Network Asset Management Strategy

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WALES&WEST UTILITIES

Contents

Acronym Key

AGI	Above Ground Installation
ALARP	As Low As Reasonably Practicable
CBA	Cost Benefit Analysis
CDS	Complex Distribution System
CP	Cathodic Protection
DSEAR	Dangerous Substances and Explosive Atmospheres Regulations
DST	Decision Support Tool
ECV	Emergency Control Valve
GDN	Gas Distribution Network
HSE	Health and Safety Executive
IMRRP	Iron Mains Risk Reduction Programme
LPG	Liquefied Petroleum Gas
LTS	Local Transmission System
MOB	Multiple Occupancy Building
MRPS	Mains Replacement Priority System
NARM	Network Asset Risk Metric
NTS	National Transmission System
PRI	Pressure Reduction Installation
PSSR	Pressure Systems Safety Regulations
RCM	Reliability centred maintenance
RIDDOR	Reporting of Incidents, Diseases and Dangerous Occurrences Regulations
SCADA	Supervisory Control and Data Acquisition
VCMA	OES
WSoE	Written Schemes of Examination

1. Introduction

WWU have a clear ambition.

“Trusted to expertly serve customers and communities with safe, reliable and affordable energy services today, whilst investing wisely to create a sustainable, greener future.”

Our successful asset strategy continues to revolve around two key elements – firstly meeting all our licence and statutory obligations and secondly reflecting the aspirations of stakeholders and consumers where practical.

Our Business Plan strategy is based on six key principles

- Stakeholder and consumer focused.
- Outputs led.
- Sustainable.
- Risk based.
- Financeable.
- Value for money.

Our key objectives are essentially to continue to meet our statutory obligations and stakeholder requirements by:

- Continuing to maintain the safety levels of running our network.
- Reducing our greenhouse gas emissions to support a sustainable energy future.
- Investing to maintain the reliability levels within our network.
- Investing in new technologies that add value. Value may include safety, cost, social and environmental benefits.
- Continuing to provide excellent customer service.
- Supporting the connection of renewable gas entry into, and distribution around, our network.
- Continuing to provide value for money services to customers and consumers - using innovative, risk management strategies to provide cost effective solutions.

1.1. What outputs do we plan to deliver?

In response to the feedback we received from stakeholders we have proposed challenging output targets for delivery. In headline terms we plan to deliver:

Safety

- Minimising the risk of explosion by removing a further 430km of metallic pipes and associated services per annum
- Addressing condition and safety risk of our high pressure steel pipelines and associated components including replacing 50km of end of life pipelines in our Wales region
- Ensuring the optimum balance between risk and costs by prioritising public reported escapes where the risk of explosion and impact is greatest
- Ensuring public safety by maintaining the emergency standard of 97% each for controlled and uncontrolled escapes

Reliability

- Maintaining the performance of pressure reduction equipment by predominantly life extending interventions on district governors and Pressure Regulating Installations.
- Maintaining a reliable gas supply whilst managing peak gas demand and responding to local increases in peak demand through reinforcement of mains and governors.
- Improving network monitoring and control by investing in improved Telemetry and associated IT systems.
- Reducing non-routine faults with targeted maintenance, using improved Reliability Centred Maintenance and root cause analysis.

Environment

- Take action to address our significant aspects and compliance obligations.
- Manage environmental risks and where appropriate identify and consider opportunities at the business level.
- Set targets to reduce WWU's carbon footprint (by 16% over the RIIO-GD3 period) by further reducing gas leakage from the network and from lower carbon output from business activities.
- Continuing to manage WWU owned land and use innovative techniques to remediate sites wherever practicable.
- Reducing waste to landfill and the importing of virgin aggregate wherever appropriate through the continual improvement of site activities and controls.
- Continue to integrate environmental requirements into all business processes and evaluate this through internal inspections, monitoring and review.
- Consider technological options and improvements as these become fit for purpose and financially sustainable.

Customer Satisfaction

- Maintaining upper quartile customer performance in our sector - using root cause analysis of customer feedback towards further improvement
- Further reducing customer complaints, and satisfactorily addressing complaints which are received
- Maintaining stakeholder engagement throughout the plan period

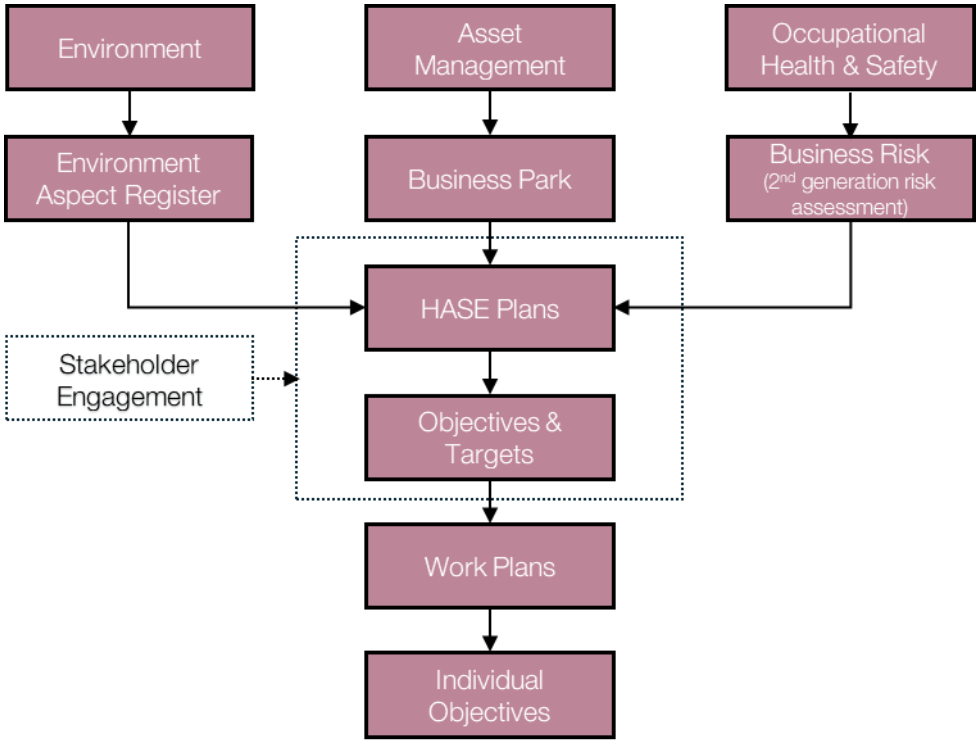
Connections

- Maintaining upper quartile service standards performance
- Proactively supporting the connection of renewable gas entry into our network
- Increasing public awareness of the risks of Carbon Monoxide poisoning
- Further reducing the impact of our street works on the public

2. Planning to achieve asset management objectives

2.1. Asset targets & work Plans

The WWU Executive is responsible for developing asset targets and plans to achieve the objectives and has delegated authority to implement and modify objectives to ensure they remain relevant to business needs. Objective setting is risk based and is summarised below:



2.2. Requirements for objective setting

The following is considered when developing objectives for inclusion in annual Health, Asset, Safety, and Environment (HASE) plans. The objectives cover the range of departments and are suitable for inclusion at all levels of the business.

- Public and employee safety.
- Compliance with our regulatory and statutory obligations.
- Reliability of the gas supply.
- Delivering quality services and customer satisfaction.
- Sustainability of gas supply.
- Environmental impact and minimal public nuisance.
- Environmental compliance obligations.
- Delivering value for money, minimising the overall costs to current and future consumers.
- Delivering shareholder value.
- Delivering our priority services for benefit to society.
- The processes and conditions for connection of new consumers.

2.3. Asset Management Plans

This document outlines the WWU process for deriving, allocating and monitoring of asset plans required to deliver the asset policy and strategy.

The risk mitigation processes will result in annual plans based at asset group level, detailing the programmes of work to be carried out and the mechanisms for delivery of those programmes. The plans are based on the use of Network Asset Risk Metrics (NARM) to estimate probability of failure and subsequent consequences to estimate the risk profile of the assets. The goal is to propose optimal solutions which are well justified and deliver clear outputs. Outputs will generally fall into the categories of safety; reliability; environment and customer service and are assessed for their financial impact to deliver outcomes based on value for money and sustainability.

2.4. Asset Investment Plans

Our investment plans are based on an 8-year horizon, focused on delivering outputs
The Asset Investment Planning process includes undertaking various enabling projects to allow suitable investment forecasting, which intern feeds into the business plan.

- WWU Investment Plans have been produced to deliver “pan organisation” solutions rather than regional priorities whilst utilising whole life considerations and ensuring our compliance with legislation.
- WWU Asset Investment plans are written in a common format across the asset groups in order to form the basis of an overarching asset strategy document which feeds into WWU's Business Plan.
- The structure of the investment plans is designed to incorporate evidence of previous efficient investment as well as to justify future investment. It captures the risks associated with the asset and the investment drivers whilst articulating a number of options for future investment incorporating innovation wherever possible.
- Each of the plans documents an optimum level of investment in order to deliver set outputs within the categories Safety, Reliability, Environment, Customer Satisfaction, Connections, and Social Obligations.
- The plans are designed to ensure value for money is demonstrated and, where appropriate, show that whole life costing has been taken into consideration. WWU realises the importance of stakeholder engagement and consultation is a key part of the investment decision making process.
- Investment plans are finalised by a panel review mechanism, this engages various senior managers, executive members, and the WWU board, ensuring that appropriate and well justified investment proposals are part of the final business plan.

2.5. Responsibility and governance

Asset plans are formulated by the Asset Management department annually in good time to form the basis for business planning cycles and maintenance through the year. The Head of Operations is responsible for delivery of work plans. The work plans are approved by our Business Performance Delivery Committee or Wales & West Utilities Board in line with delegated levels of authority. Our committee reviews progress against proposals on an ongoing basis.

Monitoring of run rates and achievement of workload, cost management and records update is managed through a structure of progress meetings held across the organisation.

2.6. Methodology

Asset plans are built and maintained as outlined above. The condition of assets is established through inspection or maintenance. The data collected is used to determine maintenance frequencies, and to inform refurbishment or replacement programmes. A summary of work plans is included later in this section.

The assets are numerically well identified and sub divided into asset groupings. These are:

- Above 7bar Pipelines
- NTS Offtakes & Above 7bar Pressure Regulating Installations (PRI)
- Below 7 bar Pressure Regulators (District Governors)
- Above 7bar Special Fittings, Supports & Crossings
- Below 7bar Special Fittings, Supports & Crossings
- Above 7bar Storage
- Service Governors (Below 7 bar Pressure Regulators)
- Service Pipes
- Telemetry & SCADA (Network Management)
- LPG Statutory Undertakings
- Gas Entry Connections (Biomethane)
- Multi Occupancy Buildings and Complex Distribution Systems (MOB / CDS)
- Below 7bar Mains

We understand our stakeholder and consumer requirements for each asset group, and bring those requirements to bear in asset planning
The investment planning processes take account of growth, asset lives, serviceability and condition
We maintain good working relationships with asset operators to bring pragmatism to our planning processes

2.7. Optimisation and improvement

Inspection and monitoring regimes including Reliability Centred Maintenance, Mains Risk Prioritisation and NARMs are in place to monitor the performance of assets. Where performance or condition issues or trends are identified, work plans and policies are modified.

It is clear that work plans can impact across asset groups. For example, the replacement of obsolete pressure control on pressure regulators will have an impact on low pressure mains leakage. Factors such as these are taken into account in the work definition process.
Our Chief Operating Officer has appointed an Innovation Manager to act as the main focal point for internal and external parties, and to act as program manager for innovation projects. The Innovation manager chairs the G23 Forum (an allocated a team to identify and review emerging technologies and best practice), that is the link with the supply chain to bring new products into usage, and to provide guidance to the supply chain on required research and development.

2.8. Procurement

The annual work plan will be used to develop procurement plans for example; pipe diameters required for mains replacement are visible to the procurement team allowing negotiation and purchase lead times. Changes to maintenance level or regimes may also affect the purchase of spares and the information in the work plans are used to inform the LINK TO overall procurement strategy.

2.9. Asset management plans

A summary of the work plan topics is laid out below:

- Annual Maintenance Plan (AMP) - planned maintenance and inspections required to meet statutory obligation or monitor asset performance.
- Non-routine Opex Projects – Asset specific, identified, approved expenditure that is additional to the AMP and is required to return assets to an acceptable condition or level of performance.
- Capital Projects – LTS Growth. Pipelines or pressure reduction station rebuilds.
- Capital Projects – LTS Condition. Refurbishment or replacement projects required to mitigate risks identified through asset risk assessment.
- Capital Projects - <7 bar growth – Mains – Reinforcement pipelines.
- Capital Projects - <7 bar growth – PRS's - Additional or upsized pressure reduction installations.
- Capital projects - <7 bar condition – Replacement PRS's, pressure control systems, & buildings.
- Customer connections plan – New and alter services, supply mains, mains diversions and housing sites.
- Mains and service replacement plan – 30:30 risk plus condition.
- Emergency response and repair – forecast work volumes.
- Property – Environmental investigation, remediation and disposal.
- Operational technology – new or upgraded systems, hard-ware and communications.
- The above plans utilise whole life cost assessments to deliver value for money for todays and future consumers.

2.10. Consultation, communication and review

Consultation at the planning stage and subsequence communication of the plans is aimed at identifying the impact of the plans and providing opportunity to review them to minimise or eliminate adverse impacts. In addition, any interaction with other management plans can be identified and mitigated.

The plans are reviewed on a regular basis with interdepartmental monthly meetings, monthly committee meetings and the annual management reviews.

