DD Supporting Evidence: EJP13

Pipeline Isolation Valves

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1 Introduction

This annex provides the additional supporting evidence requested by Ofgem in Table 34 of the July 2025 Draft Determination, addressing concerns regarding forecast workload derivation and unit costs in Cadent's Pipeline Isolation Valves investment case (EJP13) for I&C and HP valves. This annex should be read in conjunction with EJP13.

Our pipeline isolation valve programme is underpinned by statutory obligations set out in the Pipeline Safety Regulations (PSR) 1996, Gas Safety (Management) Regulations (GSMR) 1996 and the Gas Safety (Installation and Use) Regulations (GSI&UR) 1998. These require regular inspection and maintenance of over 24,000 valves. Our approach ensures compliance, safety and network resilience through proactive interventions based on inspection findings.

This submission provides:

1. An explanation of the **methodology** for how the inspection-to-intervention process aligns with our pipeline integrity approach (Section 0)
2. How this has been used to derive **fault rate** (Section 0) and applied to provide **forecasted volumes** (Section 0)
3. Explanation of the **unit costs** (Section 0)
4. The full list of **options** that have been considered (Section 8)
5. Confirmation of the preferred **workload volume and costs** (Section 9)

The preferred investment option reflects the minimum level of intervention required to maintain compliance and asset health. It proposes [redacted] interventions over RIIO-3 at a forecast cost of [redacted] This will maintain fault rates at current levels and aligns with our Network Asset Management Strategy (Appendix 10).

This annex demonstrates that our pipeline isolation valve programme is justified, deliverable, and cost-reflective, addressing Ofgem's concerns and supporting a safe, resilient, and compliant gas network.

The RIIO-2 and RIIO-3 workload and expenditure are summarised below for completeness.

Price Control Period	Volumes (count)	Capex (£m)
RIIO-2 Forecast	[redacted]	
RIIO-3		

Table 1: Summary of RIIO-2 / 3 intervention volumes and expenditure for Pipeline Isolation Valves

2 Purpose of Document

This document provides additional information in response to Ofgem's engineering review comments in Table 34 of the Draft Determination (July 2025) and the 22nd of July Ofgem Bilateral meeting. It addresses concerns regarding optioneering, cost and volume estimates for I&C and HP valves, and justification for unit cost variations for pipeline isolation valves across all pressure tiers. The response outlines our methodology for forecasting intervention volumes, inspection-to-intervention approach, asset health tiering, and unit cost derivation, supported by historical data and engineering analysis.

For clarity, Ofgem's feedback on EJP13 is shown below (Table 2).

Feedback Source	Needs Case	Optioneering	Scope Confidence	Comments
RIIO-3 Draft Determinations – Cadent **Table 34: Summary of Cadent Engineering Recommendations**	Partially Justified	Not Justified	Low Confidence	Outcome proposed: Partially justified. We have proposed reduced volumes. Volumes for all valve types (HP, IP, MP, I&C) have been provided. For IP and MP, data has been provided to support the proposed volumes. This data includes failure rates based on maintenance inspection, intervention type and unit cost. For I&C valves, data to support the proposed volumes is inadequate. The rate of failure is based on historical rates and costs are based on full replacement only. For HP valves, no data has been provided to support the proposed volumes. Rate of failure and costs are copied from RIIO2. Complete data for HP and I&C will be required to support proposed volumes and optioneering confidence.
22nd July Ofgem Engineering – Cadent Bilateral	• Provide long list options for intervention with workload volumes • Provide additional commentary around proposed options			

Table 2: Specific EJP13 feedback from the RIIO-3 Draft Determinations Cadent Annex

3 Our Approach

The following process flow illustrates how our inspection data underpins the pipeline isolation valve investment case. It demonstrates the logical sequence from inspection to intervention, aligned with Ofgem's expectations for transparency, defined deliverables, and data-driven justification. The structure of this document is aligned to the 4 key steps within this process.

