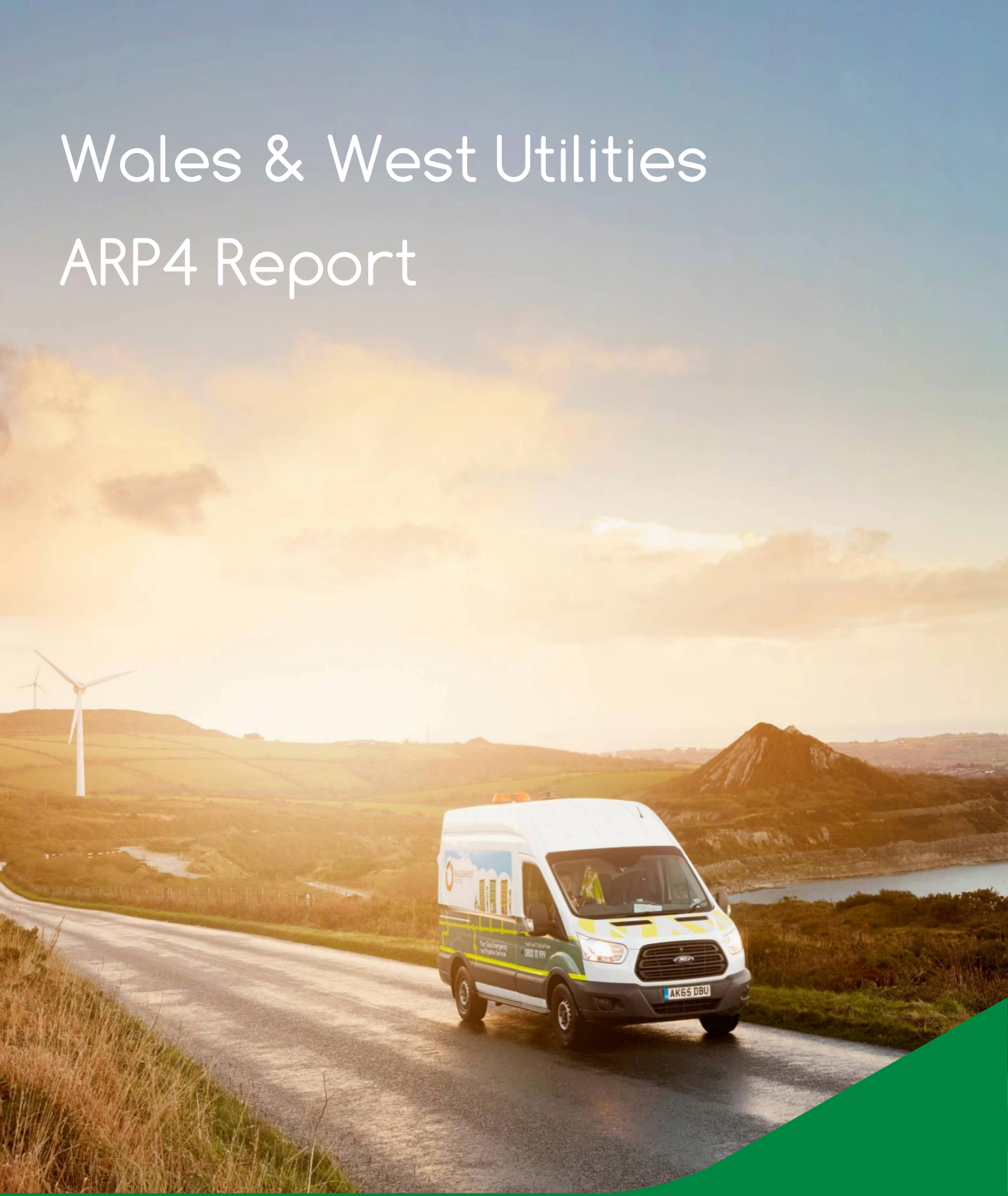
Wales & West Utilities
ARP4 Report



December 2024

WALES&WEST UTILITIES

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1. Introduction

This report is Wales & West Utilities (WWU) fourth round of adaptation reporting to the Department for Environment, Food and Rural Affairs (Defra), submitted for Adaptation Reporting Power (ARP), as introduced under the Climate Change Act 2008.

1.1 Introduction to Wales & West Utilities

WWU was launched as an independent gas distribution business in June 2005 following the sale of the gas network for Wales and the Southwest of England. With more than 35,000 km of mains, we transport gas to 2.5 million households and 100,000 businesses across a geography covering 1/6th of the UK and serving a population of 7.5 million people. We are regulated by Ofgem and the Health and Safety Executive, to deliver the following defined outputs:

- To maintain a safe and reliable network;
- To make a positive contribution to sustainability and protect the environment;
- To provide connections to supply new customers and support the connection of new gas entry points into the network;
- To meet social obligations; and
- To provide an agreed standard of service to consumers and other stakeholders.

Figure 1. Map of WWU geographical boundary.

1.2 Response to Climate Change

We have placed increasing focus on climate adaptation and resilience, both due to regulatory requirements and stakeholder awareness in emergency planning. We consider climate change through committees, documented processes and required reporting, as well as through safety cases and internal procedures.

We must consider climate adaptation requirements, to maintain and increase resilience to future climate hazards and continue to provide our defined business outputs (Section 1.1). Gas infrastructure is designed to withstand extreme conditions and due to being mostly underground, networks are inherently resilient to extreme weather. However, network components above ground have already been affected by climate hazards, with impacts to the physical network and service provision already occurring (Section 4.2.2). The impacts may affect customers, employees and stakeholders (directly and indirectly) and in extreme circumstances may hinder our ability to meet our

outputs. Climatic variables that our network is particularly vulnerable to include precipitation, temperature, and wind, as identified in previous climate change risk assessments. Key hazards include seasonal changes in average rainfall, prolonged periods of warm or hot weather and extreme high temperatures, and increased intensity and frequency in heavy rainfall events. The approach to climate risk assessments and the latest findings are detailed in Section 4.

Financial allowances are agreed in funding cycles to deliver approved work streams and any future adaptation actions identified will be subject to these funding mechanisms.

1.3 Report Scope

The objective of the report is to outline our approach to climate risk management and adaptation. This report builds on previous ARP Reports (Section 2), and details new objectives, changes and developments the business has made since the previous reporting round.

This report is in alignment with ARP guidance provided by Defra and aims to outline:

- Previous report findings and WWU's maturity since the first reporting round;
- Both new and existing physical climate risks and opportunities with the potential to affect WWU as an organisation; and
- WWU's Approach to adaptation, including potential pathways and next steps.

Climate adaptation related risks to all business functions and areas are considered within the scope of this report.

Transition risks (risks associated with the transition to a low carbon economy such as changes associated with legislation, government or regulator policy, societal changes and technological developments) have not been included within this report.

1.4 Structure

Chapter 2 ARP Reporting: Defines and outlines how ARP was established and provides a summary of our first, second and third round of ARP reports.

Chapter 3 Governance, Management and Strategy: Describes our approach to governing climate risk and considers the collaboration with external stakeholders.

Chapter 4 Risk Assessment and Profile: Reports on the risk methodology, the changes to risk profile from ARP3 and provides a summary of all the notable risks identified in the report.