We are committed to demonstrating a systematic and co-ordinated approach to asset stewardship and risk management. Our gas assets include high pressure pipelines, pressure reduction stations, buried mains, services and above ground pipework. These are controlled and monitored by electrical and instrumentation equipment. Optimising the use of these assets requires a clear and well-defined approach.
We follow the methodology outlined in ISO 55001 to achieve this. We were the first gas network in the world to achieve accreditation to ISO55001 (in 2013) and have continued to maintain compliance since. This accreditation recognises our strong leadership and acknowledges that our asset strategy is understood and embraced at all levels of our organisation.

It is our policy to make sure assets meet the needs of all stakeholders by:

- Identifying the risks inherent in assets that may prevent the delivery of stakeholder needs and develop asset strategies to mitigate these
- Managing all our assets in a way that will optimise whole-life costs
- Developing short and long-term performance targets for assets that optimise the use of resources, and are consistent with sustainability principals
- Developing and maintaining an approach to data management that will underpin asset decision-making
- Developing and maintaining asset plans that enable the asset policy objectives to be delivered
- Designing, constructing, operating and maintaining the company's assets to make sure high standards throughout their complete life cycle
- Ensuring our supply chain is competent and accountable for good OH&S performance
- Measuring and improving the effectiveness of the company's approach to asset management by continuous review and adjustment
- Enabling employees to have the competencies necessary to deliver asset commitments
- Delivering best value for our stakeholders
- Actively promoting co-operation, consultation and communication to manage our assets
- Ensuring compliance with applicable legal, regulatory, and other asset management requirements
- Minimise the impact on the environment

2.11. Keeping our asset strategy relevant and appropriate

Our Network Asset Management Strategy supports the safe transportation, distribution and storage of gas to deliver a continuous supply to the public and to industry. We deliver best in class asset stewardship in line with this strategy in order to protect the safety of our employees, the community and the environment from the effects of accidents, incidents and pollution. As a minimum we always comply with all legislative, regulatory and statutory requirements.

We have established processes for identifying and assessing these requirements by engaging actively and positively with all relevant stakeholders, including but not limited to Ofgem, consumer groups, the Health and Safety Executive (HSE), the Institute of Gas Engineers and Managers (IGEM), as well as trade associations such as the United Kingdom Onshore Pipeline Operators' Association, equipment manufacturers, the other Gas Distribution Networks (GDNs) and our consumers.

These processes also include identifying and assessing occupational health and safety requirements and those pertinent to management of our impact on the environment achieved by engaging with the HSE, the Environment Agency (England) and Natural Resources Wales. The identification of changes to legal and other compliance obligations is achieved by a number of means including:

- Direct from our Regulatory stakeholders and interested parties.
- Engaging a Parliamentary and European legislative monitoring service.
- Subscription to The Solicitors Journal (General Counsel) and Croner HS&E.
- Membership of professional bodies including e.g. IGEM, IOSH, IEMA, etc.
- Membership of industry working groups e.g. FEN, GTOSG, GNCF
- Membership of Croner.
- Engagement of professional advisers.
- Attendance at appropriate seminars.

Regulations clarify particular aspects of general duties of the HSWA and are mandatory. They may take one of three forms:

- Process Regulations, for example, where the requirement is to undertake risk assessments.
- Goal Setting Regulations, where the obligations are stated but freedom is left on how the obligation is to be met.
- Standard Setting Regulations, where an appropriate response to a hazard is prescribed.

The different forms of regulation are not mutually exclusive; one set of regulations could contain examples of all three.

Approved Codes of Practice (ACoPs) Approved Codes of Practice clarify particular aspects of the general duties and regulations and have a special guidance status. If employers are prosecuted for a breach of health and safety legislation, and is it proved that they have not followed the relevant provisions of an approved code of practice, a court can find them at fault unless they can show that they have complied with the law in some other way that can be shown to be equally effective as the preferred approach.

Guidance Published guidance is not law but provides advice on the measures available and on good practice.

Consultation on Proposed Legislation Before government puts forward proposals to parliament it issues formal consultation documents which are made publicly available and have a wide circulation to ensure that the government is aware of the views of a wide range of people and institutions that may be affected by new legislation.

European Legislation In recent years, legislation has often been introduced to implement European Directives.

Key Gas Industry Legislation The Company as a Gas Conveyor is required to demonstrate, by means of a 'Safety Case' that it complies with:

- The Gas Act 1986
- The Gas Safety (Management) Regulations 1996 (GS(M)R)
- The Pipelines Safety Regulations 1996 (PSR)
- The Pressure Systems Safety Regulations 2000 (PSSR)
- The Control of Major Accident Hazard Regulations 2015 (COMAH)

Gas Act 1986 (as amended) The Gas Act 1986 privatised the gas industry and is one of the most important pieces of legislation that governs Wales & West Utilities as a company. The Company holds a licence under the Act to convey gas through pipes and lay, maintain, connect and replace gas apparatus. The Act prohibits the unauthorised conveyance of gas through pipes otherwise than by Gas Transporters. The Act sets out our principal duties in Section 9 of the Act:

3. Scope of Assets Covered

Wales & West Utilities own a set of gas distribution assets throughout Wales and the South West of England that are critical to the task of transporting gas from our 17 Offtake points, the interfaces with National Gas' National Transmission System (NTS) assets, through to the 2.4 million customers who take gas supplies in our region. Those assets have a regulatory asset value of over £1bn, and a current cost replacement value of circa £5bn.

The scope includes:

- Above 7bar Pipelines
- NTS Offtakes & Above 7bar Pressure Regulating Installations (PRI/PRS)
- Below 7 bar Pressure Regulators (District Governors)
- Above 7bar Special Fittings, Supports & Crossings
- Below 7bar Special Fittings, Supports & Crossings
- Above 7bar Storage
- Service Governors (Below 7 bar Pressure Regulators)
- Service Pipes
- Telemetry & SCADA (Network Management)
- LPG Statutory Undertakings
- Multi Occupancy Buildings and Complex Distribution Systems (CDS)
- Below 7bar Mains
- Operational land holdings

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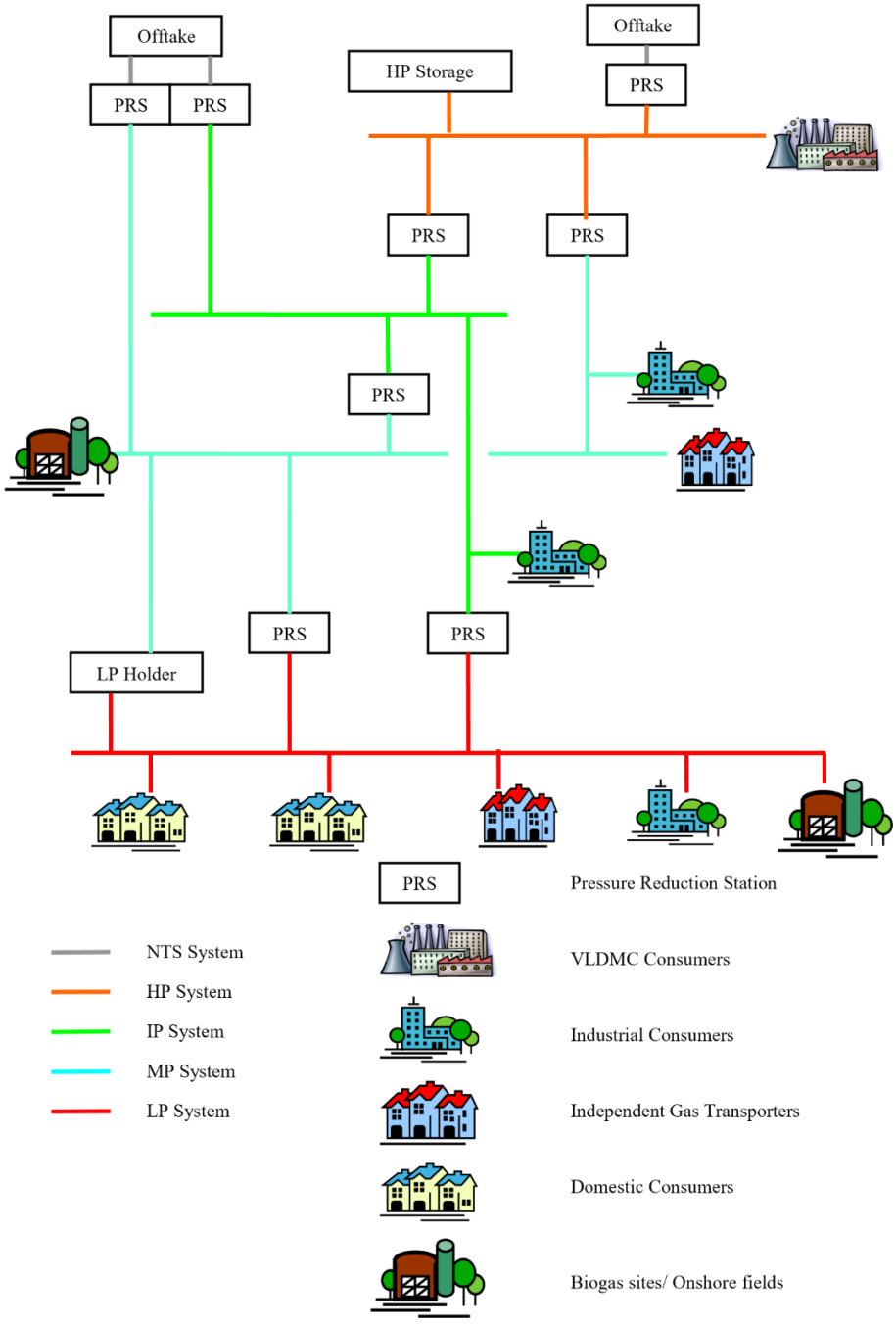
Excluded from this definition of assets are the non-operational groups, such as IT systems and equipment, vehicles and plant, tools and equipment and non-operational property.



3.1. Scope of the Asset Management System

The above diagram illustrates the organisational boundaries and the interfaces of the Asset Management System. The Asset Management System consists of all WWU policies and procedures that must be followed for the safe and reliable design, operation, maintenance, decommissioning and disposal of assets.

The Asset Policy and Asset Strategy set out the requirements to be used by the Asset Management and Operations directorates to deliver stakeholder requirements by means of extension, modification, renewal, abandonment and disposal of the assets, as well as the way that the assets are operated, inspected and maintained.

Each of the asset groups we operate has been reviewed to identify inherent risks that may prevent the assets performing to required standards. A description of asset profiles, attributes and functional requirements is included together with a summary of medium to long term strategic actions required to mitigate the identified risks.

The appropriateness of the Asset Policy and Asset Strategy are reviewed annually, and changes approved by the WWU Executive.

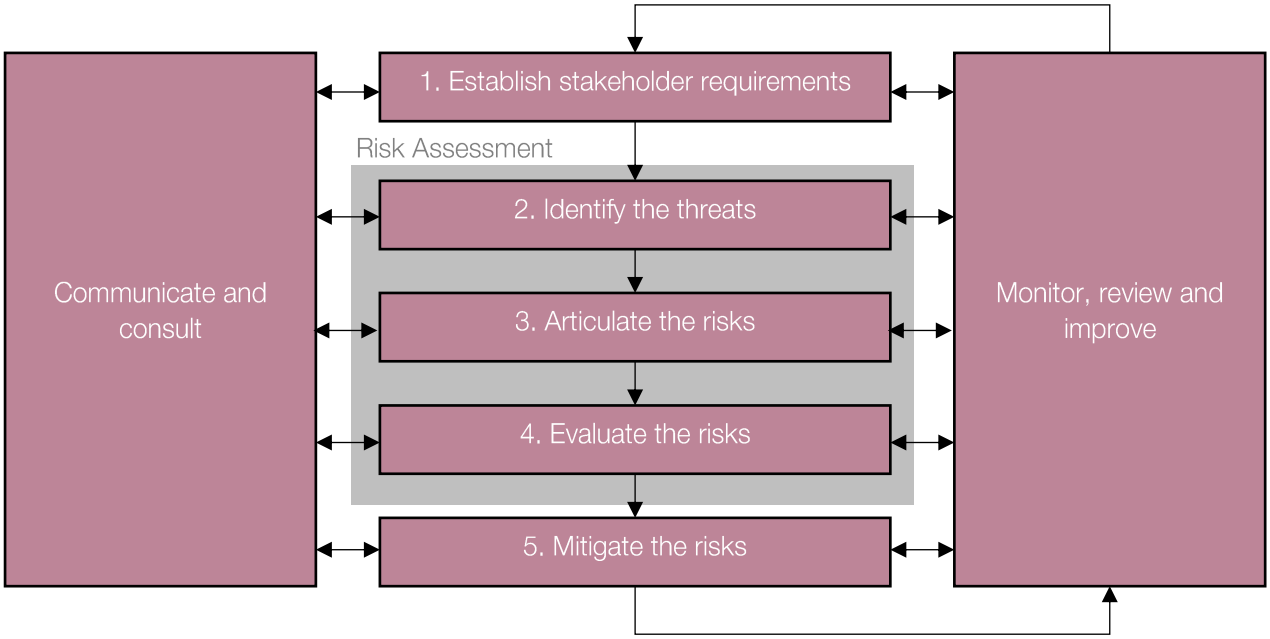
The figures below illustrate the elements of the Asset Management Strategy and the relationships between some of the key elements within the Asset Management and Environmental Management Systems.

3.2. Managing business risks

The risk that the assets do not deliver stakeholder requirements is carried as a high-level business risk. From there, each of the asset groups is subject to an individual analysis to identify and prioritise actions to mitigate the risk. Those actions may result in an investment plan, or a change in the operational scenario.

4. Dealing with risks

The WWU risk assessment methodology uses a semi quantitative assessment of risk to achieve a risk rating. The diagram below outlines the approach



Risks are managed using the following hierarchy:

- Risk Avoidance
- Risk Retention
- Risk Transfer
- Risk Reduction

Resources are allocated to implement the required measures and provide continuous improvement in performance.

