Northern Gas Networks

RIIO-2 Draft Determination Consultation Response

Repex GDQ34

we are the network

Introduction

Ofgem's Draft Determination set out that it had disallowed in full NGN's proposed workload associated with Tier 3 Iron Mains, >2" Steel, Zero Scoring Iron Mains, and Other Mains. The Draft Determination clarified the main reason as the CBA's for three of the asset classes didn't pay back within 16 years – by 2037 – and that there wasn't enough granularity in the >2" Steel CBA (this was confirmed in a subsequent Engineering Bilateral held on the 12th August 2020).

NGN are disappointed with this outcome and have several concerns around the process and policy that has led to this position, as well as the impact it will have on our ability to deliver on our statutory obligations and our customers expectations that we will deliver a safe and reliable network – our stakeholders number one priority. The disallowance of spend on entire categories of assets places unacceptable risks and costs to customers and would most likely require catch-up investment in future price controls. This would be more expensive for customers in the long run and represent poor value for money compared to our proposed balanced investment in GD2. The first part of this document sets out our concerns and these likely impacts.

Notwithstanding this, following further review and the engineering bilateral, we are now able to provide updated information at a greater resolution to Ofgem we believe should resolve their concerns. The second part of this document and the attached updated CBA models provide this extra resolution. Ofgem stated in the bilateral they were not able to provide a 'tick list' of their requirements. It does concern us that Ofgem and their consultants have not and are still not able to provide us with more detailed specifications of what they expect to see. Consequently if what is provided here is not clear or deemed not enough, we would expect to receive this feedback and to have an opportunity to respond to this prior to any final determination.

1. Statutory Obligations

We have a major concern that the Draft Determination, if unchanged, would not allow NGN to meet its broader Statutory Obligations, and that Ofgem, in making this decision, has made significant errors in both 'fact and law'.

Our particular concerns include that Ofgem have made no adjustment elsewhere to manage these assets or taken into account the impact on other targets, including the following:

- We will still need to inspect, maintain, repair and replace these assets;
- The volume and amount of time we interrupt customers will increase, with increased likelihood of a major incident;
- We estimate there will be a significant worsening environment performance for our network – estimated at 38,000 tCOe; and
- The associated costs this will drive.

There seems to have been an implicit and incorrect assumption that no interventions will be required on these assets until at least 2037, which is patently incorrect.

This decision also fails to recognise that we have a series of broader obligations to manage a safe and reliable network – and that our Repex programme across all of the Tiers and material types is key to delivering these obligations, which include:

- Health and Safety at Work Act 1974;
- HSE Enforcement Policy – which covers more than iron;
- Pipeline Safety Regulations – 13, 13a;
- Gas Distribution Safety Case;
- Gas Distribution Licence; and
- The Gas Act.

If we have no funds to manage a significant proportion of our assets, this severely restricts our ability to comply with these obligations.

We have sought advice on this and as a result there is a very high likelihood that if this workload remains disallowed this position will require an appeal to the CMA.

2. Stakeholder engagement and feedback

Customers and stakeholders clearly expressed a preference in our engagement with them to increase levels of mains replacement in order to deliver on their priorities of increased levels of safety, reliability and environmental performance. Again we are concerned that this appears not to have been taken into account. We would like to see the Ofgem engagement that has taken place to support this decision.

Disallowing this work means our network will be less safe, with higher gas leakage, increasing pipeline leaks, asset failures and associated repairs. There will be knock on impacts, with more roadworks and business disruption, more complaints, and a worsening environmental performance.

If Ofgem do then allow more operating costs to manage this poorer performing network, as their own Draft Determination question recognises, this means we will have more 'fast' money, leading to a higher bill in the short term. This may well be exacerbated in the long term because at some point these pipes will need to be replaced in any case on a condition or economic basis.

We cannot identify where Ofgem have specifically considered these issues in their Core documents and / or the delayed Impact Assessment when disallowing this work.

3. Process and Policy concerns

The key policy position – the 2037 payback cut off – underlying the decision to disallow this workload were not set out in the SSMD, any of the Repex Working Group meetings, or the

Business Plan Guidance. We do not necessarily agree with the 2037 cut off – discussed below – but knowing this earlier would have allowed us to refocus our plans, activities and would have more than likely have lead to a different focus in our submission, with different supporting analysis.

