vector

CLIMATE-RELATED DISCLOSURES 2024

About this report

This report is the Vector Limited group's (Vector or the group) first mandatory climate statement prepared under New Zealand's climate-related disclosures regime. The Vector group comprises Vector Limited and its subsidiaries. This report relates to the reporting period 1 July 2023 to 30 June 2024 and constitutes Vector's climate statement in respect of that period under the Financial Markets Conduct Act 2013 (FMCA).

Under the FMCA, Vector is required to produce climate statements that comply with the Aotearoa New Zealand Climate Standards (NZCS) 1, 2 and 3 issued by the External Reporting Board (XRB). Accordingly, this document has been prepared in compliance with NZCS 1, 2 and 3, and covers four thematic areas: governance, strategy, risk management, and metrics and targets.

The intended primary users of this report, are existing and potential investors, lenders and other creditors.

This report is published as part of a reporting suite, which also includes our 2024 greenhouse gas emissions inventory report, and annual report. All three reports are available at vector.co.nz/investors/reports.

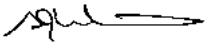
Given this report relates to the FMCA and NZCS requirements, it necessarily differs from earlier Vector reports prepared voluntarily in response to the recommendations of the taskforce on climate related financial disclosures.

Unless the context otherwise requires, all references in this report to we, us, our and Vector should be interpreted to relate to the Vector group.

Approved on behalf of the Board on 26 August 2024.

Doug McKay

Chair



Anne Urlwin

Chair, audit committee

Adoption provisions

Vector has elected to use the following NZCS2 adoption provisions for this FY2024 report. This means the disclosures in this report do not cover these aspects of the NZCS, though some information is provided to maintain consistency with Vector's wider disclosures.

Adoption provision 1: Current financial impacts

Adoption provision 2: Anticipated financial impacts

Adoption provision 3: Transition planning

Disclaimer

This report is not earnings guidance or financial advice for investors. Rather, this report provides a summary of Vector's current understanding of, and response to, climate-related risks and opportunities, and Vector's current climate-related governance, risk management, strategy, metrics and targets. The report reflects Vector's current understanding as at 26 August 2024, in respect of the 12 months ended 30 June 2024.

Climate-related risk management is an emerging area, and often uses data and methodologies that are developing and uncertain. Vector acknowledges that the understanding of climate risk, and the inputs to assist with this understanding are constantly evolving.

Vector (including its directors, officers and employees) do not:

- represent that the statements, intentions and/or opinions contained in this report will not change, or will remain correct after publishing this report, or
- promise to revise or update those statements and opinions if events or circumstances change or unanticipated events happen after publishing this report.

Vector is committed to progressing our response to climate-related risks and opportunities over time but is constrained by the novel and developing nature of this subject matter. In particular, the statements contained in this report involve assumptions, forecasts and projections about Vector's present and future strategies and Vector's future operating environment. Such statements are inherently uncertain and subject to limitations, particularly as inputs, available data and information are likely to change. As such, Vector cautions reliance on climate-related forward-looking statements that are necessarily less reliable than other statements Vector may make in its annual financial reporting.

The risks and opportunities described in this report, and Vector's strategies to achieve our targets, may not eventuate or may be more or less significant than anticipated. There are many factors that could cause Vector's actual results, performance or achievement of climate-related metrics (including targets) to differ materially from that described, including economic and technological viability, climatic, government, consumer, and market factors outside of Vector's control. Vector gives no representation, warranty or assurance that actual outcomes or performance will not materially differ from the forward-looking statements.

To the maximum extent possible under New Zealand law, Vector (including its directors, officers and employees), does not accept and expressly disclaims any liability whatsoever for any direct, indirect or consequential loss or damage occasioned from any use or inability to use the information contained in this report, whether directly or indirectly resulting from inaccuracies, defects, errors, omissions, out of date information or otherwise.

Vector makes no representation as to the accuracy of any information in this report. We recommend you seek independent advice before acting or relying on any information in this report. Vector reserves the right to revise statements made in, or its strategy or business activities described in, this report, without notice.

This disclaimer should be read along with other methodologies, assumptions and uncertainties and limitations contained in this report, as well as in Vector's greenhouse gas emissions inventory report for FY2024.

Unless the context otherwise requires all references to amounts in $ in this report are estimates, are in NZ dollars and all references to balances or amounts relate to amounts at the end of each financial year, namely 30 June.

This report is not an offer document and does not constitute an offer or invitation or investment recommendation to distribute or purchase securities, shares, or other interests. Nothing in this report should be interpreted as capital growth, earnings or any other legal, financial tax or other advice or guidance. For detailed information on our financial performance, please refer to our annual report, available on vector.co.nz/investors/reports..

Glossary of terms

Table 1: Definition and glossary of terms

TERM	DESCRIPTION
CO_2	Carbon dioxide
CRD	Climate-related disclosures - that comply with Aotearoa New Zealand Climate Standards
Demand-side orchestration	Where demand is shaped by coordinating and scheduling customer demand (such as electric cars, and hot water load)
Dynamic operating envelope	An emerging concept to maintain electricity network stability by placing limits on the amount of electricity that can be imported from, or exported to, the network at any time. Under a dynamic operating envelope limits could be set in response to network conditions. This is in contrast to a traditional 'static operating limit' where limits are set ahead of time to ensure the network can tolerate an anticipated 'worst case' scenario of electricity import/export[1]
Emissions	Greenhouse gas emissions
EPD	Environmental product declaration
EV	Electric vehicle
Flexibility	The ability for electrical consumption and injection to be adjusted in response to a price signal, grid frequency or an active signal from the network operator
FSP	Field service provider
FY	Financial year - 1 July to 30 June
GHG	Greenhouse gas For the purposes of this report, GHGs are the seven gases listed in the Kyoto Protocol. These are currently: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6) and nitrogen trifluoride (NF_3)
GHG Protocol	The Greenhouse Gas Protocol, a partnership between the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD). The GHG Protocol develops standards and guidance, such as the Corporate Standard and the Corporate Value Chain (scope 3) Standard, both used as guidance for this report
IPCC (AR6)	Intergovernmental Panel on Climate Change (Sixth Assessment Report)
LPG	Liquefied petroleum gas - a mixture of hydrocarbons, consisting primarily of propane and butane. The higher density - in contrast to natural gas - allows it to to be easily compressed to liquid, and is therefore largely distributed in bottles
MfE	Ministry for the Environment (New Zealand)
Natural gas	Natural gas is a naturally occurring mixture of gaseous hydrocarbons, consisting primarily of methane. The gas is largely distributed through piped infrastructure
NGFS	Network for greening the financial system - an international network of central banks and supervisory authorities including the Reserve Bank of New Zealand
NZCS	New Zealand Climate Standards
RY	Regulatory year: 1 July to 30 June for the gas distribution network; 1 April to 31 March for the electricity business
SAIDI	System average interruption duration index – average outage duration per consumer in a regulatory year. This metric was developed by the Institute of Electrical and Electronics Engineers (IEEE) and used by the Commerce Commission to regulate electricity distribution networks
- Major event SAIDI	A 24 hour period during which the cumulative SAIDI due to unplanned events exceeds a predetermined major event boundary value
SAIFI	System average interruption frequency index – average number of interruptions per consumer in a regulatory year. This metric was developed by the Institute of Electrical and Electronics Engineers (IEEE) and used by the Commerce Commission to regulate electricity distribution networks
SBTi	Science Based Targets initiative
SF_6	Sulphur hexafluoride - a gas used to electrically insulate electrical assets. SF_6 has a global warming potential of 23,500 times that of CO_2
tCO_2e	Tonnes of carbon dioxide equivalent
Traditional infrastructure	Physical electrical infrastructure, such as electricity cables, lines, transformers and zone substations. This is in contrast to non-network solutions like demand-side orchestration

1. For additional explanation, see 'Promoting efficient and affordable infrastructure to enable electrified transport' [11]

About Vector

Vector Limited is NZX listed and 75.1% owned by Entrust, a private community trust which represents 365,000 households and businesses in central, east and south Auckland (as at 2024 roll date).

A breakdown of Vector's businesses and investments is detailed in the table below.

VECTOR BUSINESS	DESCRIPTION	REVENUE FY2024 ($M)
Electricity distribution network	Owns and operates the electricity distribution network within the wider Auckland region. This consists of more than 19,000 km of electricity lines, delivering power to over 624,000 homes and businesses.	871.1
Vector Technology Solutions	A digital solutions business that takes internally developed products to market.	10.1
HRV	Provides energy-efficient solutions across New Zealand covering home ventilation, home heating, and water filtration systems, as well as electric vehicle charging.	39.7
Vector Fibre	Owns and operates a fibre-optic data network within the wider Auckland region.	30.4
Natural gas distribution network	Owns and operates the gas distribution network within the wider Auckland region, supplying gas to over 120,000 homes and businesses, through some 4,650 km of mains pipelines, distributing around 13 PJ of gas per year.	75.6
Vector Ongas	Distributes and sells LPG to residential, commercial and industrial consumers throughout New Zealand, through bottled LPG products and piped LPG networks. On 26 July 2024 (after the balance date of this disclosure) Vector entered a conditional agreement to sell the Ongas business. Any future sale of Ongas will be reflected in future reports as required/appropriate.	111.0
Natural Gas Trading	Supplied natural gas to industrial and commercial businesses in the North Island. Vector has entered a conditional agreement to sell the remaining contracts of the Natural Gas Trading business. This transaction was completed on 1 July 2024 and has discontinued operations, which will be reflected in future reports as required/appropriate.	100.3
VECTOR INVESTMENTS	**DESCRIPTION**	
Liquigas (60.25%)	Provides tolling, storage and distribution of bulk LPG. On 26 July 2024 (after the balance date of this disclosure) Vector entered a conditional agreement to sell the 60.25% shareholding of the Liquigas business. Any future sale of Liquigas will be reflected in future reports as required/appropriate.	
Bluecurrent (50% joint venture)	Smart metering business providing smart meter data services for electricity and gas meters throughout New Zealand and Australia. Bluecurrent is jointly owned by QIC and Vector.	
mPrest (8.1%)	mPrest technology allows companies to better monitor, analyse and control energy networks. On the 22 August 2024 (after the balance date of this disclosure) Vector sold its shares in mPrest. Vector's shareholding in mPrest is excluded from its analysis.	

Governance

Vector's board oversight

Vector Limited's board of directors is the governance body ultimately responsible for overseeing Vector's strategic direction and its climate-related risks and opportunities. Climate-related risks and opportunities are considered as part of Vector's 16 group-level material risks that are monitored with priority. These 16 risks are generally reviewed four times per year at the group material risk review. In FY2024 four of these 16 risks relate to climate change. Refer to the governance report within Vector's annual report for a list of these group material risks [1].

The board's role in relation to climate-related issues is supported by two board committees: the audit committee, and the risk and assurance committee. These committees have delegated responsibility for managing Vector's risks, including its climate-related risks and opportunities.

