

OFGEM – Final Report

GD2 Engineering Justification Paper Reviews

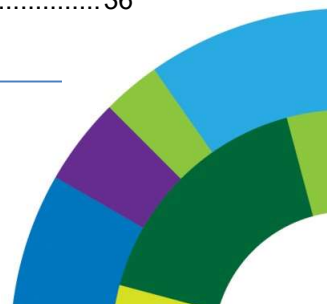
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Disclaimer

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Glossary

• ADM	-	Access Deterrent Measures
• AGI	-	Above Ground Installation
• AMR	-	Automated Meter Reading
• ARV	-	ARV Consulting Limited
• BPDT	-	Business Plan Data Template
• BSR	-	Bulk Service Renewal
• Capex	-	Capital Expenditure
• CBA	-	Cost Benefit Analysis
• CP	-	Cathodic Protection
• DG	-	District Governor
• E&I	-	Electrical & Instrumentation
• EJP	-	Engineering Justification Paper
• ET	-	Electricity Transmission
• GDN	-	Gas Distribution Network
• GT	-	Gas Transmission
• HSE	-	Health & Safety Executive
• HP	-	High Pressure
• I&C	-	Industrial and Commercial
• IMRRP	-	Iron Mains Risk Reduction Programme
• IP	-	Intermediate Pressure
• LDZ	-	Local Distribution Zone
• LP	-	Low Pressure
• LTS	-	Local Transmission system
• MOB	-	Multi Occupancy Building
• MP	-	Medium Pressure
• MRPS	-	Mains Risk Prioritisation System
• NARM	-	Network Asset Risk Metric
• NGN	-	Northern Gas Networks
• Opex	-	Operational Expenditure
• PCD	-	Price Control Deliverable
• PE	-	Polyethylene
• PRE	-	Public Reported Escape
• PRI	-	Pressure Reducing Installation
• PRS	-	Pressure Reducing Station
• PSSR	-	Pressure Systems Safety Regulations
• PSR	-	Pipeline Safety Regulations
• PSUP	-	Physical Security Upgrade Project
• PV	-	Photo Voltaic
• QEMS	-	QEM Solutions Limited
• Repex	-	Replacement Expenditure



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- RTU - Remote Telemetry Unit
- SGN - Gas Network Company Serving Scotland & Southern England
- SME - Subject Matter Expert
- SPIV - Strategic Pipeline Isolation Valve
- SQ - Supplementary Question
- Totex - Total Expenditure
- UHF - Ultra High Frequency
- UM - Uncertainty Mechanism
- WWU - Wales & West Utilities

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1. Executive Summary

As part of the process of reviewing spending requests submitted by the UK's gas distribution network (GDN) companies for the RIIO-GD2 price control process, the Ofgem Engineering Hub required the support of an independent engineering team with experience in the gas distribution sector to review investment proposals for gas distribution schemes, above ground installations such as system entry points and other pressure reduction stations. The review focused on specific named projects as well as network wide asset health replacement programmes of gas distribution equipment. The purpose of the review was to highlight areas of engineering spend where the proposed investment needs case was not justified, or had insufficient justification / doubt relating to the volumes proposed.

The review focused on individual network company's spending proposals and flagged areas where reductions or deferrals in workloads were deemed possible based on the need (or not) to complete the work during the RIIO-GD2 period. Given the multi discipline nature of the investment requests, the review also assessed a number of cost benefit analyses associated with the engineering type justifications across more than one discipline. Where a needs case was accepted, but the proposed volumes within an EJP were challenged or undefined, an independent view was offered by the review team of modified volumes or uncertainty mechanism.

QEM Solutions (QEMS) and ARV Consulting (ARV) were engaged and asked to work collaboratively to undertake the reviews of the submitted engineering justification papers (EJP) on behalf of, but independently from, the Ofgem Engineering Hub. A team of 12 gas industry subject matter experts with, collectively, c. 400 years of experience between them was assembled for the task and set to work using online collaboration resources, fed from the Ofgem 'Huddle' virtual data room.

A total of 159 EJPs were made available for on-line review by the QEMS/ARV resources, including the related business plan data templates and cost benefit analyses across all of the gas distribution networks, totaling £5,785m in value. The review scope addressed the proposed GDN intervention volumes for Replacement (Repex) and Capital (Capex) expenditure interventions only.

The programme for the review work was mobilised on 6th Jan 2020, with the target completion date of end of March 2020. Given the volume of EJP reviews required in the time allowed, the approach focused initially on reviewing all EJPs >£10m (46 EJPs in total @ c. £5,486m) which represented 95% of the GD2 spend submitted to QEMS/ARV for review. The balance of the EJPs (113 EJPs @ c. £299m) would be reviewed thereafter, up to the target date.

On 23rd Mar 2020, an EJP Data template was issued by QEMS/ARV to the Ofgem Engineering Hub with the summary review outputs for all 46 EJPs >£10m. The template was accompanied by the detailed review sheets for each of these EJPs.

On 5th Apr 2020, an updated EJP Data template was issued with the summary review outputs for all of the remaining 113 EJPs <£10m. The template was accompanied by the detailed review sheets for each of these EJPs.

The initial summary of all review outcomes is shown below:

1.1. EJP Review Outcomes Summary

Category	EJP Count	Reject	Accept (No Mods to Volume)	Accept (Modify Volume)	Uncertainty Mechanism / Re-opener (Note 1)	Accept (Modify Volume) & Uncertainty Mechanism
AGI Security / PSUP	3	1	2	0	0	0
Cathodic Protection	4	0	2	0	0	2
Crossings	7	0	5	1	1	0
District Governors	23	2	17	3	1	0
E&I Scope	6	1	3	2	0	0
Gas Holders	1	0	1	0	0	0
I&C Governors	3	0	3	0	0	0
Iron Mains	13	0	4	1	4	4
LTS Pipelines Non Piggable	3	0	1	1	0	1
LTS Pipelines Piggable	5	0	3	0	0	2
Odourisation & Metering	5	0	3	0	2	0
Offtake Pre-heating	3	0	3	0	0	0
Offtakes & PRS (General)	16	4	11	1	0	0
Other Mains	10	0	2	5	0	3
PE Mains	15	5	1	0	7	2
Process Plant	3	1	0	2	0	0
PRS Filters	1	0	1	0	0	0
PRS Pre-heating	14	1	13	0	0	0
PRS Slamshut/Regulators	2	0	2	0	0	0
Risers	4	0	1	0	3	0
Service Governors	2	0	2	0	0	0
Services	7	0	5	0	0	2
Steel Mains	9	1	5	3	0	0
Totals	159	16	90	19	18	16
Proportion of Total EJP		10%	57%	12%	11%	10%
Submitted EJP Value (£m)	5,785.3	74.7	1,853.7	483.1	2,830.7	543.1
Proportion of Total Value		1.3%	32.0%	8.4%	48.9%	9.4%

Notes:

- The totals of EJPs above determined as 'Uncertainty Mechanism / Re-opener' include EJPs proposed by the network companies as requiring an Uncertainty Mechanism, plus also EJP's additionally determined by the EJP review process as having indefinite volumes, costs, demand or timing. Section 1.2 defines these subcategories.

1.2. Uncertainty Mechanisms (UM) and Indefinite EJP Review Outcomes

The EJP review process found that 18 EJPs had outcomes where a needs case had been established, but where some aspect(s) of the scope was unable to be defined, or contained elements of doubt / poor definition. These were categorised as EJPs where either:

- The network itself was unable to define the scope or timing, and so had proposed an uncertainty mechanism, or where;
- The EJP review process itself had additionally revealed EJP volumes that were indefinite in some respect or not adequately defined.

These are shown below:

Network	Total of Uncertain or indefinite EJPs	UM Proposed by Network	UM Proposed by Network (£m)	Indefinite EJP Review Outcome	Indefinite EJP Review Outcome (£m)
Cadent	6	4	315.1	2	2,004.1
SGN	9	6	8.5	3	99.1
Northern Gas Networks (NGN)	2	1	393.6	1	10.1
Wales & West Utilities (WWU)	1	0	0.0	1	0.3
Totals	18	11	717.2	7	2,113.6

Details of each EJP are itemised in Appendix 1. The summary review table in 1.1 is further broken down into EJP review outcomes by GDN company below:

1.3. EJP Review Outcomes by Network – Volume Determination by Count

Network	Total EJP	Reject	Accept (No Mods to Volume)	Accept (Modify Volume)	Uncertainty Mechanism / Re-opener	Accept (Modify Volume) & Uncertainty Mechanism
Cadent	27	0	15	1	6	5
SGN	112	16	63	16	9	8
NGN	12	0	7	1	2	2
WWU	8	0	5	1	1	1
Totals	159	16	90	19	18	16
		10%	57%	12%	11%	10%

1.4. EJP Review Outcomes by Network – Volume Determination by Value

Network	Total EJP	Reject	Accept (No Mods to Volume)	Accept (Modify Volume)	Uncertainty Mechanism / Re-opener	Accept (Modify Volume) & Uncertainty Mechanism
Cadent	2,984.53	0.00	264.25	37.40	2,319.19	363.69
SGN	1,732.61	74.67	1,378.29	82.64	107.50	89.50
NGN	728.46	0.00	120.39	136.60	403.70	67.77
WWU	339.69	0.00	90.74	226.48	0.30	22.17
Totals (£m)	5,785.28	74.67	1,853.67	483.12	2,830.69	543.13
		1.3%	32.0%	8.4%	48.9%	9.4%

These EJP intervention volume reviews were accompanied, where appropriate, by cost 'observations' by the EJP review team and captured on an EJP Data template.

