Taskforce for Climate-related Financial Disclosures Report

AUGUST 2023

Disclaimer

This report is a summary of Vector's assessment of future climate risks and opportunities and its resulting strategy. It is intended to inform readers about Vector's business strategy with respect to climate risk and opportunity but it is not earnings guidance nor financial advice for investors, and it is unaudited.

Given its focus on future risks and opportunities, this report contains estimates, projections and assumptions about future socio-economic, policy and regulatory, technological, physical climate and other conditions, as at 25 August 2023. Although the use of scenario analysis is rapidly developing to support this future focus, there are limitations to the modelling methodology and available data, and therefore scenario analysis. These limitations are identified throughout this report and in particular are outlined in the Strategy Section.

While Vector has taken efforts to ensure that such assumptions have a reasonable basis and are coherent and plausible (including basing them on modelling, public scientific information, market knowledge and projections, government policy proposals, and reasonable/expert opinions), assessments of the future are challenging and inherently uncertain. The assumptions, estimates, projections and modelling relied on in this report may not be realised at the scale and pace anticipated and/or the future may involve circumstances that are different to that anticipated in this report.

In light of the above, while Vector has taken all due care in preparing this report, including its scenarios and assumptions, Vector makes no representation as to the report's accuracy, completeness or reliability, in particular in relation to Vector's assumptions regarding future events.

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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.

2023 Reporting Suite

This TCFD Report is published as part of a reporting suite, which also includes our Green House Gas Emissions Inventory Report, and Annual Report. All three reports are available on vector.co.nz.

The enabling decade to mitigate climate change

The transformation to an efficient renewable energy system underpins decarbonisation efforts, and offers a foundation for success in building a livable and sustainable future for all.

Vector plays an enabling role in this transformation so that it is ready to support the demands of a decarbonised future. In our view the energy sector must be decarbonised, digitised, democratised, and decentralised. It is not just the increase in large renewable generation, but the development of digital platforms to manage the intermittent nature of renewables. It is not just the electrification of transport, but the orchestration of smart charging to optimally utilise the network. It is a future where electricity distribution networks transform from a traditional one-way chain into an intelligent, multi-directional energy system where customers have more choice and control.

New Zealand's high renewable electricity penetration, combined with the urgent need to decarbonise transportation and industrial emissions lays a platform for Vector to drive this transformation. From smart electric bus charging to smart meter data platforms, these digital solutions have the potential to be scaled globally, and we leverage that potential through global alliances such as that with Amazon Web Services.

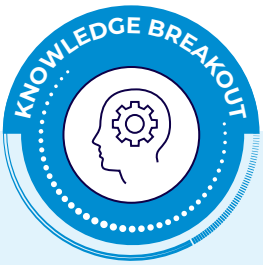
These fundamental changes in the energy system are not just technical, but also require an overhaul of policy and regulatory frameworks that are inadequate at overseeing and supporting such critical transformations. Vector consults actively on policy and regulatory reform to help better govern this transformation in a co-ordinated and strategic manner.

Vector also acknowledges its fossil fuel assets, such as the natural gas network in Auckland. Managing the transition from fossil gas requires regulatory and policy reform that decouples the de-growth of fossil gas use from capital recovery risk. This can be achieved through mechanisms such as accelerated depreciation, asset securitisation, and managed electrification.

Finally, the impacts of climate change are already here in New Zealand. The New Zealand Treasury estimated that total damage from the Auckland Anniversary Floods and Cyclone Gabrielle caused between $9 – 14.5 billion dollars of asset damage to the country [1] . Vector is rapidly advancing its climate change modelling analytics and deepening its approach to resilience to cater to this new normal.

"Any further delay in concerted anticipatory global action on adaptation and mitigation will miss a brief and rapidly closing window of opportunity to secure a livable and sustainable future for all"

IPCC AR6 Summary for Policy makers D.5.3



The unknown unknowns

Predicting the future is often challenging as our assumptions are based on "known knowns". For example, we know that there is accelerated electric vehicle uptake in New Zealand, along with policy directions, and this allows us to forecast impacts to the electricity system. We also know that climate change is happening and can use scientific climate change predictions to understand corresponding physical impacts.

There are also "known unknowns". For example, we don't know the status of geopolitical stability in supply chains, or whether a catastrophic climate change feedback loop, such as the release of arctic methane, will materialise. In some cases, these known unknowns can be factored into our scenario models to show the divergence, but in other cases the breadth of the unknown is so significant that it isn't realistic to do so.