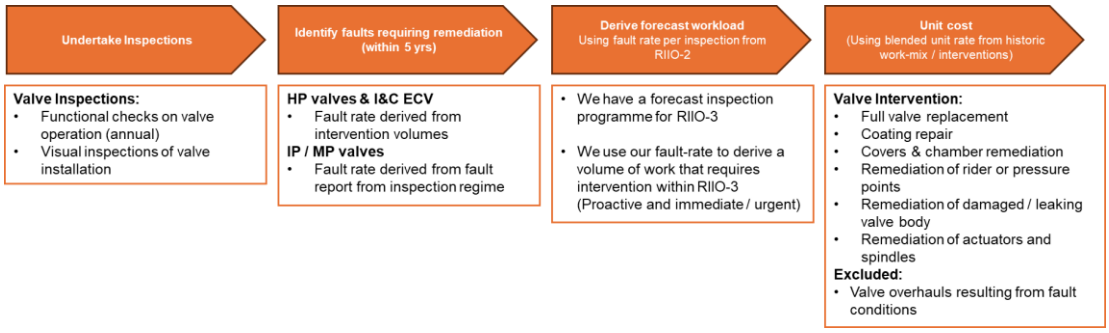

Figure 1: Process flow from inspection to intervention forecasting for Pipeline Isolation Valves (EJP13)

3.1 Process Flow Summary

1. Undertake Inspections
    - Annual functional checks
    - Visual inspections of valve installation
2. Identify Faults Requiring Remediation
    - Faults are classified using standardised health scoring
    - Only faults requiring remediation within 5 years are considered for intervention
3. Derive Forecast Workload
    - Fault rates per inspection (from RIIO-2) are applied to the RIIO-3 inspection programme
4. Unit Costs
    - Standard unit rates from our Unit Cost Workbook applied to workload
    - Blended unit rates applied to forecast workload
    - Maintenance OPEX costs, including valve overhauls triggered by low level faults, are excluded from the unit cost consideration for this investment case.

This approach ensures that the proposed RIIO-3 workload is evidence-based, risk-prioritised, and compliant with statutory obligations.

4 Our Inspection Programme

Our inspection programme is aligned with statutory requirements under PSR (1996), GSMR (1996) and the GSI&UR (1998). This is defined in full within EJP13, but includes:

- HP Valves: functional maintenance every 12 months for critical valves and every 24 months for non-critical valves, assessing their accessibility, operability, and condition, with six-yearly maintenance examinations also including a functional check as a minimum.
- IP and MP Valves: inspections every 5 years for M1 and IP M3 valves, and every 10 years for MP M3 valves, assessing their accessibility, condition, and operability (for M1 only).
- I&C ECVs are primarily managed through reactive interventions as issues emerge. A proportion of faults are identified during routine maintenance of their associated pressure regulating installations. Only a proportion of I&C governors are subject to routine maintenance.

5 Identifying Faults Deriving Forecast Workload

Forecast volumes are derived using:

- Historical inspection data (10 years)
- Forecasted inspection plans
- Cleansed RRP data

To establish an estimate of future fault volumes, the availability of fault information for each valve type (HP valves, IP/MP valves, and I&C ECVs) has been evaluated. The granularity and quality of fault data from inspections varies across valve types, as described in the remainder of this section.

We sourced and validated the actual intervention costs and volumes for activities reported in RRP to inform our intervention volume assumptions, used to derive our failure rate calculations.

Specific application of this methodology to each valve type is described below.

5.1 HP Valves

For HP valves, the relationship between inspections and resultant interventions is the basis for forecasting volumes as defined in section 3.1.

We have used the RRP data to identify intervention volumes, which are then used to derive the volume. Confidence in the data is high because it is subjected to robust tracking via our Management of Change processes which can be provided if required.

We have not used fault reports per inspection because while there is fault data available, the granularity of the data is insufficient to robustly identify intervention strategy. In EJP13 section 6.1.2. we outline improvements we are making to improve the fault data collection to align with the approach taken for IP and MP valves, which will resolve this issue. At present not all faults recorded will lead to an investment intervention. Certain faults (e.g. inoperable valve mechanisms) will trigger an ad-hoc major overhaul maintenance which will typically resolve a proportion of the faults and return the affected valves to operable condition. The fault data we hold does not allow this proportion to be established due to lack of granularity.