All EJP reviews >£10m have been the subject of detailed discussions with the Ofgem Cost Assessment Repex and Capex teams to allow their accurate interpretation of the independent EJP review outputs, their alignment with BPDT and CBA data and so to allow appropriate cost determination model inputs.

For the Capex EJP's, these detailed discussions with the Ofgem Cost Assessment team led to 16 'Deep Dive' reviews to offer more detailed EJP review outcomes where volumes or costs had been challenged.

This outcomes summary is further broken down in the following sections of this report for each of the gas distribution network companies:

- Section 5: Cadent
- Serving the North West, West Midlands, North London & East of England
- Section 6: SGN
- Serving Scotland and Southern England
- Section 7: Wales & West Utilities (WWU)
- Serving Wales and the South West of England
- Section 8: Northern Gas Networks (NGN)
- Serving the North East of England

This report and its findings do not offer an indication of the Ofgem price control determination outputs, nor is Ofgem bound by any of its content. It is an independent review of the intervention volumes proposed by the GDNs in RIIO-GD2, and is offered solely to Ofgem to assist with asset volume definition to the price control cost model inputs.

2. Introduction

The Ofgem Engineering Hub is an internal division at Ofgem comprising a team of engineers dedicated to providing support to the management of transmission and distribution network issues within the Systems and Networks Directorate.

As part of the UK regulatory process of reviewing spending request submitted by the UK's GDN companies for the RIIO-GD2 price control process, the Ofgem Engineering Hub required the support of an independent engineering team with experience in the gas distribution sector to review investment proposals for gas distribution schemes, above ground installations such as system entry points and other pressure reduction stations.

The review focused on specific named projects as well as other asset health network wide replacement programmes of gas distribution equipment. As such, the review of the investment proposals considered elements such as:

- Asset condition and predicted deterioration
- Supply and demand picture
- Normal maintenance practices and replacement spend
- Normal cost/benefit justification for expenditure

The purpose of the review was to highlight areas of engineering spend where the proposed investment needs case was not justified, or had insufficient justification / doubt relating to the volumes proposed. The review focused on individual network company's spending proposals and flagged areas where reductions or deferrals in workloads were deemed possible based on the need (or not) to complete the work during the RIIO-GD2 period. Given the multi discipline nature of the investment requests, the review also assessed a number of cost benefit analyses associated with the engineering type justifications across more than one discipline.

Where a needs case was accepted, but the proposed volumes within an EJP were challenged or uncertain, an independent view was offered by the review team of modified volumes or uncertainty mechanism.

QEM Solutions and ARV Consulting were engaged and asked to work collaboratively to undertake the reviews of the submitted engineering justification papers on behalf of, but independently from, the Ofgem Engineering Hub. A team of 12 gas industry subject matter experts with, collectively, c. 400 years of experience between them was assembled for the task and set to work using online collaboration resources, fed from the Ofgem 'Huddle' virtual data room.

A total of 159 EJPs were made available for on-line review by the QEMS/ARV resources, including the related business plan data templates (BPDT) and cost benefit analyses (CBA) across all of the gas distribution networks, totaling £5,785m in value.

The review scope addressed the proposed GDN intervention volumes for Repex and Capex only.



The programme for the review work was mobilised on 6th Jan 2020, with the target completion date of end of March 2020. Given the volume of EJP reviews required in the time allowed, the approach developed a prioritisation schedule for the reviews which considered EJPs by value and by GD1 v GD2 anomaly in each asset category in order to ensure that the bulk of key EJPs were addressed in the time allowed. The balance of lower priority EJPs would be reviewed thereafter, time permitting, up to the target date.

The table below summarises the value and number of the submitted EJP documents per asset category:

Asset Category	EJP Count	EJP Value (£m)
AGI Security / PSUP	3	£21.57
Cathodic Protection	4	£53.93
Crossings	7	£57.64
District Governors	23	£58.66
E&I Scope	6	£24.64
Gas Holders	1	£15.99
I&C Governors	3	£27.49
Iron Mains	13	£3,892.65
LTS Pipelines (Non Piggable)	3	£60.94
LTS Pipelines (Piggable)	5	£87.52
Odourisation & Metering	5	£31.60
Offtake Pre-heating	3	£23.19
Offtakes & PRS (General)	16	£212.59
Other Mains	10	£43.78
PE Mains	15	£22.63
Process Plant	3	£3.79
PRS Filters	1	£5.20
PRS Pre-heating	14	£65.11
PRS Slamshut/Regulators	2	£15.07
Risers	4	£332.01
Service Governors	2	£4.77
Services	7	£419.75
Steel Mains	9	£304.77

The total of the proposed RIIO-GD2 EJP interventions reviewed is £5,785.28m.

Each of these 159 EJP documents was independently reviewed by the QEMS/ARV team, complying with the process as described in the following 'Methodology' section of this report and volume determinations made for each.



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3. The Review Team

In late 2019, Ofgem undertook a nationwide call for competition via 'myTenders' to procure gas distribution support resources to support the Ofgem Engineering Hub. Both QEM Solutions and ARV Consulting independently and successfully responded to the Ofgem call for competition and were engaged on 23 Dec 2019.

QEM Solutions is a business providing project services resources, technical consultancy, management consultancy and software solutions to the energy utility and infrastructure industry.

ARV Consulting is an independent energy transmission & distribution infrastructure consultancy business offering professional services and consulting advisory services to the UK's gas and electricity transmission and distribution markets.

Both QEMS and ARV mobilised on 6th Jan 2020.

Following discussion with the Ofgem Engineering Hub, ARV was identified to take the lead on the independent RIIO-GD2 EJP review process and would manage QEMS resources whilst providing reports to the Engineering Hub.

In order to bring together the necessary skills sets and experience within an independent EJP review team, the EJP documents were initially and individually reviewed at high level to assess alignment with any of the network asset risk metric (NARMS) categories for each paper. The relevant subject matter expert (SME) requirement was then determined to lead each paper review.

The programme of EJP review works and the volumes of papers in each NARMS category was then assessed to determine whether multiples of specific SME skill sets would be needed to undertake the workload and achieve the review outcome target date in each asset category.

Asset Category (Repex Examples)	EJP Count
Iron Mains	13
Other Mains	10
Polyethylene (PE) Mains	15
Risers	4
Services	7
Steel Mains	9

The example of the above Repex related EJPs (all asset categories) numbered 58 in total and was judged to need a minimum of 2x Repex SMEs to achieve the required review programme outcome. Candidate EJP resources from the QEMS team were then allocated as Lead EJP reviewers for each asset category and mobilised as appropriate. Duplicate 'Peer' resources were also identified for each asset category to undertake check reviews.

3.1. The EJP Review Team

The following collaborative team was assembled and mobilised to manage and undertake the EJP RIIO-GD2 EJP reviews:

Resource	Years in Industry	Qualifications	Role & Assigned EJP Lead Asset Category
Rob Graham	20+	BSc Civil & Environmental Engineering	Project Sponsor
Tony Voss	33	BEng (Hons) Electronics Chartered Engineer	Project Manager Local Transmission Systems Offtakes & PRS General
Stuart Elliot	20	BSc (Hons) Civil Engineering	Project Coordinator Security Infrastructure Gas Holders
Bob Lawson	40	Post Graduate Diploma Prince 2 Practitioner	District Governors Overcrossings
Jeremy Bending	40	BSc (Hons) Production Engineering & Management Chartered Engineer	Cost Benefit Analyses Scottish Independent Undertakings
John Wilkinson	40+	Incorporated Engineer	Odourisation & Metering E&I Scopes
Mark Danter	30+	BEng (Hons) Computer Engineering Chartered Engineer	Offtakes & PRS General Slamshuts & Regulators
Peter Christie	40	BEng Mechanical Engineering Chartered Engineer	Repex (All categories of mains, services and risers)
Simon Lane	40	City & Guilds Gas Distribution City & Guilds Streetworks	Repex (All categories of mains, services and risers)
Adam Sadler	20	BEng (Hons) Building Environment Engineering Chartered Engineer	Offtakes & PRS Pre-Heating
Tim Green	38	Engineering Council Part 2 Examination HND Mechanical Engineering	Local Transmission Systems Cathodic Protection
Paul Howard	45	City and Guild Gas Governor Fitter BTEC in Gas Utilisation	I&C and Service Governors Crossings PRS & Offtake Filters

Biographies for each resource are included in Appendix 3.

4. Methodology

4.1. Preparation

In total, 162 of the EJP's submitted by the gas distribution networks (GDN) were identified for review by QEMS / ARV. The EJP count and values are summarised below:

Network	EJP Count	Value (£m)
Cadent	27	2,984.53
SGN	115 ¹	1,762.90 ²
WWU	8	339.69
NGN	12	728.46

Notes:

1. Includes 2x Environmental EJPs (asbestos) and 1x Cyber EJP which were not required to be reviewed by QEMS/ARV.
2. Includes £30.29m for the 3x EJPs in Note 1 which were not required to be reviewed by QEMS/ARV.

