediate cause for concern.</li> </ul>
		<ul style="list-style-type: none"> <li>Some indication that the project is in line with the objectives and requirements of the NIC Gas evaluation criteria. However further scrutiny is required to ensure this,</li> <li>There are some gaps in the information provided,</li> <li>Further assurance is needed to confirm that the project is viable and that risks are appropriately managed</li> </ul>
		<ul style="list-style-type: none"> <li>Significantly more assurance is required that the project is in line with the objectives and requirements of the NIC Gas evaluation criteria,</li> <li>There are some major gaps in the information provided,</li> <li>Considerable scrutiny is needed to confirm that the project is viable and that risks are appropriately managed,</li> <li>Potential major risks to the viability of the project.</li> </ul>

Evaluation Criteria <sup>2</sup>	Rating	Overall assessment
Criterion A: Low carbon and benefits		<p>The project has the potential to deliver financial benefits in terms of reductions in operational costs to some degree. However, the assumptions driving the benefits claimed are not adequately substantiated and can best be summed up as tenuous.</p> <p>Reductions in carbon emissions are claimed. Limited additional information has been provided in response to a request for details of the tCO<sub>2</sub>e assessment, and SGN has stated that this matter will be addressed in the resubmission.</p>
Criterion B: Value for money		<p>The Project costs are modest relative to the scale and cost of asset management operations and costs to which it refers.</p> <p>If successful, SGN expect to deliver financial benefits that far exceed the project costs. The assumptions driving the benefits claimed are not adequately substantiated.</p> <p>The project learning has a potential direct impact on SGN's operational performance against RIIO-GD1 output targets, with particular reference to improving the efficiency of Tier 2 and Tier 3 iron mains repair and replacement activities.</p> <p>There are no specific and detailed references to management of project costs in the main submission from which to assess</p>

<sup>2</sup> Further information on evaluation criteria can be found in the Gas Network Innovation Competition Governance Document





Evaluation Criteria <sup>2</sup>	Rating	Overall assessment
		whether or not the Project will be delivered at a competitive cost.
Criterion C: Generates new knowledge		Current operations to maintain and replace Tier 2 and Tier 3 iron gas mains invariably involve excavation in the highway and are high cost. The primary objective of the project is to develop new robotic technologies which operate inside the live gas main to perform pipe inspection and remediation operations.  If successful, the robotic developments proposed will provide new learning that is of high relevance to other Network Licensees.
Criterion D: Innovative and unproven business case		The robotic developments proposed to address the GB iron pipe problems are considered pioneering and will provide new learning that is relevant to other Network Licensees.  SGN did not request an allowance under RIIO – GD1 Price Control Review and, therefore does not have funding available from that source.  There are no specific and detailed references to associated commercial, technical or operational risks included in the submission to justify why the project will only proceed with NIC funding.
Criterion E: Involvement of other partners & external funding		There is no reference to external funding in the project submission.  Project participants were identified when SGN undertook a feasibility study to assess a range of companies and products in the market and ULC Robotics were identified as being at the forefront of pipeline robotics. It is understood that they are the only specialised pipeline robotics company with successful and demonstrable experience of robotic solutions in the world.  There is no reference to contractual arrangements with ULC Robotics in the project submission.
Criterion F: Relevance and timing		The project addresses current and ongoing problems associated with maintenance and risk driven replacement of iron gas distribution mains. If successful, learning from the project will be applied to ensure that performance of these activities is optimised in terms of efficiency, risk management and environmental impact.  The timing of the project is appropriate in terms of the planned investment in iron mains assets under RIIO-GD1, and in the period beyond.
Criterion G: Demonstration of robust methodology		The project proposals are generally satisfactory in terms of technical, customer impact and safety perspectives. However, there is a lack of detail in some areas.



<b>Evaluation Criteria<sup>2</sup></b>	<b>Rating</b>	<b>Overall assessment</b>
Criterion: Appropriateness of the SDRC definitions and timing and adequacy of links to key project milestones		The categories/stages specified and the details provided in the submission meet the SDRC requirements to some degree, but do not include any reference to achievement of the potential project outputs that drive the financial and environmental benefits claimed.



## 4. CRITERION A: LOW CARBON AND BENEFITS

Criteria	Rating	Overall assessment
<p><b>Criterion A: Accelerates the development of a low carbon energy sector and/or environmental benefits &amp; has the potential to deliver net financial benefits to existing and/or future customers</b></p> <p>Credibility of the carbon, environmental and financial benefits claimed for the project.</p>		<p>The project has the potential to deliver financial benefits in terms of reductions in operational costs to some degree. However, the assumptions driving the benefits claimed are not adequately substantiated and can best be summed up as tenuous.</p> <p>Reductions in carbon emissions are claimed. Limited additional information has been provided in response to a request for details of the tCO<sub>2</sub>e assessment, and SGN has stated that this matter will be addressed in the resubmission.</p>