The CBAs we submitted have been accepted by Ofgem, but the disallowance of the >2" steel work has been linked to a lack of resolution in the CBA. The level of resolution or disaggregation of work in the CBAs was again not part of any policy or guidance. We completed the CBAs in accordance with the guidance, and have had no Subsequent Questions asking for further information on any of these issues. Furthermore Ofgem did not bring this issue up at the Engineering Bilateral we had in May. Draft Determination is the first time we were aware there was an issue with any of our submission and that it wouldn't be accepted in full.

In making this decision we also believe Ofgem have not fully considered the impact of disallowing this workload. Indeed one of the questions in the Draft Determination expressly asks if there is an impact elsewhere but only focuses on Opex, which grossly underestimates the impact, as this change would be felt in both Capex and Repex as well. Fully reflecting the impact will be a complex, difficult and time consuming exercise, and in fact we will need to resubmit all BPDTs with costs on, with the appropriate governance and internal sign offs that requires. The key reasons are:

- Repex attracts a considerable Overhead recharge, and this will need to be looked at, reallocated where appropriate across Opex, Capex, and the remaining Repex activities, and decisions may need to be made to reduce costs if we can, and over what timescales;
- The same applies to the back office, planning and data management activities that sit in Repex, which will need to be reviewed and reallocated within Repex;
- Within Repex project delivery the unit costs submitted are based on the current integrated projects we deliver, which in most cases contain projects across all Tiers. The disallowed workloads will mean a reduction in these integrated projects, efficiency and higher unit costs elsewhere, as well as potentially an increase in the volume of open cut work we undertake, as many of the larger pipes in the disallowed workload are open cut to allow upsizing and insertion elsewhere.
- Then you get onto the knock on impacts in Opex across Emergency, Repair, Operations Management, Customer Management, and back to Other Services not associated with Mains Replacement in Repex. All of these costs will go up as we will have more poor performing pipes across the network.

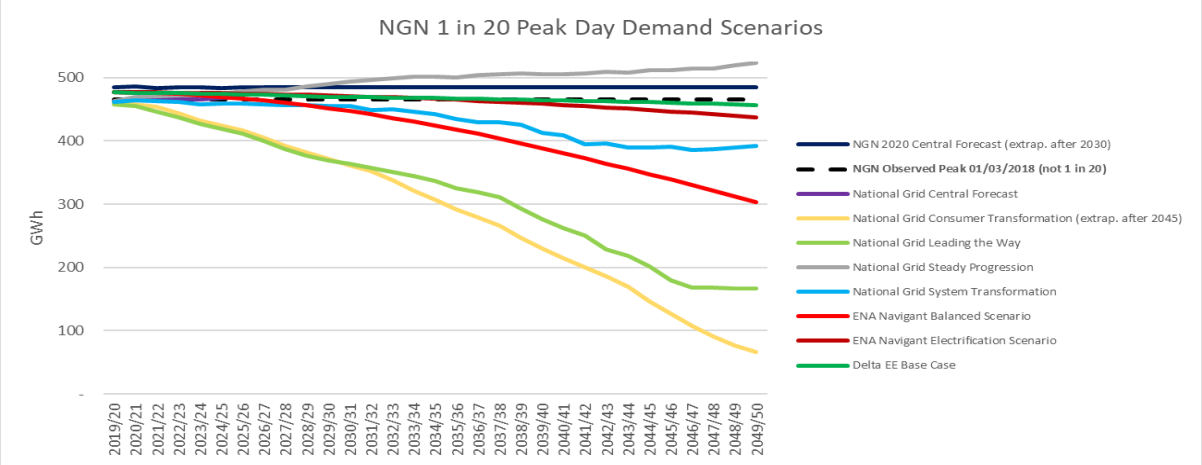
Clearly therefore this is a complex process, and in some cases will require judgements and assumptions which will take a considerable amount of work.