Therefore 159 EJPs were initially reviewed at high level to align the content and context with a NARMS asset category (as far as was possible) in order to identify the appropriate specialist skill set to undertake each review. Additional asset categories were defined, for the purposes of the EJP review process, to address EJPs that did not clearly align with a defined NARMS category. In total, 23 defined asset categories captured all 159 EJPs scheduled for review (see Section 1.1).

Prior to the engagement of QEMS/ARV, Ofgem had developed a process for the reviews, which followed the guidance and made constant reference to the following suite of key Ofgem documentation:

- Ofgem Guidance – Engineering Justification Paper Frameworks for RIIO-GD2 and RIIO-GT2
- Draft – GD and GT Engineering Justification Paper Review Procedure
- Network Output Measures Health & Risk Reporting Methodology & Framework
- Asset Health EJP Review Template (NB: No Ofgem requirement to 'score' these EJPs)
- Major Project EJP Review Template (NB: No Ofgem requirement to 'score' these EJPs)

Complimentary to the above, QEMS/ARV subsequently developed an EJP Review Workflow (Appendix 2) which was mapped against these Ofgem documents for the review process and defined each of the steps the reviewers must follow to ensure consistency of approach and outcomes.

Each asset category was allocated a Lead Reviewer SME and Peer Reviewer to ensure appropriate challenge and breadth of review. Critically, the EJP review process guidance was underpinned by the sole focus of determining asset 'Volumes' within the documents reviewed.

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A number of the GDNs produced aggregated EJPs that crossed multiple NARMS boundaries. In these cases the asset type/component within the aggregated EJP with the highest proposed intervention value, determined the Lead Reviewer skill set.

During the EJP review process the key outputs (to the Cost Assessment team from the Engineering Hub) were defined by Ofgem as:

- Provision of Asset Health EJP reviews – The key output of the review of each paper is to either highlight issues with the volumes proposed and provide options to resolve the issue in conjunction with the company, highlight issues with the unit cost scopes noted or propose a suitable uncertainty mechanism for a given spend.
- Provision of Major Project EJP Reviews – The key output of this review is to confirm that the project scope is suitable (including proposing to “do nothing”) and confirm that the project delivery risks are properly understood to protect the bill payers’ interests.

Ofgem defined 3 levels of priority threshold for the EJP review process. Priority 1 was defined as any proposed GD2 asset interventions in categories exhibiting the greatest deltas (i.e. value/volume) compared to its GD1 equivalent. Priority 2 as the proposed key GD2 Repex interventions. Priority 3 the balance of proposed GD2 Repex and Capex interventions. Specifically, these were defined as:

Priority 1:

- Local Transmission System (LTS) pipelines, entry and storage
- Steel mains >2" diameter

Priority 2:

- Reinforcement
- Tier 2B & Tier 3 iron mains
- Tier 1 Repex
- Multi Occupancy Building (MOBs)
- Rechargeable diversions

Priority 3:

- Governors
- Connections
- Other Repex categories
- Other Capex categories

Each EJP review determined whether the EJP was an Asset Health or Major Project intervention, and reviewed accordingly using the appropriate review template.

Bringing projects together

In all cases, the review process took account of the following questions:

- Is the EJP complete with all reference material available?
- Does the EJP present a clear and unambiguous 'needs case' for intervention in the RIIIO-GD2 period?
- Have all reasonable options been considered and validated?
- Is the Preferred Option proportionate to the needs case?

For the Priority 1 Steel Mains and LTS EJP's, a sample of CBA reviews was also undertaken to ensure alignment with the EJP to determine value for money and efficiency.

A process for generating supplementary questions (SQ) by the review process was also developed and SQ's directed to the GDNs to request clarification(s) and to aid the EJP review outcomes. A maximum of 2 iterations for any single SQ was deemed sufficient opportunity for any GDN to clarify a particular issue. In total 695 SQ's were raised.

The EJP review volume determination categories were set by the Ofgem Cost Assessment team and fell into just 1 of 5 defined categories:

- Reject
- Accept with no modifications to volumes
- Accept with modified volumes
- Accept with modified volumes & uncertainty mechanism
- Uncertainty mechanism/reopener & indefinite outcomes

To ensure manageable control and reporting of both the EJP review process and document version control, QEMS set up a 'virtual' cloud-based environment for the review team to operate within. The EJPs and all related Ofgem documentation was uploaded to a bespoke and secure Microsoft Team and SharePoint platform, and the designated Lead / Peer reviewers given unique access to their allocated EJP document folders. All reviews were carried out online in this virtual data room.

Once all procedural preparations were in place, a face-to-face review kick-off meeting was held on 24th Jan 2020 with all QEMS/ARV management and reviewers in attendance. The Ofgem Engineering Hub also attended to meet the review team and offer final guidance prior to the start of the works.

Thereafter, the EJP reviews commenced from Monday 27th Jan 2020.

4.2. Execution

The execution of the reviews followed the Ofgem defined priorities and a weekly review call was convened for the duration of the works by the Engineering Hub, with the Ofgem Cost Assessment team and QEMS & ARV management to monitor and assess progress, costs, programme and issues/conflicts.



A weekly Progress Report was routinely issued to the Engineering Hub to support the weekly call, and which contained updates on:

- EJP Data dashboard
- General progress
- SQ updates
- Programme
- Costs
- Conflicts / Issues

The SQ's generated by the review process were captured in an SQ Register and issued weekly to the Ofgem SQ Manager. Responses from the networks were uploaded to Huddle within the stipulated 5 day response period and then mapped by QEMS/ARV back to the original to allow ease of look-up.

A parallel weekly call was also convened by QEMS/ARV to assemble all EJP Reviewer resources and share knowledge / feedback to ensure consistency of approach. The outputs from the weekly Ofgem calls and SQ Manager were also shared with the QEMS/ARV team weekly. Ofgem was optionally invited to this call.

Complimenting this were bi-weekly Engineering hub planning session calls to ensure alignment of the GD2 with the parallel Gas Transmission (GT) and Electricity Transmission (ET) reviews.

The GD2 EJP review work followed this weekly priority routine for the duration of the programme, but importantly was punctuated by two rounds of bilateral meetings, face-to-face with each of the 4 GDN companies.

The first round of bilateral meetings were scheduled:

- 10th Feb 2020 – Cadent & NGN (Glasgow: Weather impacted, led to conference call)
- 13th Feb 2020 – WWU & SGN (London: Face-to-face)

The second round of bilateral meetings were scheduled:

- 10th Mar 2020 – Cadent & WWU (London: Face-to-Face)
- 12th Mar 2020 – NGN & SGN (London: Face-to-face)

The agendas for these bilateral meetings was heavily influenced by the preliminary EJP review findings at each point, and afforded QEMS/ARV and the Engineering Hub the opportunity to discuss priority aspects of the EJPs directly with the GDN representatives and to challenge and seek clarification of some of the key issues raised in the ongoing SQ processes.

In the 5th Mar 2020 weekly progress report, QEMS/ARV reported that once the 'Priority 1' EJP reviews were complete, it would pursue a process of focusing on the reviews of EJPs >£10m in proposed value (46 EJPs in total @ c. £5,486m) which represented 95% of the GD2 spend submitted to QEMS/ARV for review.

As many of the balance of the EJPs (113 EJPs @ c. £299m) would then be reviewed thereafter, up to the target date.





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An interim EJP review report was published by QEMS/ARV to the Engineering Hub on 11th Mar 2020 summarising the progress, initial findings and issues associated with the >£10m EJPs.

On 23rd Mar 2020, an EJP Data template was issued by QEMS/ARV to the Ofgem Engineering Hub with the summary review outputs for all 46 EJPs >£10m. The template was accompanied by the detailed review sheets for each of these EJPs.

On 5th Apr 2020, an updated EJP Data template was issued with the summary review outputs for all of the remaining 113 EJPs <£10m. The template was accompanied by the detailed review sheets for each of these EJPs.

These EJP intervention volume reviews were accompanied, where appropriate, by cost 'observations' by the EJP review team and captured on an EJP Data template. All EJP reviews >£10m have been the subject of detailed discussions with the Ofgem Cost Assessment Repex and Capex teams to allow their accurate interpretation of the independent EJP review outputs, their alignment with BPDT and CBA data and so to allow appropriate cost determination model inputs. Where any aspect of doubt remained, in selected cases, direct interaction with the GDN (as appropriate) was sanctioned by Ofgem where clarifications were sought. In each case, those conversations were captured by the SQ process retrospectively.

For the Capex EJP's, these detailed discussions with the Ofgem Cost Assessment team led to 16 'Deep Dive' reviews by QEMS/ARV to offer more detailed EJP review outcomes where volumes or costs had been challenged. Those Deep Dive assessments were issued to Ofgem Costa Assessment team on 4th May 2020.

The following sections of this report summarise the reviews of all EJPs.