We have applied the failure rate to the inspections planned for RIIO-3 to derive a volume of interventions.

Network	Fault report per inspection	Intervention per inspection
Eastern		
NL		
NW		
WM		
Cadent		

Table 3: HP Valve Failure Rates

5.2 I&C ECVs

I&C ECV faults may be identified via two routes:

- Reactively via interaction with I&C customers.
- I&C governor maintenance. Cadent undertake routine maintenance on approximately 68% of I&C governor; these are typically of construction and capacity consistent with district governors.

Valve inspections on I&C governors is focussed on confirming accessibility to valves rather than on functional checks, therefore is less robust than for equivalent IP and MP valves. Similar to HP valves, the data capture is also limited and therefore have lower quality data associated with I&C failure rates.

The fault analysis below assumes a relationship between I&C ECV faults and I&C governor maintenance. We assessed the fault rate using the same principle as HP valves, using the ratio of inspection to interventions (Table 4).

We used the RRP dataset to identify intervention volumes which are used in the failure calculation. This volume data is not subject to the same robust tracking and management as HP valves, and we therefore have moderate confidence in its accuracy. However, it is the sole data source we have available and therefore is the basis of failure rate and volume forecasting.

To increase confidence in the proposed workload volumes, we have reviewed the data and identified discrepancies, most notably for the Eastern network (specifically the East Midlands region) where the unit rate was considerably higher than other networks. We therefore extrapolated a volume of interventions based upon an average unit rate from other networks.

We concluded that raw fault data for I&C ECVs was not suitable to inform a forecast as is limited in volume and quality. Furthermore, the use of forecast inspection volumes in RIIO-3 assumes a strong relationship between interventions and inspections; but we recognise that this relationship is uncertain as an unknown proportion of faults will be identified via this route.

Network	Total Inspections	Total Interventions (extrapolate)	Intervention per inspection
Eastern			
NL			
NW			
WM			
Cadent			

Table 4: I&C ECV Failure Rates

5.3 IP and MP Valves

The failure rate for IP and MP valves remains consistent with data provided in the original submission. The fault rate is calculated as the ratio of inspection to faults identified; this applies to each failure more. We then use the fault rate to extrapolate a volume using the future inspections. The IP and MP fault data is of higher granularity than HP valves and allows both the failure mode and intervention strategy to be identified. We applied the failure rate to the inspections planned for RIIO-3 to derive a volume.

In our RRP dataset for IP and MP valves we have high confidence in the cost data as it is robustly validated. However, we have lower confidence in the volume of reported data as it is not subject to the same robust tracking as HP valves. Given the high quality of fault data and inspection volume projections, we have not used the RRP volume dataset as the basis for our forecasts. This data was provided as part of EJP13 supporting evidence in our original submission.

A summary is shown below in Table 5. Please refer to the EJP13 section 4 for full details of this failure rate.

Failure per survey	Marker post / plate missing / damaged	Pit or cover missing / damaged	Rider / pressure point / body vents Fault	Valve inoperable / damaged	Buried / inaccessible	Total Failures Per Survey
IP Class M1						
IP Class M3						
MP Class M1						
MP Class M3						

Table 5: Summary of IP and MP Failure Proportions from EJP13

6 Forecast Volumes

Inspection volumes for all valves have been collated from RIIO-2 and projected into RIIO-3, derived from SAP maintenance work orders. While the inspections are broadly similar between RIIO-2 and RIIO-3, we note natural variation in volumes due to the differing maintenance frequencies, which are commented in the remainder of the section. The data quality is considered robust across all valve types.

6.1 HP Valves

Analysis of HP valve fault data and inspection volumes led to the following intervention volume options:

- **RIIO-2 Comparative Volume**, which maintains consistent RIIO-2 intervention volumes.
- **Uncapped Modelled Volume**, applies failure rates to planned inspections, resulting in a higher workload.