4.1. Mitigating Asset Risks

To mitigate risks to either stakeholder requirements or legal requirements not being met, we will:

- Increase the capacity of the assets to deal with potential growth, satisfy the Licence requirements to plan for a 1 in 20 winter.
- Increase the capacity of the assets to deal with storage requirements.
- Replace or refurbish the assets whether in whole or in part to deal with:
- Condition – where the condition of the asset will lead to an unacceptable level of risk in the short term.
- Serviceability – where the performance of the asset leads or will lead to poor levels of service and increased cost.
- Security – where the security of the asset may lead to an unacceptable societal impact.
- Obsolescence – where the asset is no longer maintainable due to lack of manufacturer support or where replacement with more effective modern technology is cost effective.
- Legislation – where changes to the assets are required to enable us to comply with new legislation.

- Safety – where the performance or failure mode of an asset may lead to an unacceptable risk to staff or society.
- Modify the operational regime, in respect of maintenance, inspection or operation – in this respect we will utilise a Reliability Centred Maintenance approach, or similar structured techniques.
- In respect of our stewardship of the assets, we will utilise whole life costing methods to minimise the financial impact on customers and investors.

4.2. Asset Plans

The risk mitigation processes will result in annual plans based at asset group level, detailing the programmes of work to be carried out and the mechanisms for delivery of those programmes. The plans will be based on (where available) the use of Health Indices (HI) to estimate probability of failure and Condition Based Risk Management (CBRM) to estimate the risk profile of the assets. The goal is to propose optimal solutions which are well justified and deliver clear outputs as measured and reported in the NARMs metrics. Outputs will generally fall into the categories of safety; reliability; environment and customer service and will be assessed for their financial impact to deliver outcomes based on value for money and sustainability.

4.3. Asset Data

We will continue to invest in IT systems and collection of data to move to a position where risk analysis, and solutions to mitigate risk, will be supported by data. Our policy will be to use the core SAP Work and Asset Management System supplemented by appropriate applications as means of data collection and storage, with decision support tools and health indices accessing and manipulating that data through the use of Business Warehouse. This will require progressive investment over the time.

In addition to this, we have implemented a Data Quality Management System as part of the Data Quality & Governance Programme for key master asset and work management data. This will involve the assessment of both the data and the associated processes in order to consider any data cleansing that may be required or any actions that need to be put in place to prevent data issues from occurring in the future and the introduction of a Data Quality Index to monitor on-going data quality.

4.4. Managing Risk

Understanding risk is an essential and critical component of our asset strategy. Identifying stakeholder informed business objectives and understanding the risks that need to be managed to achieve those objectives enhances the ability to make better decisions, deliver strategic and operational performance targets.

4.5. How we assess and monetise asset risk

We operate a risk-based approach to managing and operating our network. We put a monetised value to risk which enables comparative analysis of risk;
— over time;
— between geographical areas;
— between asset groups;
— with and without different types of interventions.

4.6. Probability of failure

Asset failure is defined as “any operation or function which the asset fails to correctly perform which gives rise to consequences”. Failures are categorised into failure modes. As an example, a pressure reduction station could over-pressurise or under-pressurise a downstream network.

The probability of asset failure can be calculated to estimate the expected number of consequence events in any given time period, and the deterioration of this curve over time. A ‘failure rate’ will be used to calculate the probability of failure. The failure rate gives the rate of occurrence (frequency) of failures at a given point in time. We have invested in condition surveys of assets and in systems to record faults and failures to inform our assessment of the probability of asset failure.

We apply the rate of deterioration to forecast future levels of risk. Using this future forecast of risk, we can optimise intervention plans to manage that risk. Consequence analysis determines the nature and type of impact that could occur, assuming that a particular event (ie caused by asset failure) has taken place. When an asset fails, there will be an associated impact resulting from that failure (which is referred to as an event).

4.7. Criticality of the Asset

Decisions are based upon an understanding of the risk, which considers what the consequence of such a failure would be. There is a variation in consequence across a group of similar assets. For example, on district governors, the number of consumers connected to each asset varies considerably, and the impact on the downstream network of assets is determined by different configurations.

Criticality is therefore set in relationship with:

- Number and type of customers affected by a fault
- Network configuration
- Location of the asset
- Pressure tier
- Proximity of the asset to properties, i.e. the impact of disruptive failure or an explosion on buildings and occupiers

These consequence factors are then weighted to represent the relative severity. In order to estimate the relative significance of a failure, we establish the criticality of an individual asset for each consequence factor which is described below.

4.8. Consequence of failure

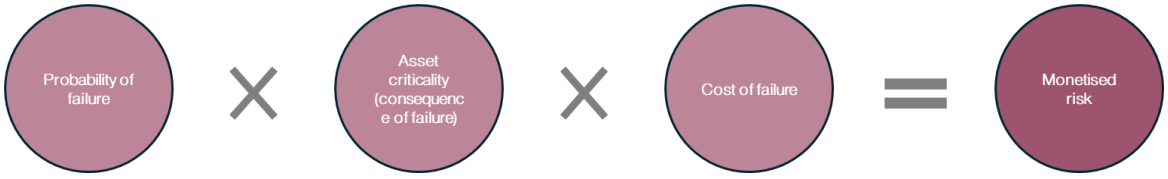
The factors that affect the criticality of the asset are for example, the number and type of customers, the network configuration, pressure, building proximity etc. The consequence of failure (COF) can also be considered in terms of corporate costs and the cost to society, to enable cost benefit analysis. The risk score we assign is the COF adjusted depending upon the criticality. The consequence of failure considers the following areas:

- Safety
- Security of Supply
- Environmental
- Financial

4.9. Calculation of risk

Using all of this analysis we determine the risk:

We apply the rate of deterioration to forecast future levels of risk. Using this future forecast of risk, we can optimise intervention plans to manage that risk.



Once we understand the risk, we consider the net present value (NPV) calculation and determine when the optimum time to take an intervention. Intervention can range from wholesale asset replacement to component replacement or even installation of additional assets. As this process is applied reviews will be carried out to refine the process, identify improvement the information content and look for opportunities in information capture process and model refinement.

We constantly review data requirements to continuously improve our assessment of risk and, in turn, our targeted intervention plan. Our future survey plan is risk-based, with frequency determined by the current condition of assets and forecast deterioration.

We have a number of asset groups that present varying levels of stakeholder risk depending upon their function, levels of redundancy and physical presence within the gas distribution network. Using a risk-based model allows us to assess large numbers of differing assets using a single, consistent and objective mechanism.

The engineering life of assets is the age at which it would be expected that the asset would require intervention and that for long term asset management purposes, the engineering life may be used as a proxy for prioritisation of asset replacement or refurbishment. We use asset life as a long-term planning tool, but the decision to replace or refurbish is not based on age but on consideration of safety, condition, capacity, serviceability, obsolescence and risk or a combination of these factors.

As part of our Network Asset Management Strategy, we have developed a number of decision support tools (DST's), each DST is unique to each asset group and is dependent upon the number and complexity of the asset group. In addition, the delivery of best value, through the use of financial models, will be utilised to inform the timing of intervention and compare different investments across asset groups.

he following table outlines the risk models and decision support tools WWU have in place: -

Asset Group	Risk Model
NTS Offtakes & Above 7 bar Pressure Regulating Installations	NARM
Below 7 bar Pressure Regulators (District Governors)	NARM
Above 7 bar Pipelines	NARM
Above 7 bar Special Crossings	NARM
Below 7 bar Mains	MRPS and MRP GAS

Other Decision Support Tools	
Below 7 bar Special Crossings	Manual Assessment
Above 7 bar Storage	Manual Assessment
Liquid Petroleum Gas Installations	Manual DST
Service Governors (Below 7 bar)	Manual Assessment
Services	Postcode analysis of service leakage (SPC/Enforcement/186)
Multi Occupancy Buildings and Complex Distribution Systems (MOB / CDS)	M.O.B. Risk Matrix

Our Asset Risk Management processes include Cost Benefit Analysis (CBA) and are used in two ways:

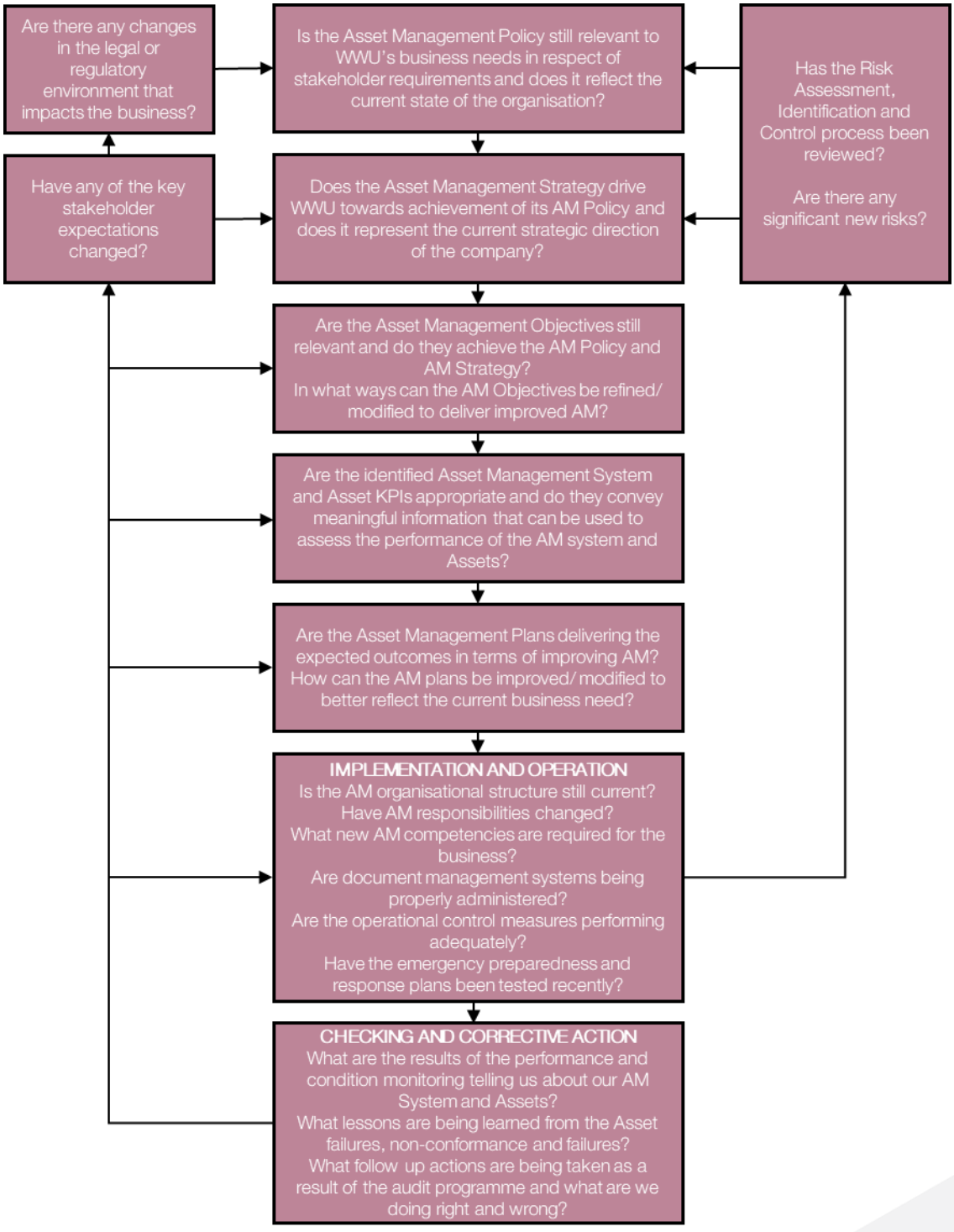
- To establish the requirement for intervention.
- To optimise the intervention option across the life of the asset.

In some instances, the intervention option identified is stipulated by HSE enforcement or current relevant Regulation, e.g. metallic service replacement with PE in conjunction with the below 7bar mains replacement programme.

5. Continual Improvement

As we move forward, the needs of stakeholders, legal requirements and the regulatory environment may change. As our vision is to be a leading player in our sector, the position of our peers may also change. All of these changes require that we look continuously to improve how the assets deliver stakeholder needs.

The diagram below illustrates the approach we will take to ensure continual improvement.



5.1. Managing Growth

We plan and design our network using the principles laid down in Gas Legislation Guidance, supported by our policies and procedures.

Pipeline and storage systems are designed to supply the predicted 1 in 20 peak day demand that would only be exceeded during 1 winter out of 20 years.

WWU has procedures in place to determine the long-term demand forecast to be used in the investment planning process. Volumes are monitored through the winter by comparing the actual and expected throughput.

Software modelling techniques are used to develop pipe and storage requirements to inform investment planning. For the above 7 bar network, forecasts are planned to a 10-year horizon and for below 7 bar a 5-year horizon.

In accordance with its Gas Transporters Licence Special Condition D3, WWU publishes details of volume forecasts; system reinforcement projects and associated investment for above 7 bar projects.

When planning replacement of iron mains, system capacity is considered to ensure any benefits from marginal upsizing are realised.

Where requests for new connections include potential for downstream development with no defined timescale, consideration is given to sizing the asset to accommodate the potential additional load on the basis of probability. Under agreement with Ofgem, WWU will wholly or partially fund the cost of investment of reinforcement to support customer specific loads subject to an economic test.

5.2. Costing Principles

WWU uses an SAP system both for financial management and for work and asset management. SAP can maintain hierarchies that enable costs to be aggregated through management structures and through asset structures. At its lowest level work instructions (job cards) collect financial transactions of labour costs, materials costs and bought in services costs to form the basis of both management and asset costing principles.