Chapter 5 Interdependencies and Cascading Risks: Includes a detailed overview of the notable interdependent risks to WWU and how these risks will be approached and addressed appropriately.

Chapter 6 Adaptation Action Plan and Implementation: how we will develop the plan in co-ordination with the Climate Resilience Strategy, drawing upon our best approaches used in previous ARP cycles and learning from others.

Chapter 7 Summary

2. ARP Reporting

2.1 Introduction to ARP Reporting

The Climate Change Act 2008 provides the framework for ensuring the UK's ability to adapt to climate change. Defra established an 'Adapting to Climate Change Programme' and in November 2009 laid a strategy before Parliament for using the Adaptation Reporting Power (ARP) under the Act. Under the ARP, the Secretary of State directs reporting organisations (those with functions of a public nature or statutory undertakers) to report on how they are addressing current and future climate impacts. Reports should detail:

- The current and future projected impacts of climate change on their organisation.
- Proposals for adapting to climate change; and
- An assessment of progress towards implementing the policies and proposals set out in previous reports.

As one of the five UK Gas Distribution Network Operators (GDNs), Defra have requested that we report under this act. Currently, it is not a mandated requirement for WWU to produce an ARP report, however in line with best practise and industry peers, we voluntarily produce, submit and share our ARP reports publicly.

2.2 First Round

Our first ARP report, ARP1, was published in 2011. The report assessed six climate hazard themes: (1) flooding and heavy rainfall, (2) snow and ice, (3) increases in temperature, heat waves and drought conditions, (4) coastal erosion from sea level rise, (5) river erosion and (6) storm events. This risk assessment and report used climate data from the UKCP09 dataset, which has since been replaced by UKCP18. The risk assessment did not classify any risks as 'high'.

2.3 Second Round

The second round of ARP was published in 2015. Similarly to ARP1, ARP2 highlighted the same risks and relied on data from UKCP09. ARP2 also included information on uncertainties, interdependencies and monitoring, building on the findings of ARP1. ARP2 did not identify or include climate related opportunities or financial benefits of adopting climate resilient adaptation strategies (WWU ARP3, 2021).

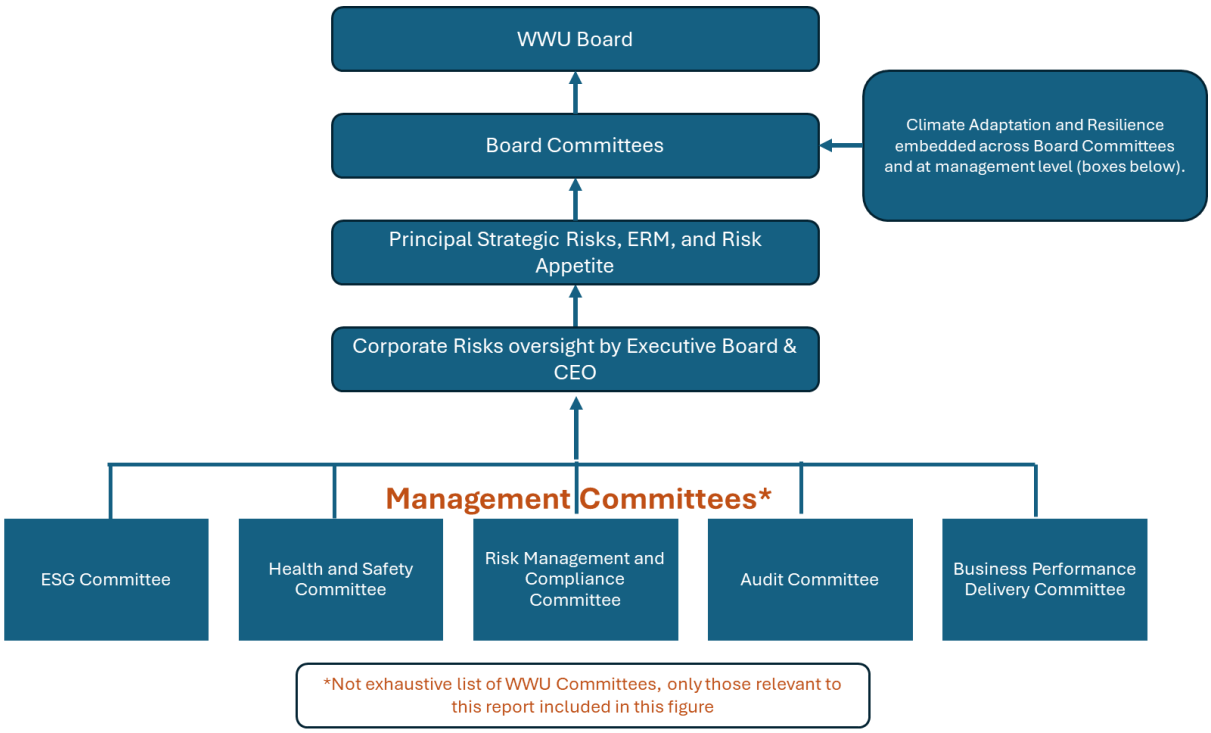
2.4 Third Round

ARP3 included an improved understanding of the climate hazards and risks identified in the first and second round reports. The risk assessment methodology for ARP3 used the latest climate modelling from UKCP18, and updated baseline (1981-2000), in line with best practice. Unlike our previous assessments, ARP3 aligned to our Business Risk Model (BRM). To allow for comparison, ARP1 and ARP2 risk assessments were also realigned to this model. The ARP3 assessment identified WWU is particularly vulnerable to seasonal changes to rainfall and extreme temperatures (WWU ARP3, 2021).

3 Governance, Management and Strategy

3.1 Governance

Our governance structure allows for a top-down and bottom-up approach to climate risk management.



The Board

The Board is responsible to the shareholders for all aspects of the Group's and Company's performance and meets on a bi-monthly basis to review the strategic direction of all business activities and monitor performance against approved business plans and budgets. The Board is responsible for identifying the major business risks faced by the organisation and appropriate response to these risks.

Risk Management and Compliance Committee

The Risk Management and Compliance Committee, as a committee of the Board, operates under delegated authority to discharge responsibility on their behalf. The Board is responsible for reviewing the effectiveness of control of WWU's key business risks. The Risk Management and Compliance Committee has been established to assist both executive and non-executive Directors in fulfilling its oversight responsibilities. The Risk Management and Compliance Committee assists with the following:

- overseeing the risk profile and risk management function of the Company and compliance with obligations determined by statute, legislation, regulations, contracts, or agreement;
- reviewed the development and implementation of the compliance and risk management programme and processes – a review of the effectiveness of the programme will follow in future meetings;
- received regular reports at its meetings outlining the status of those risks and management's action plans to mitigate such risks;

ESG Management Committee

The ESG Management Committee reviews the Company's strategic Environmental, Social and Governance reporting compliance including climate change adaptation and resilience as it relates to mandatory financial reporting frameworks. It also considers the integration of climate adaption into the Sustainability Strategy considering the related environmental and social challenges and opportunities. The Committee is chaired by the Chief Executive Officer and reports directly to the Board ESG Committee which in turn reports to the full Board.