We discounted the Uncapped Modelled Volume from EJP13 on the basis that it is inflated by changes to the inspection volume caused by a restructuring of the work orders, specifically for block valves. In practice we will inspect a static population of valves every 1-2 years (dependent upon criticality) and therefore do not credibly expect the fault volume to increase by such a pronounced volume.

We have since undertaken further analysis and have assessed a **Capped Modelled Volume** option, which caps the modelled volume at RIIO-2 levels. A summary of this and the two original options are included in Table 6 below, and full calculations are included in section 0.

Option	1	2	3
Title	RIIO-2 Comparative	Uncapped Modelled Volume	Capped Modelled Volume
Volume Description	Like for like RIIO-2 volumes.	Modelled volume based upon the failure rate and expected inspection volumes.	Modelled volumes capped at the maximum volume experienced in RIIO-2.
EE	[redacted]		
NL			
NW			
WM			
Cadent			

Table 6: HP Volume Options

6.2 I&C ECVs

In our original submission our analysis led to two intervention volume options:

- **RIIO-2 Comparative volume**, which maintains consistent RIIO-2 intervention volumes.
- **Normalised extrapolation volume**, which was provided in the original submission and forecasts forward a rounded rate based upon the RIIO-2 actual delivery.

The submitted volume were based upon the normalised extrapolated volume. We discounted the like for like option because of our analysis concluded the uncleansed data was not sufficiently robust for two reasons:

1. In the Eastern network (East Midlands specifically) we had low confidence in the volume of reported interventions, (see fault analysis discussion in section 6.2). In the normalised extrapolation option, we corrected this based upon the average unit rate for the remaining networks.

2. For the West Midlands network, we noted low reported volume and high unit rate for this area and due to lower confidence in the data quality excluded this volume. In the normalised extrapolation option, we rounded up the proposed volume to account for this uncertainty.

We did consider another option where we linked the interventions on I&C ECVs to our governor maintenance programme. We created a modelled volume option by extrapolating the volume of inspections forward based upon the RIIO-3 annual maintenance plan. However, due to the uncertainty over the relationship maintenance inspections and the identification of I&C ECV faults as described in section 5.2, we discounted this option from consideration. We have included it here for completeness only

These options are summarised in Table 7 below with full calculations in section 0.

Option	1	2	3
Title	RIIO-2 Comparative	Normalised extrapolated volume.	Modelled volume
Description	RIIO-2 volumes except in EM where volumes are extrapolated using average unit rates.	Extrapolate and rounded volumes based upon RIIO-2 actual rates	Modelled volume based upon the cleansed failure rate and expected inspection volumes.
EE	[redacted]		
NL			
NW			
WM			
Cadent			

Table 7: I&C ECV Volume Options

6.3 IP and MP Valves

We forecasted our failure rates for IP and MP valves based upon the reported fault rate and the projected inspection rate in RIIO-3. The quality and granularity of the fault data and inspection plans is robust as described in sections 0 and 5.2.

In EJP13 we only presented one option; this was to remediate all faults based upon a targeted intervention type for both class M1 and M3 valves. The table below shows the other options that were considered.

We considered continuing with our RIIO-2 strategy of targeting only M1 valve but discounted this option on the basis that this would result in reduced operability of M3 valves. This would restrict our ability to isolate network sections in an emergency, which would pose a compliance risk against PSR and place customer at risk.

We also discounted the option to remediate only fully inoperable valves in favour of remediating faults proactively when identified to prevent further deterioration, which could lead to inoperability or inaccessibility. Only remediating fully inoperable values would also lead to restricted ability to isolate networks and introduce PSR compliance risk and increase customer risk.

The forecasted volumes are included for completeness in Table 8 below.