Where the need for investment is identified, projects are prepared using known unit costs. If more than one option is identified, or the solution is phased, discounted cash flow calculations are used to compare business case benefits. These outputs, together with an assessment of whole life costs and safety considerations, are used to select the most appropriate project solution.

Our IT system provides the basis for whole life costing processes. Irrespective of the quantity of data in the system, whole life processes will be employed in the selection of projects and also to ensure that when installing new assets, the appropriate balance is struck between installation cost and maintenance cost, reliability, skills requirements etc. This will form a mandatory requirement of the investment procedures that all projects must comply with.

Resource and cost requirements are set using zero based budgeting, whereby process managers set proposed work plans that are subject to challenge and review.

5.3. Maintenance and Maintainability

Reliability Centred Maintenance

Reliability centred maintenance (RCM) has been operating in WWU since 1996. The approach has been applied to the below 7 bar district pressure regulator and industrial commercial installations (I&C) population, as well as to selected above 7bar assets. Historically, inspection intervals have been based on Failure Finding Inspection (FFI) calculations using component Mean Time between Failure (MTBF) data derived from fault reports and additional interviews with operational staff.

Fault finding inspection frequencies have to date been capped in line with other inspection and maintenance requirements, for example, site husbandry, statutory pressure systems inspections etc. WWU periodically reviews fault data to ensure FFI frequencies remain valid and to establish whether the extension of RCM principles can be extended across a wider group of assets.

In addition to providing operational cost benefits, the RCM philosophy will improve longer term reliability by removing failures that occur as a result of intrusive maintenance. WWU will monitor instances of failure and fault reports to inform and modify maintenance priorities.

With experience of RCM studies, the hierarchy of maintenance will become: -

Inspection - Regular visits and condition reporting that mitigates risk and provides the information for maintenance.

Maintenance - Regular or non-regular processes that return the asset to serviceability, and maintain condition, so that the asset is better placed to deliver its full life.

Refurbishment - Replacement of a major part of the asset when maintenance will no longer return the asset to serviceability, or where the annual cost of maintenance is more than the annual cost of capital refurbishment.

Replacement - Where the refurbishment of components will not return the asset to serviceability, or where a number of planned refurbishments may be brought together.

5.4. Data Strategy

WWU continues to invest in IT systems and tools to deliver optimum asset stewardship. A high percentage of data is held in a single core register (SAP) and in our geographic information system (ARCGIS). However, it is recognised that some elements of asset data is held by third parties or resides in other peripheral systems including smaller software packages, spreadsheets, emails, reports etc. As part of WWU's continuous improvement process, a gap analysis has been undertaken and an asset data strategy is currently in development. This will determine the most appropriate course of action and make data available to support whole life cycle costing and assessment of asset condition using asset specific data. Additionally, the strategy will address inconsistencies caused by duplication of data in peripheral systems.

Business Warehouse reporting tools are being made available to asset managers to support the extraction and manipulation of data and production of KPI.

Where appropriate condition surveys will be used to supplement asset data.

5.5. Physical Security of the Assets

We maintain regular communication with government departments, including the Counter Terrorism Security Advisors (CTSA) and the National Protective Security Authority (NPSA), regarding potential threats to energy installations from various adversaries.

As a member of the Executive Energy Emergency Committee (E3C STG), established by the Centre for the Protection of National Infrastructure (CPNI), now known as the NPSA, we participate in meetings to discuss the current threat level, security developments, equipment, IT & cyber measures and personnel security, while sharing best practices and experiences.

After reviewing the criticality and risks associated with each site, several approved security enhancements have been successfully implemented. We collaborate with the Department of Security for Net Zero (DESZN) to identify asset and assess site importance, ensuring enhanced appropriate security measures are in place at designated critical locations.

The security strategy approved by our Executive, along with the established control procedures and specifications for the implemented systems, will be documented in a Security Policy, Security Procedures, and Security Specifications. These documents will be incorporated into the WWU Asset Management System.

5.6. Treatment of Disused Assets

We recognise that redundant land or gas equipment can present societal and environmental risks. WWU's strategy is to reduce long term health, safety, environmental and financial liability by decommissioning, demolition and disposal of disused assets.

5.7. Resources and Competencies

WWU will define the resources required to deliver asset plans through a process of Zero Based Budgeting (ZBB), this will also form the basis for budgeting expenditure.

WWU define competence as a having the ability, appropriate training, knowledge and experience to carry out design planning and execution of work being undertaken in a safe and proper manner. The Safety Technical Competency (STC) assessment process in place is directed at confirmation of the above and draws upon many sources of evidence to do so. Acceptable forms of evidence include training courses, relevant qualifications, and job notes of successfully completed work, projects the individual has been involved with, or managed and written witness statements. In addition, WWU have developed its own Asset Management Competency Framework based upon the guidance issued by The Institute of Asset Management (IAM).

It is Asset Management's responsibility to communicate work definition requirements to the Head of Operations. It is the responsibility of the Head of Operations to set the level of resource required to deliver the defined workloads within approved expenditure levels.

6. System Operation Responsibilities

Our System Operation activities cover areas consistent with all the GDNs as well as some other areas which may differ. The control centre has been established since 2009 and our activities are subject to continuous development as we accommodate new customer requirements such as biomethane entry, including through the implementation of smart pressure control and reverse compression and new regulatory requirements such as Directive on security of network and information systems (NIS) and the Cyber Assessment Framework (CAF) which will impact our systems and security arrangements.

The control centre was the subject of the Physical Security Upgrade Programme (PSUP) re-opener in GD2 with funds allocated to support the build of new primary and secondary control centres which will take place across GD2 and GD3.

System Operation support several Net Zero initiatives within WWU and across the industry and recognise that changes will be required to our processes, systems and ways of working under a range of future energy scenarios:

- to accommodate hydrogen as a blend with methane or 100%
- to support continued system optimisation
- to support new industry processes resulting from revisions to regulations and market frameworks
- to support reconfiguration of our network for hydrogen or decommissioning
- to ensure our systems and processes are designed to promote situational awareness of our engineers as they operate our network through its transition

We have completed work in these areas during GD2 and anticipate further work in this area in GD3 to be funded by net zero uncertainty mechanisms.

6.1. Asset Key Performance Indicators

In order to measure the effectiveness of WWU Asset Management it is of critical importance that a measurement system is in place to monitor asset performance and condition. The asset measurement system forms part of the WWU Asset Management System. Asset performance and monitoring will encompass both assets (asset groups) and Asset Management Systems (processes and compliance).

Asset management performance and condition targets translate Asset Policy, Strategy and Objectives into practical metrics that are used to manage asset performance, risk and expenditure. This requires a set of informative, measurable and reliable Performance Indicators that can be used for the purpose of ensuring asset plan delivery and effecting improvements where they may be necessary. WWU recognises that other performance indicators may exist in parallel. These may be required by regulatory bodies such as Ofgem or HSE or may be financial reporting KPI's required by investors.

Performance Indicators are based upon measurement (information / data) and may reflect opinion (information) or be precise and measurable (data).

Key Performance Indicators (KPIs) will be used to effectively monitor the key asset objectives as determined through the asset management system. KPIs will be reported in a manner that is meaningful to senior management and written in a clear and concise manner with a documented methodology.

Performance Indicators will be used to provide Asset Management with effective tools to monitor performance and condition of asset groups and the asset management system.

All performance indicators should be:

- Transparent, giving a clear picture of performance.
- Easily measurable in a cost-effective way utilising, a phased approach in their implementation.
- Useful as a management tool.
- Reflective of Asset Inspection/Maintenance, Asset Usage, Operating Costs, Asset Condition and Asset Functionality.
- Subject to a continual cycle of review to ensure that they remain meaningful, useful and appropriate.

We have created a set of Asset Key Performance Indicators using a balanced scorecard approach. These KPIs measure our assets, health, safety and environmental performance, highlighting areas requiring increased focus and conversely areas where performance is potentially higher than required. It is designed to highlight failings at the appropriate level and be used as a tool to drive business decisions.

7. Asset groups

The following sections detail our approach for each asset group, for more information please see the RIIO3 investment Decision Packs.

7.1. Above 7bar Pipelines

WWU has approximately 2360km of welded steel pipelines operating at pressures of 7 to 70 bar and 36 Above Ground Installations (AGI) where the LTS comes above ground in a valve or pig-trap compound, but there is no pressure regulating equipment.

Function

Their function is the bulk transportation of gas over distance and the provision of storage to meet diurnal demand. When considered with other storage methods (NTS pipeline pressure cycling, and above 7bar pressure vessels, storage must be sufficient to meet peak demand that might occur 1 out of every 20 years.

Intervention Options

Our approach to this asset group is a balanced programme of inspection, maintenance, refurbishment and replacement to deliver continued safe and efficient operation. Cost benefit analysis is used to evaluate the whole life cost of each intervention option to ensure best value solutions are proposed to maintain or improve the asset health for the expected lifetime of the pipeline.

Options will include:

- Replacement (full or part).
- Decommissioning or downrating.
- Refurbishment. Following an integrity study, options to maintain the health (such as improving Cathodic Protection (CP) will be proposed.
- Additional inspection. Enhanced condition monitoring as a pipeline begins to approach the end of its asset life will enable better assessment of its health.
- Routine and non-routine maintenance. Planned preventative maintenance will ensure a pipeline asset reaches its full potential. (described below)

- Fault response. Monitoring of faults with timely correction.

Performance and Condition Requirements

LTS pipelines are designed operated and maintained in accordance with industry standards to ensure compliance with the Pipelines Safety Regulations and the Pressure Systems Safety Regulations. These pipelines range in construction age from 1956 to current day, those pipelines constructed between 1956 and 1972 predate any recognised construction standards and consequently include girth welds of unknown or poor quality and other latent or active defects. This is a consideration when site work is performed on or near these pipelines.

Impressed current CP systems are installed to protect LTS pipelines from corrosion. The performance and effectiveness of the CP systems are regularly monitored, and the results reviewed to identify any deficiency in the system and initiate timely repair action. Where possible, pipelines are internally inspected by In-Line Inspection (ILI) techniques, enabling any damage or metal loss features to be identified and remedied. The frequency of these inspections is risk-based, determined using the Intervals2 model which takes into account the pipeline parameters and operating history, with an upper limit of at least once every 15 years.

Fatigue life is monitored for storage pipelines as these are subject to pressure cycling and therefore fatigue.

The capacity of LTS pipelines network is computer modelled using the Synergee analysis tool. Modelled results are periodically compared with actual flows/pressures to ensure reasonable accuracy of models. Outputs are used to develop a capacity plan with a 10 year planning horizon to ensure reinforcement or downrating of pipeline or installations are identified in sufficient time to allow for the work to be planned and delivered.

Safety

These assets are subject to the Pipelines Safety Regulations (PSR) which include a legal duty to maintain them in an efficient state, in efficient working order and in good repair, and the Pressure Systems Safety Regulations (PSSR) which place WWU under a legal obligation to produce Written Schemes of Examination (WSoE) detailing examination and inspection regimes and the preparation of Major Accident Hazard Pipeline Plans (MAHP).

There are constraints on development within the proximity of Major Accident Hazard Pipelines and on-going monitoring is in place, e.g fortnightly aerial surveillance, plant protection services, TD1 surveys, etc.

Sustainability and Environment

LTS Pipelines have an engineering design life of at least 40 years (In general, operational life is expected to be considerably beyond the design life). In practice, the life of this asset group is influenced by a number of factors, including duty such as the number of pressure cycles they are subjected to and the continued integrity of the coating system.

LTS mains pose a risk to the environment through the release of large volumes of gas in the event of failure or interference damage. Third party interference is the highest risk and infringement of ground works or development in the vicinity of these pipelines is monitored by fortnightly helicopter patrols, in accordance with IGEM/TD/1. There are no known instances of environmental damage, however, there is a potential for contamination of the environment, water ways etc. in the event of a significant failure.

The construction of LTS pipelines can have significant environmental impacts. Pipelines are built with regard to the effect their construction may have on the surrounding environment.

Safety Outputs

Delivery of the key inspection activities: In-line Inspection; OLI/4 surveys; CIPS; and completion of the WSoE are reported monthly to the Business Performance Delivery Committee which is attended by senior management and members of the Executive.

To contribute to benchmarking across the pipeline industry WWU is a member of the UK Onshore Pipeline-operators Association (UKOPA). The number of pipeline failure incidents arising from corrosion and other causes are reported by UKOPA in their annual Pipeline Fault Database report, the number of pipeline infringements are reported by UKOPA in their annual Infringement Report.

7.2. NTS Offtakes & Above7bar Pressure Regulating Installations (PRI)

WWU has a population of 17 National Transmission System (NTS) Offtakes and 307 above 7bar Pressure Regulating Installations (PRI). The 17 Offtakes are amongst the highest criticality sites and along with the PRIs are essential to both physical and commercial delivery.

Function

NTS Offtakes form the physical interface between the National Gas transmission system and the WWU network, the sites are owned by WWU but some of the pipework, valves, electrical and instrumentation systems are owned by National Gas. Their prime function is to ensure adequate, but not excessive pressure and flow of gas is received into the WWU LTS system, to meet daily demand. The above 7bar PRIs ensure pressure, flow and storage is managed safely in the LTS and other downstream systems.

The high volume of gas flowing through NTS Offtakes is metered to enable shrinkage gas (unaccounted for gas funded by WWU) and transportation income to be calculated.

The Calorific Value of the gas passing through NTS Offtakes is measured in order to use the Flow Weighted Average Calorific Value (FWACV) charging method (permitted by The Gas Calculation of Thermal Energy Regulations and regulated by Ofgem). FWACV gives an accurate reflection of the energy being delivered to consumers by calculating the total energy passing through a charging area and dividing this by the total volume being passed through.