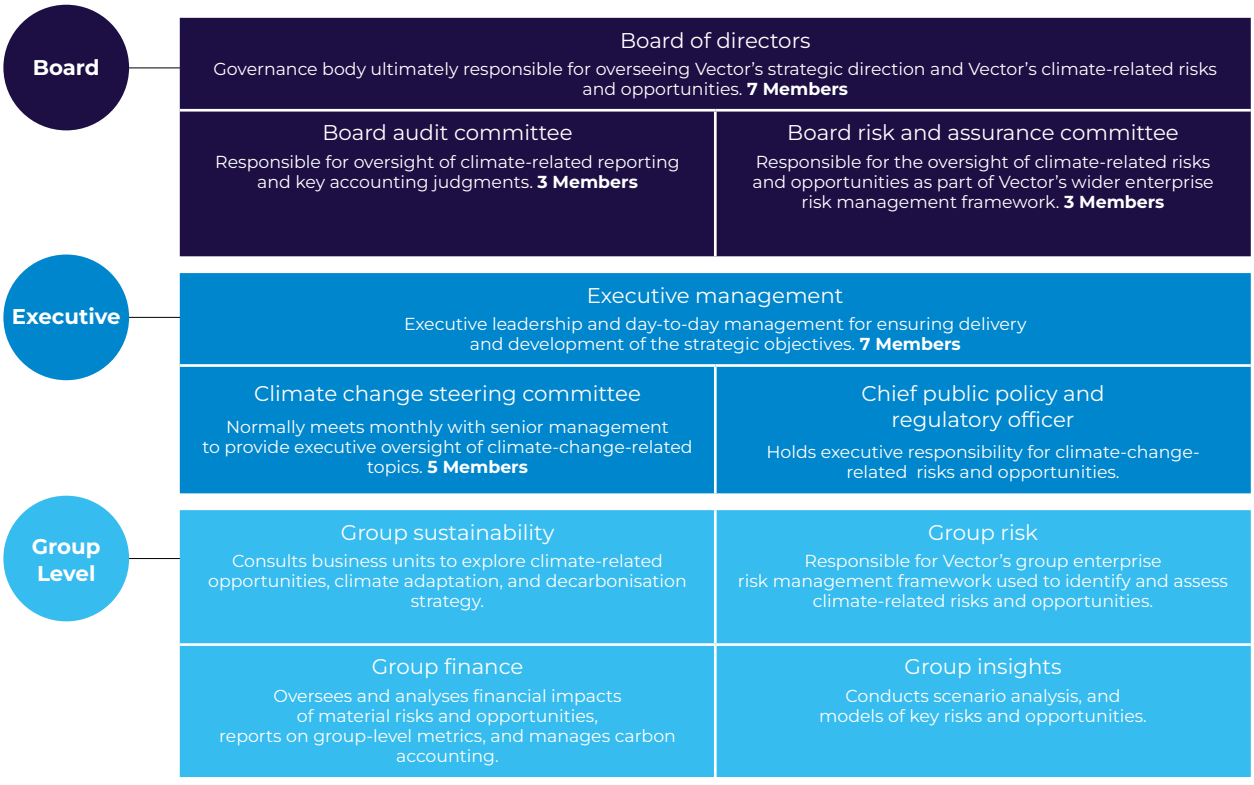
The audit committee is responsible for oversight of climate-related reporting. This committee meets to review key accounting decisions which include those regarding climate-related scenarios, materiality thresholds, consolidated risks and opportunities, as well as greenhouse gas emissions quantification and target. The audit committee is responsible for reviewing and recommending the climate-related reports, under the Financial Markets Conduct Act (FMCA), for board approval. The audit committee is responsible for ensuring Vector's climate-related disclosures comply with the New Zealand Climate Standards (NZCS) and is responsible for external reviews and assurance in relation to the climate-related disclosures. The independent reasonable assurance of Vector's greenhouse gas emissions by KPMG is set out in Vector's greenhouse gas inventory report [1].

The risk and assurance committee is responsible for the oversight of climate-related risks and opportunities as part of the committee's oversight of Vector's enterprise risk management framework.

These two committees are accountable to the board and each generally meets at least four times per year. Following each meeting the relevant committee updates the board in relation to matters within its scope that significantly affect Vector, as well as noting decisions of the committee and recommendations to the board. The board notes or approves the findings or recommendations of the committees as appropriate.

All committee papers are available to the full board and all directors have the opportunity to submit questions and/or attend committee meetings.

Members of Vector's management attend the meetings of the committees also, where relevant, to provide a two-way engagement between the board and management. Charters of the board and relevant committees can be found in the governance section of Vector's website [2].



The board ensures that it has the appropriate skills and competencies by accessing expertise from within the group as well as external advice where needed. For example, the group sustainability team has expertise in physical and transitional climate change trends, while the group insights team has skills to produce and update transitional scenario models for the electricity distribution network. The board also holds sessions that assist in upskilling the directors on topics relevant to Vector's businesses. For example, in FY2024 the board held a session with the National Institute of Water and Atmospheric Research (NIWA) on climate change and the impact of extreme weather events on Vector's network. Vector's board charter requires that all directors continuously educate themselves to ensure that they can perform their duties appropriately and effectively.

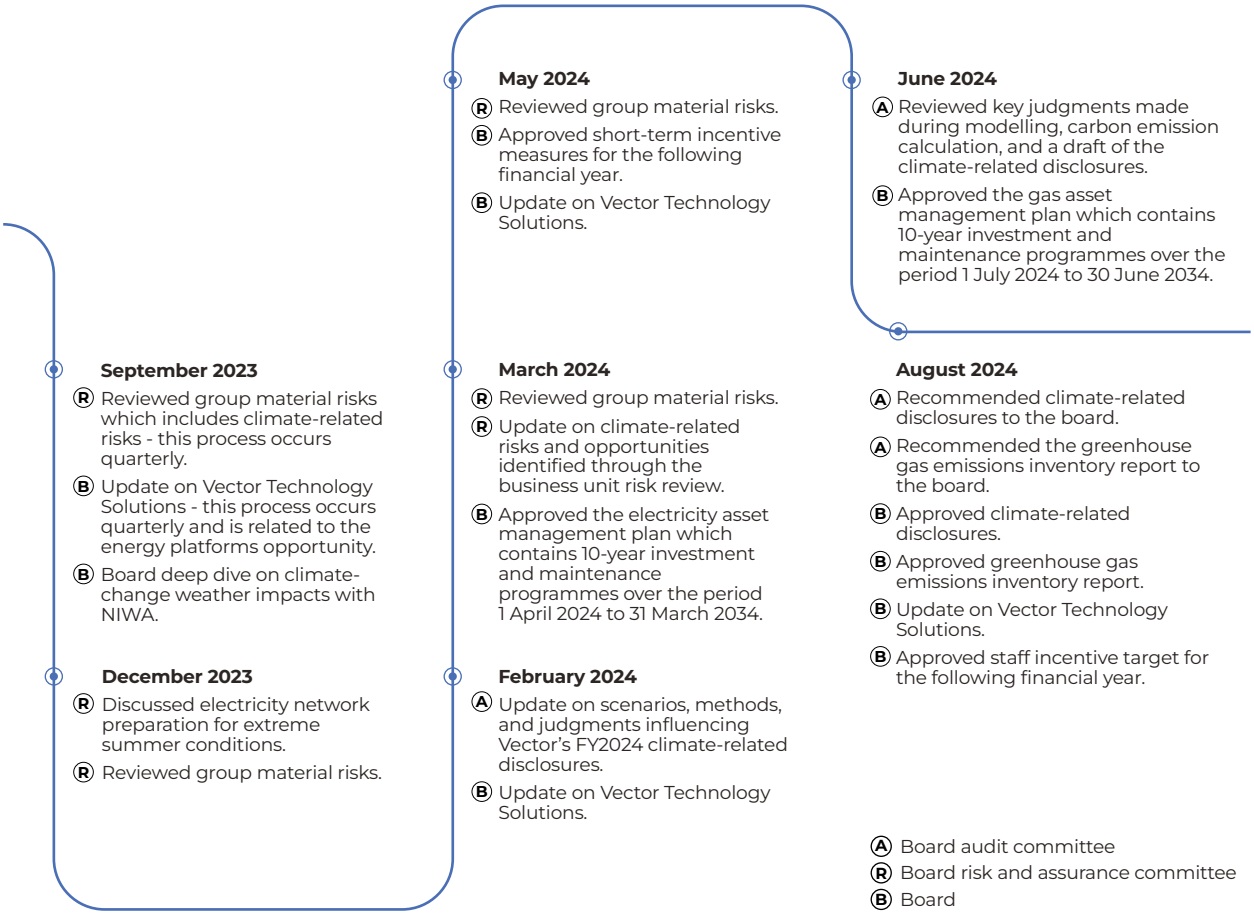
A summary of key board and board committee meetings in FY2024 is found in figure 1.

Vector's executive management oversight

The group chief executive is responsible for the day-to-day leadership and management of Vector's businesses to ensure the business strategy and objectives are successfully developed and delivered.

The climate change steering committee is a subcommittee of the executive, consisting of five members, and normally meets monthly to provide executive oversight of climate-related topics including climate change risks and opportunities. The climate change steering committee is chaired by the chief public policy and regulatory officer, who holds overall executive responsibility for climate-related risks and opportunities. The climate change steering committee reports to the chief executive periodically via the chief public policy and regulatory officer.

Figure 1: Key board and board committee meetings that occurred during FY2024 related to climate-related risks and opportunities



Governance (continued)

Tracking climate-related metrics and targets

The climate-related metrics set out in this report are prepared by Vector's management and discussed with the Vector board audit committee. The metrics are monitored by management and integrated into performance dashboards. Any noteworthy changes in Vector's performance against metrics can be presented to the group chief executive via a chief public policy and regulatory report. Relevant contents from the monthly report are then reported to the board in the group chief executive's report.

As noted on page 23, Vector's greenhouse gas emissions reduction target was developed by thinkstep-anz, and approved by the board in FY2021. In addition, Vector has targets for consumer outages which are set by Vector's economic regulator, the Commerce Commission.

Progress against Vector's targets is monitored by Vector's management and integrated into performance dashboards. Also, Vector's management is responsible for updating the board on performance against these targets. For example, consumer outage performance is presented to the board in an electricity distribution networks operational board paper.

In FY2024, short-term incentive payments for Vector's executive and their direct reports included a component linked to Vector's performance against its emissions reduction and consumer outage targets. These incentive targets are designed and agreed by the executive team, and approved by the board. Specific details can be found in the metrics and targets section on page 29.

Vector's group oversight

The Vector group risk team is responsible for Vector's enterprise risk management framework. Risks, including climate-related risks and opportunities, are identified, assessed and managed across the group in line with the enterprise risk management framework and the group risk assessment criteria. This approach to risk management is designed to ensure that there is appropriate and regular board and management oversight of material risks identified to drive informed decision-making. Vector's group sustainability team consults with Vector's business units to drive Vector's climate change strategy. The group sustainability team reports to the chief public policy and regulatory officer and sets the agenda for the climate change steering committee. Greenhouse gas emissions are accounted for by group finance, with transitional scenario modelling conducted by the group insights team or external consultants, as needed.

Integrating climate-related disclosures with wider disclosures

Vector's climate-related disclosures are informed by and informs a suite of inter-related disclosures.

DISCLOSURE	INTEGRATION
Electricity asset management plan	The electricity asset management plan, as required by regulation, discloses Vector's electricity asset management policy, objectives, 10-year expenditure plans, and the context in which expenditure decisions are made. Expenditure forecasts in the asset management plan are not commitments as they are also scrutinised through appropriate internal governance processes, and are subject to periodic regulatory approval of capital allowances before decisions are made. Integration with climate-related disclosures: Information relevant to the risks – *inability to efficiently manage peak load*, *increase in extreme weather events*, and the *distributed energy resources* opportunity – are discussed in the electricity asset management plan in the context of the electricity network managed by Vector. While scenario analysis informs the asset management plan, the expenditure decisions disclosed do not necessarily relate to a specific scenario. This is explained in further detail in figure 2 on page 12.
Gas asset management plan	The gas asset management plan, as required by regulation, discloses Vector's gas asset management policy, objectives, 10-year expenditure plans, and the context in which expenditure decisions are made. Expenditure forecasts in the asset management plan are not commitments as they are also scrutinised through appropriate internal governance processes, and are subject to periodic regulatory approval of capital allowances before decisions are made. Integration with climate-related disclosures: *Gas transition* risk is discussed in the gas asset management plan. While scenario analysis informs the asset management plan, the investment decisions disclosed do not relate to a specific scenario - rather, they are investments tested against those scenarios to deliver a prudent asset management strategy. This is explained in further detail in figure 2 on page 12.
Greenhouse gas emissions inventory report	Discloses Vector's greenhouse gas emissions, methodology, assumptions, and emissions reduction initiatives. Integration with climate-related disclosures: The greenhouse gas emissions accounting and target are expressed in the greenhouse gas emissions inventory report and feed into the climate-related disclosures' metrics and targets.
Vector annual report, half-yearly report, and operational performance updates	Discloses financial and operational information at a group level. Integration with climate-related disclosures: Operational statistics disclosed in the operational performance update inform the metrics and targets section of the climate-related disclosures. Some information from the climate-related disclosures, and greenhouse gas emissions inventory report is repeated in the annual report so that fair and accurate information is available to readers of the annual report.
Electricity and gas distribution information disclosures	Annual disclosures of historical financial and non-financial performance, in accordance with regulatory information disclosure requirements. Integration with climate-related disclosures: Metrics disclosed here, such as SAIDI/SAIFI, inform the metrics and targets section of the climate-related disclosures.
Electricity and gas distribution price quality statement	Annual assessment of performance against price path and quality standards, in accordance with distribution services regulatory price/quality path requirements. Integration with climate-related disclosures: Metrics disclosed here inform the metrics and targets section of the climate-related disclosures.