Business Performance Delivery Committee

The impacts of climate hazard events across all business functions would be reported at this committee with the opportunity for cross-business discussion on how our systems responded and the lessons learnt.

Risk Registers

Within the organisation, the risk management process is based on assessments of operational (including health and safety), regulatory, financial, and other business or project risks. Key business departments prepare and maintain their own risk registers that capture their key risks and the actions being taken to manage them. These risk registers support the organisations strategic risk register; this incorporates risks that are viewed as important to the organisation from an ongoing risk management and mitigation perspective.

We are currently integrating climate risk into the strategic risk register. In addition, Environment and Climate Change is identified as one of the seven strategic risks.

Day-to-day Risk Management

We appointed a Sustainability and Environment Manager in January 2023. This role leads the work on climate resilience and relies heavily on collaboration with the Asset Integrity, Asset Strategy, and Health and Safety teams with additional support from Facilities, Estates, and Procurement. The Sustainability and Environment Manager is the document owner for the Aspects and Impacts, and Risks and Opportunities registers that underpin the Environmental Management System (EMS). This is certified to ISO14001 and ensures that these documents include climate hazards and relevant risk controls. The Aspects and Impacts register will be updated to be coherent with the 2024 ARP climate risk register.

In addition to the formal channels for managing climate risk and opportunity, climate risks are also considered in standard WWU approaches such as during inspection and maintenance operations. Some examples of this include major infrastructure, the land remediation programme and asset management.

3.2 Examples of Risk Management in Practice

Major Infrastructure

The Capital Delivery team at WWU consider resilience of major new infrastructure and gas main diversions through consultation with internal subject matter experts (SMEs) and consultants. Resilience is considered within civil engineering standard practice at WWU, for example reviewing potential flood risk of future design schemes. These considerations are not currently captured in a formal adaptation record; there is an opportunity to document these as we develop our formal governance and accountability on climate risk, resilience and adaptation. Current major project design requirements include avoidance and mitigation of deleterious impacts on nature, as well as avoidance of and adaptation to predicted climate related impacts, such as subsidence or ground movement.

Land Remediation Programme

We own a portfolio of 169 former gas production and gas holder sites which historically contained various hazards such as heavy oils, tars and asbestos. We have a duty of care to ensure these assets do not pose a risk of significant harm to human health, controlled waters (surface and groundwater bodies) and the environment. Ninety-six of the sites have been assessed as currently not posing an unacceptable risk to human or environmental health; for example, by removing the risk of transport of contaminants by raised water levels. The condition of the remaining seventy-three sites is monitored and the sites maintained as part of a rolling annual land management programme. The programme focuses on any changes to risk status which would include changes resulting from climate-related events or conditions. Any required intervention is undertaken by specialist contractors.

By default, all site investigations include a request that consulting land remediation specialists consider the impacts of climate hazards on any contamination present. This is reviewed against possible impacts under a high emissions scenario, using RCP8.5 (90th percentile). Remediation work must also ensure durability, accounting for the predicted effects of climate change. The default instruction to Contractors is: “The environmental improvement works implemented should provide a durable solution which should take into account reasonably foreseeable effects of climate change.”

Asset Management

Our Asset Management team (comprising the Asset Integrity and Asset Strategy business units) evaluate climate change impacts on their maintenance and inspection programme, with adaptation considered a core component of ongoing asset management. We were the first gas network to achieve accreditation to ISO 550001 and have continued to maintain compliance since. The recently updated standard (ISO 550001:2024) advances asset management by explicitly requiring organisations to consider climate change when determining relevant internal and external issues.

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. Each class of asset has its own performance metrics that account for the conditions within which the asset operates. For example, below 7bar Special Fittings, Supports & Crossings:

WWU has an estimated 1,304 special crossings associated with the below 7bar distribution system. They transport gas above ground across obstacles or geographical features, i.e. streams, canals, carriageways and railways. 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. 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.

Health and Risk Indices have been calculated for these assets based on a combination of the likelihood and consequence of failure; the scores are based on an individual assessment of the special fitting, support or crossing and identify if further detailed inspection is required. The results of the detailed inspection will identify what intervention is required. Intervention options may include replacement or removal or maintenance activities to ensure suitability of continued operation. 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.

3.3 Plans, Strategies and Reporting

Since 2024 we have been required by the regulator, Ofgem, to publish and maintain a Climate Resilience Strategy. Existing plans, strategies and reports (listed below) consider and reference climate change, risk and adaptation.

Strategy: Sustainability Strategy (April 2023)[1] for 2023-2050
Overview of Strategy: The Sustainability Strategy has been developed in line with UN Sustainable Development Goals (SDG), in particular UN SDG13, Climate Action. The strategy acknowledges the challenges climate change presents to WWU and its operations, and states network resilience is a crucial consideration for WWU and its stakeholders. The Strategy commits that WWU will work to evaluate how climate change will impact its assets and operations by carrying out risk assessments to support long-term planning.

Report: Annual Environmental Report (2023-2024)[2]
Overview of Report: In line with the Sustainability Strategy 2023, the Annual Environmental Report outlines the pressing environmental impacts facing WWU. The Annual Environmental Report details WWU's environmental action plan commitments, including to 'Update our climate risk management with the latest government issued climate change projections' with a target year of 2026, as well as signposting to this ARP4 report.

Plan: Business Plan for 2021 - 2026[3]
Overview of Plan: Under the theme of 'responsible business', WWU have an ambition to 'reduce our negative impact and increase our positive impact on the environment'. A focus area of this is to analyse climate change adaptation methods for assets.

Strategy: Climate Resilience Strategy (2026-2031 and subsequently to 2050)[4]
Overview of Strategy: Summarises position as per this report and identifies strategic actions to be implemented in co-ordination with the Adaptation Action Plan to address medium to long-term adaption and resilience. The Strategy will be updated on a five yearly cycle concurrent with price controls and will help to guide evidence building for necessary investment, ensuring alignment with the evolving national strategy on infrastructure resilience.

3.4 Climate Resilience Strategy and ARP

This ARP report aims to identify key physical hazards and associated risks to WWU and provide an overview of the adaptation measures that address those. The ARP reports aim to build on each other, as well as note changes and progress since the previous reporting cycle. The ARP4 report and the Climate Resilience Strategy (CRS) have been developed in tandem, with this report providing the technical evidence base to the CRS. The CRS considers the physical risks and adaptation measures identified in ARP4, along with transitional assessments and wider carbon and sustainability considerations. The CRS details actions and considerations for the next price control period, supporting investment justification.