Sub-Criteria	Assessment and <a href="#">material document references</a>
* contribution to what part of the DECC Plan?	<p>The submission provides an assessment of the potential carbon benefit for the SGN gas network and extrapolation for all GB networks, and the reductions in emissions are quantified.</p> <p><a href="#">Evaluation Criteria, Section 4, p19</a></p>
* carbon benefits claimed & assumptions	<p>The estimated reduction in carbon emissions over the RIIO-GD1 period post project completion is 16,441 tonnes and 65,764 tCO<sub>2</sub>e for SGN and GB networks respectively.</p> <p>A potential secondary benefit, as a consequence of a reduction in the use of replacement polyethylene pipe, would further reduce emissions by 215 tCO<sub>2</sub>e per year or 1,290 tonnes CO<sub>2</sub>e over the remainder of the RIIO-GD1 period. Extrapolated to all the other GDNs the total GB benefit would be approximately 5160 tCO<sub>2</sub>e.</p> <p>These reductions are based on an assumption regarding elimination of methane leakage from Tier 3 iron mains, but details of the build up are not included in the submission.</p> <p>Limited additional information has been provided in response to a request for details of the tCO<sub>2</sub>e assessment, and SGN has stated that this matter will be addressed in the resubmission.</p> <p><a href="#">Evaluation Criteria, Section 4, p19</a> <a href="#">NIC QA Response Robotics Q10</a></p>



Sub-Criteria	Assessment and <b>material document references</b>
<p>* environmental benefits &amp; assumptions</p>	<p>The project is designed to deliver environmental benefits to UK gas customers through:</p> <ul style="list-style-type: none"> <li>• The accelerated reduction of leakage and gas emissions</li> <li>• Reduced excavation requirements in the highway</li> <li>• Reduced gas mains repairs as a result of less public reported gas escapes</li> <li>• Reduced gas main replacement activity</li> </ul> <p><a href="#">Evaluation Criteria, Section 4.1, p25</a></p>
<p>* financial benefits claimed, robustness of claims and assumptions</p>	<p>The cost benefit analysis does not include evaluation of the carbon emissions benefits.</p> <p>The SGN financial benefits claimed are driven by:</p> <ul style="list-style-type: none"> <li>• Prioritised replacement or remediation of mains, assessed at £9.75m in the first year.</li> <li>• Automated live asset replacement module for distribution services, assessed at £4.4m/year.</li> </ul> <p>The CBA includes details of the operational activity assumptions that are the basis for the financial benefits claimed. In response to a request for clarification, SGN simply state that the assumptions are a result of engineering judgement and experience. No other explanation or evidence has been provided.</p> <p>The financial benefits claimed are significantly dependent the credibility of the operational assumptions, in particular, regarding development of the process, incorporating pipe integrity data gathered robotically, that will address the principle of iron mains condition assessment/remediation versus replacement. The CBA assumption in this respect is that 55% of Tier 2 and Tier 3 mains surveyed will be repaired rather than replaced but there is no supporting evidence to establish the credibility of this assumption. The risk management process envisaged will require acceptance in principle by the HSE but SGN has not yet had any preliminary discussions with the authority regarding the project proposals which SGN describe as simply conceptual at his stage. Also, the current MRPS risk assessment process takes into account substantial historical detailed information regarding the risks associated with iron pipes and the consequences of failure; SGN confirmed, during discussions at the Project Team meeting, that the historical information regarding Tier 2 and Tier 3 mains is limited and mainly comprises failure mode analysis following incidents. The timescale necessary to establish confidence in the proposed risk assessment process may mean that the potential benefits will not be fully realised during the RIIO-GD1 period and beyond.</p> <p>If successful, the project has the potential to deliver financial benefits in terms of reductions in operational costs to some degree. However, the benefits claimed are not adequately substantiated and can best be summed up as tenuous.</p> <p><a href="#">Business Case, Section 3, p17 &amp; p18</a>  <a href="#">CBA, Appendix D</a>  <a href="#">NIC QA Response Robotics Q7</a></p>



Sub-Criteria	Assessment and <b>material document references</b>
* quantitative analysis provided	<p>The submission is limited in terms of quantitative analysis to support the potential carbon emissions and financial benefits claimed.</p> <p><a href="#">Evaluation Criteria, Section 3.3a, p15</a></p>
* cost, time and speed to implement	<p>Including the submission and project preparation processes, the detailed project plan extends from 1st July 2013 to 21st December 2015 and the project operations start date is 1st June 2014.</p> <p>These timescales ensure that any potential cost benefits will be determined and delivery will commence within the RIIO-GD1 period.</p> <p>The cost estimates and the timescale of the Project Plan are credible and appropriate with respect to the overall scope of the project and the necessary engineering works. Details of the project cost build up are limited to the information provided in Appendix A.</p> <p><a href="#">Appendix A, Full Submission Spreadsheet</a>  <a href="#">Appendix D, Cost Benefit Analysis</a>  <a href="#">Appendix F, Project Plan</a></p>
* claims for potential for replication across GB	<p>Learning from this project is directly relevant to all GB gas distribution networks and is core to their asset management activities.</p> <p><a href="#">Evaluation Criteria, Section 4, p20/21</a>  <a href="#">Knowledge Dissemination, Section 5</a></p>
* claimed capacity released and how quickly released, if relevant	<p>There are no references to claimed release of gas distribution network capacity from the project.</p>



## 5. CRITERION B: VALUE FOR MONEY

Criteria	Rating	Overall assessment
<p><b>Criterion B: Value for money</b></p> <p>The size of benefits and learning from the project that is applicable to the relevant network</p>		<p>The Project costs are modest relative to the scale and cost of asset management operations and costs to which it refers.</p> <p>If successful, SGN expect to deliver financial benefits that far exceed the project costs. The assumptions driving the benefits claimed are not adequately substantiated.</p> <p>The project learning has a potential direct impact on SGN’s operational performance against RIIO-GD1 output targets, with particular reference to improving the efficiency of Tier 2 and Tier 3 iron mains repair and replacement activities.</p> <p>There are no specific and detailed references to management of project costs in the main submission from which to assess whether or not the Project will be delivered at a competitive cost.</p>