Ofgem have also not taken into account that some of this workload is not directly driven by CBA, and that some pipes just fail and need replacing, whilst others could be continuously repaired but it is uneconomic to do so. This needs to be factored in, as having no allowance even for this work would put serious pressure on the network and our operations.

4. 2037 Payback and CBA

As mentioned above we do not agree that a 2037 payback is appropriate, and we also have some concerns that the CBA model used does not fully reflect all the costs and benefits of this work, and is likely to under value the replacement of these assets, meaning choosing a payback is even less relevant.

Regarding setting a payback limit at 2037, this position is not consistent with Demand forecasts across the Pathways to Net Zero. Gas is expected to have a significant role to play well past 2037, as demonstrated by 2020 National Grid FES Scenarios. In 6 out of the 8 scenarios gas has a significant role in the 2040s and even the 2 outlier scenarios require use of and investment in our assets to meet legal obligations.



When queried on this Ofgem's main defence appears to be that whereas gas may be in use, there is a chance that certain areas may well be all electric by then and not all pipes will be required. We would look to Ofgem to produce the analysis they have done to assert this, we are not aware of any that has been published, and certainly none relevant to our network. There is no suggestion that an area such as Leeds would be all electric by 2037. If this isn't the case, even if some pockets of a city do become electric this will predominantly impact Tier 1 mains. Our larger Tier 3 mains act as trunk mains, distributing gas around the localised networks in cities like Leeds, and these will still be needed well past 2037 to ensure the network is robust, safe and reliable.

Furthermore the 'Payback' approach and CBA employed by Ofgem is overly-simplistic and does not fully address the 'real-world' issues of managing these assets. In particular the NARMs based CBAs don't take account of all impacts and benefits from replacing the pipes that have been disallowed. These include:

- NARMS assumes that pipes can always be repaired on failure, but this is not always the case and sometimes replacement or insertion is the only option. This undersells the likely cost of leaving pipes in situ;
- NARMs does not take account of traffic and business disruption due to traffic management required to do repairs and limiting access to businesses, underselling the benefit of replacement;

- The models do not fully take account of customer disruption from repairs due to restricting access to properties, noise and dust, again underselling the benefit of replacement;
- The Leakage on failure risk is modelled, but background leakage of leaving the pipes in situ (as estimated by the Shrinkage Model) isn't taken account of – materially underestimating the environmental benefit of replacement, a key issue for our stakeholders; and
- The Opex impacts of frequently failing pipes aren't full accounted for in NARMs, such as the costs of monitoring leaks, and the cost of complex / non-standard repairs.

5. Tier 1 Stubs

We do not believe it is appropriate for these costs to have been disallowed. These mains are and remain part of the HSE Enforcement Policy on Iron Mains, which currently makes them part of our mandatory replacement programme, and should remain so until there is a formal decision by the HSE to amend the policy.

We recognise that the HSE are reviewing Tier 1 Stubs, but at this point it is not clear when the proposed HSE review will be complete and, if required, any necessary changes to the Enforcement Policy will have been approved. It is not clear at this point what the result will be, and whether any change may happen, a partial change, or a full change.

Without an explicit exemption from the HSE, Ofgem's position to disallow this work and instead allow a reopener to add the work back in, affords NGN no protection under PSR13 in the event of an incident associated with one of these mains. In addition a proportion of these mains pipes will be classified as Seed Pipes and their risk score will dictate their priority for replacement during RIIO-2. This overrides Ofgem's unofficial definition of a 'Stub End'.

Ofgem appear to have made the assumption that in cancelling this work, if the result is that we still need to complete Tier 1 Stubs that we can just pick this work up again and complete it on time. This is flawed – the work is often complex, in difficult locations which require local authority approval, and in many cases requires specialist resource which we will lose in the meantime. Delaying the work will place both operational and commercial pressures, and likely lead to higher cost.