Strategy

Vector's transition plan

A key aspect of Vector's strategy, known as Symphony, aims to use digital technologies, specifically demand-side orchestration, to more efficiently manage the electrification during the low-carbon transition.

Vector's strategy for our electricity distribution business is to orchestrate distributed energy resources, such as managable electric vehicle (EV) charging and hot water effectively, to reduce the need for additional spend on infrastructure. Vector's electricity management plan reflects this through a future network road map [3].

This strategy reduces the traditional approach of constructing physical infrastructure to meet increasing peak demand. While Vector may still earn an appropriate return on this larger infrastructural spend, consumers may be impacted by a higher price for their electricity. This opens Vector to regulatory/policy risk, which is detailed in *risk 1: inability to efficiently manage peak load*.

Vector's strategy for our gas distribution business is to advocate to government and regulators for a managed gas transition whereby future gas network costs and potential stranded asset value is recovered from current consumers through capital recovery models such as accelerated depreciation. As Vector's gas network is regulated, we need clear and timely policy direction and regulatory coordination to achieve this while minimising impact to future consumers during the transition. Our gas asset management plan reflects this strategy, for example by minimising capital expenditure where it is safe to do so [4].

Our approach to asset management

As a regulated entity, Vector publishes detailed 10-year electricity and gas asset management plans, available here [3,4]. These plans detail our prudent asset management strategy, and are informed by asset management specific scenario modelling - see figure 2 on page 12.

Our approach to using climate scenarios

Vector has developed three group climate scenarios, as outlined in the adjacent table, which adapt data from the Intergovernmental Panel on Climate Change (IPCC) Assessment Report Six [5] for physical analysis, and the Network for Greening the Financial System (NGFS) [6] (an international network of central banks and supervisory authorities including the Reserve Bank of New Zealand) for transitional analysis. We consider that the IPCC scenarios [5] are best suited for New Zealand physical risk impact analysis due to their data availability. Likewise we consider that the NGFS scenarios are relevant to Vector's assessments as they capture the consumer burden on an unmanaged transition.

These group scenarios were initially developed by Vector's management, informed by existing scenario modelling for asset management, globally recognised scenarios, and engagement with the wider electricity distribution and transmission sector in New Zealand. These group scenarios are assessed and if necessary updated with oversight from our climate change steering committee and board audit committee. For example, if changes to the group scenarios are considered necessary, these would be discussed by the climate change steering committee who would then provide a recommendation to the board audit committee for final approval of changes.

Orderly decarbonisation

- **Limits warming to 1.5°C (RCP 1.9) by 2100**
- **Net zero by 2050 in New Zealand and globally**
- **Transition includes uptake of digital platforms for demand-side management**
- **Rapid electrification managed through demand response**
- **Regulations aligned with decarbonisation, and pricing models that manage whole-of-system costs**
- **Ongoing efforts with energy efficiency to reduce demand**
- **Managed transition away from fossil fuel gas**
- **SSP 1-1.9**

Disorderly decarbonisation

- **2.7°C world (RCP 4.5) by 2100**
- **New Zealand still achieves net zero by 2050 but via a disorderly transition**
- **World maintains current emissions until 2050 and net zero by 2100**
- **Transition focuses on large-scale renewable supply with no demand side or digitalisation**
- **Rapid unmanaged electrification**
- **Regulations lag behind decarbonisation efforts and create barriers to efficient decarbonisation**
- **Consumers bear the cost of an expensive unmanaged transition**
- **Unmanaged transition from fossil fuel gas**
- **SSP 2-4.5**

Hothouse

- **4.4°C world (RCP 8.5) by 2100**
- **Emissions triple by 2075**
- **Policies revert New Zealand to the fossil fuel era**
- **Consumers bear the cost of expensive fossil fuel energy**
- **Regulations block decarbonisation spending**
- **SSP 5-8.5**

Under the orderly decarbonisation scenario, the world shifts gradually but pervasively towards decarbonisation. This scenario describes a future where global net-zero emissions are reached by 2050, and global temperatures peak around 1.6°C by 2050 and then decline to 1.4°C by 2100. This prevents the most extreme predicted impacts of climate change (which are described in the hothouse scenario below). However, this scenario will still result in an increase in extreme weather impacts including flooding, increased heavy wind events, land erosion and increased sustained hot and dry weather.

For New Zealand, the orderly decarbonisation scenario describes a future where domestic actions and policies are consistently aimed at achieving net-zero domestic emissions by 2050. This scenario sees actions and policies providing for clear and early decarbonisation actions that integrate a whole-of-system approach, including both the supply side and demand side of the energy system.

In relation to the electricity sector, the orderly decarbonisation scenario's future provides for the New Zealand electricity grid supplying near to 100% renewable electricity by 2050. It also assumes regulatory settings that incentivise and prioritise demand-side energy management solutions, distributed generation, and energy-efficiency measures, which allow the energy sector to manage electrification and renewable generation while avoiding substantial increases in peak-time electricity demand. In particular, this demand-side participation by energy consumers optimises the use of the existing physical electricity distribution network to reduce inefficient capital expenditure and assumes regulatory settings that optimise the wholesale market to leverage the low cost of renewable power. The combined effect keeps electricity prices low, and therefore enables an easier transition from fossil fuels to electricity.

Globally the need for higher-quality energy data, digital platforms, and energy analytics increases as more electric vehicles and distributed renewable generation enter the electricity system.

With respect to the natural gas sector, the orderly decarbonisation scenario describes a future where gas supply networks undergo a managed transition in response to reduced gas usage. This means that capital asset costs associated with existing gas transmission and distribution assets are recovered through early regulatory and policy changes, thereby minimising future consumer impacts as costs are recovered over a larger current consumer base.

Under the disorderly decarbonisation scenario, the world follows a decarbonisation pathway whereby emission trends do not shift markedly from historical patterns, with some countries making relatively good progress while others fall short. CO_2 emissions are expected to remain at current levels until approximately 2050 and then fall by 2100 causing global temperatures to reach 2.0°C by 2050, and 2.7°C by 2100.

Consequently, with respect to physical risks of climate change, the increased temperatures that are assumed to occur under the disorderly decarbonisation scenario (when compared to the orderly decarbonisation scenario) would cause more significant weather impacts to be felt in New Zealand. These weather impacts include physical risks to Vector's physical assets, including in particular its electricity assets.

In regards to transition risks, under the disorderly decarbonisation scenario New Zealand achieves its net-zero emissions target by 2050. However, policy measures in the lead up to 2030 lack cohesion and the failure to coordinate policy stringency across sectors results in inefficient capital investments.

In the electricity sector, this delay and incoherent policy approach results in a high cost burden on energy consumers (due to inefficient investment in physical electricity assets to respond to higher peak energy demands), and creates energy reliability issues.

Under the disorderly decarbonisation scenario, decarbonisation policies focus on supply-side policies which enable new large-scale renewable electricity generation and support the rapid electrification of transportation. The absence of demand-side management of electric vehicle charging and industry electricity demands result in high peak-load power requirements, needing large infrastructural upgrades with costs largely passed on to consumers. This could result in intervention by regulators and/or government - therefore impacting the approval of capital allowances.

The absence of demand-side management also limits consumers' abilities to leverage technology to reduce consumption at peak periods, increasing the strain on the wholesale market and dependence on large-scale backup generation. This failure to realise opportunities to reduce overall energy costs through system efficiencies results in high electricity prices. Such high electricity prices not only intensifiy energy affordability issues but also create dependency on government subsidies and high carbon prices to achieve the 2050 targets.

In relation to the natural gas sector, the disorderly decarbonisation scenario presumes a 2050 wind-down without regulatory or policy intervention to preserve cost recovery leading to an increase in cost recovery risks. In addition, gas consumers face their own stranded asset risk.

The hothouse scenario describes a future where minimal and fragmented efforts towards climate change mitigation have resulted in severely increased physical impacts.

Under this scenario, the rest of the world prioritises economic and social development over decarbonisation efforts leading to the exploitation of fossil fuel resources. As a result, under the hothouse scenario GHG emissions triple by 2075 and global temperatures reach 2.4°C by 2050 and 4.4°C by 2100.

With respect to physical risks, there would be a significant increase in extreme weather events leading to expensive climate change adaptation measures and low grid reliability.

Regarding transition risks, this scenario represents a future where there is no or minimal action towards domestic and global emissions targets. Regulations form barriers to decarbonisation spending, and policy incentives to facilitate faster carbon reductions are ineffective or absent.

Consumers continue to bear the cost of fossil fuel energy and ongoing climate change adaptation.

In relation to the natural gas sector, the hothouse scenario assumes a continuation of fossil fuels such as natural gas and LPG beyond 2050. Likewise the electricity network only sees a low and manageable uptake of electric vehicles through to 2080.

Strategy (continued)

Select assumptions of the group scenario narratives are used in scenario modelling as relevant to the appropriate Vector business unit. For example, when modelling future electricity load we consider inputs such as electric vehicle uptake, demand-side control, energy efficiency, and gas to electricity switching, but do not include others, such as temperature forecasts. Likewise when modelling the future gas network we include assumptions such as the regulatory settings around gas networks, but do not include physical climate change impacts or the transitional impacts of the electricity network. The relationship between scenarios and modelling is detailed in figure 2. There is no model that combines all assumptions presented in the scenarios narratives.