5. Cadent

5.1. Overview

The Cadent EJP's were generally well thought through submissions and have generally followed the Ofgem EJP guidance framework document, making evaluation a more consistent task. Cadent being, in effect, 4 separate networks (i.e. North West, West Midlands, East of England and North London) covers a large geography and so single EJP documents across such a large area have proved challenging to breakdown and assess / evaluate.

Many of the EJPs reference risk models and in-house decision support tools which overlay onto NARMS and which the EJP review process did not have access to. This was challenged at the bilateral meetings and verbal assurances of model validations were given.

Although the focus of this report is a view on proposed intervention volumes, many of the EJP reviewers cited many Cadent EJP examples of high cost estimates, high unit costs or high contingency values. All cost observations were referred to the Ofgem Cost Assessment team.

5.2. Repex

Cadent has used four distinct volume categories in its enhanced EJP for Distribution Mains and Associated Services (Iron, PE, Steel & Other), namely:

- Mandated IMRRP mains.
- Non-Iron Safety Mains (PSR).
- CBA Driven mains.
- Services associated with mains replacement.

All mains volumes are subject to ongoing MRPS validation. For iron mains replacement, Cadent argues that the risk profile of the balance of its work is sufficiently flat to apply a range of changes to their use of the risk model and components (e.g. no seed pipes, use of societal risk instead of individual risk of injury, MRPS risk scores to prioritise other safety volumes) and so proposes to move away from the 80:20 rule to enhance delivery efficiency. The claimed level of enhanced efficiency is not detailed in the EJP but was challenged at the bilateral meeting on 10th Mar 2020 and determined to be only 2%. Its Repex EJP is based on this premise, which has yet to be accepted by the Health & Safety Executive (HSE). It will be at Cadent's risk or require a further review if the HSE denies the request. Unit costs seemed high for all volumes

For multi occupancy buildings (MOB) a detailed plan of improvement to replace and refurbish, fault repair, lessen interruption impacts and facilitate energy exchange and survey/inspection is proposed. The volumes proposed are driven by the relative risk model scoring and to improve customer experience involving interruption. The programme of MOB work exceeds what was planned in GD1 and contains uncertainty due to anticipated legislative change resulting from the Hackitt inquiry.

The approach to services not associated with mains replacement seems sensible regarding most work categories and volume.



The forecast of relays after escape is based on last 3 years actual data and is supported. Bulk Service renewal is comparatively low as it is a new category. Unit costs seem excessive.

Cadent will continue in GD2 not to undertake any stub pipe replacement as outlined in their policy document (REP/2) which has been agreed with HSE. Dependent on the parent main diameter, the definition of stub length can vary, but is deemed up to 3m to remain 'classified' as fittings.

5.3. Capex

Increased upstream reinforcement is proposed in order to increase downstream insertion rates. Volumes proposed are high given that current GD1 volumes are only at around 50% of budget (18/19 data). Use of the proposed Uncertainty Mechanism seems sensible but is still dependent on the HSE approving the move away from the 80:20 risk model. The unit costs are based on an average of GD1 costs from a low volume and require review for GD2.

Connections base case volumes seem sensible as they are based on minimum volumes selected from the GD1 period. An Uncertainty Mechanism should be agreed for GD2. Service unit costs seem relatively high.

IP/MP valve volumes are for the remaining safety critical SPIVs to be remediated in GD2 and GD3 as the continuation of a previously approved GD1 project. It is likely this programme will underspend in GD1 leading to higher proposed GD2 volumes, which could be the consequence of lack of maintenance/appropriate intervention in the past. High unit costs were observed.

Regarding LTS assets, there have been instances of limited forecasting sample sizes when considering the data that should be available to Cadent. They have generally followed NARMs methodologies to define monetised risk, plus CBA to derive their tabulated EJP outcomes, although some table errors and ambiguity was evident in the EJPs. The intervention types are justified however the cost range for intervention types is high. Reduced depth of cover on LTS assets is an issue for Cadent, although the significant majority of the EJP addressing this is Opex and not Capex.

Crossings volumes include pipe remediation in all cases. Maintainability issues that require monitoring and possible replacement in a 5 to 10 year timeframe could be deferred to GD3.

Electrical & Instrumentation (E&I) scope volumes are broadly accurate & detailed and the solutions appear sensible & well thought out given they are similar to GD1 and so are well understood. In some cases, obsolescence and/or predicted fault rates have been forecast to increase with no real evidence that this is the case & nothing to support this from the manufacturers or suppliers. Execution strategy of the metering system upgrade programme proposed could be considered sub-optimal and does not take account of economy of scale in execution.

Capacity Upgrades (e.g. >7 bar AGI reinforcements) volumes appear ok but high costs and high contingencies were observed.



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The Cadent pre-heater programme considers options more expensive than like-for-like replacement, in some cases without robust justification re: enhanced asset longevity to justify the higher costs. In other above 7 bar Above Ground Installation (AGI) asset upgrades, some projects have very high contingency levels (e.g. 35%).

Addressing Cathodic Protection (CP) there is good broad justification but few details on historic numbers or costs for work types to validate GD2 forecasts of this reactive work. The programme for GD2 appears based purely on extrapolation of GD1 spend, not intervention volumes. There has been a significant increase in compliance of Cadent CP assets during GD1 which should lead to less volume and cost in GD2. Historic spend indicates a reduction in proposed GD2 volumes is justified.

5.4. Supprt to Cost Assessment

As part of the EJP reviews, the following additional reviews were undertaken:

Deep Dives:

- Valves (IP/MP valves)
- Capacity Upgrades >7 bar reinforcements (AGI) - Base case
- Offtakes & PRS Metering Systems

Deep Dive outcomes were passed to Ofgem Cost Assessment for further consideration.

Cost Benefit Analysis Conclusion Summary

Each of these summaries is an extract from the CBA review passed to Ofgem Cost Assessment:

- Distribution Mains and Associated Services (Iron, PE, Steel & Other):
Tier 2B – East Of England - The immediate payback for this CBA is surprising and needs further investigation
Steel – London - The immediate payback for this CBA is surprising needs further investigation and steel pipe replacement in London network needs to be considered in the round not just in this category.
- Cathodic Protection:
An NPV analysis has not been developed for this EJP. If an NPV analysis had been completed then the switching analysis developed would provide a useful sensitivity. Failure analysis is based on failure of the CP system rather than the wider pipeline system.
- Reduced Depth of Cover >7 bar:
The "illustrative CBA" adds little to a well written paper to support the chosen option. The conclusions reached from the CBA switching analysis are surprising.
- LTS Pipelines (Piggable and Non Piggable):
The key issue is that the CBA analysis is not completely aligned to the chosen option and the benefits case is very marginal. The CBA would benefit from further sensitivity analysis around POF due to the level of uncertainty involved for low frequency high consequence events.

5.5. Outcomes

The more detailed findings of each of the Cadent EJPs are tabulated in Appendix 1, although a summary of the Cadent EJP review outcomes by NARMS and asset category is shown below:

Asset Category	EJP Count	Reject	Accept (No Mods to Volume)	Accept (Modify Volume)	Uncertainty Mechanism / Re-opener (Note 1)	Accept (Modify Volume) & Uncertainty Mech
AGI Security / PSUP	2	0	2	0	0	0
Cathodic Protection	1	0	0	0	0	1
Crossings	2	0	1	1	0	0
District Governors	1	0	1	0	0	0
E&I Scope	1	0	1	0	0	0
Iron Mains	3	0	0	0	2	1
LTS Pipelines (Piggable)	3	0	1	0	0	2
Odourisation & Metering	2	0	1	0	1	0
Offtakes & PRS (General)	1	0	1	0	0	0
Other Mains	1	0	1	0	0	0
PE Mains	2	0	0	0	2	0
PRS Filters	1	0	1	0	0	0
PRS Pre-heating	1	0	1	0	0	0
PRS Slamshut/Regulators	1	0	1	0	0	0
Risers	1	0	0	0	1	0
Services	2	0	1	0	0	1
Steel Mains	2	0	2	0	0	0
	27	0	15	1	6	5
		0%	56%	4%	22%	19%
Totals by Value (£m)	2,984.53	0.00	264.25	37.40	2,319.19	363.69

Notes:

- The totals of EJPs above determined as 'Uncertainty Mechanism / Re-opener' include EJPs proposed by the network companies as requiring an Uncertainty Mechanism, plus also EJP's additionally determined by the EJP review process as having indefinite volumes, costs, demand or timing.