Sub-Criteria	Assessment and <b>material document references</b>
<p>* Proportion of benefits to customers (the relevant network system) as opposed to elsewhere on the supply chain</p>	<p>SGN state that the Final Proposals for RIIO-GD1 include arrangements for the return of benefit to the customer via the IQI mechanism, which provides for efficiency savings made against expected expenditure during the price control to be shared with customer. 36% of savings on total expenditure are returned to customers, via a reduction in allowed revenue. The expected reduction in costs from successful roll out of the methods trialled in this project will result in a £5.094m/year benefit to SGNs’ customers. As indicated above, limited information has been provided to substantiate these potential benefits.</p> <p><a href="#">Project Business Case, Section 3, p18</a></p>
<p>* how the project has a potential direct impact on the network</p>	<p>The project learning has a potential direct impact on SGN’s operational performance against RIIO-GD1 output targets, with particular reference to improving the efficiency of Tier 2 and Tier 3 iron mains repair and replacement activities.</p>
<p>* justification that the scale &amp; cost of the Project is appropriate in relation to the learning that is expected.</p>	<p>SGN has provided information throughout the submission to justify the scale of the project proposal. Details of the project cost build up are limited to the information provided in Appendix A.</p> <p>The learning is expected to deliver benefits that far exceed the project costs, £7,378k. Potential cost benefits comprise £9.75m in the first year from prioritised replacement or remediation of mains and £4.4m/year from the automated live asset replacement module for distribution services. Limited information has been provided to substantiate these potential benefits.</p> <p><a href="#">Business Case, Section 3, p17 &amp; p18</a></p> <p><a href="#">Appendix A</a></p>



Sub-Criteria	Assessment and <a href="#">material document references</a>
<p>* the processes that have been employed to ensure that the Project is delivered at a market competitive cost</p>	<p>The submission states that:</p> <ul style="list-style-type: none"> <li>• Procurement of services and operational equipment and materials will be carried out in accordance with SGN’s standard Procurement Procedures.</li> <li>• The primary participants in the project will be SGN and ULC Robotics. Other smaller suppliers will be selected through our established procurement processes and of course subject to competitive tender.</li> </ul> <p>There are no specific and detailed references to management of project costs in the main submission. However, the Knowledge Dissemination Plan refers to project financial tracking and reporting on a monthly frequency to the SGN Investment committee under the arrangements for internal dissemination of knowledge.</p> <p>The ULC Robotics prices submitted within the project have been benchmarked against previous work and based on projected daily rates.</p> <p>Collectively, the information provided does not provide assurance that the Project will be delivered at a market competitive cost.</p> <p><a href="#">Project Readiness, Section 6, p30, p31, p33</a>  <a href="#">Project Summary, Section 1.3. p1</a>  <a href="#">Evaluation Criteria, Section 4, p22</a>  <a href="#">Appendix G, Internal Dissemination of Knowledge</a></p>
<p>* how Project Partners have been identified and selected including details of the process that has been followed and the rationale for selecting Participants and ideas for the Projects</p>	<p>There is no reference to funding partners in the project submission.</p> <p>SGN state that:</p> <ul style="list-style-type: none"> <li>• A feasibility study was undertaken to assess a range of companies and products in the market and ULC were identified as being at the forefront of pipeline robotics. They are the only specialised pipeline robotics company with successful and demonstrable experience of robotic solutions in the world.</li> <li>• ULC Robotics has been selected for their unique experience and competence in this area to support this project and many of the concepts and ideas has contributed to the development of the project requirements and proposal.</li> </ul> <p><a href="#">Evaluation Criteria, Section 4, p22</a></p>
<p>* the costs associated with protection from reliability or availability incentives and the proportion of these costs compared to the proposed benefits of the Project</p>	<p>There are no references to costs associated with protection from reliability or availability incentives in the project submission.</p>



## 6. CRITERION C: GENERATES NEW KNOWLEDGE

Criteria	Rating	Overall assessment
<p><b>Criterion C: Generates new knowledge</b></p> <p>The potential for new learning to be generated by the project</p>		<p>Current operations to maintain and replace Tier2 and Tier3 iron gas mains invariably involve excavation in the highway and are high cost. The primary objective of the project is to develop new robotic technologies which operate inside the live gas main to perform pipe inspection and remediation operations.</p> <p>If successful, the robotic developments proposed will provide new learning that is of high relevance to other Network Licensees.</p>

Sub-Criteria	Assessment and <a href="#">material document references</a>
<p>* the potential for new learning to be generated by the Project</p>	<p>Current operations to maintain and replace Tier2 and Tier3 iron gas mains invariably involve excavation in the highway and are high cost.</p> <p>The primary objective of the project is to develop new robotic technologies which operate inside the live gas main to perform pipe inspection and remediation operations. It is expected that the inspection capability will provide pipe condition assessment data that will support development of alternative risk management/reduction processes that will obviate the need for mains replacement to a significant degree.</p> <p>The project scope includes:</p> <ul style="list-style-type: none"> <li>• Detailed design and manufacture of modular robotic platforms</li> <li>• Development of management and operational procedures</li> <li>• Full testing to ensure the robots can be operated safely inside a live gas pipe</li> <li>• A detailed commercial appraisal</li> </ul> <p>The robotic developments proposed will provide new learning that is very relevant to the UK gas transportation businesses generally.</p> <p><a href="#">Project Summary, Section 1.3, p1</a>  <a href="#">Project Description, Section 2, p3</a></p>
<p>* how learning relates to the distribution system</p>	<p>The proposal is intended to address the following problems associated with iron gas distribution mains:</p> <ul style="list-style-type: none"> <li>• Gas leakage to ground/atmosphere as a result of pipe or joint failure.</li> <li>• Disruption and high levels of expenditure resulting from current maintenance practices which typically involve extensive highway excavation and traffic obstruction.</li> <li>• Management/reduction of the risk to society due to gas leakage and the potential consequences of an explosion incident.</li> <li>• Provision of accurate mains location information and interference damage.</li> <li>• Disruption and expenditure associated with the current practices for excavation and connection of services following mains replacement by insertion techniques.</li> </ul>