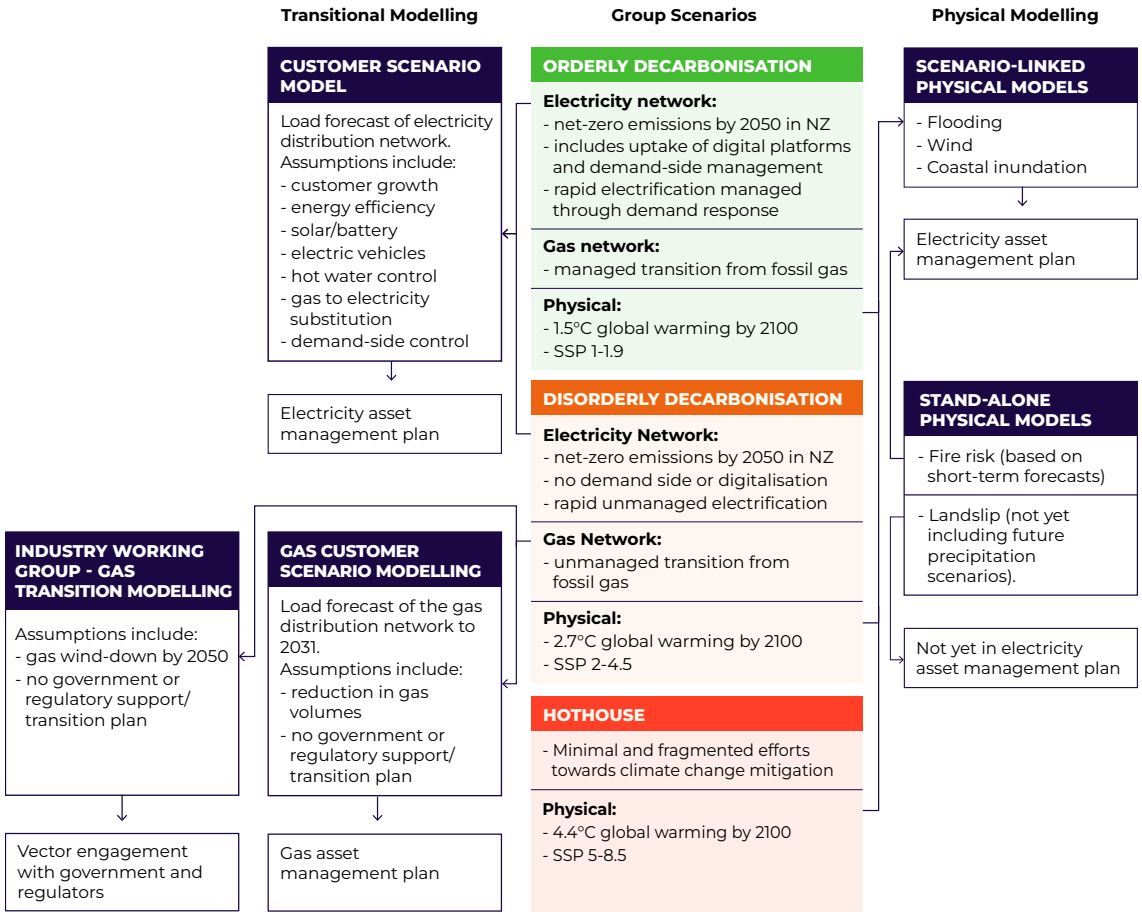
Scenarios represent plausible descriptions of how the future may develop based on a set of assumptions including both physical and transitional climate-related risks in an integrated manner. Scenarios are used to prepare for uncertain future impacts of climate change and test the resilience of Vector's business model and the Symphony strategy. Scenarios are not intended to be probabilistic or predictive or to identify the 'most likely' outcomes of climate change. Future group scenarios may also change in time, given the significant interconnection with government and regulatory decisions.

Vector's scenario analysis covers the group and all subsidiaries. The chosen scenarios are appropriate to Vector as they allow us to assess the resilience of our business strategy against different potential futures that could emerge as part of the energy transition.

Vector is currently working with the wider New Zealand energy sector to align on scenarios. This work was finalised in June 2024 and we expect to consider this in our scenarios and scenario modelling for the following financial year (FY2025). This may result in changes to our strategy, and risk and opportunity assessments.

As explained above, Vector's scenario modelling informs our strategy including our gas and electricity asset management plans as detailed in figure 2.

Figure 2: Interconnection of Vector's modelling with overarching climate scenarios



Physical impacts modelling

Drawing on our group scenarios, Vector conducts detailed physical and transitional modelling.

Physical climate modelling highlights that electrical assets in the Auckland region are exposed to the various physical impacts of climate change. Assessment and management of physical risks on Vector's electricity distribution network have therefore been a focus.

In FY2022 Vector began assessing specific physical risks on its electrical infrastructure assets. We did so by prioritising those risks with the highest expected impact, being: risks associated with higher wind-speed, flooding, landslip, fire, and ground temperature increases. In FY2022 Vector commissioned ClimSystems to analyse extreme wind analysis, and coastal inundation. In FY2023 freshwater flood analysis was conducted, and in FY2024 the flood models were improved to include flood depth. The flood modelling results were mapped against our electricity zone substations.

In FY2024 Vector commissioned a team from the University of Auckland's Department of Civil and Environmental Engineering to conduct a landslip susceptibility assessment in relation to Vector's overhead electricity assets. Geospatial landslip risk maps were then mapped against Vector's overhead asset base to understand asset susceptibility to landslips.

We worked closely with NIWA and Fire and Emergency New Zealand to conduct a dry year and associated fire zone analysis for the electricity distribution network for the FY2024 summer.

Vector engaged with international electricity distribution companies, including Florida Power & Light Company and San Diego Gas & Electric, to help us understand and prepare for the impacts of extreme weather events. In the case of Florida Power & Light, this was in response to the growing frequency and severity of cyclones, to learn more about how they were managing their adaptation, while the work with San Diego Gas & Electric was around how they managed their wildfire risk.

Physical climate change impact modelling is part of our scenario analysis and informs Vector's climate change strategy via the engineering and asset management processes. For example, in FY2024 we developed an approach to flood abatement over zone substations within flood-risk zones and integrated those expenditures within our 2024 electricity asset management plan. These include activities such as the raising of assets above flood plain levels, or relocating the assets altogether.

There is usually a time-lag between Vector's climate scenario modelling/analysis, and asset management processes. For example, once an asset is identified as having a potential vulnerability, detailed modelling and engineering studies are often required before appropriate action can be proposed. Note that the proposed mitigation actions in the asset management plan are not a commitment to spend, and also require specific regulatory funding from Vector's economic regulator, the Commerce Commission.

Transitional impacts modelling

The Climate Change Commission highlighted that electrification will be key to the decarbonisation of New Zealand's economy [7]. Transitional aspects of Vector's group climate scenarios have been selected to identify the boundary conditions for infrastructural demand. The scenarios help Vector to focus on the strategies that can better utilise existing infrastructure - such as regulated standards for smart electric vehicle charging, which informs our position on wider policy and regulations concerning the electrification transition.

Through our scenario modelling, we consider elements of both an orderly and disorderly transition to help us understand future demand. For example, modelling of peak load under the disorderly decarbonisation scenario assumes misaligned management of consumer assets and appliances, resulting in the greatest peak demand. The converse is true of the orderly decarbonisation scenario, where peak load is minimised - for example through the integration of smart digital platforms, network visibility, the alignment of consumer incentives, and demand side orchestration of consumer assets.

An example of this would be electric vehicle uptake. In a disorderly scenario we model a greater proportion of unmanaged electric vehicles charging around peak periods, which ultimately increases the capacity requirements on the network. In an orderly scenario, demand-side orchestration results in fewer electric vehicles being charged at peak times.

This scenario modelling has been considered within Vector's strategy processes including the electricity asset management plan, which presents a detailed discussion on network growth and security in chapter 10 [3].

Transition risks to Vector's gas network have been modelled as part of the wider Gas Industry Futures Working Group - a collaboration of gas distribution and transmission companies in New Zealand. We model the disorderly transition scenario as it relates to gas, which presumes a 2050 network wind-down with no regulatory or policy intervention. This is appropriate to analyse given the significant potential asset cost recovery risks.

Limitations of scenario modelling

As noted on page 3, climate-related risk management, and scenario modelling in particular, is an emerging area, and often relies on data and methodologies that are developing and uncertain.

By way of example, our flood modelling is largely dependent on precipitation forecasts, pre-storm water levels, elevation topology based on light detection and ranging (LiDAR) scans, ground surface roughness and infiltration. The elevation topology represents a 'bare earth' model and therefore does not take into account buildings or subsurface stormwater reticulation.

Our wind modelling does not have spatial resolution, and therefore is not geospatially integrated into our asset analysis. This limits our ability to incorporate wind models into targeted asset planning.

In addition, our landslip modelling does not take into account the impacts of future precipitation.

Vector's transitional scenario modelling on the electricity network is also limited. For example, it only includes transitional consumer impacts, such as electric vehicle uptake, industrial decarbonisation, new point loads, population growth, demand response, solar/battery uptake, and energy efficiency. It does not take into account how the physical impacts of climate change (such as temperature change) may impact consumer energy demand in the future. We exclude the hothouse scenario too, as this assumes no transition.

In addition, gas network scenario models are highly sensitive to the current and future policy and regulatory framework, future gas prices, availability, and consumer sentiment towards fossil fuels. These regulatory settings, market conditions, and policy settings are not yet clear and therefore our assumptions may prove incorrect.

Value chain

In considering Vector's exposure to climate-related risks and opportunities, we have also taken into account the exposure of our value chain. As part of that assessment, we have defined our value chain as encompassing Vector's investments including the following:

- Bluecurrent: Vector owns a 50% share in Bluecurrent (formerly known as Vector Metering). It provides smart electricity and gas meters, and related data services. Bluecurrent operates in Australia and New Zealand.
- Liquigas: Vector owns a 60.25% share of Liquigas, a New Zealand company providing tolling, storage and distribution of bulk LPG.

As noted in the risk management section, we have excluded any investments where Vector has less than a 20% ownership interest. This has resulted in the exclusion of mPrest.

We have also assessed upstream risks by including consideration of climate-related risk exposure of some of our tier 1 suppliers but have excluded tier 2 and 3 suppliers (for example, copper mining suppliers) from our upstream value chain analysis due to the current difficulty in analysing such a large and complex supply chain.

Impacts on downstream consumers, such as the cost of gas appliance conversions, are considered as well and are relevant to our assessment of climate-related risks and opportunities.

Current transitional impacts

Vector is already observing growth in electric transport uptake and industrial decarbonisation in the Auckland region, which impacts the load on Vector's electricity distribution network.

This is reflected in our updated capital investment plans highlighted in our electricity asset management plan - for example, an increase in infrastructure to support public transport electrification such as electric buses [3].

Vector's management of electric bus charging infrastructure in Auckland is an example of where we are seeking to work directly with a customer to manage electricity demand on the network more efficiently.

Further to this, Vector has developed Diverge, an energy data management software platform for the collection, processing, storage and delivery of smart meter data. Our electricity distribution network uses Diverge for ingesting and storing smart meter and related energy data which can be used to increase visibility of customer demand on Vector's low-voltage network.

Vector's gas network has been experiencing a decline in natural gas volumes since 2019 across all customer categories. We also note the industry commentary at the time of publication, regarding New Zealand's current gas supply market shortages.

In 2022 the Commerce Commission implemented accelerated depreciation from the start of the third default price/quality path commencing on 1 October 2022. Shortening asset life can reduce the risk of economic network stranding. In December 2023 the Commerce Commission's final gas input methodology decision resulted in a reduction in the weighted average cost of capital, resulting in a decrease in future revenues for the gas distribution business.

Vector recognised an impairment loss of $60 million in respect of goodwill allocated to the gas distribution business in FY2024.

Current physical impacts

In recent years, including FY2024, Vector's electricity network has been impacted by extreme weather events. These include:

High wind-speeds, storms and cyclonic events: Responsible for power outages, largely through vegetation falling on Vector's electricity distribution network, and related repair costs.

Flooding: Resulting in flood damage, asset relocation costs, operational costs to disconnect and reconnect power for the safety of our consumers, and geo-technical instability leading to landslips and increased vegetation fall.

For example, costs to Vector in FY2023 from Cyclone Gabrielle (a category 3 cyclone) and the Auckland Anniversary Floods were $17.1 million. This can be compared with the 2018 category 2 cyclone that cost $6.1 million.

Hot and dry weather: Reducing current capacity in electricity assets and increasing the risk of electrical equipment failing or causing wildfires.

RISK 1:

Inability to efficiently manage peak electricity load

Risk description

Key scenario: disorderly decarbonisation

Type: transitional – policy risk

Sector: electricity distribution network

Geography: Auckland

In a disorderly decarbonisation scenario, an absence of timely policy and regulatory changes to enable efficient decarbonisation (such as regulated standards for smart EV charging) leads to an overbuild of traditional infrastructure to cater for future peak demand.

Time period

Long term: 10 – 30 years

Anticipated impacts

Scenario modelling highlights that under a disorderly decarbonisation scenario the growth over the next 30 years would result in a substantial increase in the demand on Vector's network.

If future network load growth is managed disproportionately through traditional infrastructure it may lead to an overbuild of that infrastructure, which is not flexible enough to meet future market needs. This may impose a range of risks including increased costs to consumers. This could result in intervention by regulators and/or government, impacting the return on the deployed assets.

Vector's risk management strategy

Vector's strategy to manage this risk over the medium-term period to 2034 involves the effective demand-side orchestration of distributed energy resources (such as electric cars and hot water), and the deployment of non-wire alternatives to smooth load profiles. This includes increasing our ability and capability to manage these distributed energy resources (either ourselves, or through third parties), and the alignment of market, regulatory and policy settings to support and enable this. Also included is the management of loads during critical events, such as a grid emergency, to ensure electricity system stability.