6. Revised analysis and CBAs

As highlighted earlier following further discussions with Ofgem and considering in detail the draft determination, we are now able to provide updated information and revised analysis to support our Repex plans. Our general approach has been to provide further granularity as to why we do the work where that is appropriate, and to update CBAs with greater resolution and revised data where appropriate. The main updates include:

- Confirming the proportions of pipe that will need to be replaced when they fail, for economic reasons, and under CBA modelling;
- Updating the CBA models to reflect the latest pipe level failure and repair data;
- Using a significant proportion of 'real' projects with some extrapolation in the CBA models;
- Updating the CBA models to reflect the real risk we would lose customers downstream of the pipe in question, and using sensitivity analysis to challenge this;
- Providing examples including 'drawings' and pipe level CBA results to highlight the spread of pipes and CBA results within each portfolio where appropriate.

These points and the revised results are considered below.

6.1. Downstream customers

In our previous CBAs – submitted with our December 2019 Business Plan – the "customer loss of supply" impact was limited to those service pipes directly connected to the main in question. For our larger trunk mains, such as Tier 3 mains and larger diameter steel, this does not properly reflect the real risks. These pipes transport gas in bulk to very large numbers of downstream customers and, even in an integrated network, failure of one of these mains would jeopardise supplies to significant numbers of these customers, not just those directly connected to the main.

We see real life examples each year where an issue further upstream in our network can impact thousands of customers, and showed an example to Ofgem during our Bilateral in March 2020 which could have impacted c20,000 supplies in Leeds following an incident on an 18 inch main.

Fortunately the incident took place in midsummer and through effective network management and a public appeal to reduce gas consumption across a wide area we just managed to maintain sufficient pressure in the system until the escape was secured.

In addition we have seen 10 incidents impacting more than 250 connections during RIIO-1, with all taking place since 2015/16. These incidents include 3rd party damages to mains as well as network issues, not just major trunk mains, but show the potential for an issue in one area of a network to have significant impact downstream. The largest incident impacted 3,402 connections, we have seen a further two impact 2,756 and 1,248 connections, with the remainder averaging over 400.

Clearly it would not be reasonable to assume we would lose all downstream connections as a result of a pipe failure. When a main fails there is a full range of possibilities, from no consequences (where pressures can be maintained whilst the repair is undertaken) to 100% loss of supply for all connections. For the CBA analysis we have not assumed that pipe failure will lead to loss of supply to all downstream customers. This will be dependent on numerous variables including the nature of the failure, the time of year, the level of integration in the network vs single feeds, requirements for pressure reduction, etc. We have taken a realistic view that, for the purposes of CBA, 5% should be used for the likelihood of loss of supply. We have also assessed 10% and 20% customer impact as sensitivities. It is important to reflect the NARMs models that the CBA calculations are based on are risk and probability based.

6.2. CBA breakdown

We considered whether it was possible or helpful to split the CBA results into tranches to further support the analysis and the conclusions. However we did not pursue this for the following reasons:

- We have completed the CBAs to a lower resolution in any case, for instance by diameter band for >2" steel, and by activity / material type for Other Mains, which partly delivers the brief of lower resolution;
- The revised payback periods from the updated models mean it would add little to our case; and
- There are three major competing factors that drive the CBA result – the number of customers connected or downstream of the pipe, the cost of the project, and the performance and assumed deterioration of the pipe. Selecting appropriate tranches with three competing variables is problematic and does not provide a simple clear relationship.

As a result where appropriate we have provided examples of projects to show the spread of projects covered in the CBAs.

6.3. Tier 3 Mains

Tier 3 iron mains are those of >= 18" nominal diameter. At the start of RIIO-2 we anticipate that there will be approximately 260km of these mains remaining live in the network.

These large diameter mains are generally used to transport gas in bulk and have an essential role in providing supplies to large numbers of downstream customers.

Although there are no requirements for us to replace a specified volume of these mains within a particular timeframe, we have obligations under our Safety Case and Gas Transporter Licence to ensure we manage these pipes so that they can operate safely and provide a secure and reliable supply of gas. Where they cannot be effectively and / or efficiently maintained they should be replaced.

Analysis has shown that failure rates for Tier 3 iron pipes are significantly higher than Tier 2 iron pipes (>8" and <18") at 1.02 failures per km compared with 0.5 failures per km and have not stabilised, but are getting worse. As a result our Business Plan proposal for RIIO-2, submitted in December 2019, was to increase our proposed workload in Tier 3 from 5km / year through RIIO-1 to 10km / year. This was rejected in its entirety by Ofgem at Draft Determination as the programme did not payback before 2037.