Sub-Criteria	Assessment and <b>material document references</b>
	<p>The project objectives address these issues and the learning is applicable to all gas distribution networks in GB.</p> <p><a href="#">Project Description, Section 2</a></p>
<p>* applicability of learning to other network licensees</p>	<p>The problems associated with maintenance and operations of iron gas distribution mains are common to all GB gas transportation networks. The robotic developments proposed will provide new learning that is very relevant to the network licensees.</p>
<p>* the proposed IP management strategy and conformance with the default principles</p>	<p>SGN intend to conform to the default IPR requirements.</p> <p>All parties involved in the project will have the freedom to discuss work undertaken as part of the project in seminars or presentations, give instruction on questions related to such work and publish results obtained during the course of the work undertaken as part of the Project.</p> <p>Following discussions at the Project Team meeting, SGN provided further detailed clarification of the IPR issues.</p> <p><a href="#">Knowledge Dissemination, Section 5, p28</a>  <a href="#">NIC QA Response Robotics Q13</a></p>
<p>* credibility of the proposed methodology for capturing learning from the trial</p>	<p>The project has been divided into specific elements; each element represents a sub-project within the overall scope:</p> <ul style="list-style-type: none"> <li>• Element 1 – Development of a robotic ‘platform’ and launch system to enable deployment of modular repair and inspection devices for tier 2 and tier 3 pipe</li> <li>• Element 2 – Development of an internal mechanical joint installation module and Weco seal repair method for tier 2 and tier 3 pipe</li> <li>• Element 3 – Robotic visual and non-visual inspection</li> <li>• Element 4 – Automated live asset replacement for distribution services and mains for tier 1 mains</li> </ul> <p>Elements 1 and 2 have been grouped together since they will be performed as a single development by one team of engineers.</p> <p>As each element progresses learning will be captured and demonstrated.</p> <p>The proposed methodology for capturing learning from each element of the project is described at high level and is credible.</p> <p><a href="#">Project Description, Section 2</a></p>
<p>* quality of plans for knowledge sharing</p>	<p>Comprehensive details of the proposals for dissemination of learning are provided in the submission. The various processes described are robust and will enable all interested parties/stakeholders, including professional and industry organisations, to access information as the project progresses through to publication of the final report.</p> <p><a href="#">Knowledge Dissemination, Section 5, p26</a>  <a href="#">Appendix G, Knowledge Dissemination Plan</a></p>
<p>* how alternative IP strategy would deliver value for money to customers</p>	<p>There are no references to an alternative IP strategy in the submission.</p>



## 7. CRITERION D: INNOVATIVE AND UNPROVEN BUSINESS CASE

Criteria	Rating	Overall assessment
<p><b>Criterion D: Innovative and unproven business case</b></p> <p>The extent to which projects could not be performed as part of a network licensee’s normal course of business.</p>		<p>The robotic developments proposed to address the GB iron pipe problems are considered pioneering and will provide new learning that is relevant to other Network Licensees.</p> <p>SGN did not request an allowance under RIIO – GD1 Price Control Review and, therefore does not have funding available from that source.</p> <p>There are no specific and detailed references to associated commercial, technical or operational risks included in the submission to justify why the project will only proceed with NIC funding.</p>

Sub-Criteria	Assessment and material document references
<p>* The justification that the project is truly innovative: how the project is innovative and evidence that it has not been tried before</p>	<p>Current operations to maintain and replace Tier2 and Tier3 iron gas mains invariably involve excavation in the highway and are high cost.</p> <p>The primary objective of the project is to develop new robotic technologies which operate inside the live gas main to perform pipe inspection and remediation operations. It is expected that the inspection capability will provide pipe condition assessment data that will support development of alternative risk management/reduction processes that will obviate the need for mains replacement to a significant degree.</p> <p>The project partner, ULC Robotics, has USA experience of developing robotic capability to perform iron pipe joint remediation inside live gas mains. However, this capability is only one aspect of the project and the technology requires further development to deal with the characteristics of gas distribution systems in the UK.</p> <p><a href="#">Project Description, Section 2</a></p>
<p>* the credibility of why the network licensee could not fund such a project through its price control allowance</p>	<p>SGN did not request an allowance under RIIO – GD1 Price Control Review and, therefore does not have funding available from that source.</p>
<p>* why the project can only be undertaken with the support of the NIC, including scrutiny of the claimed commercial, technical, or</p>	<ul style="list-style-type: none"> <li>• SGN does not have funding available from the RIIO–GD1 allowances.</li> <li>• A key principle for NIC funding is learning dissemination which would not be required or provided under BAU.</li> <li>• In claiming that the project is innovative and not BAU, SGN simply states:</li> </ul> <p><i>'Due to the novelty of the robotics application, the project has particular technical challenges, specifically the engineering and operational aspects that require to be controlled in order to operate complex electronics in a live</i></p>