[1] https://www.wwutilities.co.uk/media/4824/sustainability-strategy-2023.pdf
[2] wwu-2023-24-annual-environmental-report.pdf
[3] 3-wwu-business-plan-december-2019.pdf
[4] 49-climate-resillience-strategy.pdf

3.5 Collaboration and Engagement

We collaborate and engage with a number of external stakeholders, working groups and forums to share best practice. Recent and ongoing collaboration around climate risk, management, adaptation and resilience includes:

- We have been a member of the Energy Networks Association (ENA) cross sector Climate Change Reporting Adaptation Group. While the gas networks have left the ENA (as of 2024), we intend to continue collaboration on climate resilience. Energy Networks Association (ENA) is a group that “represents the energy networks in the UK & Ireland”. ENA are responsible for safety, environment, engineering, network resilience and external affairs.
- We also participate in the CS-Now Project, a global research initiative that aims to educate and inform businesses and practices about climate resilience strategies. The programme, which began in 2021 and is scheduled to end in 2025, has proven effective in disseminating current knowledge.
- WWU is a member of the Infrastructure Operators Adaptation Forum (IOAF) which helps members understand infrastructure in the context of climate resilience. The IOAF hold a workshop every 6 months, to inform members on industry updates.

Our involvement in sector specific forums and associations demonstrates our commitment to learning from peers and partners, sharing best practice and lessons learned. In addition, we work with external consultants and subject matter experts where required and maintain a running dialogue with our Independent Stakeholder Group and Citizens Panel to ensure that our work on adaptation and resilience encompasses the needs of customers.

3.6 Guidance and Standards

We do not currently consider climate adaptation standards formally, and instead rely on collaboration and engagement with groups such as IOAF as a source of further guidance. Relevant climate adaptation guidance and standards will be considered and integrated into our Adaptation Action Plan (Section 6), such as principles of ISO14090, ISO14091 and sector specific climate resilience and adaptation research.

4 Risk Assessment and Profile

4.1 Risk Assessment Methodology

The latest climate risk assessment undertaken by WWU builds upon the existing risk profile. For ARP3, we utilised the outputs of a physical risk assessment commissioned by ENA and delivered by the Met Office in 2021 using UKCP18 data. These risks were scored through an internal stakeholder workshop using the risk methodology described below. The key risks identified were increases in average and extreme temperatures in summer and seasonal changes in average rainfall.

For ARP4, we procured technical support from Frazer-Nash Consultancy (Frazer-Nash) to support an update to this assessment, reviewing the risk profile and scoring. Frazer-Nash facilitated a workshop with the Sustainability Manager, which was attended by key stakeholders from across the business, namely Asset Management, Operations, Net Zero, Health and Safety, Procurement, Facilities, System Management, and Corporate Environment.

The workshop consisted of the following key tasks:

- Stakeholders reviewed the existing risks identified in ARP1 – ARP3 and considered, where relevant, additional risks to add to the risk register.
    - Using WWU risk scoring criteria for likelihood and consequence (Section 4.1.1), scores were allocated for each risk under three scenarios (Section 4.1.2). The scenarios selected align with Defra ARP guidance and considered three time horizons: short term (GD3), medium term (mid-century) and long term (end of century).
    - Following the workshop, risk owners were responsible for completing the scoring for any outstanding risks. A nominated stakeholder from each group maintained a record of key assumptions, that will support further characterisation of risks and adaptation actions within the register (Appendix A).

Further detail on the methodology and results are provided in the following sections.

4.2 WWU Risk Scoring Criteria

The scoring criteria used in this assessment (Figure 2 and Figure 3) were correct at the time of the workshop and scoring process (June 2024). We have since updated our Enterprise Risk Management (ERM) and risk governance process (September 2024), with updated scoring criteria for both likelihood and impact. We aim to update and align this assessment, where relevant, to the updated ERM strategy in the next major risk scoring review in 2027 (in anticipation of or aligned with ARP5) and with annual minor reviews up to that date.

Our likelihood scoring matrix (Figure 2) provided scores from 1 – 5, indicating likelihood of occurrence as ‘Rare’ to ‘Almost Certain’, respectively. In addition to likelihood, stakeholders assigned consequence scoring, using our corporate risk scoring matrix (Figure 3). Consequence may materialise differently according to categories for financial cost, safety, reputation, environment, and security of supply. Consequence is graded 1 – 5, ‘Insignificant’ to ‘Serious’, respectively.

Figure 2. WWU Likelihood Matrix

Likelihood Matrix		
5 Almost Certain	More likely to occur than not, one or more a year	> 90 % chance
4 Likely	Significant chance of occurring, < once in 5 yrs.	> 60% & < 90% chance
3 Possible	Will probably occur, < once in 10 yrs.	> 40% & < 60% chance
2 Unlikely	Unlikely to occur, < once in 15 yrs.	> 10% & < 40% chance
1 Rare	May occur in exceptional circumstances, < once in 20 yrs.	< 10 % chance

Figure 3. WWU Consequence Matrix

	1	2	3	4	5
Consequence Matrix	**Insignificant**	**Minor**	**Moderate**	**Significant**	**Serious**
Financial: (impact on 'operating profit')	<£500k	£500k - £1m	£1m - £10m	£10m - £20m	>£20m
Safety	Minor injury / Near miss / Negligible	Lost time injury / HSE Letter of Concern	Major injury e.g. RIDDOR reportable	Fatality / HSE Enforcement notice	Multiple fatality / HSE Enforcement notice
Reputation	Negligible	Local press, low running order. Actions criticised in forums	Industry press. Negative reaction in national forums, supported by Regulator	Local TV (terrestrial) or low running order in tabloid press. Reputation impacted, minor reduction in value of company	National media, TV / newspapers. Failure to address breach of license. Company reputation impacted, significant drop in value of company
Environment	Negligible environmental impact	Minor impact e.g. localised spillage	Major environmental incident e.g. contamination of water courses/EA letter of concern	EA enforcement notice / improvement notice	EA Prohibition Notice
Security of Supply		Interruptible supplies disrupted / negligible disruption	Tariff customers in Distribution Networks disrupted (multiple I&C &/or >250 domestics)/ Short term system failure.	Distribution Networks disrupted / major outage for significant period of time	NTS disrupted / total system outage for a lengthy period of time

Table 1. WWU Risk Scoring Matrix, Likelihood (1-5) and Consequence (1-5)

	Consequence				
	1	2	3	4	5
Likelihood	Insignificant	Minor	Moderate	Significant	Serious
5 Almost Certain	5	10	15	20	25
4 Likely	4	8	12	16	20
3 Possible	3	6	9	12	15
2 Unlikely	2	4	6	8	10
1 Rare	1	2	3	4	5

Table 1 shows the risk matrix, combining scores for likelihood and consequence for a particular risk. This report discusses risks as low, medium, high or very high, which have been classified using the following risk scores:

- Low risk – Scored between 1 and 4 inclusive.
- Medium risk – Scored between 5 and 10 inclusive.
- High risk – Scored between 12 and 15 inclusive; and
- Very high risk – Scored between 16 and 25 inclusive.

4.3 Scenario analysis

In order to undertake an assessment of risks and opportunities of possible future climatic conditions, we must be informed on what the future climate may be, and the uncertainty associated with this. Climate scenario analysis is used to explore what a future world would look like as a result of the physical, technological and socioeconomic changes associated with a changing climate and low carbon transition. This supports the identification of potential future impacts upon a business, sector or country under a range of future states.