Option	1	2	3	4
Title	All class M1 and M3 faults	Inoperable class M1 valves and M3 only	All class M1 faults only	Inoperable class M1 only
Description	Volume forecasted for all class M1 and M3 valve faults, based upon fault rate and planned inspections	Volume forecasted for class M1 and M3 valve faults where the valve is operable, based upon fault rate and planned inspections	Volume forecasted for only class M1 valve faults, based upon fault rate and planned inspections	Volume forecasted for only class M1 valve faults where the valve is operable, based upon fault rate and planned inspections
EE	[redacted]			
NL				
NW				
WM				
Cadent				

Table 8: IP and MP Volume Options

7 Unit Cost Methodology

To derive unit costs for each applicable intervention mode, we sourced data from several locations. These are:

- Actual intervention costs and volumes for activities reported in the RRP, which provides a view of the current intervention work mix and associated blended cost.
- Uplifted RIIO-2 Final Determination cost estimates for IP and MP valves, where the complexity mix remains consistent between RIIO-2 and RIIO-3.
- The Unit Cost Workbook valuation for full remediation and valve replacements.

Please note that all costs presented in these sections are for the Eastern Network (East Midlands region) for illustration, except where specified. Full details of cost breakdowns can be found in attached data files in section 11 (Calculations).

7.1 HP Valves

For HP valves three intervention modes were considered in our long list options analysis. These are summarised in the table below. Only the Blended Rate was included within the EJP, as the work mix could not be confidently derived from the fault and intervention data to apply the refurbishment or replacement option.

Key feature	Mode 1	Mode 2	Mode 3
Intervention mode	Average Blended RIIO-2 Rate	UCW Refurbishment	UCW Replacement
Technical details and scope of intervention mode	Applies where the exact work mix is unknown. In this instance, the historic work mix is assumed to be consistent with forecasted work.	Applies where the valve is inaccessible, inoperable and/or leaking. Requires extensive excavation to locate the valve and pressure / rider points and fully refurbish it, including pits, chambers and lids.	Applies where the valve is inaccessible, inoperable and/or leaking. Requires extensive excavation to locate the valve and pressure / rider points and fully replace it including new pits, chambers and lids.
Unit costs	[redacted]		
Basis of unit cost	Average uplifted unit cost from historic trend analysis from RIIO-2 delivery, assuming consistent intervention modes in RIIO-3	Unit Cost Workbook	Unit Cost Workbook
What are the benefits	All options restore full functionality and ensures safety for highly degraded or inaccessible valves		

[1]The blended rate shown for HP valves is a Cadent average.

Key feature	Mode 1	Mode 2	Mode 3
Delivery timescales	Valve remediation works including traffic management can take up to 3 months to plan, and typically take 1 - 2 weeks to execute depending upon location and network analysis / complexity		
Asset life	Dependent upon asset health scoring (HI1-HI5) defined in the Network Asset Management Strategy (section 5) Typical asset life of a valve is 50 years; however, it can be extended with proactive maintenance		

Table 9: HP Valve Intervention Mode and Unit Cost Summary

7.2 I&C ECVs

For I&C ECVs we considered two additional modes as summarised in the table below. The Blended Intervention mode was excluded from EJP13 owing to low confidence in unit rate from the RRP data set.

Key feature	Mode 1	Mode 2
Intervention mode	Blended Intervention	Replacement
Technical details and scope of intervention mode	Applies where the exact work mix is unknown. In this instance, the historic work mix is assumed to be consistent with forecasted work.	Applies where the valve is inaccessible, inoperable and/or leaking. Requires extensive excavation to locate the valve and pressure / rider points and fully refurbish it, including pits, chambers and lids.
Unit costs of the intervention mode	[redacted]	
Basis of unit cost	Average unit cost from historic trend analysis from RIIO-2 delivery, assuming consistent intervention modes between RIIO-2 and RIIO-3	Unit Cost Workbook based upon IP valve replacement
What are the benefits	Restores full functionality and ensures safety for highly degraded or inaccessible valves	
Delivery timescales	Valve remediation works including traffic management can take up to 3 months to plan, and typically take 1 - 2 weeks to execute depending upon location and network analysis / complexity	
Asset life	Dependent upon asset health scoring (HI1-HI5) defined in the Network Asset Management Strategy (section 5) Typical asset life of a valve is 50 years; however, it can be extended with proactive maintenance	

Table 10: I&C ECV Valve Intervention Mode and Unit Cost Summary

7.3 IP and MP Valves

For IP and MP valves the intervention modes have been applied to our volumes as summarised in table below. Modes 2,3 and 4 are consistent with EJP13 and have been include for context. Mode 1 was discounted from EJP13 on the basis that the dataset for volume reported is unvalidated and therefore confidence in this data is low. See section 5.3 (fault rate discussion) for more details.