The summary of the Cadent EJP review outcomes by discrete EJP submission (listed by title) is shown below:

EJP Type	Scope Description	Value (£m)	Determination
Enhanced EJP	Distribution Mains and Associated Services (Iron, PE, Steel & Other)	1,985.00	Uncertainty Mechanism / Re-opener
Enhanced EJP	Transforming the Experience for Multiple Occupancy Building Customer Risers	227.30	Uncertainty Mechanism / Re-opener
Asset Health	Services Not Associated with Mains Replacement	219.00	Accept (Modify Volume) & Uncertainty Mech
Major Projects	Connections Base Case	95.94	Accept (No Mods)
Major Project	London Medium Pressure	79.80	Uncertainty Mechanism / Re-opener
EJP	Cathodic Protection	49.50	Accept (Modify Volume) & Uncertainty Mech
EJP	Pipeline Reinforcement - Base Case	48.10	Accept (Modify Volume) & Uncertainty Mech
EJP	Offtake & PRS Pre-Heating	38.17	Accept (No Mods)
EJP	Pipeline Crossings	37.40	Accept (Modify Volume)
EJP	Reduced Depth of Cover > 7 bar	36.23	Accept (Modify Volume) & Uncertainty Mech
EJP	Valves (IP/MP valves)	34.00	Accept (No Mods)
Major Projects	Capacity Upgrades - >7 bar reinforcements (AGI) - Base case	32.66	Accept (No Mods)
EJP	Offtakes & PRS Metering Systems	19.10	Uncertainty Mechanism / Re-opener
Major Project	Security Interventions Cat2a	17.19	Accept (No Mods)
EJP	Offtakes & PRS Slam Shut Regulators	13.28	Accept (No Mods)
EJP	Pipeline Sleeves	12.73	Accept (No Mods)
EJP	LTS Pipelines (Piggable and Non Piggable)	10.86	Accept (Modify Volume) & Uncertainty Mech
EJP	Governors (District, I&C and Service)	6.25	Accept (No Mods)
EJP	Pipelines/ Mains Diversions - Chargeable > 7 & < 7bar - Base Case	5.90	Uncertainty Mechanism / Re-opener
EJP	Offtakes & PRS Filters	5.20	Accept (No Mods)
Major Project	Category 3 And Above Mandated National Security Upgrades	4.12	Accept (No Mods)
EJP	Pipelines/ Mains Diversions - Non-Chargeable > 7 & < 7bar - Base Case	2.09	Uncertainty Mechanism / Re-opener
Major Project	Holford Salt Cavity E&I	1.93	Accept (No Mods)
Major Project	Brunel Bridge Crossing	0.99	Accept (No Mods)
Major Project	Winnington Lane Crossing Replacement	0.77	Accept (No Mods)
Major Project	Mersey Tunnel Access Refurbishment	0.75	Accept (No Mods)
EJP	Offtakes & PRS Odourisation Systems	0.26	Accept (No Mods)

6. SGN

6.1. Overview

SGN created a large number of highly disaggregated EJPs, in many cases per site/installation, as opposed to per asset category. This resulted in both positive and negative impacts on the EJP review process.

The upside to this approach was that the EJP asset groups created separately for Southern and Scotland by SGN did add clarity, if not less work for the review team. The intervention model is bespoke which, although broadly matches Ofgem interventions, could be confusing. Many of the EJPs reference risk models and in-house decision support tools which the EJP review process did not have access to.

The downside of this approach was a high number of EJPs required review and assessment, along with the consequentially high number of supplementary questions (SQ) that inevitably were raised, responded to and further evaluated. This hampered progress. In addition, as a direct consequence of SGN taking this approach, the review process uncovered a higher proportion of cut/paste errors compared to the other network EJPs, in many cases with Scotland and Southern parallel documents containing errors and/or duplications.

There was also a higher proportion of inadequately defined indirect company costs and contingencies in the SGN Capex EJPs which needed to be sent for further cost assessment.

6.2. Repex

In some cases, capacity upgrades and reinforcement proposals were put forward without confirmed downstream development justifying the need to cater for increased demand. In such cases of suspected investment ahead of a needs case, SQ's were raised.

The EJPs addressing Tier 1 Mains and Associated Services for Scotland (Sc) and Southern (So) both included Opex in headline values, with numerous errors in the Scotland paper. Both proposed accelerated programmes to give better NPV value, reduced carbon emissions and reduced Opex therefore facilitating the networks chance of completing the programme on time, although GD2 cost reductions are feasible if these programmes were not accelerated. The Service density and relay to transfer ratio forecast was challenged as it included an element of forecast dynamic growth. Reducing these volumes could also defer spend into GD3.

For the Tier 2B Mains and Services for Sc and So, the network is proposing a reduction in mains volumes in GD2 compared to GD1 as they aim to do less Tier 2b and more >2" steel, given that is where they have concerns. This is broken down to Condition Based, Cost Benefit Analysis and Associated with Tier 1 projects. They are also proposing that the existing volume driver arrangements currently in place for GD1 remain for GD2. The SQ process flushed out errors in associated services volumes which should be adjusted downwards.

The Risers programme for SGN proposes to continue to spend in GD2 at the same rate as in GD1 which was deemed sensible.

Uncertainty is inherent re: replacing or refurbishing risers in these unique buildings, but no uncertainty mechanism was proposed by the network. Legislative changes anticipated during Hackitt inquiry provides more future uncertainty.

An uncertainty mechanism is recommended to protect customers interests and prevent flexing between the expensive >40m band to the lower cost <20m band.

Volumes of GD2 iron pipes >30m and steel, including associated services, are increased based on GD1 rates due to steel failure rates which are deteriorating across the SGN networks. SGN stated that this data was provided from core systems and analysed independently. Associated service volumes seem sensible given that densities are broadly similar although the ability of SGN to deliver is challenged. The change in unit costs from GD1 to GD2 also seems considerable.

Tier 3 mains and associated services in the SGN networks continue to replace Tier 3 iron pipes at a lower rate than GD1, so that the network can focus on other pipework Tiers, including steel. At the proposed rate it will take over 100 years to replace the entire population. The network proposes to do this based on their condition monitoring, MRPS model and CBA analysis. Therefore considering the volumes and the method the network will use to select pipes for decommissioning the paper is reasonable and can be justified.

6.3. Capex

The SGN EJP for Transmission Asset Compliance did not adequately justify volumes, although there is likely a needs case for this work (e.g. pipeline painting, inspection, revalidation, AC mitigation, CP works, etc...) plus PSSR requirements in GD2. The paper contained unclear justifications and the volume determinations were also unclear and conflicted in the SQ process. The review was unable to determine volumes. The paper also contained a blend of Opex and Capex and was difficult to assess given it did not provide tabulated forms. The paper did contain some unit cost rates but without specific sites and volumes being listed was unusable. The paper was rejected.

Apparent duplication of projects and costs was evident in the LTS Capacity works programme and a further separate Transmission EJP (Dunkeld) appeared to contain bias towards the preferred option in favour of other likely less costly options which were not adequately estimated. Intervention is justified but the options require further work, especially given the high unit cost of the preferred option.

Addressing Regulators, the creation of a high volume of site specific EJP's with separate documents for Scotland and Southern proved sensible given the spread of geographic and asset disparity, although these EJPs also contained statements of obsolescence which were challenged.

SGN Pre-heating interventions were generally identified per site with dedicated needs cases per site, independent cost plans of concept designs but with multiple sections identical text across all business cases (albeit different values).

Many of the balance of proposed Capex interventions, for example E&I scopes, PRS rebuilds, Governors, etc... had in many cases sensible proposals for interventions but were accompanied with an array of observations of apparent high estimates, high unit costs, some duplications, high contingencies and/or high indirect costs. All were passed to Cost Assessment for further review and, in cases, underwent a deep dive.

6.4. Support to Cost Assessment

As part of the EJP reviews, the following additional reviews were undertaken:

Deep Dives

- R02 Pipeline – Replacement Local to Dunkeld/ Transmission - Scotland Network
- LTS Capacity Works Programme Transmission - Scotland and Southern Networks
- Provan PRS Full Site Rebuild and Above Ground Pipework Rationalisation/Transmission
- Ulysses Telemetry Replacement Programme
- Winkfield South East Offtake Pre-heating and Volumetric/Pressure Control system replacements
- Newton Mearns PRS & Waterfoot PRS Rationalisation / Transmission
- Electrical, Instrumentation & Control Upgrade Programme
- Winkfield South Off take - Pre-heating and Volumetric/Pressure Control system replacements
- Industrial & Commercial Automated Meter Reading Equipment Replacement Programme
- Mappowder NTS Offtake

Cost Benefit Analysis Conclusion Summary

Each of these summaries is an extract from the CBA review passed to Ofgem Cost Assessment:

- Tier 2B Iron Mains and Associated Services – Southern:
Clarification required regarding the validity of using different capitalisation rates in Baseline and chosen Option 1. This approach has been taken in all three SGN Repex projects that I have reviewed giving similar results. I have not come across this in any other CBAs that I have reviewed.
- Iron Pipes >30m and Steel Pipes Including Associated Services - Southern Network:
CBA is probably "fit for purpose". However more detail required to demonstrate that chosen option is the right one
- R02 Pipeline – Replacement Local to Dunkeld/ Transmission - Scotland Network:
It is clear that something must be done here to address the risk of further potential river back erosion. However, when only one feasible option is presented in the paper (apart from the base case) then a CBA is pointless!
- Tier 3 Iron Mains and Associated Services – Scotland:
Clarification required regarding the validity of using different capitalisation rates in Baseline and Option 1. This approach has been taken in all three SGN Repex projects that I have reviewed giving similar results. I have not come across this in any other CBAs that I have reviewed.