Gas is not odorised within the NTS and WWU choose to odorise the gas at NTS Offtakes before it enters the LTS /distribution network (under the Gas Safety (Management) Regulations).

The volumes of gas passing through the Offtakes and PRIs at large pressure differential result in reductions in temperature (Joule-Thompson effect); to counteract this gas is preheated before pressure is reduced.

Intervention Approach

Our approach to this asset group is a balanced programme of inspection, maintenance, refurbishment and replacement to deliver continued safe and efficient operation. Cost benefit analysis is used to evaluate the whole life cost of each intervention option to ensure best value solutions are identified to maintain or improve the asset health for the expected lifetime of the Offtake or PRI.

Options will include:

- Complete site rebuild or complete replacement of a sub-system,
- e.g. Pre-heating.
- Component replacement of sub-systems, e.g. pipe supports, actuators, control boxes, roof/door replacement etc.
- Site painting.
- Additional inspection. Enhanced condition monitoring as an Offtake or Regulator sub-system begins to approach the end of its asset life will enable better assessment of its health.
- Routine and non-routine maintenance. Planned preventative maintenance will ensure an Offtake or PRI asset reaches its full potential. (described below)
- Fault response. Monitoring of faults with timely correction. (described below)

Performance and Condition Requirements

NTS Off-takes and above 7bar PRIs must have sufficient capacity to meet peak aggregate hourly demand which is likely to be exceeded in 1 year out of 20 years. They are maintained in a suitable condition to ensure the continued supply of adequate pressure, when taking designed redundancy into account, without undue risk of over pressurisation or under pressurisation of the downstream system.

These installations are designed operated and maintained in accordance with industry standards. Performance monitoring is undertaken by subjecting each sub-system to a functional check according to category. Any repair action is generated according to the results of these checks; overhauls are not undertaken as a matter of course. The physical condition of these installations is monitored via an independently managed inspection programme detailed in a WSoE in accordance with PSSR. This provides assurance of continued safe operation.

Safety

NTS Offtakes and above 7bar PRI must be designed, maintained and inspected to ensure the risk of over or under pressurisation of the downstream system is acceptable.

These asset groups are subject to the Pipelines Safety Regulations (PSR), and the Pressure Systems Safety Regulations (PSSR). The potential for a sudden release of stored energy that may follow over pressurisation of any component is a significant risk.

Physical and Cyber Security arrangements for these sites are imperative, particularly in respect of potential third-party interference. There are varying levels of security provided by fencing, locking and intruder alarms, depending on the criticality of the site and past experience, as well as the deployment of secure instrumentation and telemetry equipment.

Sustainability and Environment

NTS Offtakes and PRIs have an engineering design life of around 40 years, although some sub-systems have substantially shorter asset lives and others much longer, such as buildings and pipework, if maintained adequately. Excluding electrical and instrumentation equipment which may have as short a life as 5 years, due to duty or obsolescence, the gas preheating equipment is the element that has the shortest Technical Asset Life of around 10-15 years for the boiler system.

NTS Offtakes and above 7bar PRIs may pose a risk to the environment through the release of large volumes of gas in the event of failure. Maintenance regimes are set to minimise this risk. WWU also invests in new technology that reduces the volume of vented gas released during normal operation.

Outputs

Delivery of the key inspection and maintenance activities carried out in accordance with the Annual Maintenance Plan (AMP) and completion of the WSoE are reported monthly to the Business Performance Delivery Committee which is attended by senior management and members of the Executive.

As part of the HSE Process Safety Performance Indicators WWU record the following fault information as part of a wider suite of Key Performance Indicators;

- (number of faults x duration)/number of telemetered above ground installations
- the percentage of these faults responded to within 2 hours
- NARMS risk metrics

7.3. Below 7 bar Pressure Regulators (District Governors)

WWU has a population of approximately 2375 District Governors, these are pressure regulating installations (PRI) operating at below 7bar inlet pressure

Function

The prime function of below 7bar pressure regulators is to ensure adequate, but not excessive pressure is passed to downstream Medium Pressure and Low Pressure distribution systems.

Intervention Options

Our approach to this asset group is a balanced programme of inspection, maintenance, refurbishment and replacement to deliver continued safe and efficient operation. Cost benefit analysis is used to evaluate the whole life cost of each intervention option to ensure best value solutions are proposed to maintain or improve the asset health for the expected lifetime of the regulator.

Options will include:

- Complete site rebuild, e.g. kiosk, regulators etc.
- Component replacement or refurbishment, e.g. painting, auxiliary pipework, kiosk replacement.
- Additional inspection. Enhanced condition monitoring as a regulator begins to approach the end of its asset life will enable better assessment of its health.
- Routine and non-routine maintenance. Planned preventative maintenance will ensure a District Governor reaches its full potential. (described below)
- Fault response. Monitoring of faults with timely correction.

Performance and Condition Requirements

Below 7bar pressure regulators must have sufficient capacity to deliver minimum Pressures on Low Pressure Networks at Demand Conditions below 1 in 20, this being an average pressure over a six minute period of at least 21.5 mbar at the consumers (emergency) control valve under normal conditions.

Installations are designed operated and maintained in accordance with industry standards. Performance monitoring is undertaken based on a Reliability Centred Maintenance (RCM) approach, which is applied to the majority of the population to determine the frequency of functional checks; overhauls are not

undertaken as a matter of course. For sites with >2bar inlet pressure, the physical condition and performance of safety devices is monitored via an independently managed inspection programme detailed in a WSoE in accordance with PSSR. This provides assurance of continued safe operation.

Risk assessment has identified there is a risk of vehicle impact for this asset group. WWU's site specific risk assessment completed under Construction Design & Management regulations (CDM) includes a more detailed assessment of traffic risks. Where a vehicle impact is experienced the district governor will be relocated or protected to mitigate future vehicle impact.

Safety

This asset group is subject to the Pipelines Safety Regulations (PSR), and for regulators operating at above 2bar by the Pressure Systems Safety Regulations (PSSR). The potential for a sudden release of stored energy that may follow over pressurisation of any component is a significant risk.

The Dangerous Substances & Explosive Atmospheres Regulations 2002 (DSEAR) legislation require employers to control the risks to safety from fire and explosions, as such. Requiring WWU to risk assess the potential for venting gas to ignite.

Physical and Cyber Security arrangements for these sites are an important consideration, particularly in respect of potential third-party interference. There are varying levels of security provided by fencing and locking, as well as deployment of secure instrumentation and telemetry equipment.

Sustainability and Environment

Below 7bar PRIs may pose a risk to the environment through the release of large volumes of gas in the event of fault or failure. Maintenance regimes are set to minimise this risk.

Safety Outputs

Delivery of the key inspection and maintenance activities carried out in accordance with the Annual Maintenance Plan (AMP) and completion of the WSoE are reported monthly to the Business Performance Delivery Committee which is attended by senior management and members of the Executive.

7.4. Above 7bar Special Fittings, Supports & Crossings

WWU has a known population of above 7bar special fittings, supports and crossings that form part of the LTS system.

Function

They transport gas above ground across obstacles or geographical features, i.e. Streams, canals, carriageways and railways, or below ground under rivers, or through ducts, e.g. across major traffic arteries.

Intervention Options

Cost benefit analysis is used to evaluate the whole life cost of each intervention option to ensure best value solutions are proposed to maintain or improve the asset health for the expected lifetime of the fitting, support or crossing.

Options will include:

- Replacement or diversion.
- Refurbishment. Following an integrity study, options to maintain the health will be proposed e.g. Structural survey, replacement of support brackets, River bed/bank remedials, In line valve refurbishment, painting.
- Additional inspection. Enhanced condition monitoring as a fitting, support or crossing begins to approach the end of its asset life will enable better assessment of its health.
- Routine and non-routine maintenance. Planned preventative maintenance will ensure a pipeline asset reaches its full potential. (described below)
- Fault response. Monitoring of faults with timely correction.

Performance and Condition Requirements

Above 7bar special fittings, supports and crossings are designed and maintained in accordance with industry standards. They are exposed to the environment and are prone to weather deterioration, wear, or erosion so a key inspection for below ground water crossings is depth of cover.

Where pipes are protected by sleeves, for example at road crossing points, these are subject to testing of CP and, where appropriate, presence of inert gas (Nitrogen) shielding.

Faults identified are reported in accordance with a robust fault procedure and feed through to the intervention programme which is reviewed and approved annually.

Safety

These assets are subject to Pipelines Safety Regulations (PSR) and the Pressure Systems Safety Regulations which place WWU under a legal obligation to produce WSoE detailing examination and inspection regimes and the preparation of Major Accident Hazard Pipeline Plans (MAHP).

The potential failure modes include corrosion leading to loss of integrity (supports) or through wall corrosion (pipes and fittings) leading to an uncontrolled release of gas.

Sustainability and Environment

LTS pipelines, including special crossings pose a risk to the environment through the release of large volumes of gas in the event of failure or interference damage. Third party interference is the highest risk and ground works or development in the vicinity of these pipelines is monitored by regular helicopter patrols.

The construction of LTS pipelines including special crossings can have significant environmental impacts. Pipelines are built with regard to the effect their construction may have on the surrounding environment.

There are no known instances of environmental damage, however, there is a potential for contamination of water ways etc. in the event of a significant failure.

Safety Outputs

Delivery of the key inspection activities are reported monthly to the Business Performance Delivery Committee which is attended by senior management and members of the Executive.

7.5. Below 7bar Special Fittings, Supports & Crossings

WWU has an estimated 1,304 special crossings associated with the below 7bar distribution system.

Function

They transport gas above ground across obstacles or geographical features, i.e. Streams, canals, carriageways and railways.

Intervention Options

When a detailed inspection study identifies an unacceptable risk the optimum intervention option will be determined and planned to ensure continued safe operation. Cost benefit analysis is used to evaluate the whole life cost of each intervention option to ensure best value solutions are proposed to maintain or improve the asset health for the expected lifetime of the fitting, support or crossing.

Options will include:

- Replacement or decommissioning.
- Refurbishment. Following an integrity study, options to maintain the health will be proposed e.g. Structural survey, replacement of support brackets, painting.
- Additional inspection. Enhanced condition monitoring as a fitting, support or crossing begins to approach the end of its asset life will enable better assessment of its health.
- Routine and non-routine maintenance. Planned preventative maintenance will ensure a pipeline asset reaches its full potential. (described below)
- Fault response. Monitoring of faults with timely correction. (described below)

Performance and Condition Requirements

Below 7bar special fittings, supports and crossings are designed and maintained in accordance with industry standards. They are exposed to the environment and are prone to weather deterioration or wear. Faults identified are reported in accordance with a robust fault procedure and feed through to the intervention programme which is reviewed and approved annually.

Safety

These assets are subject to the Pipelines Safety Regulations (PSR) which include a legal duty to maintain them in an efficient state, in efficient working order and in good repair.

The potential failure modes include corrosion leading to loss of integrity (supports) or through wall corrosion (pipes and fittings) leading to an uncontrolled release of gas.

Sustainability and Environment

Below 7bar crossings pose a risk to the environment through the release of large volumes of gas in the event of failure or interference damage. There are no known instances of environmental damage, however, there is a potential for contamination of water ways etc. in the event of a significant failure.

Safety Outputs

Delivery of the inspection activities are reported monthly to the Business Performance Delivery Committee which is attended by senior management and members of the Executive.

7.6. Above 7bar Storage

WWU has 3 above 7bar storage sites with above ground vessels providing approximately 6% of the network's above 7 bar storage requirements.

Function

The primary function of the above 7bar gas storage assets, which are integral to the local transmission system in the south-west LDZ, is to enable the network to supply the within day variation in demand whilst minimising installed system capacity costs.

A secondary function is to provide support in the event of a local gas supply emergency.

Intervention Options

The outcomes of any routine inspection, maintenance or major examination will determine the intervention requirements over and above routine maintenance to ensure continued safe operation. Cost benefit analysis is used to evaluate the whole life cost of each intervention option to ensure best value solutions are proposed to maintain or improve the asset health for the expected lifetime of the storage installation.

Options will include:

- Replacement of major sub-systems, e.g. pre-heating, meters, RTUs, etc.
- Refurbishment. Following an integrity study, options to maintain the health will be proposed e.g. Major repairs, revalidation, and painting. Component replacement of subsystems.
- Additional inspection. Enhanced condition monitoring as a storage vessel begins to approach the end of its asset life will enable better assessment of its health.
- Routine and non-routine maintenance. Planned preventative maintenance will ensure the facility reaches its full potential. (described below)
- Fault response. Monitoring of faults with timely correction. (described below)

Performance and Condition Requirements

Storage assets must be available for operation at periods of highest demand between 1st October and 30th April each year.

When considered with other storage methods (NTS pipeline pressure cycling, and LTS pipeline pressure cycling), storage must be sufficient to meet peak demand that might occur 1 out of every 20 years.

Each site is operated under a Hazardous Substances Consent, required under The Planning (Hazardous Substances) Regulations 1992 as amended by The Planning (Control of Major-Accident Hazards) Regulations 1999.

The high pressure storage vessels are inspected in accordance with T/PM/PS/3 Management Procedure for Ensuring Compliance with The Pressure Systems Safety Regulations 2000 General Compliance Duties, which details the Written Scheme of Examination applicable, and are maintained in accordance with T/PM/MAINT/4 Management Procedure for Maintenance of High Pressure Storage Installations.

Safety

Above 7bar storage sites are subject to the Pipelines Safety Regulations (PSR) and the Pressure Systems Safety Regulations (PSSR). The potential for a sudden release of stored energy that may follow over pressurisation of any component is a significant risk...