Key feature	Mode 1	Mode 2	Mode 3	Mode 4
Intervention mode	Blended Intervention	High Complexity	Medium Complexity	Low Complexity
Technical details and scope of intervention mode	Applies where the exact work mix is unknown. In this instance, the historic work mix is assumed to be consistent with forecasted work.	Involves extensive excavation and full valve replacement or refurbishment where valves are buried, inoperable, or leaking, including associated pressure/rider points and installation of appropriate chambers and lids.	Requires partial excavation to access and refurbish pressure and rider points, with the valve generally functional, and installation of appropriate chambers	Covers basic interventions such as replacement or refurbishment of lids, chambers, and marker posts to ensure operability and accessibility where valves are visible and fully accessible.
Unit costs of the intervention mode	[redacted]			
Basis of unit cost	Average unit cost from historic trend analysis from RIIO-2 delivery, assuming consistent intervention modes between RIIO-2 and RIIO-3		Like for like unit cost, uplifted from RIIO-2 Final Determination.	
What are the benefits	Restores full functionality and ensures safety for highly degraded or inaccessible valves			
Delivery timescales	Valve remediation works including traffic management can take up to 3 months to plan, and typically take 1 - 2 weeks to execute depending upon location and network analysis / complexity			
Asset life	Dependent upon asset health scoring (HI1-HI5) defined in the Network Asset Management Strategy (section 5) Typical asset life of a valve is 50 years; however, it can be extended with proactive maintenance			

Table 11: IP and MP Valve Intervention Mode and Unit Cost Summary

8 Options

This section contains fully costed long list options for all valve types in scope of EJP13. While these long-list options were considered, a proportion were discounted and therefore not submitted due to the mandated nature of the programme and strict inspection timeframes.

8.1 Above 7 Bar Valves

Option	1	2	3	4	5	6	7	8	9
Title	RIIO-2 actual volumes, Average Blended RIIO-2 Rate.	Uncapped Modelled Volume, Average Blended RIIO-2 Rate.	Capped Modelled Volume, Average Blended RIIO-2 Rate.	RIIO-2 actual volumes, UCW Refurb.	Uncapped Modelled Volume, UCW Refurb.	Capped Modelled Volume, UCW Refurb.	RIIO-2 actual volumes, 90% Refurb, 10% Replace.	Uncapped Modelled Volume, 90% Refurb, 10% Replace.	Modelled Volume Capped at RIIO-2 actual Levels, 90% Refurb, 10% Replace.
Volume Description	RIIO-2 Like for Like	Uncapped Modelled Volume	Capped Modelled Volume	RIIO-2 Like for Like	Uncapped Modelled Volume	Capped Modelled Volume	RIIO-2 Like for Like	Uncapped Modelled Volume	Capped Modelled Volume
Cost Description	Average Blended RIIO-2 Rate is applied, assuming consistent work mix into RIIO-3	Average Blended RIIO-2 Rate is applied, assuming consistent work mix into RIIO-3	Average Blended RIIO-2 Rate is applied, assuming consistent work mix into RIIO-3	UCW Refurbishment rate is assumed to apply to all interventions.	UCW Refurbishment rate is assumed to apply to all interventions.	UCW Refurbishment rate is assumed to apply to all interventions.	UCW refurb rate for 90% volume, UCW replacement for 10% volume (RIIO-2 FD strategy)	UCW refurb rate for 90% volume, UCW replacement for 10% volume (RIIO-2 FD strategy)	UCW refurb rate for 90% volume, UCW replacement for 10% volume (RIIO-2 FD strategy)
Status	Original option	Original option	New Option for DD	Original option	Original option	New Option for DD	Original option	Original option	New Option for DD
Included in EJP13	Yes	No	No	No	No	No	No	No	No