6.5. Outcomes

The more detailed findings of each of the SGN EJPs are tabulated in Appendix 1, although a summary of the SGN EJP review outcomes by NARMS and asset category is shown below:

Asset Category	EJP Count	Reject	Accept (No Mods to Volume)	Accept (Modify Volume)	Uncertainty Mechanism / Re-opener (Note 1)	Accept (Modify Volume) & Uncertainty Mech
AGI Security / PSUP	1	1	0	0	0	0
Cathodic Protection	3	0	2	0	0	1
Crossings	4	0	4	0	0	0
District Governors	20	2	14	3	1	0
E&I Scope	5	1	2	2	0	0
I&C Governors	2	0	2	0	0	0
Iron Mains	7	0	4	0	1	2
LTS Pipelines (Non Piggable)	1	0	0	1	0	0
Odourisation & Metering	2	0	2	0	0	0
Offtake Pre-heating	3	0	3	0	0	0
Offtakes & PRS (General)	12	4	7	1	0	0
Other Mains	9	0	1	5	0	3
PE Mains	13	5	1	0	5	2
Process Plant	3	1	0	2	0	0
PRS Pre-heating	13	1	12	0	0	0
PRS Slamshut/Regulators	1	0	1	0	0	0
Risers	2	0	0	0	2	0
Service Governors	2	0	2	0	0	0
Services	3	0	3	0	0	0
Steel Mains	6	1	3	2	0	0
	115	16	63	16	9	8
		14%	55%	14%	8%	7%
Totals by Value (£m)	1,732.61	74.67	1,378.29	82.64	107.50	89.50

Notes:

- The totals of EJPs above determined as 'Uncertainty Mechanism / Re-opener' include EJPs proposed by the network companies as requiring an Uncertainty Mechanism, plus also EJP's additionally determined by the EJP review process as having indefinite volumes, costs, demand or timing.

The summary of the SGN EJP review outcomes by discrete EJP submission (listed by title) is shown below:

EJP Type	Scope Description	Value (£m)	Determination
Asset Health	Tier 1 Iron Mains and associated services – Southern	819.21	Accept (No Mods)
Asset Health	Tier 1 Iron Mains and associated services – Scotland	270.30	Accept (No Mods)
Asset Health	Network Risers - Southern	76.49	Uncertainty Mechanism / Re-opener
Asset Health	Tier 2B Iron Mains and associated services – Southern	59.23	Accept (Modify Volume) & Uncertainty Mech
Asset Health	Iron Pipes >30m and Steel Pipes Including Associated Services Southern Network	50.71	Accept (No Mods)
Asset Health	Compliance Transmission Scotland and Southern Networks	43.74	Reject
Asset Health	Tier 3 Iron Mains and associated services – Southern	40.38	Accept (No Mods)
Major Project	R02 Pipeline – Replacement Local to Dunkeld/ Transmission - Scotland Network	25.77	Accept (Modify Volume)
Asset Health	LTS Capacity Works Programme Transmission Scotland and Southern Networks	23.53	Accept (Modify Volume)
Asset Health	Network Risers - Scotland	21.02	Uncertainty Mechanism / Re-opener
Asset Health	Tier 2B Iron Mains and associated services – Scotland	19.16	Accept (Modify Volume) & Uncertainty Mech
Asset Health	Provan PRS Full Site Rebuild and Above Ground Pipework Rationalisation/Transmission Scotland Network	14.41	Accept (No Mods)
Asset Health	Iron Pipes >30m and Steel Pipes Including Associated Services Scotland Network	12.54	Accept (No Mods)
Asset Health	Industrial and Commercial Governor Replacement - Scotland	12.27	Accept (No Mods)
Asset Health	Tier 3 Iron Mains and associated services – Scotland	10.80	Accept (No Mods)
Asset Health	Ulysses Telemetry Replacement Programme	9.43	Accept (Modify Volume)
Asset Health	Industrial and Commercial Governor Replacement - Southern	8.62	Accept (No Mods)
Asset Health	Winkfield South East Offtake Pre-heating and Volumetric/Pressure Control system replacements	8.58	Accept (No Mods)

EJP Type	Scope Description	Value (£m)	Determination
Asset Health	Newton Mearns PRS & Waterfoot PRS Rationalisation/ Transmission – Scotland Network	8.54	Accept (No Mods)
Asset Health	Electrical, Instrumentation & Control Upgrade Programme	8.41	Accept (Modify Volume)
Asset Health	Winkfield South Off take - Pre-heating and Volumetric/Pressure Control system replacements	8.14	Accept (No Mods)
Asset Health	Industrial & Commercial Automated Meter Reading Equipment Replacement Programme	7.54	Accept (No Mods)
Asset Health	Mappowder NTS Offtake	6.47	Accept (No Mods)
Asset Health	The proposed replacement of 15 ERS Gas Control Module PRIs in SGN's Scotland LDZ	5.84	Reject
Asset Health	CPM7996 South East Wedge (Edinburgh) Appendix B – Asset Health	5.03	Accept (Modify Volume)
Asset Health	Kingsferry Bridge Phase 1	4.91	Accept (No Mods)
Asset Health	Bulk Service Renewal Southern Network	4.83	Accept (No Mods)
Asset Health	St Mary Cray System 2 Turbo Expander: Pre-Heating System Replacement	4.65	Reject
Asset Health	Shalford PRS	4.43	Accept (No Mods)
Asset Health	Metering Uncertainty Programme	4.40	Accept (No Mods)
Asset Health	Domestic Service Governor Replacement - Scotland	4.39	Accept (No Mods)
Asset Health	The proposed responsible demolition and removal of 13 abandoned in situ exposed pipe crossings in our Scotland Network	3.99	Accept (No Mods)
Asset Health	IP Services - Reconfiguration	3.87	Accept (No Mods)
Asset Health	Reading PRS	3.40	Accept (No Mods)
Asset Health	Georgetown PRS Full Site Rebuild/ Transmission Scotland Network	3.39	Reject
Asset Health	Westerham PRS System 1 (HP-IP PRS)- Full System Rebuild	3.21	Accept (No Mods)
Asset Health	Distribution Network Valve Remediation - Southern	3.17	Accept (Modify Volume) & Uncertainty Mech
Asset Health	CPM6564 Newbury DPG (Newbury IP)	2.96	Uncertainty Mechanism / Re-opener
Asset Health	Battle PRS System 2 (HP-MP PRS) Full System Rebuild	2.83	Reject
Asset Health	Westerham PRS System 2 (HP-MP PRS)- Full System Rebuild	2.76	Reject
Asset Health	Below 7 Bar Cathodic Protection – Southern	2.74	Accept (Modify Volume) & Uncertainty Mech
Asset Health	Woking PRS	2.61	Accept (No Mods)



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EJP Type	Scope Description	Value (£m)	Determination
Asset Health	St Andrews PRS Decommissioning /Transmission Scotland - Network	2.56	Accept (No Mods)
Asset Health	Gas Profiler and Logger Systems Southern LDZ	2.51	Accept (No Mods)
Asset Health	Bulk Service Renewal Scotland Network	2.40	Accept (No Mods)
Asset Health	Remote Pressure Management Southern Networks	2.39	Accept (No Mods)
Asset Health	Lauder & Airth SPRS Full Site Rebuild/ Transmission Scotland - Network	2.36	Accept (No Mods)
Asset Health	Hooley Pipe Bridge Refurbishment	2.33	Accept (No Mods)
Asset Health	Solar PV Installation on profiling governor sites - Southern	2.20	Accept (No Mods)
Asset Health	Lockerbie Offtake Full Site Rebuild/ Transmission Scotland Network	2.18	Accept (No Mods)
Asset Health	Distribution Network Valve Remediation - Scotland	2.15	Accept (Modify Volume) & Uncertainty Mech
Asset Health	Carleith PRS, Craibstone PRS & Granton PRS Boiler Replacements / Transmission Scotland -Network	2.10	Accept (No Mods)
Asset Health	Proposed programme of 90 Governor Refurbishments throughout Scotland Gas Network	2.10	Accept (No Mods)
Asset Health	Hillside PRS	1.96	Accept (No Mods)
Asset Health	E&I Minor Works Repair Programme	1.96	Reject
Asset Health	The proposed replacement of 77 ERS Gas Control Module PRIs in SGN's Southern LDZ	1.95	Reject
Asset Health	Remote Pressure Management South London LP Networks	1.89	Accept (No Mods)
Asset Health	016 CPM4845 Lympe (East Kent IPMP)	1.87	Uncertainty Mechanism / Re-opener
Asset Health	Nitrogen Sleeves	1.85	Accept (Modify Volume)
Asset Health	Fairmilehead PRS Replacement of Pressure Control Systems/ Transmission Scotland - Network	1.79	Accept (No Mods)
Asset Health	Godstone PRS Pre-Heating System Replacement	1.78	Accept (No Mods)
Asset Health	Hurst Green PRS Pre-Heating System Replacement	1.78	Accept (No Mods)
Asset Health	CPM5295 Cliffsend CGS (Thanet IPMP)	1.73	Accept (No Mods)
Asset Health	Proposed programme of 95 Governor Refurbishments throughout Southern Gas Network	1.71	Accept (No Mods)
Asset Health	Smarden PRS Pre-Heating System Replacement	1.63	Accept (No Mods)