It is important to recognise that c15% of our forecast Tier 3 projects (based on analysis of our actual workload in recent years) are driven by pipes which cannot be reliably repaired due to extreme non-localised corrosion, or where the pipes have shown recent and rapid deterioration and it would be more expensive to keep the pipe in service and continue to repair the failures than it would be to replace the pipe. This is the minimum workload we need to complete each year, irrespective of further CBA analysis.

The remaining c85% of our Tier 3 projects are driven by pipes which have been subject to failures, are known to be deteriorating, where escapes can often have major stakeholder impacts (for example unplanned large excavations in main roads or junctions causing significant congestion) and / or where there is a risk of widespread loss of supply should the main fail catastrophically.

As part of our rolling business planning process we have now identified over 110km of potential candidate projects which would form the core of our planned Tier 3 workload through the remainder of RIIO-1 and into RIIO-2 and have used Network Analysis to calculate the number of customer supplies at risk for each of these projects.

A selection from the potential candidate projects was optimised using our C55 tool to identify a portfolio of approximately 10 km / year – our proposed overall RIIO-2 workload. This was assessed using CBA analysis with 5% customer impact and showed an average 5-year payback across the whole portfolio of projects. 10% and 20% customer impacts were also assessed, and these showed payback periods of <1 year.

In order to analyse the spread of paybacks within the candidate projects we then carried out individual CBAs for 4 projects – taking into account the three key variables of cost, customer numbers and pipe performance. We focused on 1 project we believed would show a short pay back, then three projects which we expected to be below average to near the lowest

paybacks. These were all analysed at 5% customer impact. The summarised results for these are below and project drawings are included for information:

- Domestic Street, Leeds (BSR 350680)
    - Customers at risk – 20,000
    - Estimated project cost – £617k
    - Payback – <1 year
- Brook Street, Huddersfield (BSR 351434)
    - Customers at risk – 7,000
    - Estimated project cost – £87k
    - Payback – 9 years
- Roscoe Street, Scarborough (BSR 351387)
    - Customers at risk – 3,000
    - Estimated project cost – £183k
    - Payback – 15 years
- High Northgate, Darlington (BSR 351560)
    - Customers at risk – 0
    - Estimated project cost – £34k
    - Payback – 16 years

The results were as we expected, with one project showing a payback of less than 1 year, with the three below average projects showing paybacks of between 9 and 16 years. Given this analysis, the fact that the average payback for the 50km of projects analysed is 5 years at 5% customer losses and sensitivities show this could be much shorter, and that 15% of the portfolio we would need to complete on a condition or economic basis in any case, we are confident all projects we undertake will have less than a 16 year payback. Furthermore, this ignores the limitations in the CBA model used we highlighted in section 4 above, which we believe underestimates the payback and the value to the customer, and that Tier 3 pipe performance has not stabilised.

6.4. >= 2" Steel

Steel mains are subject to corrosion. Very few distribution steel mains have cathodic protection applied. Even where coatings were applied these can deteriorate over time to the extent that they no longer provide protection.

Analysis carried out by AESL and Newcastle University has shown that the rate of failure of steel mains is increasing, demonstrating that the rate of replacement carried out recently is not keeping up with the rate of deterioration. Additional analysis that NGN has carried out on our own population of steel mains has shown that, between 2011 and 2018, the incidence of Gas in Building from the failure of steel mains has doubled. These are the drivers behind us increasing our proposed workloads for RIIO-2. Similar to Tier 3 c15% of pipes we replace are those that cannot be reliably repaired or where the pipes have shown recent and rapid deterioration and it would be more expensive to keep the pipe in service, with 85% driven by pipes which have seen failures, are known to be deteriorating, with

known stakeholder impacts, and / or where there is a risk of widespread loss of supply should the main fail catastrophically.

We carried out CBA assessment for our proposed RIIO-2 programme for >2" steel replacement of 30km / year contained in our December 2019 Business Plan which showed a payback period of approximately 13 years. This was rejected in its entirety by Ofgem at Draft Determination and, following discussion, we are now providing extra resolution and enhancements to the CBA modelling to provide additional information to support our RIIO-2 proposals. We have done this by breaking down our assessments into diameter tranches, as discussed with Ofgem at our Bilateral on 12 August 2020.