ARP4 provides guidance on climate scenarios and analysis, to facilitate a more consistent approach to risk assessments by those reporting. ARP4 guidance for reporting organisations states:

- Organisations should state timeframes and levels of warming used to generate climate scenario data used within risk assessments.
- Scenarios should consider present day (near-term), mid-century (medium-term) consistent with a 2°C rise end of century (long-term) with a 2°C rise and end of century (long-term) consistent with a 4°C rise.
- Organisations may choose to examine longer timescale impacts, or impacts associated with greater levels of warming. Scenarios used in this case must be described.
- Organisations should state if information used derives from national climate information or specific local information.
- Organisations must detail how they have explored inherent modelling uncertainty. For example, have a range of model outputs been considered (e.g. the 10th to 90th percentiles), or has the worst case (90th percentile only) been considered for a more conservative approach.

ARP4 scenario selection

We have scored risks against four scenarios, which encompass the timeframes and levels of warming recommended within the ARP4 guidance.

Time horizons: Scenarios consider the present day (near-term - inclusive of the GD3 pricing period), mid-century (medium-term) and end of century (long-term).

Levels of warming: Climate projections for physical hazards have been selected that are consistent with a 2°C rise by mid-century, and a 2°C rise and a 4°C rise by end of century, respectively.

Data: A comprehensive quantitative climate analysis was undertaken by the Met Office on behalf of the ENA, to inform ARP3. In recognition of the shorter reporting window, Defra guidance to reporting organisations stated ARP4 should focus on updates since the previous reporting round. Given this guidance, further quantitative climate analysis of key hazards has not been undertaken for ARP4. To inform scoring, stakeholders were provided with a briefing pack that summarised the climate projections for key hazards under the relevant time horizons and levels of warming. This collated publicly available data on national and regional projections from reputable sources including UK Climate Resilience Programme, UKCP18 science reports, Met Office data visualisation tools, and Welsh Government publications. The modelling uncertainty associated with these projections were

also presented, most commonly with the 10th to 90th percentile range. Where possible, data was presented for multiple future emissions scenarios (Representative Concentration Pathway (RCP)). RCP4.5 in the medium term and RCP8.5 in the medium and long term.

Out of scope

In ARP4, we have not considered:

- Longer timescale or greater warming levels; they are not considered appropriate to the business or its operations.
- Risk scoring under a high impact, low likelihood (HILL) scenario; we have not undertaken quantitative analysis or qualitative review of such scenarios at this stage. This will form part of the Climate Resilience Strategy activities in RIIO-GD3.

4.4 Results

In line with Defra guidance for ARP reporting, Section 4.2.1 summarises the main changes in the WWU risk profile since ARP3. A more detailed summary of the ARP4 assessment outputs is provided in Section 4.2.2.

4.5 Changes to Risk Profile

As a result of the latest risk assessment, 21 risks were added to the climate change risk register. Following a period of extreme heat in the summer of 2022, we reviewed vulnerability specific to this hazard and concluded that extreme temperatures (specifically high temperatures and its associated potential impacts) were not prioritised sufficiently in the ARP3 risk assessment. This is reflected in ARP4, where extreme heat contributes to 50% of the newly added risks.

The majority of the newly identified risks are attributed to precipitation and temperature related hazards, which account for 33% and 47% respectively. Other key climate variables include sea level rise and wind.

Of the new risks identified in ARP4, fifty two percent are owned by 'Operations'. The other owners include, 'Asset Integrity', 'Facilities' and 'HS&E'. Table 3 further breaks down the newly identified risks by scenario. The table shows the majority of the new risks are considered high in both the short term and mid-term for example, in the short term there were zero very high risks, 1 high risk, 18 medium risks and 3 low risks. The large number of new medium risks were predominantly under the risk owner 'Operations'. The refreshed Adaptation Action Plan from 2025 will ensure that operational procedures will account for this raised risk profile.

Table 2. New risks added in ARP4, by scenario and risk rating.

	GD3 2031	Mid Century +2 Scenario	End Century +2 Scenario	End Century +4 Scenario
Number of very high risks	0	1	2	8
Number of high risks	1	1	10	7
Number of medium risks	18	19	9	6
Number of low risks	2	0	0	0

4.6 Overview of Climate Risks

The risk assessment identified risks to physical assets, staff and customers, and to processes that maintain a safe and effective network. The assessment also identified cascading risks where climate hazards produce cascading consequences across integrated systems, and systemic risks where vulnerabilities are inherent in procedure and governance. This report details risks associated with physical changes in the climate only. Risks relating to the transition to the low carbon economy (termed transitional risks) have not been scored in this assessment.

In the ARP4 assessment 109 risks were identified. The full risk register is provided in Appendix A. The main climate variables considered were precipitation, temperature and wind. Others included: sea level, cloud cover, humidity, and lightning. The key hazards associated with each climate variable are:

- Precipitation: Increased intensity and frequency in heavy rainfall events resulting in increase in surface water flooding, seasonal changes in average rainfall resulting in fluctuations to peak water in rivers, river flows and shape and pro-longed periods with less than average or no rainfall.
- Temperature: Increases in annual mean temperature, seasonal average and extreme temperatures in summer, as well as prolonged periods of hot weather.
- Wind: Increased intensity and frequency of strong winds.
- Sea Level Rise: Sea level rise resulting in increased coastal flooding or increase in ground saturation and rise in the water table with salt inundation.
- Cloud Cover: Increase in seasonal cloud cover resulting in decrease in sunlight.
- Humidity: Increases in annual mean humidity resulting in increased moisture in the atmosphere.
- Lightning: Increasing frequency of lightning strikes.

The number of risks by type is summarised in Table 3 below. This outlines that precipitation hazards make up the majority of the number of risks (39%), followed by temperature hazards (27%), wind hazards (8%) and sea level rise (10%).

Table 3. Number of risks per hazard type

Precipitation	Temperature	Sea Level Rise	Cloud Cover	Humidity	Lightning	Wind	Multiple
42	29	11	5	3	2	9	8

Table 4 outlines the risks identified in ARP4 by severity. There is a significant increase in the number of risks considered very high by end of century, under the 4°C scenario.

Table 4. Number and type of risk against climate projections

	GD3 2031	Mid Century +2 Scenario	End Century +2 Scenario	End Century +4 Scenario
Number of very high risks	1	2	4	24
Number of high risks	6	16	31	30
Number of medium risks	46	55	38	25
Number of low risks	56	36	36	30
Total	109	109	109	109

The information below provides specific analysis of risks by the three most prevalent hazard types, precipitation, temperature and wind.

Precipitation

Climate Risks: These include an increased number and size of fractures of metallic structures, damage to site assets, restricted access to National Transmission System (NTS) Offtakes in emergency scenarios and the submersion of pipes after periods of heavy rainfall.

Business Areas Affected: Operations and Asset Integrity.

Narrative of Key Vulnerabilities: Damage to electronics is a key vulnerability as precipitation patterns worsen, since an increase in intensity and frequency of rainfall will lead to operating difficulties. This is noted as a key concern when equipment is needed in emergency situations.

Table 5. Medium and high risks associated with precipitation hazards.