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EJP Type	Scope Description	Value (£m)	Determination
Asset Health	CPM7564 Aldermaston (Basingstoke IPMP)	1.62	Uncertainty Mechanism / Re-opener
Asset Health	Box Hill PRS Pre-Heating System Replacement	1.60	Accept (No Mods)
Asset Health	Oban Vaporiser Replacement	1.57	Accept (Modify Volume)
Asset Health	Shalford Pipe Bridge, Surrey	1.55	Accept (No Mods)
Asset Health	Non – Telemetered Sites Work Programme	1.54	Accept (No Mods)
Asset Health	CPM5290 Mitcham Depot CGS (South London IPMP)	1.54	Uncertainty Mechanism / Re-opener
Asset Health	Shatterling PRS Pre-Heating System Replacement	1.51	Accept (No Mods)
Asset Health	The proposed responsible demolition and removal of 19 abandoned in situ exposed pipe crossings in our Southern Networks	1.50	Accept (No Mods)
Asset Health	Cams Hall Tunnel	1.50	Reject
Asset Health	CPM7708 Bridgend (Dundee IPMP)	1.45	Reject
Asset Health	Below 7 Bar Cathodic Protection - Scotland	1.44	Accept (No Mods)
Asset Health	Aylesham PRS Pre-Heating System Replacement	1.43	Accept (No Mods)
Asset Health	Gas Profiler and Logger Systems Scotland LDZ	1.41	Accept (No Mods)
Asset Health	CPM6728 Kingslaw (Tranent IP)	1.40	Accept (Modify Volume) & Uncertainty Mech
Asset Health	Solar PV Installation on profiling governor sites - Scotland	1.39	Accept (No Mods)
Asset Health	Campbeltown E&I Replacement	1.37	Accept (No Mods)
Asset Health	CPM5288 Mitcham Common CGS (South London IPMP)	1.32	Accept (No Mods)
Asset Health	Braishfield C PRS	1.30	Accept (No Mods)
Asset Health	Campbeltown Vessel Replacement and Repair	1.25	Accept (Modify Volume)
Asset Health	Battle PRS System 1 (HP-HP PRS)- Pre-Heating Replacement	1.19	Accept (No Mods)
Asset Health	MP Governor Replacement - South	1.16	Accept (Modify Volume)
Asset Health	Model Validation Loggers Southern	1.12	Accept (Modify Volume)
Asset Health	Governor Abandonment - South	1.10	Accept (No Mods)
Asset Health	CPM7607 Marden MP (West Kent IPMP)	1.01	Reject
Asset Health	CPM5070 Luffness Mains (Aberlady-North Berwick MP)	0.98	Accept (Modify Volume) & Uncertainty Mech
Asset Health	Campbeltown Ambient Vaporiser Replacement	0.97	Reject
Asset Health	CPM6843 Brackley (North & West Oxfordshire IPMP)	0.91	Reject

EJP Type	Scope Description	Value (£m)	Determination
Asset Health	CPM7459 Aberdeen City (Aberdeen – City Gate – Inverurie IPMP) Appendix B – Asset Health	0.86	Accept (No Mods)
Asset Health	IP Marker Posts - Southern	0.82	Accept (Modify Volume)
Asset Health	CPM7472 Sturry MP (Ashford IPMP)	0.78	Reject
Asset Health	CPM6595 Bicester MP (NW Oxfordshire IPMP)	0.78	Uncertainty Mechanism / Re-opener
Asset Health	Coastal Erosion – Scotland	0.72	Accept (Modify Volume)
Asset Health	Model Validation Loggers Scotland	0.72	Accept (Modify Volume)
Asset Health	CPM5293 Burgess Hill DPG (West Sussex IPMP)	0.69	Accept (No Mods)
Asset Health	Coastal Erosion – Southern	0.68	Accept (Modify Volume) & Uncertainty Mech
Asset Health	CPM6944 Wivelsfield (West Sussex IPMP)	0.67	Reject
Asset Health	CPM6992 Uckfield (Brighton IPMP)	0.64	Uncertainty Mechanism / Re-opener
Asset Health	CPM1062 Amisfield Mains (Haddington-Dunbar IP) Appendix B – Asset Health	0.59	Uncertainty Mechanism / Re-opener
Asset Health	Governor Replacement Named Projects - Scotland	0.51	Accept (Modify Volume)
Asset Health	MP Governor Replacement - Scotland	0.46	Accept (Modify Volume)
Asset Health	Domestic Service Governor Replacement - South	0.38	Accept (No Mods)
Asset Health	IP Marker Posts - Scotland	0.29	Accept (Modify Volume)
Asset Health	Governor Replacement Named Projects - Southern	0.29	Accept (No Mods)
Asset Health	Below Ground Governor Security	0.26	Reject
Asset Health	Cathodic Protection Transformer Rectifier Replacement Program	0.25	Accept (No Mods)
Asset Health	Governor Abandonment - Scotland	0.12	Accept (No Mods)
Asset Health	Temple Tunnel, Glasgow	0.11	Accept (No Mods)

7. Wales & West Utilities

7.1. Overview

Wales & West Utilities produced 8 very high level aggregated EJPs for its RIIO-GD2 programme. The papers were generally concise and easy to read, followed the EJP Ofgem guidance framework and contained good examples. However, the low number of EJP's with broad content, made for very challenging evaluation. There were many examples of EJPs that relied on intervention justifications based on generic references to safety standards and legislation without adequate explanation of the volumes proposed.

Many of the WWU EJPs would have benefitted from being disaggregated and given appropriate focus and clarity of their proposed interventions based on real asset condition data as opposed to GD1 based extrapolation or other non-specific factors.

There was limited evidence of detailed work and costing information behind these few EJPs leading to low confidence outcomes of some of the content.

7.2. Repex

The WWU linear Tier 1 replacement programme is scheduled to end in 2032 suggesting that the HSE is resistant to its acceleration, contrary to proposals observed in the other networks. This EJP was concise but with a number of errors and omissions. The narrative laid out well the justification although volumes had to be confirmed by the SQ process, which differed from earlier SQ data. WWU are proposing a flat profile of mains replacement execution.

The WWU approach to services also contained unclear content in the EJP regarding what needs to be done, and the data supporting it was contradictory at times. Service relays and transfers being an example where the network doesn't make clear how much main is being replaced to generate the services workload. With this uncertainty, the service density ratios are not clear nor are the number of service relays, transfers and the associated costs.

WWU risers was accepted as reasonable given the age of many of these assets. This network has a relatively small population of high rise blocks (e.g. more medium and low rise) hence the unit cost per riser is significantly less than some other networks that have a larger proportion of high rise blocks, thus requiring more construction costs.

No Tier 1 stubs programme EJP was submitted by WWU.

Unit costing detail in general for the Repex asset categories (e.g. mains, services and risers) was at high level which made for challenging understanding of costings over these diverse categories.



7.3. Capex

The WWU LTS pipelines EJP was well structured but low on detail and without volume justification or asset condition data sources for the proposed intervention volumes. The high-level approach taken by WWU also contained multiple sub-asset categories and so was challenging to review without multiple SQs and bilateral meeting dialogue.

Additionally the paper contained the duplication of an LTS pipeline proposal that had its own separate EJP and so was removed. No specific detail was offered re: the LTS sub-asset intervention volumes (e.g. CP, crossings, sleeves, marker posts, etc...) with primarily only the broad justifications to intervene provided. The paper also included uncertainty in aspects of the LTS scope due to forecast 3rd party diversions, forecast demand driven reinforcement, forecast AC mitigation due to possible electrification of rail and increasing local power gen (e.g. solar). The needs case for much of this work was clearly accepted but WWU did not make the case for its volumes robust.

The discrete pipeline replacement proposal EJP (duplicated in the generic LTS pipeline proposals EJP) was a much clearer justification due to it being given its own focused content. Much of the WWU EJP work would have benefitted from this approach. This ageing asset will lead to potential security of supply issues, safety challenges and increased annual repair costs (using GD1 as a guide) if a reactive only approach is taken. Deferring to GD3 is feasible but will likely ultimately require replacement in any event and so replacing in GD2 is timely. Downrating to IP (below 7 bar) and using larger diameter HDPE is an option which was not considered which could reduce costs, compared to like-for-like steel replacement

For Offtakes / PRS, WWU again adopted only a high-level data approach in a vague paper. It was clear that the needs case exists and that interventions are needed but volumes were calculated and not derived from asset condition surveys. WWU states not all asset subsystems can be refurbished and prefers a refurbish/repair mix but did not give any indications of cost split between these categories. Volumes looked sensible but cost were referred for review.

Concerning the odorant & metering scopes EJP, it was unclear exactly what work is required on which sites, nor the associated costs although it was accepted that the needs case in the areas identified is required.

The WWU district governor programme was clear and accepted.

7.4. Support to Cost Assessment

As part of the EJP reviews, the following additional reviews were undertaken:

Deep Dives

- HN039 – LTS Pipeline Replacement (North Wales)

Cost Benefit Analysis Conclusion Summary

Each of these summaries is an extract from the CBA review passed to Ofgem Cost Assessment:

- Mains:
Worry for steel (and indeed distribution mains) we are reliant heavily on the AIM software to optimise the programme when this is such an expensive overall programme of work. Need greater visibility of how the optimal steel programme has been determined and details of costs and volumes for each material/diameter category and expensive projects.
- Pipelines:
Need to understand more how the WWU AIM management software feeds into CBA and how it gives confidence in the chosen options and sensitivities. Needs to explore a wider range of options.