Option	1	2	3	4	5	6	7	8	9
Preferred Option	Yes	No	No	No	No	No	No	No	No
Total Volume	[redacted]								
Total Cost (£m)	[redacted]								
Average Unit Rate (£)	[redacted]								

Table 12: HP Valve Long List Options Summary

8.2 Industrial and Commercial Emergency Control Valves

Option	1	2	3	4	7	8
Title	Modelled volume. RIIO-2 Average Actual Unit Rate	Normalised extrapolated volume. RIIO-2 Average Actual Unit Rate	Modelled volume. UCW IP Replacement Rate	Normalised extrapolate volume. UCW IP Replacement Rate	RIIO-2 Actual. RIIO-2 Average Actual Unit Rate	RIIO-2 Actual. UCW IP Replacement Rate
Volume Description	Modelled volume option	Normalised extrapolated volume	Modelled volume option	Normalised extrapolated volume	RIIO-2 Like for Like	RIIO-2 Like for Like
Cost Option Description	Costs are based upon the average actual rate for I&C ECV from RIIO-2.	Costs are based upon the average actual rate for I&C ECV from RIIO-2.	Costs are based upon replacement (costed as IP) from the Unit Cost Workbook.	Costs are based upon replacement (costed as IP) from the Unit Cost Workbook.	Costs are based upon the average actual rate for I&C ECV from RIIO-2.	Costs are based upon replacement (costed as IP) from the Unit Cost Workbook.
Status	New Option	Original Option	New Option	Original Option	Original Option	Original Option

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Option	1	2	3	4	7	8
Included in EJP13	No	No	No	Yes	No	No
Preferred Option	No	No	No	No	No	No
Total Volume	[redacted]					
Total Cost (£m)	[redacted]					
Average Unit Rate (£)	[redacted]					

Table 13: I&C ECV Long List Options Summary

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8.3 IP and MP Valves

Option	1	2	3	4	5	6	7	8
Title	Fully remediate class M1 and M3 using uplifted RIIO-2 FD high complexity rates	Targeted remediation class M1 and M3 using uplifted RIIO-2 FD complexity rates	Remediate inoperable class M1 and M3 valves using uplifted RIIO-2 FD complexity rates	Fully remediate class M1 only using uplifted RIIO-2 FD high complexity rates	Targeted remediation class M1 only using uplifted RIIO-2 FD complexity rates	Remediate inoperable class M1 valves using uplifted RIIO-2 FD complexity rates	Fully remediate class M1 and M3 using blended RIIO-2 average actual rate	Fully remediate class M1 valves using blended RIIO-2 average actual rate
Volume Description	M1 and M3 valve are fully refurbished on identification of fault	M1 and M3 valve remediation is tailored to the identified fault by complexity.	Inoperative IPMP M1 and M3 valves are remediated. Only high and medium complexity interventions are undertaken.	M1 valve only are fully refurbished on identification of fault	M1 valve remediation is tailored to the identified fault by complexity.	Inoperative IPMP M1 valves only are remediated. Only high and medium complexity interventions are undertaken.	M1 and M3 valve are fully refurbished on identification of fault	M1 valve only are fully refurbished on identification of fault
Cost Option Description	High complexity refurbishment cost is applied to all interventions from uplifted RIIO-2 complexity costs.	Uplifted RIIO-2 complexity costs (High, medium, low) are applied to the corresponding intervention complexity.	Uplifted RIIO-2 complexity costs (High, medium, low) are applied to the corresponding intervention complexity.	High complexity refurbishment cost is applied to all interventions from uplifted RIIO-2 complexity costs.	Uplifted RIIO-2 complexity costs (High, medium, low) are applied to the corresponding intervention complexity.	Uplifted RIIO-2 complexity costs (High, medium, low) are applied to the corresponding intervention complexity.	Uplifted RIIO-2 average actual intervention cost is applied to all interventions.	Uplifted RIIO-2 average actual intervention cost is applied to all interventions.
Status	Original option	Original option	Original option	Original option	Original option	Original option	Original option	Original option
Included in EJP13	No	Yes	No	No	No	No	No	No

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Option	1	2	3	4	5	6	7	8
Preferred Option	No	Yes	No	No	No	No	No	No
Total Volume	[redacted]							
Total Cost (£m)	[redacted]							
Average Unit Rate (£)	[redacted]							

Table 14: IP and MP Valve Long List Options Summary

9 Preferred RIIO-3 Workload and Cost

9.1 Overall Position

The selected options presented in the original EJP13 and BPDT are reflected in the tables below. The total forecast cost and volume remains unchanged from original submission.