To defer investment in traditional infrastructure, Vector needs certainty that consumers' demand will be shifted outside peak periods. At a high level, delivery of our Symphony strategy to address this risk involves:

- Direct integration of distributed energy resources with our network management systems. An example of this could be a dynamic operating envelope which could provide network limits to retailers in real-time in response to electricity constraints on the network
- Enabling digital systems, integration protocols, cyber security, and data platforms
- Visibility of the low-voltage network, including distribution transformer and distributed energy resource visibility for more efficient planning
- Advocating for regulatory and policy settings and standards such as regulated standards for smart electric vehicle charging
- Network modernisation to support whole-of-system planning, distributed energy resource integration and detection
- Active consumer engagement to build our understanding of preferences and behaviours.

These initiatives are incorporated into Vector's financial planning processes through our electricity asset management plan [3].

Examples of actions to date that support Vector's risk management strategy include:

- Building capability to on-board large consumers onto Vector's distributed energy resource management system for demand response which can minimise the capital cost for those consumers
- Developing Diverge, an energy data management software platform for the collection, processing, storage and delivery of smart meter and related energy data
- Increasing low-voltage network visibility via the aggregation of existing smart meter data to understand remaining low-voltage headroom
- Extending our strategic alliance with Amazon Web Services (AWS). Through this alliance, we are building solutions using bespoke services, co-developed between Vector Technology Solutions and AWS
- Recommitting to our relationship with X (formerly Google X), as one of a select group of global partners, collaborating on the next generation platforms for network management. For more details, see *opportunity 1: energy platforms* on page 19.

Changes to this strategy may emerge in response to regulatory, technology and market changes, scientific developments, and customer preferences.

RISK 2:

Gas transition

Risk description

Key scenario: disorderly decarbonisation

Type: transitional – policy risk, market risk

Sector: gas

Geography: Auckland for gas networks, New Zealand for LPG and Liquigas

An absence of timely policy and regulatory decisions on a gas transition plan gives rise to a disorderly decarbonisation scenario, where gas infrastructure companies and their connected consumers are potentially exposed to material transition costs, disruption and gas-asset stranding risk. Risks also include increasing carbon prices, changing consumer attitudes towards gas, and upstream gas supply volatility.

Time period

Medium term: 5 – 10 years

Long term: 10 – 30 years

Anticipated impact

The uncertainty of the future asset life utilisation (capacity and longevity) of gas networks changes the confidence of financial cost recovery – on which gas distribution network owners invest. Under the disorderly decarbonisation scenario, this introduces a stranded asset risk whereby investment recovery is not achieved over the long term.

This becomes problematic for future investments, such as repair after a natural disaster. Due to the risk to capital recovery, a logical outcome might be to shut down the impacted network prematurely rather than deploy capital for repair.

Vector's LPG business and investment in Liquigas would be impacted also, through increasing prices (emission trading scheme carbon costs, commodity and supply chain prices), changing consumer attitudes towards gas, and possible policy changes which affect gas supply or connections.

Vector's risk management strategy

In 2021, Vector, Firstgas (now Clarus) and Powerco, with support from the Ministry of Business Innovation and Employment (MBIE), formed the Gas Infrastructure Future Working Group. The purpose was to explore scenarios for the end state and transition options for gas infrastructure [8].

Mitigating capital recovery risk requires action by suppliers and regulators to make timely changes that accelerate the recovery of capital from current consumers before an increased rate of disconnections puts that capital recovery at risk.

Examples of actions taken by Vector as part of this strategy to reduce capital recovery risk to date include:

- Advocating to both government and regulators as to the criticality of preserving the principle of regulated investment cost recovery. An example of this is Vector's paper to government on 'Managing the gas transition – options preserving solutions to manage consumer risks from gas asset stranding' in FY2024 [9]
- Advocating for the Commerce Commission to implement accelerated depreciation from the start of the third default price/quality path commencing 1 October 2022
- Requiring 100% consumer contributions for new gas connections and associated network growth costs
- Not proceeding with some previously forecast capital projects, such as future-proofing ducting
- Maintaining a cautious approach to system growth expenditure relative to that forecast prior to 2020.

This risk serves as an input into Vector's financial planning process via our gas network asset management plan [4]. It is important to note that it is not possible to deploy additional capital to manage this risk. Rather, the risk is being managed by reducing capital expenditure where safely possible to reduce exposure to further asset stranding risk.

Because of the significant impact of evolving government policy, updates to this risk, relevant scenarios, and strategy may need to be considered in future years' climate-related disclosures and asset management plans.

RISK 3:

Increase in extreme weather events

Risk description

Key scenarios: orderly and disorderly decarbonisation, hothouse

Type: physical – acute

Sector: electricity distribution network

Geography: Auckland

All scenarios identify an increase in extreme weather events which is expected to cause disruption to the Vector network in the Auckland region. These include increasing wind-speeds, freshwater flooding, coastal flooding, land erosion, and an increase in sustained hot and dry weather leading to elevated wildfire risk. These weather impacts are physical risks to our assets, in particular our electricity distribution infrastructure assets.

Time period

Short term: 0 – 5 years

Medium term: 5 – 10 years

Long term: 10 – 30 years

Anticipated impact

All scenarios highlight an increase in extreme weather events due to climate change compared to historical trends, with the most severe impacts in the hothouse scenario. Key impacts are consumer outages, reputational risks and regulatory risks/fines from those outages, public safety risks, and asset costs (via either repair or reinforcing) to Vector's network.

Our flood modelling scenario analysis conducted in FY2024 considered 113 zone substations out to the year 2100. It highlighted 13 zone substations that are identified to be at potential risk of flooding. Only some assets within these 13 zone substations are modelled as being as vulnerable. A total of 15 projects have been identified to mitigate these risks. Examples include the raising of assets above flood levels, and building bund walls. These projects need to be assessed through the appropriate internal governance process for approval of capital allowances before they can be actioned.

Regarding coastal inundation, only one zone substation was identified as being at risk and is planned for decommissioning in FY2025.

Wind speed models to the year 2100 highlight that the hours of heavy wind-speeds per year are forecast to increase across all scenarios. As heavy wind-speeds resulting in vegetation fall are responsible for significant damage on the Vector network, an increase in heavy wind-speed frequency would increase unplanned outages resulting in additional expenditure for network repair, and increase the difficulty in Vector meeting its regulatory quality standards. In addition, the cascading effects of floods with high wind-speeds can weaken the geo-technical stability of the ground, leading to increased tree fall, landslips and delayed network repair until the water has subsided. Landslip susceptibility analysis highlighted 331 power poles in potentially very high landslip risk, of which 27 could affect more than 1,000 consumers downstream.

Climate modelling across all scenarios shows that the length and severity of sustained hot and dry weather will increase too. This raises the risk of fire start from Vector's electricity distribution network under normal operating conditions. Furthermore, warmer weather decreases electrical asset capacity ratings.

Vector's risk management strategy

Our modelling shows that to materially lower known climate-change-related risks from our network would result in significant costs, as detailed in our electricity asset management plan [3]. While Vector may still earn a return on this deployed capital pending regulatory approval, we do not include it in our 2024 asset management plan because we do not consider it prudent for consumers to have to fund this extra expenditure when government policy is still uncertain and could materially alter the required investment landscape. For example, reformed tree regulations, which Vector continues to advocate for, could materially reduce tree management costs.

As detailed in our electricity asset management plan, projects to improve electricity distribution network resilience to climate change include:

- Flood hardening at zone substations
- Provision of a mobile substation
- Transfer of load from our highest flood-risk zone substation so that it can be decommissioned
- Meshing radial electricity feeders and network automation
- Re-conductoring overhead lines
- Reducing the risk of the network starting a wildfire during normal operations. Examples of risk reduction include the implementation of seasonal ratings, and switching off reclosers to prevent sparks on extreme-heat days.
- Increasing provisions for storm response costs
- Actively advocating to government for changes in tree regulations to enable electricity distribution networks to reduce network risks from trees, with potential reduction in capital and operational costs, and a reduction in consumer outages during extreme weather events
- Ongoing engagement with NIWA and Fire and Emergency New Zealand for the FY2025 summer.

OPPORTUNITY 1:

Energy platforms

Opportunity description

Key scenario: orderly decarbonisation

Type: transitional - market, products and services

Sector: electricity

Geography: global

In the orderly decarbonisation scenario, better access to data and the use of intelligent digital platforms to move loads to off-peak times which would improve network utilisation and efficiency. Advanced meters, the data they provide and the accessibility of that data can be used to increase network visibility, enable demand-side management, improve network operations, consumer service and the innovation of new products and services.

The need for Vector to build capability to process large varied datasets has driven our investment in digital platforms. Vector has developed Diverge, an energy data management software platform for the collection, processing, storage and delivery of smart meter and related energy data. Diverge is being used by Bluecurrent (a provider of smart metering services and solutions that is 50% owned by Vector) to provide power quality data to electricity distribution network operators in Australia and New Zealand, to improve the visibility of the impacts of distributed renewable generation and electrification on their networks. Vector's electricity distribution network also uses Diverge for ingesting and storing smart meter and related energy data for analytic functions.

Time period

Short term: 0 – 5 years

Medium term: 5 – 10 years

Anticipated impact

The need for more, higher-quality, and near-real-time energy data can be expected to increase as more distributed energy resources such as electric vehicles and intermittent renewable generation capacity enter the electricity system. Preparing energy platforms like Diverge would allow Vector to improve management of its electricity distribution network and offer this capability as a service to other networks. This would therefore enable us to better serve our customers and monetise this technology in the future.

Vector's opportunity management strategy

Vector has extended its strategic alliance with AWS. Through this alliance, we are building solutions using bespoke services co-developed between Vector Technology Solutions and AWS.

We are also continuing our partnership with X (formerly Google X), contributing to their Tapestry project, as one of a select group of global partners collaborating on next generation platforms for network management. These tools include 'GridAware', which uses new technology including drones and applies machine learning and modern artificial intelligence (AI) processes to survey and guide maintenance of the network. This enhances the job of traditional network inspection, which is much more labour intensive, through greater efficiency and new inspection techniques. Another, the 'Grid Planning Tool', creates robust network simulations that incorporate optimised solutions for new technology and the growth of customer-owned devices like batteries and EV chargers, to ensure an efficient network.

These two arrangements support key components of our Symphony strategy, using digital solutions and innovation to enable a more efficient use of the network, and improve our planning capabilities.

OPPORTUNITY 2:

Distributed energy resources

Opportunity description

Key scenario: orderly decarbonisation

Type: transitional – resource efficiency

Sector: electricity

Geography: Auckland

In the orderly decarbonisation scenario, distributed solar, batteries and micro-grids - combined with smart, remotely-manageable energy systems (such as hot water load control and smart electric vehicle chargers) - act as demand-side energy resources that complement centralised large-scale electricity generation. Efficient and effective demand-side management of these distributed energy resources presents an opportunity for Vector. This has the added benefit of contributing to the mitigation of *risk 1: inability to efficiently manage peak load*.

Time period

Short term: 0 – 5 years

Medium term: 5 – 10 years

Long term: 10 – 30 years

Anticipated impact

Efficient demand side management and orchestration of distributed energy resources connected to the network has the potential to reduce peak congestion on the network. This may support Vector's electricity distribution network to reduce unnecessary capital deployment and avoid increased consumer costs.

Vector's opportunity management strategy

Vector's future network road map, detailed in section 2 of the electricity asset management plan, consists of four priority areas:

- Achieving supportive regulatory and policy settings. During the short term, we will continue working with regulators, policy-makers and appliance/network standard agencies to work towards regulatory settings that enable the demand side orchestration of distributed energy resources. We expect a more rapid addition of distributed energy resources in the medium term
- Understanding consumer needs and preferences in relation to the control of distributed energy resources. Vector continues to invest in analytics to understand customer insights and behaviours
- Increasing our access to distributed energy resource capacity - through improved visibility of distributed energy resources, demand-side management, continued coordination with third parties, and direct integration of distributed energy resources with our network management systems
- Building capability: by continuing to make no-regrets investments in new enabling technologies, developing new commercial arrangements, and understanding consumer response to load management practices.