7.5. Outcomes

The more detailed findings of each of the WWU EJPs are tabulated in Appendix 1, although a summary of the WWU EJP review outcomes by NARMS and asset category is shown below:

Asset Category	EJP Count	Reject	Accept (No Mods to Volume)	Accept (Modify Volume)	Uncertainty Mechanism / Re-opener (Note 1)	Accept (Modify Volume) & Uncertainty Mech
I&C Governors	1	0	1	0	0	0
LTS Pipelines (Non Piggable)	2	0	1	0	0	1
Odourisation & Metering	1	0	0	0	1	0
Offtakes & PRS (General)	1	0	1	0	0	0
Risers	1	0	1	0	0	0
Services	1	0	1	0	0	0
Steel Mains	1	0	0	1	0	0
	8	0	5	1	1	1
		0%	63%	13%	13%	13%
Totals by Value (£m)	339.69	0.00	90.74	226.48	0.30	22.17

Notes:

1. The totals of EJPs above determined as 'Uncertainty Mechanism / Re-opener' include EJPs proposed by the network companies as requiring an Uncertainty Mechanism, plus also EJP's additionally determined by the EJP review process as having indefinite volumes, costs, demand or timing.

Bringing projects together

The summary of the WWU EJP review outcomes by discrete EJP submission (listed by title) is shown below:

EJP Type	Scope Description	Value (£m)	Determination
Asset Health	Mains	226.48	Accept (Modify Volume)
Asset Health	Services	54.54	Accept (No Mods)
Asset Health	Pipelines	22.17	Accept (Modify Volume) & Uncertainty Mech
Major Project	HN039 LTS Pipeline Replacement	13.00	Accept (No Mods)
Asset Health	Offtakes & PRS	9.40	Accept (No Mods)
Asset Health	Risers	7.20	Accept (No Mods)
Asset Health	Governors	6.60	Accept (No Mods)
Asset Health	Odorant & Metering	0.30	Uncertainty Mechanism / Re-opener

8. Northern Gas Networks

8.1. Overview

The NGN EJPs were generally concise and easy to follow although there in certain justifications there was lack of information on how some costings had been developed. In many cases, proposed intervention volumes were based on historical trends and suitably adjusted to be more realistic, with outliers removed.

Initial concerns around the clarity available on volumes and risk due to the use of in-house decision support software to complement NARMS was investigated and addressed.

The Capex programme was broadly well presented with a reasonable focus on refurbishment rather than the more expensive wholesale replacement of assets.

8.2. Repex

The Repex EJPs were broadly good and concise papers, easy to follow with direct reference to NARMS and the EJP Framework, e.g. tabulated volumes and good examples. Good data was provided to support failure rates for steel mains although other categories were not at the same level of detail, particularly risers with a request for large workload.

The mandatory Repex EJP was a multi part paper including Tier 1, ≤ 2 " Steel, non-standard materials and other services, which were deemed justified. The network is proposing a flat linear rate of Tier 1 replacement to the end of the programme with no dynamic growth, therefore as this work is mandatory there is no room for adjustment. For Tier 2a, the network proposed a volume driver due to uncertainty.

The treatment of stubs remains an issue and is dependent on the outcome of the ongoing discussions with the HSE. As such, although the network did not propose an uncertainty mechanism for stubs, one is recommended.

For non-mandatory Repex, increasing interventions on > 2 Steel and Tier 3 is justified with the reduction in mandatory iron replacement programme from GD1 rate (specifically Tier 2). Volumes are supported for Tier 2B, Tier 3, > 2 " Steel, zero scoring mains and diversions (customer driven mostly). This is based on good asset data analysis and application of appropriate systems/modelling. Volumes should be turned down for other mains and risers due to lack of justification or genuine volume uncertainty.

8.3. Capex

The Connections EJP was well written with volumes based on historical trends adjusted to be more realistic (i.e. with outliers removed). No new connections are forecast from 2025/26 but contradicts other EJP content forecasting new domestic mains in that period. Volumes require adjustment. Most of this work is customer driven and so there is doubt that this work will actually go ahead. The network proposes a Reopener mechanism for the fuel poor part of the paper but to protect the customer's interests, an uncertainty mechanism would be the best way forward for the whole paper.

Bringing projects together

The NGN Reinforcement proposals include 68 district governors which also appear in a discrete governor EJP and so were removed. The remaining work is based on trend analysis and is acceptable, based on the uncertainty mechanism proposed by the network. The current UK economic environment could significantly affect the volumes required in GD2 and likewise the impact of Covid-19 on the construction industry, which is one of the main drivers of this workload, is unknown at this moment in time.

For NGN PRS and Offtakes, the papers were clear and concise. Concerns about the impact on volumes from the use of in-house decision support software were investigated and addressed satisfactorily, and in some cases were claimed to actually reduce NARMS based volumes.

NGN continues to undertake a programme of gas holder demolition. The paper was clear and appropriate regarding volumes, although the pricing used for above ground tanks includes a single previous site with outlier costs, skewing the average cost.

The District Governor and Pressure Management papers were well presented with focus on refurbishment rather than wholesale replacement. The EJP contained adequate workload and unit cost mitigations. These assets are a critical part of efforts to reduce leakage and so the ongoing maintenance, repair, refurbishment and replacement to ensure increasing environmental risks are managed was justified.

LTS and Overcrossings were well documented in general, although flood risk contingency in the overcrossing programme was not adequately justified.

8.4. Support to Cost Assessment

As part of the EJP reviews, the following additional reviews were undertaken:

Deep Dives

- TransPennine
- Overcrossings

Cost Benefit Analysis Conclusion Summary

Each of these summaries is an extract from the CBA review passed to Ofgem Cost Assessment:

- Non-Mandatory Repex:

Tier 3 replacement is expensive and needs more detailed justification. Need to address issues around providing visibility around payback periods for individual pipes and consider a lower volume option. There is potential to reduce the scope of work here if we take a differing view on payback. Merely doubling GD1 levels is not an objective asset management strategy. Also need to discount life extension. Need to explain "other environmental benefits".

Bringing projects together

Tier 2B need to address issues around payback periods for individual pipes and consider a lower volume option. There is potential to reduce the scope of work here if we take a differing view on payback. Continuing at GD1 levels is not an objective asset management strategy. Need to explain "other environmental benefits"

- Pressure Reduction Stations:
The key issue is that the CBA analysis is not really aligned to the chosen option and apart from the baseline option no other low Totex options have been considered. Some assurance is also needed that the NARMS and Value framework changes are appropriate
- Local Transmission System:
A coherent CBA and EJP. Some assurance is needed that the Value framework changes are appropriate and would benefit from a demonstration to understand how the decision support software assesses interventions and comes up with optimal solutions.

8.5. Outcomes

The more detailed findings of each of the NGN EJPs are tabulated in Appendix 1, although a summary of the NGN EJP review outcomes by NARMS and asset category is shown below:

Asset Category	EJP Count	Reject	Accept (No Mods to Volume)	Accept (Modify Volume)	Uncertainty Mechanism / Re-opener (Note 1)	Accept (Modify Volume) & Uncertainty Mech
Crossings	1	0	0	0	1	0
District Governors	2	0	2	0	0	0
Gas Holders	1	0	1	0	0	0
Iron Mains	3	0	0	1	1	1
LTS Pipelines (Piggable)	2	0	2	0	0	0
Offtakes & PRS (General)	2	0	2	0	0	0
Services	1	0	0	0	0	1
	12	0	7	1	2	2
		0%	58%	8%	17%	17%
Totals by Value (£m)	728.46	0.00	120.39	136.60	403.70	67.77

Notes:

1. The totals of EJPs above determined as 'Uncertainty Mechanism / Re-opener' include EJPs proposed by the network companies as requiring an Uncertainty Mechanism, plus also EJP's additionally determined by the EJP review process as having indefinite volumes, costs, demand or timing.

Bringing projects together

The summary of the NGN EJP review outcomes by discrete EJP submission (listed by title) is shown below:

EJP Type	Description	Value (£m)	Determination
Asset Health	Mandatory Repex	393.60	Uncertainty Mechanism / Re-opener
Asset Health	Non-mandatory Repex	136.60	Accept (Modify Volume)
Asset Health	Connections	39.17	Accept (Modify Volume) & Uncertainty Mech
Asset Health	Pressure Reduction Stations	33.60	Accept (No Mods)
Asset Health	Reinforcement	28.60	Accept (Modify Volume) & Uncertainty Mech
Asset Health	Offtakes	23.00	Accept (No Mods)
Major Project	TransPennine	21.00	Accept (No Mods)
Asset Health	Gas Holders	15.99	Accept (No Mods)
Asset Health	District Governors	12.20	Accept (No Mods)
Asset Health	Overcrossings	10.10	Uncertainty Mechanism / Re-opener
Asset Health	Pressure Management	7.90	Accept (No Mods)
Asset Health	Local Transmission System	6.70	Accept (No Mods)