Sub-Criteria	Assessment and <b>material document references</b>
operational risks associated with the project	<p><i>gas environment. It is not feasible for such a technology to be developed to an operational standard without support and operational field trialling from a gas distribution network.'</i></p> <ul style="list-style-type: none"> <li>• In this particular respect, there are no references to associated commercial, technical or operational risks in the submission.</li> </ul> <p>There are no specific and detailed references to associated commercial, technical or operational risks included in the submission to justify why the project will only proceed with NIC funding.</p> <p><a href="#">Evaluation Criteria, Section 4, p23</a></p>



## 8. CRITERION E: INVOLVEMENT OF OTHER PARTNERS & EXTERNAL FUNDING

Criteria	Rating	Overall assessment
<p><b>Criterion E: Involvement of other partners &amp; external funding</b></p> <p>The level of external funding and appropriateness of collaborators involved in each project submission</p>		<p>There is no reference to external funding in the project submission.</p> <p>Project participants were identified when SGN undertook a feasibility study to assess a range of companies and products in the market and ULC Robotics were identified as being at the forefront of pipeline robotics. It is understood that they are the only specialised pipeline robotics company with successful and demonstrable experience of robotic solutions in the world.</p> <p>There is no reference to contractual arrangements with ULC Robotics in the project submission.</p>

Sub-Criteria	Assessment and <a href="#">material document references</a>
* appropriateness and affiliation of project partners	<p>Project participants were identified when SGN undertook a feasibility study to assess a range of companies and products in the market and ULC were identified as being at the forefront of pipeline robotics. They are the only specialised pipeline robotics company with successful and demonstrable experience of robotic solutions in the world.</p> <p>ULC Robotics has been selected for their unique experience and competence in this area to support this project and many of the concepts and ideas has contributed to the development of the project requirements and proposal.</p> <p><a href="#">Evaluation Criteria, Section 4, p22</a></p>
* level of external funding achieved, presented on a comparable basis	<p>There is no reference to external funding in the project submission.</p>
* effectiveness of systems & processes to obtain partners and ideas	<p>Essentially, the process to obtain partners and develop ideas regarding robotic technologies appropriate for application to meet the GB operational requirements was the Feasibility Study undertaken by SGN.</p> <p>Ideas for the project have been developed in detail by the SGN Project Team and in collaboration with the partners where necessary.</p> <p><a href="#">Project Description, Section 2</a></p> <p><a href="#">Evaluation Criteria, Section 4, p22</a></p>
* robustness of contractual arrangements with partners	<p>There is no reference to contractual arrangements with ULC Robotics, the project partner, in the project submission.</p>



Sub-Criteria	Assessment and <a href="#">material document references</a>
<p>* funding and benefits for each partner</p>	<p>The main participant in the project is ULC Robotics; they do not make a contribution to funding. The ULC Robotics prices submitted within the project have been benchmarked by SGN against previous work and are based on projected daily rates.</p> <p>If the project is successful ULC Robotics will be in a strong commercial position to market the robotic technology and associated services to the GB gas transportation businesses.</p> <p>Following discussions at the Project Team meeting on the 4th September, SGN provided additional clarification of the arrangements with ULCR regarding the options to facilitate access to the technology and the associated commercial implications.</p> <p><a href="#">Evaluation Criteria, Section 4</a>  <a href="#">NIC QA Response Robotics Q14</a></p>



## 9. CRITERION F: RELEVANCE AND TIMING

Criteria	Rating	Overall assessment
<b>Criterion F: Relevance and timing</b>		<p>The project addresses current and ongoing problems associated with maintenance and risk driven replacement of iron gas distribution mains. If successful, learning from the project will be applied to ensure that performance of these activities is optimised in terms of efficiency, risk management and environmental impact.</p> <p>The timing of the project is appropriate in terms of the planned investment in iron mains assets under RIIO-GD1, and in the period beyond.</p>

Sub-Criteria	Assessment and <a href="#">material document references</a>
<p>* The significance of the project in:</p> <p>Overcoming current obstacles to a future low carbon economy</p> <p>Trialling new technologies that could have a major low carbon impact</p> <p>Demonstrating new system approaches that could have widespread application</p>	<ul style="list-style-type: none"> <li>The project submission provides an assessment of the potential for significant reductions in carbon emissions. The estimated reduction in carbon emissions over the RIIO-GD1 period post project completion is 16,441 tonnes and 65,764 tCO<sub>2</sub>e for SGN and GB networks respectively.</li> <li>A potential secondary benefit, as a consequence of a reduction in the use of replacement polyethylene pipe, would further reduce emissions by 215 tCO<sub>2</sub>e per year or 1,290 tonnes CO<sub>2</sub>e over the remainder of the RIIO-GD1 period. Extrapolated to all the other GDNs the total GB benefit would be approximately 5160 tCO<sub>2</sub>e.</li> <li>The primary objective of the project is to develop new robotic technologies which operate inside the live gas main to perform pipe inspection and remediation operations. It is expected that the inspection capability will provide pipe condition assessment data that will support development of alternative risk management/reduction processes that will obviate the need for mains replacement to a significant degree. The robotic applications proposed have the potential to reduce carbon emissions.</li> <li>The robotic developments proposed to address the GB iron pipe problems are considered pioneering and will provide new learning that is very relevant to the UK gas transportation businesses generally.</li> </ul> <p><a href="#">Project Description, Section 2</a>  <a href="#">Evaluation Criteria, Section 4, p19</a></p>
<p>* why the problem is relevant and warrants funding</p>	<p>The proposal is intended to address the following problems associated with iron gas distribution mains:</p> <ul style="list-style-type: none"> <li>Gas leakage to ground/atmosphere as a result of pipe or joint failure.</li> <li>Disruption and high levels of expenditure resulting from current maintenance practices which typically involve extensive highway excavation and traffic obstruction.</li> <li>Management/reduction of the risk to society due to gas leakage and the potential consequences of an explosion incident.</li> <li>Provision of accurate mains location information and interference damage.</li> </ul>