Risk Code	Hazard	Risk	Risk Score End of GD3	Risk Score Mid Century +2 Scenario	Risk Score End Century +2 Scenario	Risk Score End Century +4 Scenario
P01	Increase in frequency extreme wet days resulting in an increase in ground movement	Pipes becoming exposed increasing risk of corrosion and damage	8	15	15	18
P03	Increased intensity and frequency in heavy rainfall events resulting in increase in surface water flooding	Difficult to access to >7bar Pressure Reduction Installations in emergency situations	9	12	12	16
P05	Increased intensity and frequency in heavy rainfall events resulting in increase in surface water flooding	Difficult access to NTS Offtakes in emergency situations	9	12	12	16
PO6	Increased intensity and frequency in heavy rainfall events resulting in increase in surface water flooding	Operating difficulties due to loss of electrics on NTS Offtakes	3	8	8	12
PO7	Increased intensity and frequency in heavy rainfall events resulting in increase in surface water flooding	Difficult access to <7bar Pressure Reduction Installations in emergency situations	6	9	9	12
P11	Increased intensity and frequency in heavy rainfall events resulting in increase in peak water in rivers, fluvial flooding	Difficult access to >7bar Pressure Reduction Installations in emergency situations	9	12	12	16
P12	Increased intensity and frequency in heavy rainfall events resulting in increase in peak water in rivers, fluvial flooding.	Difficult access to NTS Offtakes in emergency situations.	9	12	12	16
P13	Increased intensity and frequency in heavy rainfall	Operating difficulties due to loss of electrics on NTS	3	6	9	12

Risk Code	Hazard	Risk	Risk Score End of GD3	Risk Score Mid Century +2 Scenario	Risk Score End Century +2 Scenario	Risk Score End Century +4 Scenario
	events resulting in increase in peak water in rivers, fluvial flooding	Offtakes leading to lack of communications				
P14	Increased intensity and frequency in heavy rainfall events resulting in increase in peak water in rivers, fluvial flooding	Difficult access to <7bar Pressure Reduction Installations in emergency situations	6	9	9	12
P19	Increased intensity and frequency in heavy rainfall events resulting in increase in surface water flooding	Operating difficulties due to loss of electrics on >7bar Pressure Reduction Installations	8	8	15	20
P21	Increased intensity and frequency in heavy rainfall events resulting in increase in surface water flooding	Critical staff can't get to work resulting in low workforce availability and extended emergency response time	10	8	15	20
P22	Seasonal changes in average rainfall resulting in fluctuations to peak water in rivers, river flows and shape	Under river pipes become exposed and damaged leading to loss of supply	8	15	15	15
P23	Seasonal changes in average rainfall resulting in fluctuations to peak water in rivers, river flows and shape	Pipes parallel to rivers become exposed and damaged from meandering leading to loss of supply	8	15	15	18
P26	Seasonal changes in average rainfall resulting in increase in winter ground saturation	Pipes submerged in water-logged ground, large diameter pipes floating in peatlands	2	6	6	12
P28	Seasonal changes in average rainfall resulting in an increase in ground movement	Pipe movement will increase, increasing stress on gas assets resulting in damage	8	15	15	24
P31	Seasonal changes in average rainfall resulting in changes in surface water flooding patterns	Depot drainage insufficient to cope with water volume resulting in flooding	9	9	9	16
P36	Seasonal changes in average rainfall resulting in wetter working conditions	Difficulties with trench water causing difficult working conditions leading to long work completion times	12	9	9	16

Risk Code	Hazard	Risk	Risk Score End of GD3	Risk Score Mid Century +2 Scenario	Risk Score End Century +2 Scenario	Risk Score End Century +4 Scenario
P37	Seasonal changes in average rainfall resulting in increase in winter ground saturation	Corrosion increase to pipes, effect on cathodic protection leading to damaged pipelines and loss of supply	12	12	12	20
P38	Seasonal changes in average rainfall resulting in decrease in summer ground saturation	Increase in gas escapes due to changes in ground conditions causing gas mains to fracture and loss of supply	12	12	12	16
P39	Pro-longed periods with less than average or no rainfall	Resulting in ground movement putting additional strain on joints leading to damage	8	15	15	18
P41	Occurrence of snow / ice falls and accumulation	Inability of teams to access work sites leading to supply and work disruption	8	8	12	12
P42	Occurrence of snow / ice falls and accumulation	Inability of teams to access emergencies leading to supply loss and a higher risk of leakage/explosion	10	8	20	15

Temperature

Climate Risks: Some examples include: an increase in annual temperature, the frequency and duration of extreme temperatures and a greater range in temperatures. Temperature related risks are the second highest category in the WWU risk profile.

Business Areas Affected: Asset integrity, facilities, operations and IT and cyber.

Narrative of Key Vulnerabilities: The most significant vulnerabilities are grouped into two sections: infrastructure and workers. In terms of infrastructure an increase in extreme temperatures will cause overheating of vehicles, impact pressure testing and processes such as electrofusion. Regarding workers, heat exhaustion will be an increasing risk requiring PPE to be more adaptable.

Table 6. Medium and high risks associated with temperature hazards.

Risk Code	Hazard	Risk	Risk Score End of GD3	Risk Score Mid Century +2 Scenario	Risk Score End Century +2 Scenario	Risk Score End Century +4 Scenario
T01	Increase in annual mean temperature	Increased demand for cooling at IT server data centre to prevent hardware shutdown	3	6	4	12
T03	Increase in annual mean temperature	Change to the specific gravity of gas resulting in inaccurate results of readings	6	8	12	16
T05	Increases in seasonal average and extreme temperatures in summer	Overheating of vehicles resulting in higher emissions	6	8	12	16
T07	Increases in average and extreme temperatures in summer	Heat exhaustion of Critical Staff leading to depletion of workforce	8	12	20	20
T08	Increases in average and extreme temperatures in summer	Requirements for changing into appropriate PPE this may not suit the current weather conditions resulting in increased health risks of colleagues	6	6	12	12
T09	Increases in average and extreme temperatures in summer	Evaporation of stored chemicals resulting in significant health risks to workforce	3	6	9	12
T11	Increases in average and extreme temperatures in summer	When conducting pressure tests on equipment a higher temperature could lead to an impact on creep calculations resulting in inaccurate readings	6	6	12	16
T14	Increase in maximum summer temperatures	High volume of PREs linked to increased No Trace events	6	6	9	12
T18	Increase frequency and or intensity of extreme hot days	High gas temperatures - real temperature increase not false alarm from instrumentation where low/no flow is indicated where instrument exposed to direct sunlight (BT)	8	8	12	16
T21	Greater range in temperatures (more frequent and intense high extremes, cold events still possible)	Tolerance range effected - Viscosity of oil causing problems with control/lock up of jet stream regulators	4	6	12	12
T22	Greater range in temperatures (more frequent and intense high extremes, cold events still possible)	Tolerance range effected - Electrofusion / Butt Welding	8	8	15	16