This opportunity is further supported by the platforms highlighted in *opportunity 1: energy platforms*.

For more information, see section 2 (future network road map) in Vector's 2024 electricity asset management plan [3].

Risk management

Vector's approach to risk management

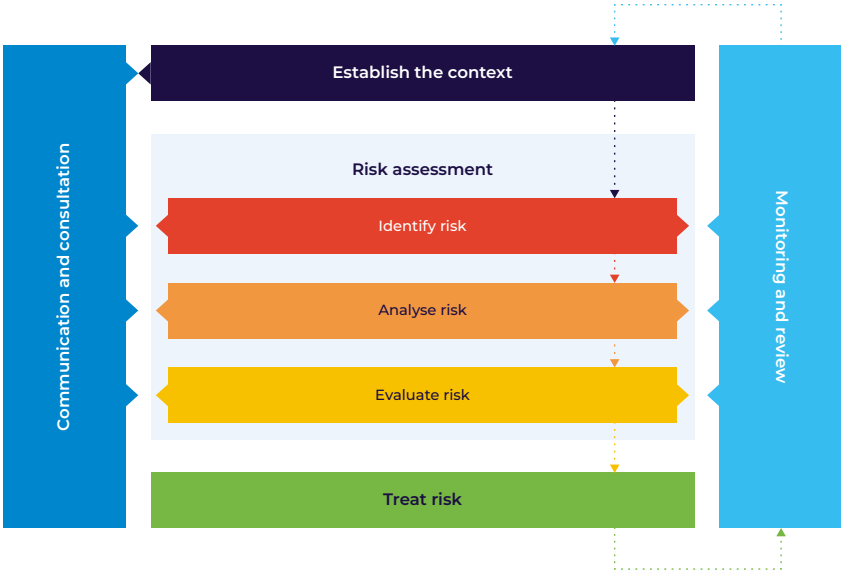
Vector's group enterprise risk management framework is consistent with the risk management standard ISO 31000. The framework is embedded in our business through our risk governance, policies, guidelines and risk partnership model that the group risk team maintains with the different business units to support Vector's risk management.

We use a risk assessment criteria within our group enterprise risk management framework to support a consistent approach to risk management across the Vector group. Our board risk and assurance committee has responsibility for overseeing and reviewing our group enterprise risk management framework, and the related policies, and Vector's group material risks.

The impacts of climate change have been recognised in Vector's group material risk profile since 2019. The board risk and assurance committee reviews a summary of climate-related material risks as part of a regular material risk review every quarter. In addition, material climate-related risks and opportunities are overseen by the climate change steering committee.

Changes to group material risks require approval from the executive lead of that group risk. These are then discussed at an executive meeting before proposal to the board risk and assurance committee for consideration and approval.

Figure 3: Vector's enterprise risk management framework



Our process for identifying and prioritising material climate-related risks and opportunities

Risks or opportunities are assessed as material if they meet any one of the following criteria:

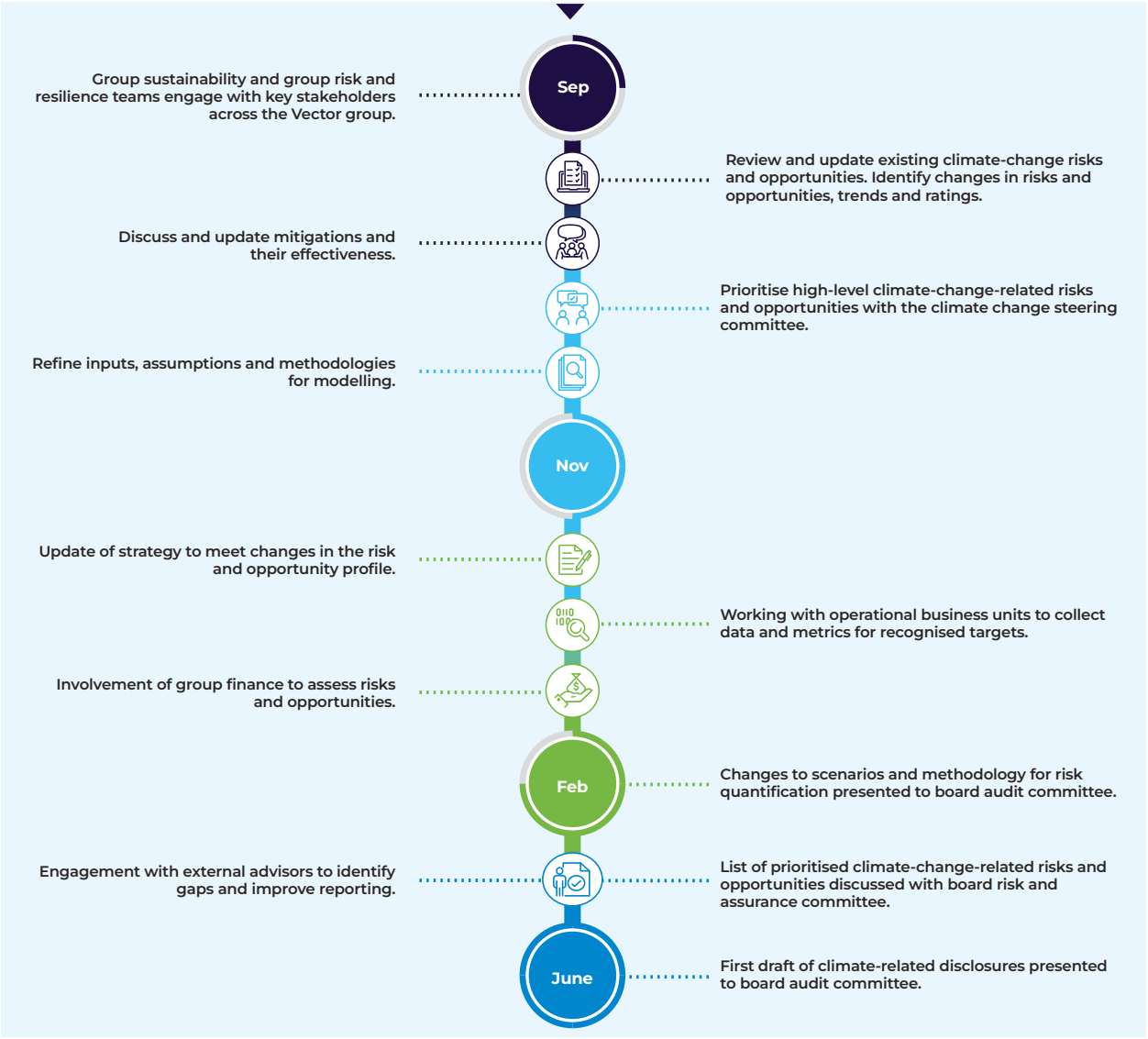
- A risk or opportunity assessed as high to very high based on the group risk assessment criteria - which takes into consideration severity and likelihood
- A risk or opportunity has a potential financial impact greater than 5% of Vector's market capitalisation
- A risk or opportunity contributes to or forms a barrier to emission reductions outside of Vector's organisational boundary which constitutes more than 1% of national emissions.

If the risk or opportunity meets any of the above criteria, it is considered material and prioritised, with oversight from the climate change steering committee. A summary of climate-related risks and opportunities is reviewed by the board risk and assurance committee.

As part of our bottom-up approach, the group risk team work to identify new climate-related risks with all business units.

Vector includes its value chain when analysing climate-related risks and opportunities. This includes our upstream supply chain, downstream consumer impacts, and Vector's subsidiaries and investments (excluding investments that fall below 20% ownership, for example Vector's 8.1% investment in mPrest). Our approach to defining our value chain boundary and exclusions is discussed in the value chain subsection of the strategy section on page 14.

Figure 4: Vector's climate-related risk and opportunity management process flow. This process occurs annually



Risk management (continued)

Our process for understanding the impacts of risks and opportunities

Vector also conducts more detailed physical and transitional risk modelling to understand the business impacts and opportunities. These are described on page 13, and summarised here for completeness.

Physical risks

Vector quantitatively and qualitatively studies physical risk, working with the University of Auckland's Department of Civil and Environmental Engineering, NIWA and ClimSystems.

To date, Vector has investigated the following climate-related physical risks:

- Fluvial and pluvial flood exposure across all electrical assets
- Flood-depth exposure at zone substations
- Extreme high water level from coastal inundation across zone substations
- Projected increase in frequency and duration of high wind-speeds generally (not against any specific asset type)
- Landslip risk to overhead electricity assets
- Fire risk after extended periods of hot and dry weather, which could be triggered by Vector's overhead assets under normal operating conditions.

Transition risks

To evaluate transition risks and opportunities, the Vector group insights team uses a customer scenario model to estimate the impact of energy transitions, such as the uptake of electric vehicles, on the electricity distribution network. The model supports Vector to assess potential future load growth requirements, plan for network flexibility requirements, and understand the impact this may have on our consumers. Further details of this scenario model, including high-level model assumptions, can be found in the strategy section and are explained in section 10 of Vector's electricity asset management plan [3].

Time frames

We use the time horizons below in our scenario analysis and physical and transitional risks and opportunities assessment.

As explained below, each time horizon has been selected due to its link to our asset planning horizons and capital deployment plans:

- Short term (0-5 years), to reflect typical business planning and regulated price path cycles which sets Vector's regulated revenue streams
- Medium term (5-10 years), to allow for our asset management plans for gas and electricity networks that detail capital and operational expenditure forecasts over a 10-year period
- Long term (10-30 years), to account for longer impacts over existing and future planned assets and business activities.

Metrics and targets

Vector uses metrics and targets to measure and manage its climate-related risks and opportunities disclosed in the strategy section. Within this disclosure we also include our scope 1, 2 and 3 greenhouse gas emissions, and our target to reduce select emissions.

Greenhouse gas emissions

Vector has published its greenhouse gas emissions in its FY2024 greenhouse gas emission inventory (GHG inventory) report, available here [1].

We measure and report our greenhouse gas emissions in accordance with:

- The greenhouse gas protocol - a corporate accounting and reporting standard
- The greenhouse gas protocol's corporate value chain (scope 3) accounting and reporting standard
- Other related technical guidance issued under the greenhouse gas protocol standard.

Together we refer to these as the greenhouse gas protocol. This splits greenhouse gas emissions into three categories:

Scope 1 – Direct emissions from sources Vector directly owns or controls such as emissions from our vehicle fleet's fuel combustion, our diesel backup generators, methane leaks from our natural gas distribution network, and SF_6 leaks from our electricity distribution network.

Scope 2 – Indirect emissions from Vector's consumption of purchased electricity, and electricity distribution losses along the network.

Scope 3 – All other indirect value chain emissions, including consumer energy consumption, and supply chain emissions.

The greenhouse gas protocol splits scope 3 emissions into 15 categories. A breakdown of Vector's emissions by scope and category can be found in table 3.

All calculations are expressed in total tonnes of carbon dioxide equivalent (tCO_2e).

Vector uses the operational control approach, as defined by the greenhouse gas protocol, to measure and report emissions. This allows emission reduction efforts to focus on emissions over which Vector has the greatest control, and thereby can influence most.

Our base year for emissions reporting is FY2020 (1 July 2019 to 30 June 2020).

Additional information on Vector's organisational boundaries for the purpose of emissions calculation, including the treatment of investments, operational boundaries, emission factors, exclusions, summary of changes to previous years, methodologies, and results, can be found in Vector's greenhouse gas emissions inventory report [1].

Independent reasonable assurance over Vector's greenhouse gas emissions inventory was provided by KPMG (see Vector's greenhouse gas emissions inventory [1]).