The smaller diameters (<=8") primarily feed directly-connected customer supplies and so we have made no adjustment for downstream customers. Our CBA analysis has shown that the workload volumes that we are proposing for RIIO-2 in this band shows a payback period of <1 year. This covers c129km of the work, 86% of the total.

For the larger diameters (9" – 17" and >=18"), as well as supplying direct connections these also have a significant role in transporting bulk supplies to significant numbers of downstream customers. In order to properly take account of the risks to these downstream customers, we have used Network Analysis to assess the number of customers potentially at risk and incorporated this into the CBA analysis. We then completed the analysis with 5% customer impact, and then 10% and 20% customer impacts as sensitivities. The results are summarised below:

- 9" to 17" – 18km of the work, 12% in total.
    - 5% customer impact – <1 year payback
    - 10% customer impact – <1 year payback
    - 20% customer impact – <1 year payback
- > 18" – 3km of the work, 2% in total.
    - 5% customer impact – 2 years payback
    - 10% customer impact – 2 years payback
    - 20% customer impact – <1 year payback

The results clearly show a strong case for completing all of the >2" steel mains work proposed in our plan. Payback for all tiers at 5% customer losses is less than 16 years, and sensitivities show this could be much shorter, with the same limitations in the CBA model used we highlighted in section 4 above, which we believe underestimates the payback and the value to the customer. Again 15% of the portfolio would need to be completed on a condition or economic basis in any case.

6.5. Zero Scoring (iron mains >30m)

Zero scoring iron mains are replaced either because it is more efficient to replace these pipes than leave them when undertaking other replacement activities or because their replacement is beneficial because of their performance.

For RIIO-2 our December 2019 Business Plan proposal was to continue with similar workload volumes seen so far in RIIO-1. We carried out CBA assessment for our proposed RIIO-2

programme as a whole and this showed a payback period of approximately 18 years. This was rejected in its entirety by Ofgem at Draft Determination and, following discussion, we are now providing extra resolution and enhancements to the CBA modelling to provide additional information to support our RIIO-2 proposals.

Approximately 20% of this workload is driven by pipes included for the efficiency of other replacement projects. This equates to only c1.5km of the annual workload. Zero scoring pipes can be included for several reasons. The primary reasons are:

- If there is a short section of zero scoring main between two positive scoring mains in a continuous run it is cheaper to continue inserting through this rather than stopping, excavating, breaking out and making connections; and
- If a zero scoring pipe attached to a project is no longer required to supply the network then it would be clearly inefficient to reconnect to this unneeded pipe when the positive scoring main is replaced, and so the zero scoring pipe is abandoned.

For the remaining 80% these are pipes which cannot be reliably repaired due to extreme non-localised corrosion, where pipes have shown recent and rapid deterioration and it would be more expensive to keep the pipe in service and continue to repair the failures than it would be to immediately replace the pipe or where pipes which have been subject to failures, are known to be deteriorating and where failure of these could have a significant impact on downstream supplies. We do not have an exact split of the pipes replaced for these reasons but expect it to be similar to Tier 3 mains and steel, with c15% replaced on a condition or no longer economic to repair basis, and the remainder based on risk and CBA.

As with Tier 3 and steel, when a main fails there can be an impact on downstream customers. In order to properly take account of the risks to these downstream customers, we have used Network Analysis to assess the number of customers potentially at risk and incorporated this into the CBA analysis. We then completed the analysis with 5% customer impact, and then 10% and 20% customer impacts as sensitivities. The results are summarised below:

- 5% customer impact – <1 year payback
- 10% customer impact – <1 year payback
- 20% customer impact – <1 year payback

The results clearly show a strong case for completing all of the Zero Scoring mains work proposed in our plan. Payback at all customer losses is less than 1 year, with the same limitations in the CBA model used we highlighted in section 4 above, which we believe underestimates the payback and the value to the customer. 20% of the workload would need to be completed for efficiency reasons as detailed above, and 15% of the remainder of the portfolio would need to be completed on a condition or economic basis in any case.