Finally, there are the "unknown unknowns". Previously unheard-of step changes in technology, international wars, economic crashes, mass social uprisings due to inequality are examples. Elements that we don't know about and cannot predict could have significant impacts that alter or void any prediction or forecast presented in this disclosure.

It is therefore important as a reader, to understand that this disclosure is an estimate, based on our known knowns, and some known unknowns. See the Disclaimer on the opening page for further details regarding our assessments and variables.

Chair's Statement

I'm proud of the progress shown by Vector in developing a highly sophisticated analysis and understanding of decarbonisation pathways. Vector will continue to hold a key position within New Zealand's transformation to move passenger transport from fossil fuels to electric power. I can assure shareholders and other stakeholders that the Vector board, management, and employees hold a genuine and deep commitment to decarbonisation and enabling customers to use energy on their terms in a low carbon world. There is significant innovation and action taking place to continue contributing to the critical energy transition that is underway.

Jonathan Mason

Chair

Vector's climate-related opportunities and risks

Scenarios

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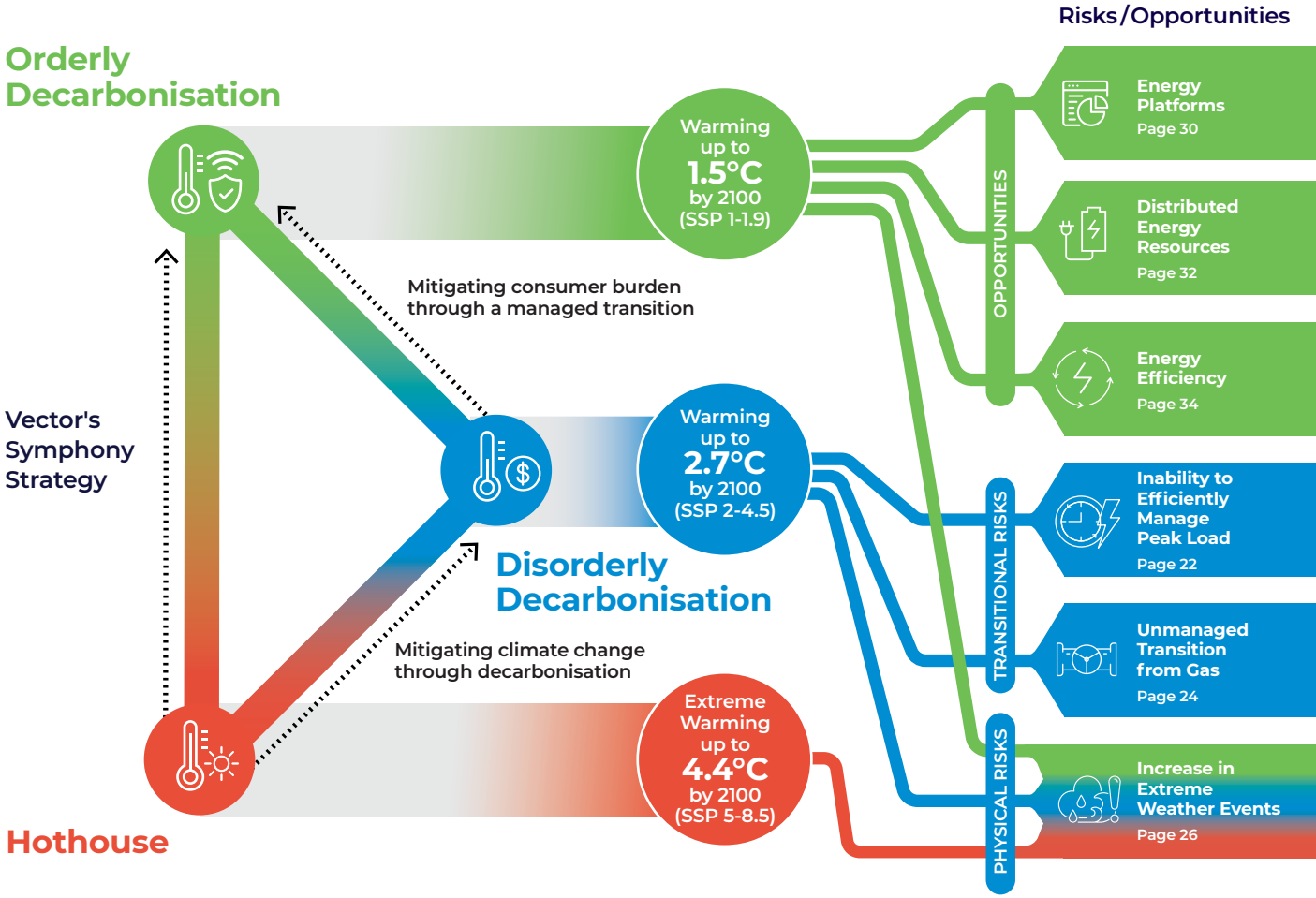
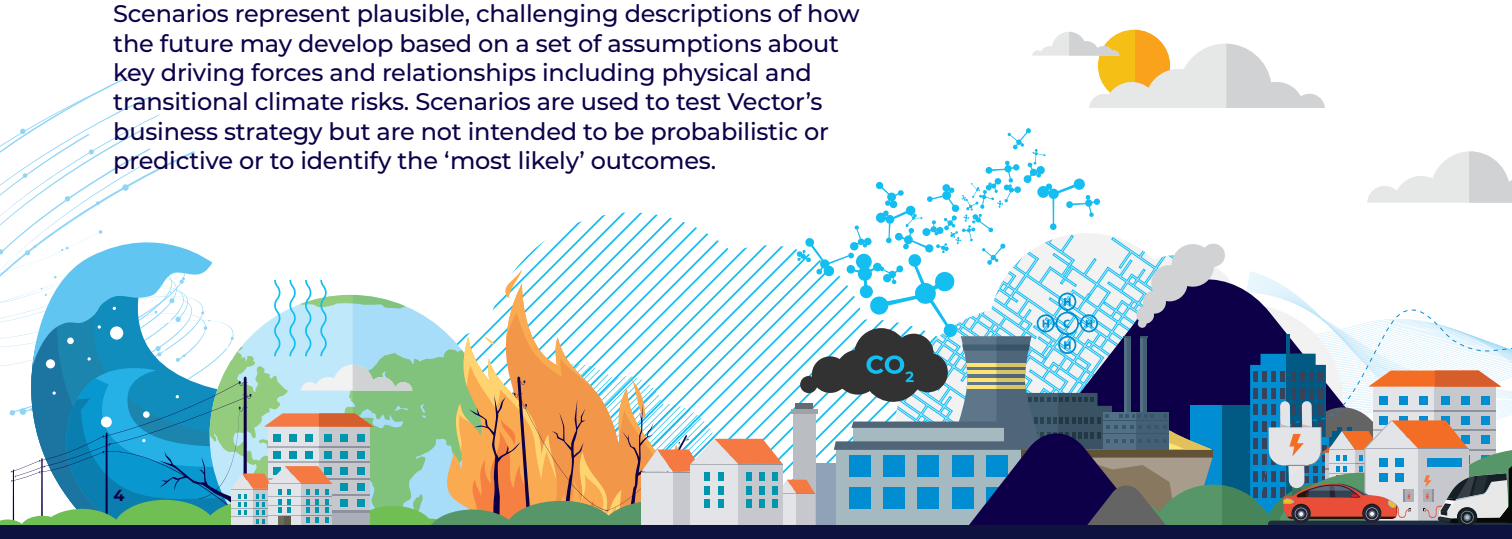