Emissions reduction target

In FY2021 Vector set an absolute emissions reduction target. That target is for Vector to reduce its scope 1 and 2 emissions (excluding electricity distribution losses) by 53.5% by FY2030 from a FY2020 baseline. The target was developed by thinkstep-anz in 2021, based on a methodology published by the Science Based Target Initiative (SBTi) and the SBTi's then applicable guidance on reductions required to be consistent with keeping global warming to 1.5°C.

Our target has not been validated by SBTi because SBTi's methodology provided for the inclusion of emissions related to electricity distribution losses, which we have excluded. Further detail regarding this exclusion is set out below.

The emissions reduction target does not rely on any offsets*. Vector does not have any interim targets. However, Vector has internal emissions reduction targets that are weighted to staff remuneration, which are explained in more detail on page 29.

In FY2024 we have achieved a reduction in our scope 1 and 2 emissions (excluding distribution losses) of 38% compared to the FY2020 baseline. This was largely due to a reduction in natural gas fugitive emissions.

Vector's total emissions across all three scopes (including electricity distribution losses) has decreased by 19% since FY2020. This is mainly due to a reduction in natural gas consumption in the Auckland region, combined with a wind-down of Vector's natural gas trading contracts.

A breakdown of emissions by scope and a comparison of emissions per scope since Vector's base year in FY2020 can be found in table 3. These summaries of emissions have been extracted from Vector's greenhouse gas emissions inventory report [1].

Electricity distribution losses

Electricity distribution losses are not like a water or gas leak; they are an inherent characteristic of electricity distribution networks. Although we can measure these losses, and report their associated emissions based on New Zealand's published electricity generation emissions factor, we can never fully remove them. As distribution losses are largely an inevitable by-product of electrical conduction, Vector has elected to exclude emissions associated with such losses from our emissions reduction target. This allows our target to focus on emissions that we can more readily manage.

By way of example, in FY2024 Vector's emissions related to electricity distribution losses decreased by 17% against a FY2020 baseline. This was due to a decrease in the emission intensity of electricity generation injected into the national grid, rather than any action taken by Vector.

As Vector does not generate electricity, the main reason for this reduction in emissions was outside of its operational control. Excluding emissions related to distribution line losses from our target better enables us to monitor and measure the impact of those management actions that are within Vector's operational control.

* Vector made a public commitment to net zero emissions by 2030 in 2017, which contemplated the use of offsets. This commitment has since been updated in FY2021 to its absolute emissions reduction target to reduce its absolute scope 1 and 2 emissions by 53.5% by FY2030, which does not anticipate use of offsets. In FY24 Vector has used the 53.5% target to manage its climate-related risks and opportunities and it is against this target that Vector tracks its performance.

Metrics and targets (continued)

Table 2: GHG emissions intensity of select scope 1 and 2 emissions

EMISSIONS INTENSITY	FY2020	FY2021	FY2022	FY2023	FY2024
kgCO_2e per gas pipeline length in m	2.66	1.96	2.33	1.90	1.34
kg CO_2e per main** lines	1.02	1.09	1.35	0.78	0.77
kg CO_2e per service** lines	5.22	3.04	3.64	3.54	1.86
kgCO_2e per MWh delivered – excluding electricity distribution losses	0.53	0.54	0.69	0.58	0.47
kgCO_2e per MWh delivered – including electricity distribution losses	4.43	4.58	5.36	5.56	3.54
kgCO_2e per kg of LPG sold	0.036	0.039	0.041	0.044	0.042

Table 3: GHG inventory by scope and category in tCO_2e. FY2024 emissions highlighted in green indicate a reduction since the base year or year in which emissions were first reported, whereas emissions in red show increases.

EMISSIONS CATEGORY	FY2020	FY2021	FY2022	FY2023	FY2024
Total scopes 1, 2 and 3	**1,900,841**	**1,682,645**	**1,602,955**	**1,620,856**	**1,530,722**
Scope 1	**24,431**	**19,991**	**23,763**	**20,019**	**15,545**
Natural gas distribution fugitive emissions ‡	18,313	13,507	16,218	13,323	9,379
SF_6 leakage ‡	524	1,263	2,081	1,299	924
Other fugitive emissions	141	142	134	141	65
Stationary combustion	3,558	2,971	3,348	3,183	3,102
Vehicle fleet	1,895	2,108	1,982	2,073	2,075
Scope 2	**33,148**	**34,448**	**39,486**	**42,810**	**26,900**
Electricity consumption* (market-based)	643	826	408	220	8
Electricity consumption (location-based)	815	801	891	1,210	682
Electricity distribution losses	32,505	33,622	39,078	42,590	26,892
Scope 3	**1,843,262**	**1,628,206**	**1,539,706**	**1,558,027**	**1,488,277**
Purchased goods and services					
Upstream-purchased natural gas	227,569	170,442	136,821	152,290	148,230
Upstream-purchased LPG	46,555	47,609	52,806	58,140	62,529
Fuel used by field service providers	6,475	6,822	6,456	7,235	7,127
Upstream-purchased materials and products	15,266	11,733	13,874	11,783	16,089
Upstream-purchased other goods and services	75,939	71,465	75,080	79,559	78,783
Fuel- and energy-related activities	1,405	1,312	1,450	1,456	1,406
Upstream transportation	2,717	2,557	3,225	2,891	3,085
Waste generated in operations				92	174
Business travel	332	103	95	271	187
Employee commuting and working from home				933	821
Use of sold products					
Distributed natural gas AKL - Total	*772,265*	*760,185*	*711,337*	*735,048*	706,356
Sold natural gas - AKL	151,603	115,578	57,149	66,376	42,475
Shipped natural gas - AKL			55,245	66,265	64,985
Other distributed natural gas - AKL	620,662	644,607	598,943	602,407	598,896
Sold natural gas - non-AKL	562,567	381,871	231,127	223,568	184,162
Shipped natural gas - non-AKL		47,002	183,614	160,293	154,973
Sold LPG	131,385	126,245	122,904	123,542	123,565
Investments					
Liquigas	87	89	108	105	86
Bluecurrent	700	771	809	821	703
Biogenic carbon	**162**	**134**	**150**	**138**	**131**

‡ Updated emission factor for methane to GWP of 28, and SF_6 to GWP of 23,500 in FY2024 in accordance with Ministry for the Environment guidance.
* Market-based method for electricity consumption. While location-based electricity emissions are also included in our inventory, the amounts in table 2 include only market-based emissions, as these form part of our emissions reduction target.
** Main gas lines refers to the shared pipeline infrastructure, while service lines connect the consumer to the main line.
*** Electricity distribution losses are excluded from our emissions reduction target (see explanation on previous page).

Marginal carbon abatement cost curve

In FY2022 Vector developed a carbon abatement cost curve to help measure and understand its reduction target (scope 1 and 2 excluding electricity distribution losses) and actions available to Vector to contribute to reaching this target.

This work identifies the financial impact of potential carbon reduction activity across scope 1 and 2 emissions, using an internal carbon cost of $140 per tCO_2e. This amount was chosen as it aligned with the Climate Change Commission's 2021 recommendations to government to meet its 2050 targets [10].

Through this work, we identified emissions that could be reduced while achieving cost savings for the group (those with negative abatement cost) and others that were close to cost neutral (those with bars close to $0/$tCO_2e$/year), with the balance assessed as being more complex to abate given the availability of current alternatives.

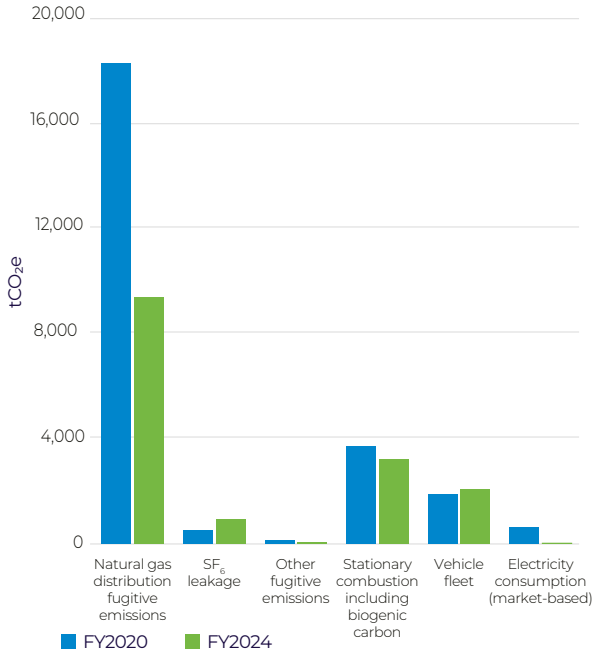
The cost curve was updated in FY2024 to include a newly identified initiative, reflect project cost changes, and highlight completed projects. We have also extended the horizontal axis to represent additional diesel generation emissions that didn't occur in FY2020. We have calculated that this increase is predominantly due to increased planned works in the electricity distribution business.

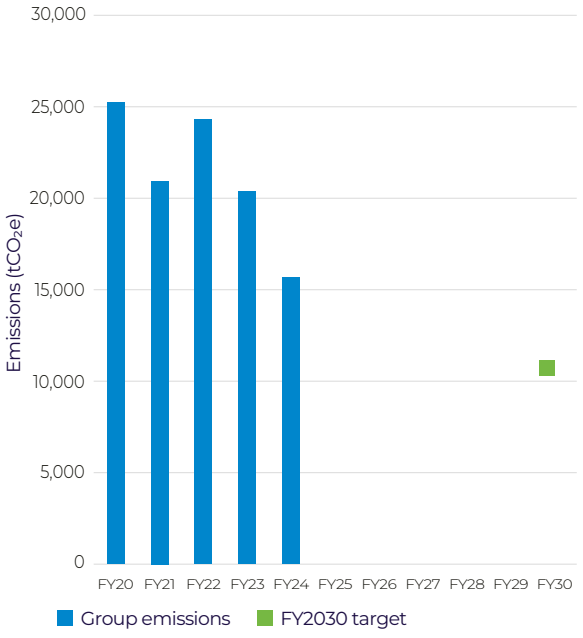
The cost curve also indicates some key challenges that Vector faces in meeting its carbon reduction target. For example, transitioning the Vector Ongas truck fleet to electric trucks is an initiative to achieve a 2030 decarbonisation target, and yet is highly dependent on the availability and cost of suitable heavy electric vehicles. A summary of key limitations is highlighted in table 4.

More information on these changes and the status of specific initiatives can be found in Vector's greenhouse gas emissions inventory report [1].

Changes in technology, project prices, emissions cost modelling, new business innovation and a range of other factors may alter the marginal carbon abatement cost curve in our future disclosures.

Figure 5: (left) Emissions included in Vector's emissions reduction target - scope 1 and 2 excluding distribution losses and their comparison to the FY2020 base year. (right) Vector's yearly scope 1 and 2 emissions excluding distribution losses since FY2020. Emissions are in tCO_2e.





Metrics and targets (continued)

Figure 6: Vector's marginal carbon cost abatement curve. The horizontal axis corresponds to Vector's total FY2020 scope 1 and 2 emissions excluding electricity distribution losses. Each bar relates to a potential emissions reduction initiative where the thickness of the bar details the amount of emission reductions estimated to be possible as a result of the initiatives. The vertical axis represents the estimated cost, with negative values indicating estimated cost savings. Initiatives are ordered left to right, from the most cost saving to the most expensive.