6.6. Other Mains – asbestos

We were required by HSE to decommission all known asbestos pipes in NGN's area by the end of 2002. Since then we have been required to decommission all discovered asbestos pipes as soon as reasonably practicable, and in any case within 12 months of their discovery. We anticipate that we will discover an average of 0.5km per year of asbestos mains through RIIO-2 which we must abandon. Costs and workloads associated with this were captured within Table 4.04 (Repex Mains Other) of our BPDT as part of "Other Policy & Condition Mains". Asbestos was rejected in its entirety by Ofgem at Draft Determination as part of the overall rejection of Other Mains.

As decommissioning of asbestos is mandated by HSE within a strict timescale, the decision to replace is not subject to specific CBA justification (these costs were included in the CBA for mandatory pipes submitted with our December 2019 Business Plan) and allowance is required in order for us to comply with HSE's requirements.

The table below summarises the costs and abandonment workload for asbestos mains contained in the Other Mains BPDT.

Asbestos	21/22	22/23	23/24	24/25	25/26	Total
Costs £m	0.09	0.09	0.09	0.09	0.08	0.43
Mains workload (km)	0.5	0.5	0.5	0.5	0.5	2.5

6.7. Other Mains – Phoenix / Paltem

A small number of mains were fitted internally with thin plastic sheaths or liners in the 1980's. Unlike inserted PE pipes, these liners are non-structural (i.e. they have low intrinsic strength) and depend on the parent pipe for their mechanical integrity. Should these liners fail – either through deterioration of the liner, ground movement leading to fracture of the parent pipe or third party interference damage – we currently have no proven methods for working on these lined pipes.

These are larger diameter (10" – 24") Medium Pressure mains transporting large volumes of gas to supply high numbers of downstream customers. Should the pipes fail, repair or replacement in an emergency situation could take many days or possibly weeks. We considered that this represented an unacceptable risk to customers and so as part of our Business Plan we included for replacement of all Phoenix / Paltem lined pipes in a planned way through RIIO-2. Costs and workloads associated with this were captured within Table 4.04 (Repex Mains Other) of our BPDT as part of "Other Policy & Condition Mains". This part of our BPDT was rejected in its entirety by Ofgem at Draft Determination.

The table below summarises the costs and abandonment workload for Phoenix / Paltem mains contained in the Other Mains BPDT.

Phoenix / Paltem	21/22	22/23	23/24	24/25	25/26	Total
Costs £m	0.70	0.70	0.70	0.69	0.69	3.48
Mains workload (km)	1.76	1.76	1.76	1.76	1.76	8.81

As Phoenix / Paltem pipes transport gas in bulk to very large numbers of downstream customers, failure of such main could jeopardise supplies to significant numbers of customers. In order to properly take account of the risks to these downstream customers, we have used Network Analysis to assess the number of customers potentially at risk and incorporated this into the CBA analysis. We then completed the analysis with 5% customer impact, and then 10% and 20% customer impacts as sensitivities.

We have also made an assessment that, should a Phoenix or Paltem pipe fail to an extent that downstream supplies are lost, restoration would take longer than for other categories of main due to the lack of any standard repair methods available. We have therefore assessed that the average period of interruption would be 6 days, although this may be conservative if it is necessary to relay the full section in order to restore supplies. We have then run sensitivities at 5% / 10% / 20% losses with a more normal interruption period. The results are summarised below:

- 5% customer impact at 6 day interruption – 7 years payback
- 10% customer impact at 6 day interruption – 7 years payback
- 20% customer impact at 6 day interruption – <1 year payback

We have also carried out individual CBAs for 2 projects – taking into account the three key variables of cost, customer numbers and pipe performance. These were all analysed at 5% customer impact with an interruption period of 6 days. The summarised results for these are below and project drawings are included for information:

- City Road, Newcastle (Z12151)
  - Customers at risk – 10,108 / 1,395
  - Estimated project cost – £404k
  - Payback – <1 year
- Bridge Road, Wakefield (PL01)
  - Customers at risk – 8,500
  - Estimated project cost – £295k
  - Payback – <1 year

The results clearly show a strong case for completing all of this work. The same limitations in the CBA model used we highlighted in section 4 above apply here, which we believe underestimates the payback and the value to the customer of replacing these pipes.