Sub-Criteria	Assessment and <a href="#">material document references</a>
	<ul style="list-style-type: none"> <li>Disruption and expenditure associated with the current practices for excavation and connection of services following mains replacement by insertion techniques.</li> </ul> <p>The project objectives address these issues and the learning is applicable to all gas distribution networks in GB.</p> <p><a href="#">Project Description, Section 2</a></p>
<p>* how the DNO would use the method in future business planning</p>	<p>SGN has significant funding within RIIO-GD1 and beyond for operational activities associated with maintenance and risk driven replacement of iron gas distribution mains. The project learning will be applied to ensure that performance of these activities is optimised in terms of efficiency, risk management and environmental impact.</p> <p>If successful, the project will generate significant cost benefits that will carry forward into future business planning and will influence forecast levels of operational activity and costs.</p>
<p>* the appropriateness of the timing of the project</p>	<p>The timing of the project is appropriate in terms of the planned investment in iron mains assets under RIIO-GD1, and in the period beyond.</p>



## 10. CRITERION G: DEMONSTRATION OF ROBUST METHODOLOGY

Criteria	Rating	Overall assessment
<p><b>Criterion G: Demonstration of robust methodology</b></p> <p>The feasibility of the project proposals from technical, customer impact and safety perspectives</p>		<p>The project proposals are generally satisfactory in terms of technical, customer impact and safety perspectives. However, there is a lack of detail in some areas.</p>

Sub-Criteria	Assessment and <a href="#">material document references</a>
<p>* the feasibility/quality of the project plan and programme governance, including responsibilities</p>	<p>The project plan is sufficiently detailed and comprehensive to provide confidence in terms of feasibility.</p> <p>The dedicated (i.e. manpower resources not involved in BAU activities) Project Team is appropriately resourced to deliver the project effectively and on time.</p> <p>Governance arrangements are described at high level and the submission states that the project will employ the standard programme management and governance approach used by SGN as described in their Project Management Procedures. No information has been provided about the successful application of this approach for other strategic projects that provides assurance that the approach is effective.</p> <p>There are no specific and detailed references to management of project costs in the main submission. However, the Knowledge Dissemination Plan refers to project financial tracking and reporting on a monthly frequency to the SGN Investment committee under the arrangements for internal dissemination of knowledge.</p> <p><a href="#">Project Readiness, Section 6</a>  <a href="#">Appendix G, Internal Dissemination of Knowledge</a>  <a href="#">Appendix G, Project Plan</a></p>
<p>* All risks, including customer impact, exceeding forecast costs and missing the delivery date</p>	<p>The submission includes summary details of the project risk and mitigation assessment. However, development of the proposed robotic capabilities, that drive the potential cost and environmental benefits, involves significant technical challenges that are not adequately addressed in the risk assessment.</p> <p>As discussed at the Project Team meeting on the 4th September, SGN has provided additional risk assessment and mitigation information regarding development the proposed robotic operations capabilities. Three categories of risk are specified and these are rated generally low in terms of 'likelihood'</p>





Sub-Criteria	Assessment and <b>material document references</b>
	<p>but high in terms of potential impact.</p> <p>There are no specific and detailed references to management of project costs in the main submission or the risk assessment. However, the Knowledge Dissemination Plan refers to project financial tracking and reporting on a monthly frequency to the SGN Investment committee under the arrangements for internal dissemination of knowledge.</p> <p>SGN state that 'the project will impact on customers within the demonstration projects for asset replacement only. The impact will be positive as we will be field trialling on a project where we are intending to replace the asset anyway and the method proposed is designed to be less disruptive than the current method'. The operations will take account of SGNs' internal obligations to their customers as well as all obligations to the guaranteed standards of service (GSOS) as specified by Ofgem.</p> <p><a href="#">Appendix I, Risk Register and Mitigation</a>  <a href="#">NIC QA Response Robotics Q11</a>  <a href="#">Customer Impacts, Section 8, p38</a>  <a href="#">Appendix G, Internal Dissemination of Knowledge</a></p>
<p>* Whether items within the project budget appear to provide value for money</p>	<p>Details of the project cost build up are limited to the information provided in Appendix A, from which it is not possible to assess whether or not the costs will ensure value for money.</p> <p><a href="#">Appendix A</a>  <a href="#">Business Case, Section 3, p17 &amp; p18</a></p>
<p>* whether the proposed resources are sufficient to deliver the project</p>	<p>The proposed project team manpower, external support and financial resources are detailed in the submission and appear to be sufficient to deliver the project.</p>
<p>* whether the project can be started in a timely manner</p>	<p>Project readiness is described in detail and gives confidence that the project can be started in a timely manner.</p>
<p>* the robustness of the project methodology, including technical rigour and statistically robust outputs.</p>	<p>The project methodology is structured, specified, and generally credible. However, detailed information is not provided regarding development of the proposed robotic capabilities, that involve significant technical challenges, and the development of the risk assessment/management process incorporating the proposed acquisition of pipe integrity data.</p> <p><a href="#">Project Description, Section 2</a></p>
<p>* the appropriateness of the risk mitigation processes</p>	<p>The submission includes summary details of the project risk and mitigation measures which are appropriate but incomplete in terms of the obstacles identified – see below.</p>
<p>* Clear vision for the project</p>	<p>The project objectives are stated clearly.</p>
<p>* Value of the project clear</p>	<p>The submission identifies and quantifies the potential financial and environmental benefits.</p>