The operation of these sites is constantly monitored via telemetry. Vessels are maintained in accordance with IGEM/SR/14 which includes a periodic review of the remaining fatigue life based on their operational duty. Physical and Cyber Security arrangements for these sites are imperative, particularly in respect of potential third-party interference. There are varying levels of security provided by fencing and locking.

Sustainability and Environment

The HP storage vessels vary in age and were designed to codes prevailing at the time of their construction. The design life of these vessels was originally set at 40 years. Their Technical Asset life was subsequently set at 165 years as the result of the conclusions of a report by British Gas Technology 'Technical Asset Life Estimation of Transco High Pressure Storage Vessels and Buried Pipe Arrays'. Further assessment has been completed following the major examination of each vessel across all three sites that has determined the remaining fatigue life of each vessel.

HP vessels may pose a risk to the environment through the release of large volumes of gas in the event of failure. Maintenance regimes are set to minimise this risk.

Safety Outputs

Delivery of the key inspection and maintenance activities carried out in accordance with the Annual Maintenance Plan (AMP) and completion of the WSoE are reported monthly to the Business Performance Delivery Committee which is attended by senior management and members of the Executive.

As part of the HSE Safety Performance Indicators WWU record the following fault information:

- (number of faults x duration)/number of telemetered above ground installations;
- the percentage of these faults responded to within 2 hours.

7.7. Service Governors (Below 7 bar Pressure Regulators)

WWU has an estimated population of approximately 15,000 service regulators operating at below 7bar inlet pressure, including domestic and industrial & commercial (I&C) service regulators above and below 200scmh-1 capacity.

Function

The prime function of below 7bar pressure regulators is to ensure adequate, but not excessive pressure is passed to downstream domestic and I&C consumers. The number of consumers per asset ranges from 1 to 10.

Intervention Options

The outcomes of the continuous condition-based survey program and the relative age of the service governor will determine the intervention requirements over and above routine maintenance to ensure continued safe operation. Cost benefit analysis is used to evaluate the whole life cost of each intervention option to ensure best value solutions are proposed to maintain or improve the asset health for the expected lifetime of the service governor.

Options will include:

- Replacement.
- Component replacement or refurbishment, e.g. painting, kiosk replacement.
- Additional inspection. Enhanced condition monitoring as a service governor begins to approach the end of its asset life will enable better assessment of its health.
- Routine and non-routine maintenance. Planned preventative maintenance will ensure a service governor reaches its full potential. (described below)
- Fault response. Monitoring of faults with timely correction. (described below)

Performance and Condition Requirements

Service governors feed small downstream networks of up to 10 customers and are designed to IGEM/TD/13 and maintained in accordance with T/PM/MAINT/2 Part 1. They are often single stream with over pressurisation protection and may be sited above or below ground. The physical condition and performance of safety devices on these installations is monitored via an independently managed inspection programme in accordance with T/PL/PS/2 to deliver compliance with the Pressure Systems Safety Regulations 2000, for sites with above 2bar inlets.

Risk assessment has identified there is a risk of vehicle impact for this Asset group and guidance issued to ensure appropriate siting. Where a vehicle impact is experienced the service governor will be relocated or protected to mitigate future vehicle impact.

Following a review of the service governor maintenance practise using an RCM approach, the maintenance regime will be: Below ground service governors will be subject to 5 yearly functional checks including operation of the protective device.

Above ground above 2bar inlet regulators will be subject to a 10 yearly functional check. These checks are in line with the requirements in T/PM/PS/3 as part of the WSoE.

Above ground below 2bar inlet regulators will be subject to a 20 yearly functional check in line with T/PM/MAINT/2 Part1.

Safety

This asset group is covered by the Pipelines Safety Regulations (PSR), and for regulators operating at above 2bar, by the Pressure Systems Safety Regulations (PSSR). The potential for a sudden release of stored energy that may follow over pressurisation of any component is a significant risk.

The Dangerous Substances & Explosive Atmospheres Regulations 2002 (DSEAR) legislation requires employers to control the risks to safety from fire and explosions as such requiring WWU to risk assess the potential for venting gas to ignite.

Security arrangements for these sites are an important consideration, particularly in respect of potential third-party interference. There are varying levels of security provided by fencing and locking.

Sustainability and Environment

Service governors may pose a risk to the environment through the release of large volumes of gas in the event of fault or failure. Maintenance regimes are set to minimise this risk.

Safety Outputs

Delivery of the key inspection and maintenance activities carried out in accordance with the Annual Maintenance Plan (AMP) and completion of the WSoE are reported monthly to the Business Performance Delivery Committee which is attended by senior management and members of the Executive.

7.8. Service Pipes

WWU has a population of around 2.5 million service pipes, which are defined as a connection from the distribution main to supply a maximum of two supply meter installations.

Function

The primary function of a service pipe is to convey gas from the main to the customers emergency control valve (ECV) without loss of containment.

Services up to and including 2" diameter

Buried steel services up to and including 2" diameter must be replaced entirely with polyethylene whenever encountered either on a mains replacement project, connections work or repair works. Above ground steel pipe entries should also be replaced but may be used as a sleeve if assessed to be in a satisfactory condition.

Existing Polyethylene services may be transferred to the replacement main following a successful approved pressure test. Where existing polyethylene services are fitted with a steel service house entry (commonly called an Eltee fitting) these must be inspected and if condition dedicates, the fitting replaced or refurbished.

Above 2" diameter services within the vicinity of a replacement project

Above 2" diameter steel services may be included for decommissioning and replacement within a mains replacement project in the same way as steel main. Where steel service pipes of above 2" diameter are discovered during the course of the work, which were not originally shown on Wales & West Utilities records an individual risk-assessment must be carried out by a competent person to determine the condition of the pipe. Pipes that are assessed to be in a satisfactory condition, and which pass the appropriate soundness test, may be reconnected to the parent main. The assessment must be recorded in the project file and a copy sent to Asset Management. Any unrecorded mains left live must be reported via the DR4 process.

Those pipes that are assessed not to be in a satisfactory condition or which fail the appropriate soundness test may not be reconnected to the replacement parent main and must be replaced.

Services above 2" diameter (emergency work)

Where work is carried out on steel services above 2" diameter during the course of emergency work, the full service length should be replaced unless the cause of leakage can be confirmed to be localised to a small section of the pipe (e.g. isolated corrosion).

Following a permanent repair being completed an individual risk-assessment must be carried out by a competent person to determine the condition of the pipe.

- Pipes that are assessed to be in a satisfactory condition may be left live.
- Those pipes that are assessed not to be in a satisfactory condition or which fail the appropriate soundness test must be replaced.

Areas of high steel service leakage

If the services are supplied from a polyethylene main, then only the services should be prioritised to be replaced. If, however, the main is metallic then consideration should be given to the decommissioning and replacement of the main at the same time.

The main should be included for intervention when it is: -

- A Tier1 iron pipe within 30m of a building.
- A Tier 2 iron pipe identified as a mandatory pipe.
- A Tier 2 iron pipe identified as a qualifying CBA pipe.
- A steel pipe identified as a qualifying CBA pipe.

For services connected to other pipe categories an individual assessment should be carried out and the best outcome for the consumer undertaken.

Intervention Options

Following the identification of a requirement for an intervention a cost benefit analysis will be utilised to evaluate the whole life cost of each intervention option to ensure best value solutions are proposed to maintain or improve the asset health for the expected lifetime of the asset.

Options will include:

- Full replacement with PE, plus those associated with mains replacement, plus those due to condition/PRE
- Refurbishment - ELTee / Tail replacement
- Routine maintenance. Planned preventative maintenance e.g. GSR Cut Offs, Valve maintenance
- Fault response – Response to PREs

Performance and Condition Requirements

The HSE have declared that it is not practicable for WWU to proactively establish and monitor the condition of all of the steel service pipes within the network. Nor is it feasible for the entire population of these pipes to be replaced immediately.

In 2011, an independent review (commissioned by HSE) into the effectiveness of the 30-year Iron Mains Risk Reduction Programme (IMRRP) concluded that the risks associated with the failure of steel service pipes does not justify their inclusion within the IMRRP. As such steel service pipes continue to be excluded from the IMRRP.

Regulation 13 of the Pipelines Safety Regulations 1996 (PSR) requires the operator of a pipeline to ensure that it is maintained in an efficient state, in efficient working order and in good repair. The Health & Safety Executive has published guidance to inspectors (SPC/ENF/186) relating to the enforcement of PSR relating to services, WWU follow this as detailed below.

WWU will ensure that they;

- Undertake steel service pipe replacement where iron mains replacement has taken place.

- Replace failed steel service pipes when they have been the subject of previous leakage report(s).
- Carry out the replacement and/or the condition assessment of the failed steel service pipe where there exists evidence of a heightened local risk of failure. (This is carried out through the postcode leakage analysis described above)

A service pipe ends at the emergency control valve (ECV) nearest upstream of the primary meter(s). Service pipes have an asset life of 30 years for steel and 150 years for polyethylene, although steel pipes typically exhibit a longer technical life.

Safety

The prime safety risk arises from through wall corrosion leading to gas ingress to buildings and consequent fire or explosion. Low pressure steel service pipes are not typically subject to cathodic protection, although those operating at higher pressures may be. Other measures to prevent external corrosion, such as wrapping or coatings, may not be fully effective or may become damaged. There is an ongoing programme of replacement to address this risk, in association with the Iron Mains Risk Reduction Programme.

This asset group is covered by Pipelines Safety Regulations (PSR) and for services operating at above 2bar by the Pressure Systems Safety Regulations (PSSR). The potential release of energy from an uncontrolled release of gas is a significant risk.

Sustainability and Environment

Leakage from services has an environmental impact. Pressure management is used to minimise joint leakage. Critical examination of PRE's is undertaken to focus on areas where high levels of service leakage (corrosion) occur and mains and service programmes are prioritised to mitigate the risk.

Safety Outputs

As part of the HSE Safety Performance Indicators WWU record the following:

- The number of GIB events found to have arisen from steel service pipe failure.

7.9. Telemetry & SCADA (Network Management)

Telemetry / SCADA systems are used to monitor and operate the strategic network, supporting the safe, secure and efficient use of our network and compliance with key legislative and regulatory requirements.

Telemetry and SCADA are here defined as: -

- Systems installed at the high pressure above ground assets that monitor the state of the pressure, flow, gas quality and security arrangements that typically interface with the Wales & West Control Centre (WWCC) operation.
- Systems installed at the lower pressure tier above ground assets that are of strategic importance in relation to pressure management or gas quality e.g. biomethane sites.
- Communications systems that transmit data.

Function

Telemetry and SCADA systems provide the capability to remotely monitor, and some instances control WWU pressure regulation and storage assets. T/SP/INE/3 details the WWU specification for the selection of telemetry.

Intervention Options

Following the identification of a requirement for an intervention a cost benefit analysis will be utilised to evaluate the whole life cost of each intervention option to ensure best value solutions are proposed to maintain or improve the asset health for the expected lifetime of the asset.

Options will include:

- Full replacement – e.g. installation of new RTUs.
- Refurbishment – e.g. Planned battery replacement.
- Routine maintenance. Planned preventative maintenance e.g. Functional checks, inspections & calibration.
- Fault response. Monitoring of faults with timely correction. (described below)

Performance requirements

Instrumentation and Telemetry equipment is designed and installed in compliance with the appropriate sections of the Electricity at Work Regulation 1989. Compliance with the maintenance requirements of this Act is delivered by following procedures set out in T/PM/EL/6 T/PM/INS/2 Part2, T/PM/MAINT/12, T/PM/INQ/6, and T/PM/ME/2.

Many of the pressure control systems in place were designed to a British Gas Engineering Research (ERS) standard and are nearing obsolescence. These play an important role in the management of leakage and hence shrinkage gas costs incurred. here is an ongoing programme to replace systems.

Cyber

With a heightened external threat environment and increased regulatory scrutiny, it is imperative that WWU keeps pace with the necessary cyber security controls required to protect its industrial control and monitoring systems. The Network and Information Systems Regulations 2018 (NIS-R) mandate that Operators of Essential Services (OES) ensure “appropriate and proportionate” cyber security controls are in place to protect critical assets relating to the provision of the service. Ofgem uses the NCSC Cyber Assessment Framework (CAF) to establish whether OES are meeting these obligations and uses its powers of enforcement and penalties where OES are found wanting.

Safety

The Dangerous Substances Explosive Atmosphere Regulations (DSEAR) requires the WWU to review the location of all electrical equipment in relation to gaseous atmospheres.

There is an ongoing programme of remedial action to make all installations compliant with DSEAR regulations.

Sustainability and Environment

Instrumentation and Telemetry systems have the shortest technical asset lives of all WWU gas assets at technically 15 and 10 years respectively. Life expectancy is significantly influenced by rapid obsolescence.

There are no specific environmental issues associated with telemetry and SCADA systems.

Gas shrinkage is directly linked to greenhouse gas emissions and accounts for 96% of our total business carbon footprint. The volume of gas released to the atmosphere is directly related to the pressure the pipe is operated at; so the higher the pressure the more leakage experienced. Therefore, having an effective pressure management strategy, functional equipment, which is suitably maintained will enable managing

pressures to keep them as low as possible minimises the amount of leakage, this is balanced with providing guaranteed pressures to the end consumer.

Safety Outputs

As part of the HSE Safety Performance Indicators WWU record the following fault information

- the percentage of Now faults responded to within 2 hours
- SCADA (Telemetry) System Availability (%)
-

Future of energy considerations

We recognise that changes may be required to our telemetry and scada systems as described earlier in the document in the system operation section.

7.10. LPG Statutory Undertakings

WWU owns 2 Liquid Petroleum Gas (LPG) Statutory Undertakings. Each comprises a distribution pipe network fed by an LPG storage site (tank farm) made up of multiple LPG tanks a vaporiser system and a pressure regulating installation.