Risk Code	Hazard	Risk	Risk Score End of GD3	Risk Score Mid Century +2 Scenario	Risk Score End Century +2 Scenario	Risk Score End Century +4 Scenario
T23	Increase frequency and or intensity of extreme hot days	Above certain temperatures a "high temperature" epoxy needs to be specified for composite repairs.	3	6	9	16
T24	Greater range in temperatures (more frequent and intense high extremes, cold events still possible)	Tolerance range effected - Reinstatement material e.g. tar, sand, gravel performance & handling	6	6	9	12
T25	Greater range in temperatures (more frequent and intense high extremes, cold events still possible)	Tolerance range effected - External storage (shipping containers on site) - storage of substances	6	6	12	9
T26	Greater range in temperatures (more frequent and intense high extremes, cold events still possible)	Tolerance range effected - Safety and wellbeing of vulnerable customers (Priority Services Register)	4	12	12	16
T27	Greater range in temperatures (more frequent and intense high extremes, cold events still possible)	Tolerance range effected - Instrument calibration	8	8	12	12
T28	Prolonged periods of warm or hot weather	Reduced gas usage, impact how we operate the system	4	9	9	15
T29	Wildfire risk increases - all fire risk increases	Kiosks and AGIs could be engulfed in fire. Increased risk of fires occurring nearby AGIs/PRI due to foliage spontaneously setting alight during dry conditions. Increased fire risks at some depots?	4	9	9	16

Wind

Climate Risks: The key climate risks include an increased frequency of strong winds.
Business Areas Affected: Operations and Asset Integrity.
Narrative of Key Vulnerabilities: Similarly to temperature the vulnerabilities from increased wind speed and duration are apparent in both the workforce and infrastructure. For example, increased frequency of wind may damage buildings and equipment on site and put workforce more at risk when working at heights.

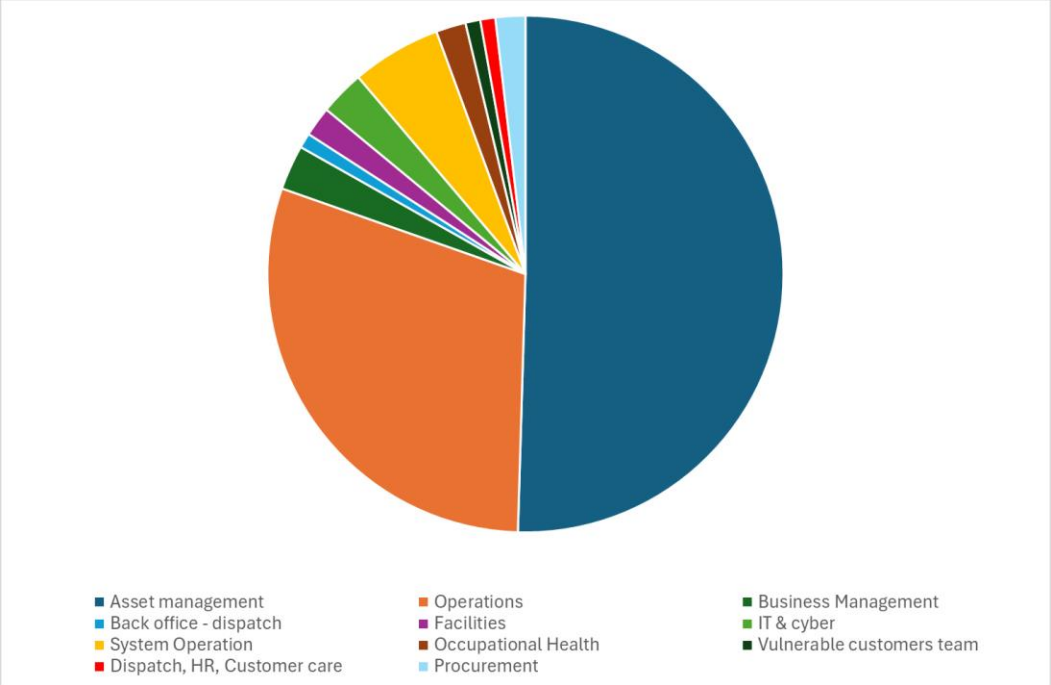
Table 7. Medium and high risks associated with wind hazards.

Risk Code	Hazard	Risk	Risk Score End of GD3	Risk Score Mid Century +2 Scenario	Risk Score End Century +2 Scenario	Risk Score End Century +4 Scenario
W01	Increased frequency of strong winds	Material blown off site resulting in contamination of lands	8	8	12	12
W03	Increased frequency of strong winds	Workers at "Working at Heights" jobs may experience occupational hazards resulting in slips, trips and falls	10	10	15	15
W04	Increased frequency of strong winds	Damage to telemetry masts, resulting in loss of data transmission to multiple sites	10	10	15	15
W05	Increased frequency of strong winds	Uprooted trees/blown material causing damage to WWU assets and staff	10	10	15	15
W06	Increased frequency of strong winds	Falling trees or structural components resulting in damage to a neighbours' property	10	8	12	15
W08	Increased frequency of strong winds	Uncontrolled movement of on-site Operational signs resulting in possible slips, trips and falls to MOPs/workers and damage to nearby properties	8	8	12	12
W10	Increased intensity and frequency in high wind	Damage to WWUs' owned buildings resulting in losing structural integrity and increasing the risk of falling debris on nearby persons	4	8	10	15

Breakdown by Primary Business Area Affected

Figure 4 shows the breakdown of risks by the business function type most immediately impacted. Cascading impacts will affect more than one area, and this will be dealt with in the Adaptation Action Plan. The figure shows of the total risks identified, 50% are related to asset management. Twenty-nine percent are related to operations, 6% to system operations, and 3% to IT and cyber. Other business areas include ‘facilities management’ and ‘procurement’. Of the newly identified risks added to ARP4, approximately half are related to operations. This may demonstrate an increased awareness of risks in this business area.

Figure 4. Breakdown of risk profile by business area affected



5 Interdependencies and Cascading Risks

One of the largest challenges when assessing climate risk is the assessment of interacting and interdependent risks. Interdependent risks occur at the point of interaction between human and physical systems, or networks. It is necessary to consider risks attributed to our wider network to gauge a holistic risk profile beyond that of primary physical risks. Similarly, cascading risks may evolve as an original single hazard produces a series of interlinked consequences. For example, localised flooding may cause physical damage to an asset, but it may also then result in restricted access for maintenance and repair and/or threats to the physical safety and well-being of employees.

We are aware of interdependent and cascading risks, having identified these in all previous ARP assessments. Interdependencies were also considered within the latest risk assessment, with colleagues reviewing and discussing potential implications and vulnerabilities to key supporting networks, including national gas transmission and electricity supply. Some interdependent and cascading risks are integrated into the latest climate risk register, for example risk P21 (Table 6). Risk P21 identifies the hazard of increased intensity and frequency in heavy rainfall events resulting in increase in surface water flooding; this may result in a risk that critical staff will not be able to travel to work due to a disruption on transport networks (illustrating interdependency with the transport sector).

5.1 Power supply

Power supply is considered a critical interdependency for our operational risks due to disruptions to power supply, although we have a degree of inbuilt resilience to mitigate this interdependency. For example, WWU's NTS offtakes have either gas fired generators or back-up diesel generators. Several of the more critical Pressure Regulating Installations (PRI) with preheating also have back-up generators. Back-up batteries are also in place at all Offtakes / PRIs to maintain telemetry and visibility to system operations in the event of a power outage.

We recognise that electricity network operators and the National Energy System Operator (NESO) continue to work to ensure that the UK electricity network, supported by the critical resilience role played by the gas system, remains one of the most reliable networks in the world, and climate change is one of the impacts considered when developing and reinforcing those networks.