Sub-Criteria	Assessment and material document references
* Impact of the project clear	The potential impact of the project outcomes and relevance to the UK gas transportation businesses is clear.
* Obstacles and impediments identified	These matters are addressed in the project description and at high level in the risk and mitigation assessment. However, there are potential obstacles and impediments that are omitted from the submission; these are associated with development of the proposed robotic capabilities, that involve significant technical challenges, and the development of the risk assessment/management process incorporating the proposed acquisition of pipe integrity data.
* Project outcomes clear	Project outcomes are clearly stated.
* Means to achieve outcomes identified	The project methodology is structured, specified, and generally credible.
* Risks that may prevent outcomes identified and managed	The submission includes summary details of the project risk and mitigation measures which are appropriate but incomplete in terms of the obstacles identified – see above.
* Project well planned	The information provided regarding the project planning process is comprehensive and robust.
* Resources clearly identified	The proposed project team manpower, external support and financial resources are detailed in the submission and appear to be sufficient to deliver the project.
* Project timeline justified	The project timeline is clearly specified in the Project Plan, including details to justify each stage.
* Technical standards clear	The submission includes appropriate references to technical standards.
* Performance requirements clear	The trial is designed to assess the capability of robotic technology to address specified problems associated with iron gas distribution pipes and performance requirements are clearly specified.
* Evidence of research of existing solutions	SGN undertook a feasibility to identify appropriate robotic solutions for development and trial.
* Collaboration options described	Collaboration options evolved from the feasibility study and appropriate partners are specified.
* Project informed by data	The project is informed by data in terms of the iron mains problems identified and by the information provided via the feasibility study which assessed the potential capability of robotic technology to meet UK operational performance requirements.
* Clear technical governance	Information regarding technical governance is limited regarding development of the robotic repair and data gathering capabilities.



<b>Sub-Criteria</b>	<b>Assessment and <a href="#">material document references</a></b>
* Clear Project Management	Project management arrangements in terms of project team structure and resources are clear. Governance arrangements are described at high level and the submission states that the project will employ the standard programme management and governance approach used by SGN as described in their Project Management Procedures.



## 11. SUCCESSFUL DELIVERY REWARD CRITERIA

Criteria	Rating	Overall assessment
<b>Criterion: Appropriateness of the SDRC definitions and timing and adequacy of links to key project milestones</b>		The categories/stages specified and the details provided in the submission meet the SDRC requirements to some degree, but do not include any reference to achievement of the potential project outputs, be they successful or not, that drive the financial and environmental benefits claimed.

<p><b>Detailed comments:</b></p> <p>The SDRC are separated into the following categories/stages of the project delivery process:</p> <ol style="list-style-type: none"> <li>1. Selection and Procurement of Motors, Gears &amp; Bearings for Propulsion System (Elements 1 &amp; 2) by 15<sup>th</sup> August 2014</li> <li>2. Identify potential live mains suitable for trial on SGN Network (Referenced in all Elements) by 13<sup>th</sup> February 2015</li> <li>3. Robot Assembly (Referenced in all Elements) by 13<sup>th</sup> February 2015</li> <li>4. Hazard and Risk Analysis of Network Mains by Asset Management (Referenced in all Elements) by 10<sup>th</sup> April 2015</li> <li>5. Site Management and CDM Requirements (Referenced in all Elements) by 3<sup>rd</sup> July 2015</li> <li>6. Prepare and authorise NRO's and PTW's under SCO (As per Element 4) by 28<sup>th</sup> August 2015</li> <li>7. Launch Robot (Referenced in all Elements) by 9<sup>th</sup> October 2015</li> <li>8. ULC Robotics/SGN Generate Final Report (As per Element 3) by 23<sup>rd</sup> November 2015</li> </ol> <p>The categories/stages specified and the details provided in the submission under these headings meet the SDRC requirements to some degree, but do not include any reference to achievement of the potential project outputs, be they successful or not, that drive the financial and environmental benefits claimed.</p>
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## 12. ADDENDUM: SYNOPSIS OF CHANGES TO THE SUBMISSION

SGN re-submitted their proposal on 10<sup>th</sup> October 2013 following meetings and discussions with the Expert Panel and Rune Associates, and after receiving and responding to written questions. The re-submission includes a substantial number of textual amendments, the removal of 3 of the original 12 appendices, changes to 8 others and the inclusion of 4 new appendices.