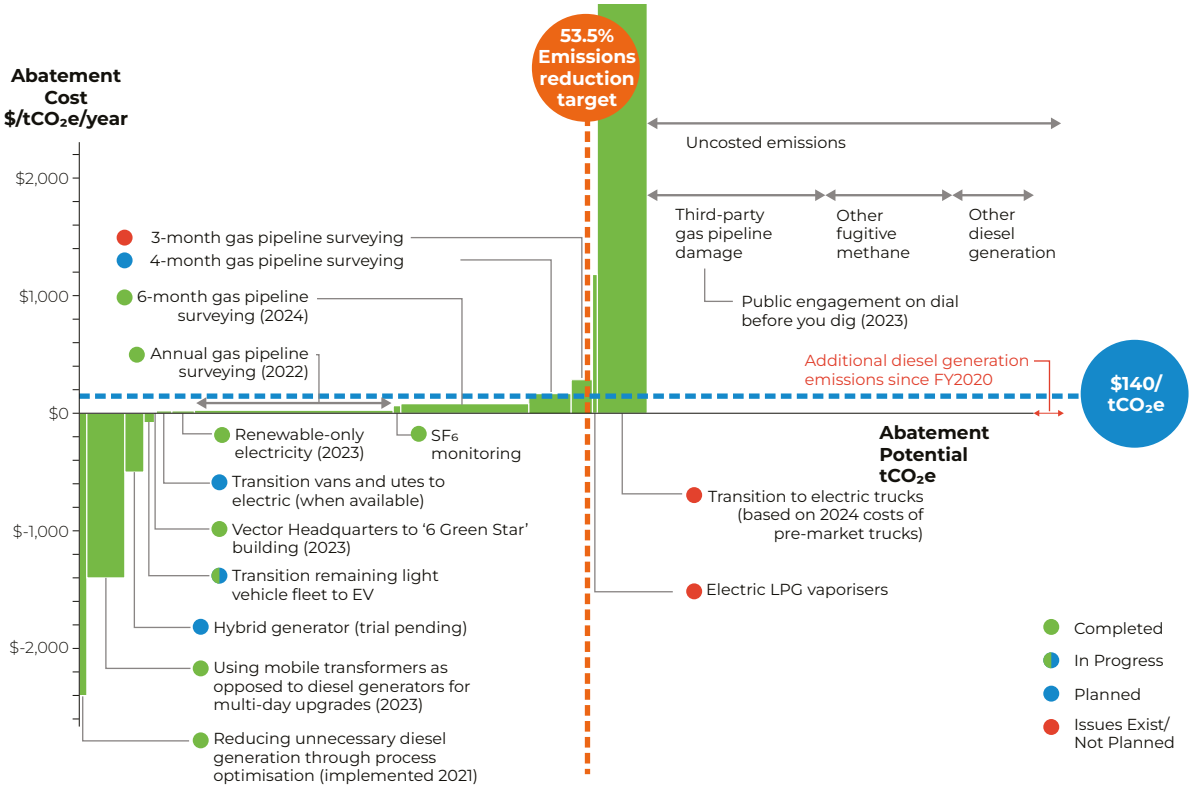


Table 4: Key risks that may form a barrier to Vector achieving its emissions reduction target

CARBON ABATEMENT RISK	DESCRIPTION
Dependency on electric truck manufacturers for heavy vehicle fleet decarbonisation	Vector Ongas has a fleet of 95 trucks. Currently there are limited suitable electric heavy vehicles available to complete this transition. Some pre-production electric trucks are available to transition a small portion of this fleet; however, this comes at a significant marginal abatement cost.
Damage to high-pressure pipelines	Damage to Vector's high pressure gas pipelines can release significant quantities of CO_2e. For example, two leaks detected in FY2022 were responsible for the release of over 3,000 tCO_2e. While Vector can reduce emissions over time on average, these high-volatility events can cause a sudden spike in emissions for that reporting year. In addition, there is a risk that emissions from third-party damages (such as a contractor digging into the pipe) remain high or increase, with limited influence from Vector's side.
Long-term SF_6 assets on Vector's network	Many of Vector's SF_6 assets have a lifetime beyond 2030. It is challenging to replace all these assets before FY2030, and leaks are largely unpredictable. Although we have installed some monitoring devices that alert us of leaks quickly, there is still a risk that leaks could increase and keep occurring. SF_6 has an emission factor 23,500 times that of CO_2; therefore, even small leaks of SF_6 can have material impacts on our emissions inventory.

Value of assets vulnerable to transition risks

This table highlights Vector's key gas businesses that are potentially vulnerable to transition risks and their associated carrying value. We are currently disclosing 100% of the total carrying value as this represents a conservative estimate of potential impacts. This does not include the electricity distribution network.

	30-Jun-23	30-Jun-24
Gas network	607.0	546.4
Ongas[1]	71.8	68.0
Natural Gas Trading	13.3	Ceased trading
Liquigas (100%)[1]	72.7	74.7

Number of assets vulnerable to physical risks

To date, Vector has modelled electricity distribution network assets vulnerable to flood impacts and landslip risk. With respect to freshwater flooding, while we have highlighted 13 zone substations at potential risk of flooding, only some assets within those zone substations are at risk of damage. A new zone substation was commissioned on 22 September 2023, which brings the total number to 114; however, this has not been analysed. As this is the first year these numbers are disclosed there are no comparative metrics.

ASSET TYPE	RISK TYPE	TOTAL ASSETS ANALYSED	POTENTIAL NUMBER OF ASSETS EXPOSED IN FY2024
Zone substations	Freshwater flooding	113	13
Zone substations	Coastal inundation	113	1
Power poles	Landslip	125,950	331

Business activities and capital deployment aligned with climate-related risks and opportunities

The values listed here represent the total carrying value, revenue and capital expenditure invested in the electricity distribution network.

We are currently disclosing 100% of the total capital expenditure of the entire electricity distribution business as there is currently no clear method to identify specific capital expenditure allocated to individual climate-related risks and opportunities, for example, the specific capital expenditure associated with managing *risk 1: inability to manage peak load, risk 3: weather impacts*, and *opportunity 2: distributed energy resources*.

ELECTRICITY DISTRIBUTION	CARRYING VALUE ($M)	REVENUE ($M)	ANNUAL GROSS CAPEX ($M)
FY2023	4,579.9	834.5	389.6
FY2024	4,863.8	871.1	427.3

[1] Conditionally sold

Metrics and targets (continued)

Electric vehicle uptake in Auckland

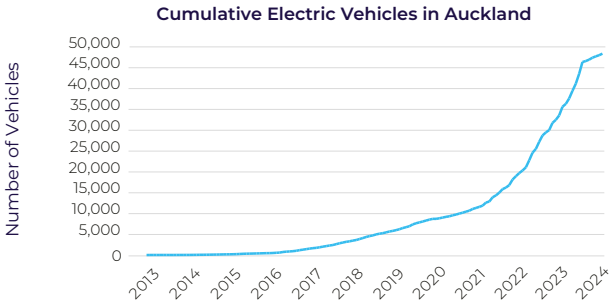
Related to risk 1:
inability to efficiently manage peak load

Related to opportunity 1:
energy platforms

Related to opportunity 2
distributed energy resources

Vector monitors electric vehicle uptake in Auckland to understand their impact on the network and emerging charging behaviours.

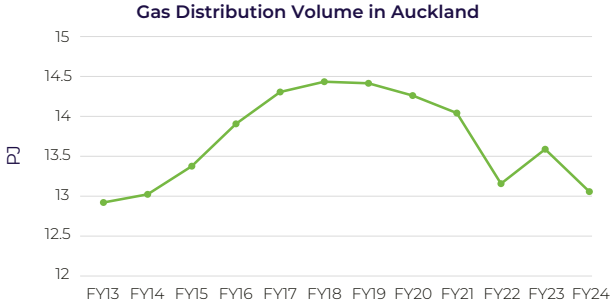
Electric vehicle registrations increased after the introduction of the government's clean car discount in April 2022. The repealing of the clean car discount in December 2023 has seen a reduction in electric vehicle uptake.



Actual gas volumes

Related to risk 2:
gas transition

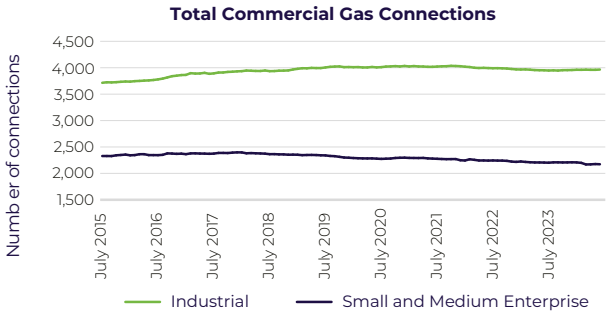
Gas distribution volumes in Auckland have been trending down since 2019. Note that COVID impacts have also caused a decrease in activity in 2022.

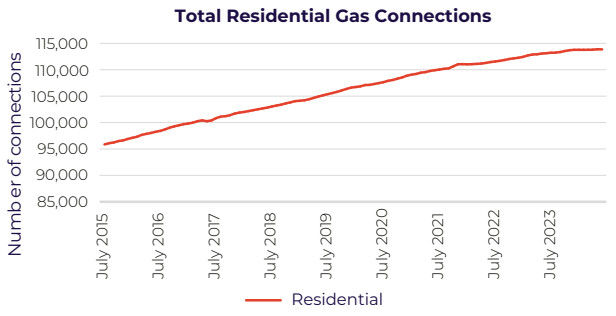


Total gas connections

Related to risk 2:
gas transition

We observed a decrease in the number of new commercial and industrial gas connections since FY2021. Residential gas connections continue to grow - however, the rate of growth has decreased.





Distributed generation uptake in Auckland

Related to risk 1:
inability to efficiently manage peak load

Related to opportunity 1:
energy platforms

Related to opportunity 2:
distributed energy resources

Vector registers distributed generation - for example photovoltaic solar-uptake in the Auckland region. This can be used to understand the uptake of this type of distributed energy resource within Auckland.

We have noted a 7.5-fold increase in capacity of distributed generation connected in RY2024 compared to RY2020. The metric refers to the electricity distribution network regulatory year, which is from 1 April to 31 March.

	RY2020	RY2021	RY2022	RY2023	RY2024
New capacity connected (MVA)	1.8	4.8	4.1	15	12
Number of new connections	219	901	582	1799	1653

Industry-based metrics/targets

Electrical power outages

Related to risk 3:
increase in extreme weather events

SAIDI and SAIFI are two measures that the Commerce Commission uses to monitor a reliable standard of service to consumers. SAIDI and SAIFI incorporate all causes of power outages, including non-weather-related outages such as car accidents on power lines, and asset failure. However, an increase in the frequency of high wind-speeds, flood events, and high temperature days can still contribute to an increase in SAIDI and SAIFI. These two metrics are defined as:

SAIDI (system average interruption duration index) – Average outage duration for each consumer served over the course of a regulatory year.

SAIFI (system average interruption frequency index) – Average number of interruptions per consumer per regulatory year.

Vector seeks to be below the regulatory limits currently set at 104.83 and 1.337 for SAIDI and SAIFI respectively.

Major event SAIDI – Days of severe impacts that breach the SAIDI unplanned boundary value of 4.83 SAIDI minutes. While major event SAIDI does not have a target, it is a metric that can indicate an increase in extreme weather events, such as cyclones. This is noted in the significant increase in major event SAIDI in the 2023 regulatory year which included Cyclone Gabrielle and the Auckland Anniversary Floods.

There are no targets for major event SAIDI.

Normalised unplanned SAIDI/SAIFI	RY2020	RY2021	RY2022	RY2023	RY2024	Regulatory limit
SAIDI	116.7	86.3	92.42	118.7	98.4	**104.83**
Major event SAIDI	3	0	59.72	292.3	14.1	**-**
SAIFI	1.36	1.07	1.05	1.19	1.13	**1.337**

Remuneration: Senior staff performance goals

In FY2024 a decarbonisation measure made up 10% to 15% of the overall short-term incentive payments to all executive team members and their direct reports. The payment is awarded if the Vector group achieves a 21.4% reduction in scope 1 and 2 emissions, excluding electricity distribution losses, compared to a FY2020 baseline. The goal was designed to show progress towards Vector's 53.5% emissions reduction target by 2030 and is not based on any interim target.

In FY2024 a SAIDI/SAIFI measure made up 20% of overall short-term incentive payments to the executive team members and direct reports in the electricity and gas distribution businesses, and 7.5% in the group-level corporate business units. The payment is awarded if the goals of 104.8 and 1.336 for SAIDI and SAIFI, respectively, are met.

The targets are designed and agreed by the executive team, ensuring alignment with our corporate strategy, and approved by Vector's people and remuneration committee and the board.

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