Table 15: Pipeline Isolation Valve Costs

Table 16: Pipeline Isolation Valve Forecast Volume

The remainder of this section provides detailed breakdown of the position for each valve type.

9.2 HP Valves

Our preferred option remains option 1; RIIO-2 Like for Like volumes using a blended average RIIO-2 rate as unit cost.

Table 17: HP Expenditure Forecasts

Table 18: HP Valve Volume Forecast

We discounted options (2, 5 and 8) using the uncapped modelled volume for further analysis and consideration. The static asset population and frequent inspection of valves in scope meant that the likelihood of identifying such a pronounced increase of workload is not credible.

We also discounted the continuation of the 90:10 refurbishment to replacement strategy applied in RIIO-2 final determination, covered in options 7, 8, and 9. For all volume scenarios this was prohibitively expensive based upon the rate options available and our actual rates to not demonstrate this level of cost increase.

Of the remaining options, our preference is to utilise the average blended RIIO-2 rate because we expect a continuation of the same mix of work types of varying complexities in RIIO-3, and this rate effectively reflects those trends. We have therefore discounted options 4, 5 and 6, which are based upon a flat refurbishment rate from our Unit Cost Workbook, as this approach, while yielding similar unit costs, does not fully represent the expected work trends into RIIO-3.

9.3 I&C ECVs

Our preferred option is the normalised extrapolated volume and the IP Unit Cost Workbook replacement rate, which is consistent with our original EJP13 submission. The intervention costs and volumes are shown in the tables below:

Table 19: I&C Valve Volume Forecast

Table 20: I&C Valve Expenditure Forecast

We have discounted Options 7, 8, and 9, which relied on reported RIIO-2 volumes, due to low confidence in the accuracy of the reported intervention volumes. Similarly, Options 1 and 2 were excluded because their unit costs were derived from average actual unit rates based on the same data, which we consider unreliable.

We also excluded Options 1, 3, and 5, which used modelled volumes based on historic interventions. This decision was based on two key concerns:

- The low quality and limited sample size of failure and intervention data used for forecasting.
- The modelled volumes assume a relationship between I&C governor maintenance and I&C ECV. This does not account for faults identified through customer and metering provider engagement, which are expected to contribute significantly to the actual workload. As a result, these options would likely underestimate the true volume of interventions required.

9.4 IP and MP Valves

Our preferred option is to retain the targeted investment in all M1 and M3 valves as stated in our original submission, as shown in the tables below:

Table 21: IP & MP Valve Volume Forecast

Table 22: IP & MP Valve Expenditure Forecast

We discounted all M1 valve-only options on the basis they did not address M3 compliance valves against the Pipeline Safety Regulations (PSR), Gas Safety (Management) Regulations (GSMR), and Pressure Systems Safety Regulations (PSSR). Furthermore, we anticipate that M3 valves will play an increasingly critical role in enabling effective isolation, particularly in response to natural events and in support of the UK's transition to net zero.

We have also excluded full remediation of all valves, as this does not represent best value for money in comparison to the targeted approach. Finally, options based on the average actual RIIO-2 unit rate have been excluded due to lower confidence in the reported volumes, although the associated costs have been validated through Regulatory Reporting Pack submissions to Ofgem.

10 Calculations

To support the optioneering of HP Valves and I&C Valves, we include the additional workings of the options as attached.

Asset	Description of file	File
HP Valves	HP Valve full costed options	[redacted]
I&C ECVs	I&C ECV full costed options	[redacted]

Table 23: Table of Calculations Supporting Evidence