6.8. Other Mains – Repex overcrossings

As part of our asset management programme, we have assessed all of our distribution mains exposed crossings for their condition, suitability, vulnerability and resilience in terms of security of supply. These pipes may cross rivers, roads, canals, railway lines, etc. Costs and workloads associated with this were captured within Table 4.04 (Repex Mains Other) of our BPDT as part of "Other Policy & Condition Mains" where the overcrossing will be completed as a Replacement project. Similar projects were included in Capex and accepted where they were not part of a replacement project.

Repex overcrossing was rejected in its entirety by Ofgem at Draft Determination as part of the overall rejection of Other Mains. Our CBA analysis has shown that our proposed investment programme for this category has a payback period of <1 year and so should be reinstated as it is beneficial to the customer. Please see the attached CBA for further details.

The table below summarises the costs and workload for overcrossings contained in the Other Mains BPDT.

Overcrossings	21/22	22/23	23/24	24/25	25/26	Total
Costs £m	1.27	1.27	1.26	1.25	1.25	6.30
Mains workload (km)	0.79	0.79	0.79	0.79	0.79	3.93

6.9. Other Mains – PE

For non-Diversion works, the vast majority of PE mains abandoned are done so as part of an overall metallic project because this gives the most efficient scheme. The reasons are very similar to the zero scoring mains primary examples?

- An iron main that is to be replaced may include a short section of PE – possibly inserted as part of a cut-out to address a previous leak – and it may be cheaper to carry on past this pipe section rather than stop and make additional connections to / from it.
- A PE main may have been connected to the iron main in years past but is now no longer required as a supply within the network – clearly, it would be inefficient to reconnect to this unneeded pipe when the iron main is replaced and so the PE pipe is abandoned.

We do also replace a small volume of PE mains which has failed, often on the joints. It is worth noting that we use new innovative techniques to minimise the chance of this happening in future. Overall our RIIO-2 workload associated with the abandonment of PE is in line with that seen through RIIO-1.

A CBA for PE replacement of PE is not appropriate as the NARMs values for the new and old pipes are virtually identical due to the low deterioration rate of PE.

The table below summarises the costs and abandonment workload for PE Mains contained in the Other Mains BPDT.

PE	21/22	22/23	23/24	24/25	25/26	Total
Costs £m	0.67	0.67	0.67	0.66	0.66	3.34
Mains workload (km)	3.34	3.34	3.34	3.34	3.34	16.71

6.10. Diversions

In our December 2019 Business Plan we restricted our forecasts for diversions to three main diameter band groups, with a limited increase in overall volumes driven by the increased quotations volumes we had seen and increased economic activity, in particular in infrastructure. Ofgem's assessment at Draft Determination was based on a very granular analysis beyond the categories contained in our proposal. Following correspondence with Ofgem we are resubmitting the same volumes and costs but are showing these at this more granular level. Please see attachment 'NGN Diversions Resubmitted BPDT template'.

Supporting Documents

CBAs
T3 @ 5%
T3 @ 10%
T3 @ 20%
T3 Project 350680
T3 Project 351387
T3 Project 351434
T3 Project 351560
ST up to 8”
ST 9” – 17” @ 5%
ST 9” – 17” @ 10%
ST 9” – 17” @ 20%
ST 18” + @ 5%
ST 18” + @ 10%
ST 18” + @ 20%
Zero scoring @ 5%
Zero scoring @ 10%
Zero scoring @ 20%
Phoenix @ 5% double duration
Phoenix @ 5%
Phoenix @ 10%
Phoenix @ 20%
Phoenix Bridge Road @ 5%
Phoenix Bridge Road @ 10%
Phoenix City Road @ 5%
Phoenix City Road @ 10%

Other
Efficiency examples for Zero and PE
Drawing for T3 Project 350680
Drawing for T3 Project 351387
Drawing for T3 Project 351434
Drawing for T3 Project 351560
Drawing for Phoenix Project(s)