Scenarios represent plausible, challenging descriptions of how the future may develop based on a set of assumptions about key driving forces and relationships including physical and transitional climate risks. Scenarios are used to test Vector's business strategy but are not intended to be probabilistic or predictive or to identify the 'most likely' outcomes.



Time Period	Strategy	
SHORT TERM 0 – 5 years; MEDIUM TERM 5 – 10 years	**Strategic Partnerships**	Developing data-driven products and services with leading technology partners to enable a greater uptake of renewable electricity supply, and electrify energy demand.
SHORT TERM 0 – 5 years; MEDIUM TERM 5 – 10 years; LONG TERM 10 – 30 years	**Network Orchestration**	Further on-boarding of distributed energy resources, increased low voltage visibility, and interoperability of data.
SHORT TERM 0 – 5 years; MEDIUM TERM 5 – 10 years; LONG TERM 10 – 30 years	**Technology Management and Innovation**	Ongoing product innovation in building efficiency systems keeps Vector at the forefront of new technology, and new channels to market
LONG TERM 10 – 30 years	**Enabling and Advocating for Demand Flexibility**	Working on the alignment of regulatory, market and policy settings, with multi-party energy industry solutions that leverage digitalisation of the energy sector, to optimise energy flexibility whilst not exceeding the physical capacity of the built network.
MEDIUM TERM 5 – 10 years; LONG TERM 10 – 30 years	**Managed Gas Transition**	Working with government, and the wider industry on the Gas Transition Plan, to establish realistic transition pathways for the fossil-gas sector to decarbonise.
SHORT TERM 0 – 5 years; MEDIUM TERM 5 – 10 years; LONG TERM 10 – 30 years	**Network Resilience Plan**	Further refinement of climate change modelling capability, along with adaptation measures which include asset relocation, network reinforcement, micro-grids, and vegetation management.