5.2 Gas Demand

An indirect interdependency for WWU is the potential effect on overall gas demand from changing electricity use due to climate change. In 2024 gas fired power stations generated well over a quarter of Britain's power, and while their overall share of generation is likely to reduce in the future, they will continue to play a critical role in 2030 and beyond[5].

Warmer conditions will likely lead to increased use of air-conditioning systems, both within our own buildings and in external commercial and domestic environments, particularly in urban areas. Increased use of air conditioning will lead to a higher drawdown of gas reserves to generate power, impacting domestic supplies.

In contrast, the increased use of renewables such as solar and wind to heat and power homes and business has the potential to reduce overall gas demand.

[5] https://www.gov.uk/government/publications/clean-power-2030-action-plan

5.3 Supply Chain

Only two risks in total were scored as High for the third-round assessment. One of these was the impact on suppliers from other countries affecting the supply of materials. This is considered a High interdependent risk due to the current high level of uncertainty, multiple potential issues, and potentially significant consequences to our operations. Further clarification on the key issues will be achieved as part of the Adaptation Plan, with the potential for collaboration with the other GDNs.

Other interdependencies previously identified include the state of the transport network, where this affects our ability to access emergencies and call outs if roads become flooded or blocked, and to telecommunications due to the requirement for electronic monitoring at pressure management sites, reporting directly to the control room. We have mitigated this risk through multi-layered back up technology and we are currently acting to improve cyber security and telecommunications resilience of data flow between both the network and control room.

We also previously identified an interdependency with the Environment Agency's (EA) continued operation and maintenance of flood defences at any locations where EA and Natural Resource Wales (NRW) flood defences are a component of our understanding of flood risk and subsequent investment in flood protection. We will need to monitor plans for managed retreat or coastal reprofiling where this is co-located with our network infrastructure.

5.4 Addressing Interdependencies and Cascading Risks

To address and mitigate possible implications of interdependencies on our service provision, we collaborate with cross sectoral stakeholder groups, to improve management and planning. This is particularly strong within the gas and electricity sector, which has high levels of engagement and cooperation mediated through the ENA. To further inform our understanding of interdependencies and therefore adaptation measures required, our Climate Resilience Strategy commits us to a detailed modelling and review of the predicted climate impacts for our region in the years between 2026 and 2031 (RIIO-GD3 price control period).

We will include all interdependent and cascading risks in the risk register for ARP5. This will allow for the risks to be compared and prioritised for adaptation response. Section 6.2 details WWU's intentions to integrate and consistently capture interdependencies.

6 Adaptation Action Plan and Implementation

6.1 Pathways

In the previous ARP3 report and in line with best practice, we considered Adaptation Pathways. Pathways should consider building adaptive capacity and delivering adaptation actions. These are defined as:

- Building Adaptive Capacity: helping to understand and respond to climate change challenges. This includes measures to create new information (e.g., data collection, research, monitoring, and awareness raising); to support governance and organisational structures; and to help build resilience and recovery after events. These are low cost, no/low regret adaptation measures and it is recommended that they should start to be implemented as soon as possible as in many cases they can help in delivering adaptation actions.
- Delivering Adaptation Actions: implementing actions that help reduce climate change risks or take advantage of opportunities. To assist in prioritisation and implementation these can be divided into four sub-categories (Box 1).

We reviewed the use of Adaptation Pathways and have adopted tangible actions on flood risk management but there is an opportunity to develop further actions and pathways in RIIO-GD3. Intended next steps to develop the pathways and establish an adaptation action plan are detailed in section 6.2.

Adaptation Action categories

Operational: changes in processes and procedures, low cost, quick to develop and implement e.g., inclusion of erosion monitoring in pipeline route walks.

Grey measures: engineered/hard structural solutions such as coastal flood defences. These tend to address a single issue well, but with limited flexibility. Typically, these are higher cost with longer lead times for implementation compared to operational changes. In addition, negative secondary effects need to be managed e.g., coastal dynamics.

Green measures: ecosystem-based adaptation. These can have more positive additional benefits, but can be complex, and typically not as effective as engineered options at reducing risk; and

Hybrid: a combination of green and grey measure

6.2 Adaptation Action Plan

We do not currently have an updated formal adaptation action plan as of December 2024. This will be a priority task for 2025 to address the period 2025-2031 working in co-ordination with the Climate Resilience Strategy**.** We plan to formalise an Adaptation Action Plan that captures existing adaptation actions and develop a roadmap to build adaptive capacity within in the short term (RIIO-GD3, 2026-2031). The action plan will include detail on risk ownership and detail on monitoring and evaluation processes to allow for review in the next ARP reporting cycle. It will provide a coherent oversight of procedures within the Asset Management, Health and Safety, and Environmental management systems.

Concurrent with the adaptation action plan, our **Climate Resilience Strategy**[6] commits us to plan for longer term risks. Whilst these are anticipated to materialise in a period from the 2030s through to the end of the century, early identification and response will enable us to adapt accordingly. Timely

[6] 49-climate-resillience-strategy.pdf

identification and response will also be more cost effective than short term or reactive measures and we will make this case to the regulator with our peers in the energy industry. Our Strategy will evolve in RIIO-GD3 to identify future adaptation action workstreams. These workstreams will consider future risk and consequences, align to price control periods and business plans out to 2050, and be coherent with strategic risk appetite. The workstreams may be grouped by hazard type, ownership and may also identify the relevant adaptation action category (Box 1).

The adaptation action plan will also consider asset and network lifecycles, to consider suitability of intervention measures. For example, when considering a potential long term high risk to an asset which is in the later stages of its design life, it may be more suitable to consider asset replacement or decommissioning as alternatives to maintain and repair.

In the next ARP cycle, we will integrate interdependencies and cascading risks within the risk register, quantitively scoring risks. Although some interdependent and cascading risks are included in the register, they are not captured consistently, and therefore this will be a high priority for the next phase of work. To further strengthen understanding of these more complex risks, we will review climate risk and adaptation reports published by key supplier networks and industry peers, consult with stakeholders and subject matter experts, and procure expert advice where necessary.

7 Summary

Wales & West Utilities understands and is aware of climate related risks on its organisation and the services it provides. Climate related risks have been identified across the organisation, with potential impacts on assets and asset integrity noted as the key business area likely to be affected.

The ARP4 risk assessment built on previous work and improved on the granularity and consistent capturing of risks across all hazard types. The climate risk register continues to be an open register, with regular reviews and updates when required.

We have established next steps, to ensure risks identified are captured and responded to appropriately. A renewed Adaptation Action Plan working with a Climate Resilience Strategy will document these steps, along with suitable risk owners and pathways which best align to our risk appetite and management. The Adaptation Action Plan will address key short-term risks and vulnerabilities relevant to business continuity, asset management and health and safety. The Climate Resilience Strategy will identify the risks and responses that require longer term planning, investment and fund allocation.

We will continue to improve our climate risk governance and understanding, embedding adaptation and resilience measures into formal governance processes and keeping up to date with the latest climate science and understanding. This will be made apparent in our annual financial reports as they align to the UK Government's adoption of International Sustainability Standards Board reporting requirements.