### 12.1. SUMMARY OF CHANGES

The following table provides a summary of the material changes from the original proposal:

Topic Area	Changes at resubmission
Funding	The initial text in Section 6, Project Readiness has been amended to confirm that the requested level of protection required against cost over-runs is 0%.
Repair Methods	A degree of further information has been provided regarding Weco seal repairs, and the identification and assessment of repair methods.
Element 4 – Robotic service replacement	Further details have been provided regarding the development and feasibility of the proposed robotic service replacement capability.
Benefits of Elements 1 (creation of a universal robotic platform) and 2 (development of the joint repair capability).	Additional information has been included regarding allowances for repair activity over the RIIO GD1 period.
Case Study Example (Element 3 – pipe data acquisition)	Additional information has been added to describe how risk can be informed and the potential changes to risk management as a consequence of the proposed application of sensor technology for pipe data acquisition.
Financial Benefits - Element 3	Text has been amended to emphasise the cost benefit after a full year rollout at £9.75m and to indicate that <i>'remediation of 13km of tier 2 and 3 gas mains at the target price would return the investment associated with Elements 1, 2 and 3'</i> .
Financial Benefits - Element 4	Further information to support service replacement has been added.
Evaluation Criteria	Additional details have been included regarding: <ul style="list-style-type: none"> <li>• Benefit to mains capacity as a result of remediation rather than replacement by pipe insertion.</li> <li>• CO2/leakage savings and customer benefits.</li> <li>• Excavated material/streetworks aspects of the environmental benefits.</li> <li>• Financial benefits to customers.</li> <li>• Project Go/No go stage gates and payment milestones.</li> </ul>



Topic Area	Changes at resubmission
Knowledge Dissemination	This section of the submission has been amended to include clarification of IPR, procurement and contractual arrangements. Commercialisation options for GB roll out and knowledge dissemination have been provided.
Project Readiness	Some details regarding learning from previous IFI projects have been provided.
Customer Impacts	The submission has been amended to provide further information for each sub section, and now includes a social cost calculation.
SDRC	The SDRC have been revised significantly to reflect the key Go/No Go Stage Gates.
Appendices	<ul style="list-style-type: none"> <li>• Appendices E, K and L have been removed from the previous Final Submission document.</li> <li>• Appendices D, E, G and I are new additions.</li> <li>• Appendices A, B, C, F, H, J, K and L have been updated.</li> </ul>



## 12.2. REVIEW OF DETAILED CHANGES

The following table indicates how the changes set out in the resubmission, impact on the assessment against the individual evaluation criteria:

Criteria	Rating	Assessment of changes including material document references
A: Low carbon and benefits		<p>The assumptions that drive the estimated financial benefits in terms of reductions in operational costs are judgement based and have not changed from the original submission. SGN states that the outcome(s) of the project will determine actual financial benefit. The resubmission emphasises that the cost benefit after a full year rollout is estimated at £9.75m and that <i>'remediation of 13km of tier 2 and 3 gas mains at the target price would return the investment associated with Elements 1, 2 and 3'</i>.</p> <p>Original concerns regarding acquisition of pipe integrity data to support development of the proposed iron mains risk management process have been addressed to some degree. The Project Plan and SDRC have been amended to include reference to engagement with the HSE at various stages in the project to discuss progress and acceptance of the risk management process by the Authority.</p> <p>Additional detailed information has been provided to clarify and support the potential reductions in carbon emissions claimed.  <a href="#">Section 3.4, 3.6.3, 3.8.3, 4, 9, NIC QA Response Robotics Q15, Appendix H</a></p>
B: Value for money		<p>The assumptions that drive the estimated financial benefits in terms of reductions in operational costs have not changed from the original submission and are dependent on the outcome(s) of the project.</p> <p>Information regarding the cost benefit to customers, via the IQI mechanism, has been amended. SGN state that <i>'if 55% remediation and service replacement targets are met, following a 3 month lag at the end of the Project full rollout in SGN within 12 months and remainder of GB within 24 months, the potential customer savings are' of the order of £74.27m.</i></p> <p>The project management proposals have been amended to include <i>'go/no go'</i> review at key stages in the robotic development process and improved financial control details.  <a href="#">Sections 3.5, 4, Appendix I</a></p>
C: Generates new knowledge		<p>Comprehensive and Detailed information to clarify treatment of IP is included in the resubmission. The re-submission is not considered to impact on the original evaluation against this criterion.  <a href="#">Sections 5.2 &amp; 5.3</a></p>



Criteria	Rating	Assessment of changes including material document references
D: Innovative and unproven business case		<p>The resubmission does not provide any additional information that significantly affects the original views stated regarding the various elements of this criterion. However, discussions at meetings with the SGN project team and improvements in the overall quality of the resubmission are considered to justify review of the evaluation against this criterion.</p> <p><a href="#">Sections 2.1, 2.2.3</a></p>
E: Involvement of other partners & external funding		<p>The re-submission is not considered to impact on the original evaluation against this criterion.</p>
F: Relevance and timing		<p>The re-submission is not considered to impact on the original evaluation against this criterion.</p>
G: Demonstration of robust methodology		<p>The project management proposals have been amended to include stage gate 'go/no go' review at key stages in the robotic development process and improved financial control details.</p> <p>Risk assessment and mitigation processes are amended to provide increased confidence particularly in terms of the significant technical challenges that impact on each stage of the project.</p> <p><a href="#">Sections 6.10, 8, Appendix 1</a></p>
Successful Delivery Reward Criteria		<p>The SDRC section of the resubmission has been revised significantly to include additional information and 'go/no go' review at key stages in the development of the robotic capabilities.</p> <p><a href="#">Section 9, Appendix I</a></p>