Governance Page 6

Board of Directors

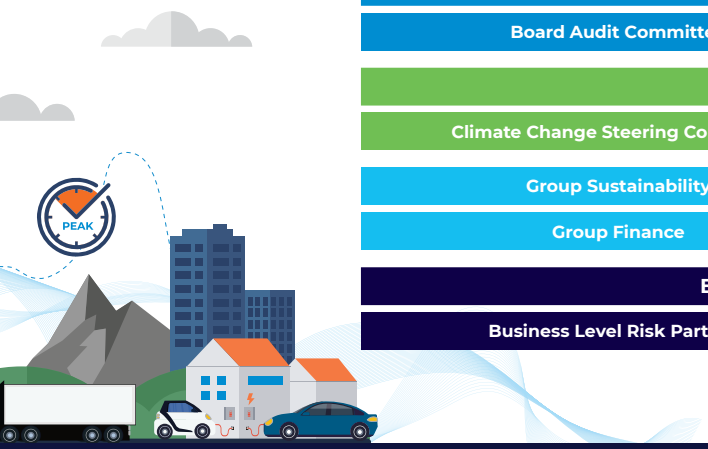
Board Audit Committee	Board Risk and Assurance Committee

Executive Management

Climate Change Steering Committee	Chief Public Policy and Regulatory Officer
Group Sustainability	Group Risk and Resilience
Group Finance	Group Insights

Business Level Senior Management

Business Level Risk Partners	Business Level Insights



Governance

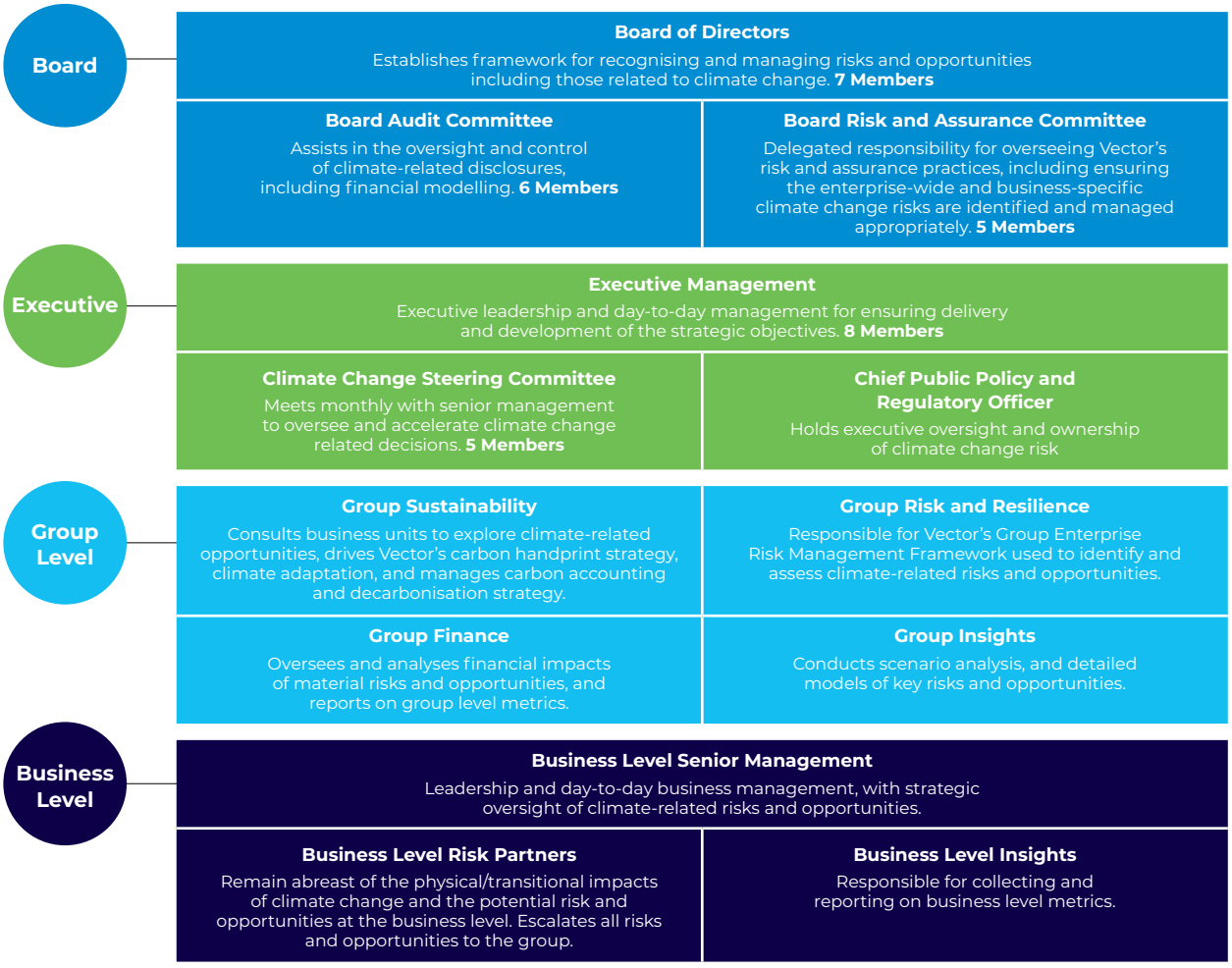
Integrated Governance for Climate Change