Function

The primary function of LPG networks is to transport gas from tank farm storage to consumer's meters without loss of containment.

Intervention Options

The outcomes of any routine inspection, maintenance or major examination plus the results of a condition assessment for distribution pipes will determine the intervention requirements over and above routine maintenance to ensure continued safe operation. Cost benefit analysis is used to evaluate the whole life cost of each intervention option to ensure best value solutions are proposed to maintain or improve the asset health for the expected lifetime of the storage installation.

Options will include:

- Replacement - Replacement of tanks, or major sub-systems.
- Refurbishment. Following an integrity study, options to maintain the health will be proposed e.g. Tanks farms - Major repairs, painting. Component replacement of sub-systems.
- Additional inspection. Enhanced condition monitoring as a tank farm or distribution asset begins to approach the end of its asset life will enable better assessment of its health.
- Routine and non-routine maintenance. Planned preventative maintenance will ensure an asset reaches its full potential. (described below)
- Fault response. Monitoring of faults with timely correction, also response to PREs.

Performance and Condition Requirements

LPG networks are designed to T/PM/NP/17 and maintained in accordance with T/PM/MAINT/10 Part 1 which is based on the LPG Codes of Practice published by Liquid Gas UK, the trade association for the LPG and bioLPG industry in the UK. The operation of these network is similar to the natural gas network although the higher specific gravity requires the maintenance of higher extremity pressures and the provision of an under-pressurisation protection cut off at each meter. There are also additional competence requirements for employees working on LPG systems.

Safety

LPG storage installations are subject to the Pipelines Safety Regulations and the Pressure Systems Regulations (PSSR). The potential for a sudden release of stored energy that may follow over pressurisation of any component is a significant risk.

The operation of these sites is constantly monitored via telemetry. Vessels (tank farms) are maintained in accordance with IGEM/SR/14 which includes decommissioning for full inspection at 10 Year intervals.

Physical and Cyber Security arrangements for these sites are an imperative, particularly in respect of potential third -party interference. Security is provided by fencing and locking, as well as the deployment of secure instrumentation and telemetry equipment.

Sustainability and Environment

HP vessels (tank farms) may pose a risk to the environment through the release of large volumes of gas in the event of failure. Maintenance regimes are set to minimise this risk.

Safety Outputs

Delivery of the key inspection and maintenance activities carried out in accordance with the Annual Maintenance Plan (AMP) and completion of the WSoE are reported monthly to the Business Performance Delivery Committee which is attended by senior management and members of the Executive.

As part of the HSE Safety Performance Indicators WWU record the following fault information;

- (number of faults x duration)/number of telemetered above ground installations.
- the percentage of these faults responded to within 2 hours.

7.11. Multi Occupancy Buildings and Complex Distribution Systems

MOBs are defined as buildings with three storeys or greater, usually in the form of a block of flats although some also house commercial properties, for example a block of flats with shops on the ground floor. MOBs are split into three classifications: Low-rise (3-5 storeys); Medium-rise (6-9 storeys); and High-rise (10+ storeys).

Complex Distribution Systems (CDS) are defined as MOBs which consist entirely of industrial and/or commercial units that do not meet the classification of either a High-rise or Medium-rise building, where supplies are to more than two primary meter points, for example a shopping centre with three or more meter points that are supplied by risers/laterals.

In addition, following the Grenfell Inquiry there is a further classification ‘High-risk Buildings’ in use in respect of MOBs where the building owner is required to submit a Safety Case to the HSE. These buildings can have either internal or external gas pipe work running within or attached to the building, supplying multiple consumers. This pipe work is commonly known as a riser (vertical) and a lateral (horizontal).

WWU has an population of 2,876 Low-rise multi occupancy buildings, 74 Medium-rise multi occupancy buildings and 43 High-rise multi occupancy buildings.

Function

Risers and laterals are effectively above ground gas mains operating at low pressure (0-75mbar) attached to or within the structure of the MOB/CDS. Their function is the transportation of gas to multiple supply points in a building to deliver gas to consumers ECVs.

Intervention Options

When a detailed inspection study is required it will identify the intervention requirements over and above routine maintenance to ensure continued safe operation. Cost benefit analysis will be utilised to evaluate the whole life cost of each intervention option to ensure best value solutions are proposed to maintain or improve the asset health for the expected lifetime of the pipe work, fittings and support.

Options will include:

- Replacement or decommissioning.
- Refurbishment. Following an integrity study, options to maintain the health will be proposed e.g. internal lining, painting, replacement of support brackets etc.
- Additional inspection. Enhanced condition monitoring as the pipe work begins to approach the end of its asset life will enable better assessment of its health.
- Routine and non-routine maintenance. Planned preventative maintenance will ensure the pipe work reaches its full potential. (described below)
- Fault response – Response to PREs.

Performance and Condition Requirements

Regulation 13 of the Pipelines Safety Regulations 1996 (PSR) requires the operator of a pipeline to ensure that it is maintained in an efficient state, in efficient working order and in good repair. The Health & Safety Executive has published guidance to inspectors (HSE/SPC/ENF/186) relating to enforcement regarding steel services, WWU also adopt this guidance as outlined in this Section for Multi-Occupancy Buildings.

Where risers and laterals are replaced the design and installation shall be in accordance with IGEM/G/5 Edition 3.

External risers

External risers may be reconnected if their condition is satisfactory and they comply with current standards (IGEM/G/5 Edition 3). An individual risk-assessment is to be carried out by a competent person to determine the suitability of the pipe for reconnection.

- Any pipework that is not PE or ST must be replaced.
- The assessment must be recorded, a copy kept in the project file, and WWUs records updated and/or corrected as necessary.

- Pipes that are assessed not to be in a satisfactory condition or which fail the appropriate soundness test may not be reconnected and must be replaced.
- In all cases, buried ST pipe work connecting the riser to the parent main must be replaced with PE.

Internal risers

Internal risers with above ground entries may be reconnected if their condition is satisfactory and they comply with current standards (IGEM/G/5 Edition3). An individual risk-assessment is to be carried out by a competent person to determine the suitability of the pipe for reconnection.

- Any internal pipework that is not ST must be replaced.
- The assessment must be recorded, a copy kept in the project file, and WWUs records updated and/or corrected as necessary.
- Pipes that are assessed not to be in a satisfactory condition or which fail the appropriate soundness test may not be reconnected and must be replaced.

Internal risers with below ground entries should be replaced or have other approved intervention measure applied, e.g., Replacing the buried pipework and reconnection to the internal riser with a live transfer kit. In all cases all buried ST pipe work, including that within the building footprint, connecting the riser to the parent main must be replaced with PE.

WWU maintain metallic supplies to high and low rise multi occupancy buildings in accordance with;

- T/PL/LC/20-Policy for the Inspection, Maintenance and Monitoring of Supplies to Multi-Occupancy Buildings.
- T/PM/LC/21-Managmemnt Procedure for the Inspection, Maintenance and Monitoring. of Supplies to Multi-Occupancy Buildings.

Safety

The prime safety risk arises from through pipe wall corrosion leading to gas ingress to buildings and consequent fire or explosion. Steel risers are not subject to cathodic protection, other measures are typically used to prevent external corrosion, such as wrapping or coatings, these may not be fully effective or may become damaged. There is an ongoing programme of replacement and maintenance to address this risk.

Sustainability and Environment

Leakage from mains and services, including risers, has an environmental impact. Pressure management is used to minimise joint leakage. Critical examination of PREs is undertaken to focus on areas where high levels of service leakage (corrosion) occur and mains and service programmes are accelerated to mitigate the risk.

Safety Outputs

Delivery of the key inspection and maintenance activities carried out in accordance with the Annual Maintenance Plan (AMP) are reported monthly to the Business Performance Delivery Committee which is attended by senior management and members of the Executive.

7.12. Below 7bar Mains

WWU has approximately 33,000 km of below 7bar distribution mains ranging in construction age from the late 1800's to current day. Approximately 4000km are iron mains with approximately 3,400km (from MRPS) within 30m of a building.

In line with the HSE's enforcement programme, iron pipes within a 30m proximity distance of a building are allocated into one of three Tiers based on their diameter as shown below:

- Tier 1 – up to and including 8" diameter mains.
- Tier 2 – Above 8" diameter to below 18" diameter pipes.
- Tier 3 – 18" diameter pipes and above.

The intervention required for each Tier differs, it must be noted that some pipes are treated separately, such as ductile iron pipes operating at medium pressure. Any ductile iron pipe operating at medium pressure and within 30 metres proximity distance of a building must be decommissioned as soon as reasonably practicable, but not later than 12 months after the date of discovery. This applies to all diameters of mains regardless of which Tier the pipe would reside in.

Tier 1 pipes have an established risk model the Mains Risk Prioritisation System (MRPS) which prioritises decommissioning based on the likelihood and consequence of a mains failure occurring.

- The HSE's enforcement notice requires that all Tier 1 pipes must be taken "off risk" by 31st December 2032.
- The minimum annual workload for the period 2025/26 to 2030/31 to achieve this target is 335km per year.

For Tier 2 pipes, WWU have developed a risk-based model that identifies the requirement for intervention based on the likelihood of an incident and the consequence of the incident in terms of probability of a fatality.

Tier 2 pipes are split into the follows three groups: -

- Mandatory pipes - these are pipes that require mandatory intervention to either remove or reduce their level of risk.
- Non-mandatory pipes – these are pipes that are not mandatory but may have intervention applied under a Cost Benefit Analysis. (CBA).
- Pipes that do not qualify under either of the above. These pipes will be maintained by approved repair methods, etc.

Tier 3 pipes - There are no mandatory Tier 3 pipes. Pipes will only be decommissioned based on a CBA basis selected on the same criteria as for Tier 2 CBA pipes.

For buried steel pipes above 2" MRPS is used to appraise their condition utilising the MRPS condition score and risk scores. This combined condition risk assessment includes both likelihood and consequence of failure. As well as individual pipes being considered for replacement, where a specific area is identified as having a high level of steel pipe failure, consideration should be given to replacement of all steel mains and services within that local area, determined by cost benefit analysis.

Where buried steel pipes above 2" diameter exist within the area of a planned iron replacement project consideration should be given to including the replacement of the steel pipe within that project.

Where work is carried out on buried steel mains up to and including 2" diameter outside of a planned replacement project, (e.g. Mains extension works, emergency work etc.) consideration should be given to replacing them entirely with polyethylene at the same time, based on a CBA. This includes those pipes discovered during the course of the work, which were not originally shown on Wales & West Utilities records.

Buried steel mains up to and including 2" diameter should not be transferred to the new replacement mains unless it is demonstrated through a documented site-specific risk-assessment that it not reasonably practicable to replace them with a polyethylene equivalent. This site-specific risk-assessment must be documented and submitted as formal deviation from WW/PM/REP2 to Asset Management for prior approval by a Senior Manager. A copy of the assessment and approved deviation form must be included in the project file.

Where buried steel mains up to and including 2" diameter are long lengths or supplying multiple properties, it may not be reasonably practicable to replace them immediately. Where this occurs the original planned work/repair should be completed and details must be forwarded to Asset Management to allow the pipes to be considered for further future intervention. Any previously unrecorded steel mains must be reported via the DR4 process.

Iron pipes at a proximity distance of greater than 30m from a building are not included for mandatory intervention under the HSE's enforcement notice. They may be replaced or have other intervention measures (other than normal maintenance etc.) applied to them if it can be demonstrated that it is cost efficient to do so. Wales & West Utilities use its Cost Benefit Analysis (CBA) tool to identify these pipes.

Intervention Options

Following the identification of a requirement for an intervention a cost benefit analysis will be utilised to evaluate the whole life cost of each intervention option to ensure best value solutions are proposed to maintain or improve the asset health for the expected lifetime of the asset.

Options will include:

- Full replacement or decommission.
- Refurbishment. Following an integrity study, options to maintain the health (such as Lining) may be proposed.
- Additional inspection. Enhanced condition monitoring as a pipe begins to approach the end of its asset life will enable better assessment of its health.
- Routine and non-routine maintenance. Planned preventative maintenance will ensure a pipeline asset reaches its full potential. (described below)
- Fault response. Monitoring of faults with timely correction. (described below)

Performance and Condition Requirements

Below 7bar mains are constructed from a range of materials. With differing estimated technical asset lives and populations. These are summarised in the table below:

Material	Technical Life (years)	Approximate % of Population
Cast Iron Mains	40	20
Ductile Iron Mains	30	7
Steel Mains (Unprotected)	30	5
Steel Mains (Protected)	80	7
Polyethylene MDPE (MP and LP Mains)	150	60
Polyethylene HDPE (IP Mains)	150	1

The length of pipe scheduled for intervention over the period 1st April 2026 to March 2031, has been developed taking account of the Health & Safety Executive's (HSE) Enforcement Policy Statement relating to iron mains, and the Ofgem Price Control Formula allowances for the period. Pipes may be taken totally "off risk" by their decommissioning or a risk reduction achieved by other approved methods.

- Risk reduction is defined as the level of risk of an incident removed from the network by interventions applied to the iron pipe population measured over the construction year.
- The level of risk removed from the network is derived from the sum of the individual pipes MRPS risk score multiplied by its length, measured in incidents per annum.
- All iron pipes that have a positive MRPS risk score and have intervention measures applied will contribute to the total level of risk reduction.

Note, Risk reduction of Tier 2 pipes will be calculated based on their risk score as measured by MRPS and not on the risk of fatality. The level of risk removed will be added to the total level of risk removed from the Network.

Tier 1 - Up to and including 8" diameter pipes

Prioritisation of workload

At the start of the planning cycle a list of iron pipes with a diameter of <=8" will be established based on the risk values from the current version of MRPS.

The workload will be prioritised on the following basis: -

- 20% of the remaining total annual workload by length will be allocated to the highest scoring risk pipes. (seed pipes)
- The remaining 80% of the annual workload will be selected from the remaining total population to achieve the most effective outcome for the consumer in totex terms.

20% Seed pipe risk threshold

A minimum of 20% of the Tier 1 iron pipe annual workload length, after the above allowances have been deducted, must be allocated to the decommissioning of the highest MRPS scoring pipes. Some Tier 1 pipes below 3m in length are allowed to be excluded as being selected as seed pipes regardless of their risk score, but all are required to be taken off risk by 1st April 2032.

A compliance list of all seed pipes must be identified at the start of the year and used to ensure that all Tier 1 seed pipes identified are decommissioned in the period.

80% Secondary pipes

Pipes below the 20% seed level but with a positive MRPS risk score will also be considered for intervention measures. These are known as secondary pipes and will be selected from the remaining total population to achieve the most effective outcome for the consumer; considerations will include:

- Pipes in proximity to or connected to seed pipes.
- Pipes that have a high maintenance history. (Cost Benefit Analysis).
- Targeting pipes within a specific geographical area, where greater operational efficiency can be achieved (growth areas).
- Pipes in areas of high service leakage.
- Pipes with other specific issues such as water ingress, customer complaints etc.
- Pipes in proximity to other WWU works, e.g. Tier 2 projects, reinforcement etc.
- Pipe within areas of 3rd party works – e.g. road resurfacing.

Dynamic Growth Pipes not initially qualifying as seed pipes may move above the 20% seed pipe threshold and become seed pipes due to: -

- Additional leakage being added to the pipe's maintenance history.
- Pipe attribute changes. (Under the DR4 process).
- MRPS survey updates (New building construction, existing buildings, etc.).

Encroachment

Pipes not initially qualifying for intervention as they are at a proximity distance greater than 30m from a building may move into the Tier 1 programme due to: -

Pipe attribute changes (under the DR4 process).

- New building construction, extensions to existing buildings
- Change of use of a building – e.g. a barn conversion.

These pipes will be added to the Tier 1 population and prioritised for intervention under the same criteria as for any other Tier 1 pipe in the next planning cycle.

Tier 2 Mandatory pipes

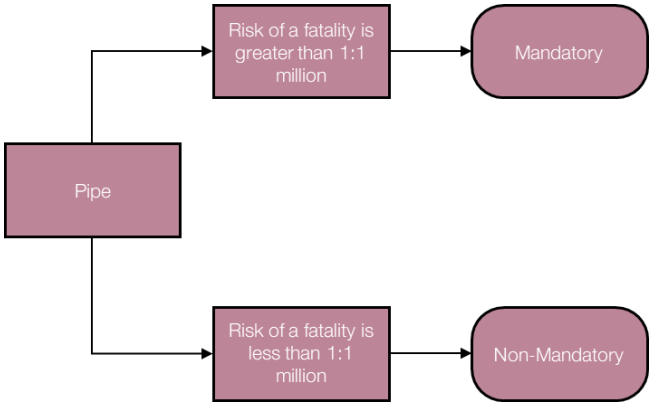
A mandatory Tier 2 pipe is a pipe where the calculated risk of a fatality occurring from an incident on that pipe is more than 1:1 million.

This is the level of broadly acceptable risk deemed to be "as low as reasonably practicable" (ALARP).

- The calculation of risk threshold used nationally resulted in an annual Tier 2 workload of 4.7km.
- The equation used is as follows:

$$Risk\ Threshold\ (MRPS\ Risk\ Score) = \frac{Number\ of\ Properties}{Number\ of\ Fatalities\ per\ Incident}$$

- This is normalised back to the national fatality rate.
- The prioritisation of this workload applies the ALARP calculation and assesses the probability of a fatality on each Tier 2 pipe.
- The intervention measure applied could be the decommissioning of the pipe or some alternative technology that reduces the likelihood of an incident occurring.



Tier 2 Non-Mandatory pipes

These are Tier 2 pipes which score below the mandatory threshold. (I.e. the risk of a fatality is less than 1: 1 million. They may be decommissioned or have other interventions applied to them if it can be demonstrated that it is cost efficient to do so.

Wales & West Utilities have developed a Cost Benefit Analysis (CBA) tool to identify these pipes. The initial full non-mandatory workload identified by the CBA tool is split equally between the current formula period and the next.

Dynamic Growth of Non -Mandatory pipes.

This non-mandatory workload will be subjected to an annual review as it may be influenced by: -

- Additional leakage being added to the pipe's maintenance history.
- Pipe attributes changes (under the DR4 process).

Note, changes to the pipes MRPS risk score will not influence its selection as a CBA pipe (but may influence its selection as a mandatory pipe).

Non-Mandatory pipe selection

Non-mandatory pipes should be selected from the total population to achieve the most effective outcome for the consumer; pipes should be considered for prioritisation for intervention on the following criteria: -

Criteria	Comments
The pipes CBA score.	Targeting the highest scoring pipes first should deliver the highest benefits earlier in the programme.

Criteria	Comments
The pipes proximity to other projects.	If the pipe is within the vicinity of an existing project then these start-up costs may already be absorbed within the exiting project and the intervention on the pipe may be delivered at a lower cost.
The replacement diameter	The initial CBA calculation uses average lay rates – The replacement diameter affects the lay technique and hence the replacement cost which will influence the CBA score.
Customer Complaints	If the pipe has been the subject of a customer complaint it may be prudent to include it for intervention.
Water Ingress	Persistent water ingress can cause loss of supply to end users and may be difficult and costly to locate the area of ingress. Replacement may be the most efficient solution.
3rd Party works	If a CBA pipe is in the area of other works such as Highway resurfacing, then it should be considered.
Maintenance history	The pipes maintenance history may be a factor in its selection. Pipes with significant recent leakage history may be an indication of the deterioration of condition of the asset.
Redundant mains	If the main is redundant due to parallel reinforcement or is no longer supplying gas due to reconfiguration of the network, it should be considered for decommissioning.

Note the above criteria are also used to prioritise the intervention of Tier 2 & 3 mains, Iron pipes at a proximity distance of greater than 30m from a building, and steel pipes.

Tier 3 (18" diameter and above pipes.)

In line with the HSE's 3 Tier programme there are no mandatory Tier 3 pipes. Pipes will only be decommissioned based on a CBA basis selected on the same criteria as for Tier 2 CBA pipes.

Other Iron pipes

Any ductile iron pipe operating at >75mbar and within 30 metres proximity distance of a building must be decommissioned as soon as reasonably practicable, but usually not later than 12 months after the date of discovery. This applies to all diameters of mains regardless of which Tier the pipe is located in.

Intermediate Pressure Iron Pipes

Wales & West Utilities does not currently operate any pipes of this material at this pressure. Any iron pipes subsequently discovered to be operating at pressures in excess of 2bar must be down rated or decommissioned as soon as reasonably practicable, but normally not later than 12 months after the date of discovery.

Services

Iron services are to be treated as for iron mains and prioritised for replacement based on their individual attributes and the diameter Tier they reside in.

Systems of maintenance for the gas transportation network are in place in line with policy T/PL/MAINT/99 Policy For Maintenance of Gas Transmission and Distribution Assets (Ref 4b.1). The policy applies to all aspects of maintenance on the gas Distribution network transportation assets, operating at all pressures.

The company policy for the Management of Distribution Pipes is set out in Engineering Policy WW/PL/REP/1.

The Procedure for the Management of Distribution Pipes, WW/PM/REP/2 describe the actions taken to identify and prioritise distribution pipes for replacement and provides a forecast of the lengths of pipe to be decommissioned over specified periods. These procedures have been developed taking account of the Health & Safety Executive's (HSE) Enforcement Policy Statement relating to iron mains, and the Ofgem Price Control Formula allowances for the period.

The planned workload to be allocated the Distribution Network (DN) in a given period is confirmed on a regular basis and submitted to HSE as a programme for approval in accordance with the provisions of PSR 13A.

The procedure WW/PM/REP/2 (Ref 4b.26) describes the process whereby prioritisation of pipe replacement activity is informed by assessment of the risk presented by individual pipes. The procedures are designed recognising that it is not reasonably practicable to replace mains purely on the basis of assessed risk and they provide a mechanism that takes account of economic and logistical constraints on the deployment of resources.

The mains replacement policy is reviewed and updated by an Industry coordinated group on a periodic basis. The company participates in this group.

This group has responsibilities for

- The Mains Risk Prioritisation system
- The Mains replacement decision support tool
- Future iron mains risk management models

Submission of Mains Replacement Programmes.

We submit an iron mains replacement programme for approval by the HSE periodically. The programme describes the total length of iron main that the DN plans to decommission. The DN also provides copies of the policy and procedures that describe the methodology for pipe replacement selection.

The DN participates with HSE and Ofgem, in a five-yearly review of the progress achieved by its replacement programmes.

Monitoring of Mains and Service Replacement

The Network risk profile is monitored and recorded annually. The length of mains laid and decommissioned and the number of services replaced against annual targets will be monitored monthly. Quarterly reports based on mains abandonment are sent to HSE.

Safety

The prime safety risk arises from through wall corrosion leading to gas ingress to buildings and consequent fire or explosion. There is an ongoing programme of replacement to address this risk.

This asset group is covered by Pipeline Safety Regulations (PSR).

For services operating at above 2bar the potential release of energy from an uncontrolled release of gas is a significant risk and Pressurised Systems Safety Regulations (PSSR) apply.

Sustainability and Environment

Leakage from services has an environmental impact. Pressure management is used to minimise joint leakage. Critical examination of PRE's is undertaken to focus on areas where high levels of service leakage (corrosion) occur and mains and service programmes are accelerated to mitigate the risk.

Safety Outputs for Iron Mains

- The total iron mains population (in km) for each network regardless of proximity to a building.
- Number of 'Gas in Buildings' (GIB) events where any gas readings have been detected within a building as a result of an iron distribution mains pipe failure, specifically:
- A fracture or corrosion of a cast/spun iron main or corrosion of a ductile iron main.

Note: to be consistent with the data already reported to Ofgem, GIB events will be reported regardless of the concentration of gas relative to the LEL.

8. Information Requirements

8.1. 4.5.1. Records and Records Management

WWU conforms to its compliance obligations and responsibilities in an efficient manner with regard to the processes and controls in place to collect and manage records and data (information). As such, it requires that everyone that collects information as part of their work on Company assets, health, safety and environment recognises that records and data are an essential part of the gas supply system and in so doing facilitates opportunities for continual improvement from within the workforce.

To ensure data is consistent and transparent both within and across business functions, WWU utilise SAP as our asset repository, work recording and financial core system alongside our corresponding Graphical Information System (ESRI). This ensures one version of the truth that is visible at an appropriate level of detail to those who need it. Where data exists outside SAP, interfaces and dependencies are clearly documented.

Additionally, robust information is essential in demonstrating our compliance obligations to external stakeholders, which includes those to who we are required to produce and submit regulatory returns. To address the data risk, the GDN community and Ofgem have developed a common approach to data assurance for all regulatory submissions, details of which are contained in Ofgem's Data Assurance Guidance (DAG) document. The overarching aim of the DAG process is to reduce the risk of inaccurate reporting and misreporting to all stakeholders by placing the onus firmly on licensees to ensure the integrity of the data submitted to Ofgem and will serve to ensure a consistency of recording and reporting on work that is undertaken.

A risk-based approach is taken to management of assets and the associated data required to inform management decisions. Consideration is given to the complexity of assets and data requirements are tailored accordingly. Information on attributes of an asset, condition, environment, faults and the asset's role are required to assess the risk posed. This information is essential in developing the asset management plan which determines safe operating requirements, maintenance schedules and intervention plans for each piece of plant and equipment within the gas system. Requirements for data to manage gas assets are clearly described in the asset health, risk and criticality manual.

For effective asset management, it is critical to have clarity of the cost of managing each asset. Financial data is collected at a minimum to site level but on more complex sites to component level. This includes both capital and operating costs. Significant changes have been made to the core system to allow costs to be captured at an appropriate level.

Critical records and data required to operate, maintain and manage the network safely and efficiently and support our compliance obligations are identified. Company policy and procedures require the collection and management of this information.

Data held for buried assets is verified when these assets are exposed during the course of the works. Whenever an error in a record is identified, it must be reported and relevant site data collected where appropriate, to allow the correction of the record. If necessary, further site investigation will be arranged to resolve the error, including evidence to substantiate the reason for the correction. This process is well documented with a clear audit trail for changes made.

WWU carry out a risk-based assessment of our data, assessing against the following criteria:

1. Complexity of data sources.
2. Completeness of data set.
3. Extent of manual intervention.
4. Complexity & maturity of reporting rules.
5. Control framework.
6. Experience of personnel.
7. Evidence of historical errors with this data.

This assessment provides a risk score for data which drives intervention where there are deemed to be weaknesses.

8.2. Asset Management Information Systems

Asset information systems are essential for achieving an effective and efficient asset management system and for the continual improvement of that system. The WWU system comprises a number of software packages, with SAP as the core Asset Register and Financial Tool. Overall, the key elements are:

- SAP as the asset register.
- ESRI as the means of graphically displaying data and as a planning tool.
- Ventyx as the field tool for scheduling, work order delivery and recording tool.
- Synergee as a mathematical representation of the gas network that is used for capacity planning.
- Asset Investment Manager to model NARMS as a tool to assess probability of asset failure, consequence of failure and therefore risk.
- Business Warehouse as a means of accessing and manipulating data to support decision making.
- GL Noble Denton Applications comprising a number of small industry specific tools for the calculation of demand, prioritisation of mains risk, pipe design etc.
- WWU Control Room Applications comprising of DNCS (SCADA system), Demand forecasting tools, Business Applications, Forecaster, and various databases.
- Microsoft Applications.