An integrated approach to climate change-related governance ensures that climate change considerations are built into daily operations. Furthermore it ensures that the appropriate skills and competencies are available, through access to Group Level expertise. For example, Group Sustainability holds expertise in physical and transitional climate change trends, while Group Insights produces detailed transitional forecasts as relevant to Vector businesses. These competencies are summarised in the matrix below. Vector uses a top-down, and bottom-up strategy to identify climate-related risks and opportunities.

The bottom-up identification strategy is led by the Group Risk and Resilience and Group Sustainability teams across each Vector business unit to identify climate-related risks and opportunities against the three-climate scenarios described in the Risk and Opportunity Management section. These risks and opportunities are consolidated and presented to the Executive Climate Change Steering Committee, and the Board Risk and Assurance Committee. The top-down strategy uses insights from the Board, Executive, senior management, and subject matter experts both internally and externally to establish objectives, targets, strategies, and budgets to address climate-related risks and opportunities.

This hybridised approach, discussed further in the Risk and Opportunity Management section, encourages staff to take action to address risks and opportunities, while still providing oversight at the Board level.

Vector's Board approves the company's strategy and metrics/targets to reduce climate-related risk and take advantage of climate-related opportunities. Vector management are responsible for updating the Board on performance against targets via Board reports. Decarbonisation makes up five percent of overall short-term incentive payments to the executive team and their direct reports.



Vector's Board Oversight

Vector's Board of Directors is responsible for the governance of Vector's strategic direction, including recognising and managing climate-related risks and opportunities and their impact on that strategic direction. Climate Change risk and opportunities are considered as part of the 16 Vector Group risks that are monitored with priority; and reviewed quarterly at the Group Material Risk Review. Four of these risks are attributed to climate change. Refer to the Governance Report within Vector's Annual Report for more details on these strategic risks [17].

The Audit Committee, and Risk and Assurance Committee are subcommittees of the Board with delegated responsibility for ensuring Vector manages its risks and compliance appropriately, including its climate-related risks. Each meets at least four times per year. The Audit Committee is responsible for oversight of climate-related financial disclosures and reporting which includes financial modelling. The committee meets to comment on key accounting judgments which include TCFD related scenarios, materiality thresholds, consolidated risks and opportunities, as well as greenhouse gas emission quantification and targets. The Audit Committee reviews and recommends the TCFD draft for final Board approval.

The Risk and Assurance Committee is responsible for the oversight of Vector's Enterprise Risk Management Framework, its maturity, and the effectiveness of the management of the framework. It regularly reviews the risk of adverse impacts, government responses, and unexploited opportunities from climate change as part of the group material risks to the delivery of its Symphony Strategy.

The Board Risk and Assurance Committee, and Audit Committee are accountable to the Board and regularly report decisions and recommendations to it. This includes a requirement to ensure that the Board is made aware of matters within the Committee's scope that significantly affect Vector.

A summary of key board meetings are found in Table 1. Note that management level staff attend these meetings to provide a two-way engagement between board and management.

Table 1: Key Board engagements for FY2023 aligned to climate risks and opportunities

	RISK AND ASSURANCE	AUDIT COMMITTEE	BOARD
September 2022	Group material risk review *		Vector Technology Solutions update *
November 2022	Group material risk review * Review prioritised climate related risks and opportunities for disclosure		
December 2022			Vector Technology Solutions update *
February 2023		Discuss and approve chosen scenarios and methodology for financial quantification of risks and opportunities.	
March 2023	Group material risk review * Resilience Programme Update		Approves Electricity Asset Management Plan ** Vector Technology Solutions update *
June 2023	Group material risk review * Resilience Programme Update Vector Climate Change Reporting Review	Reviews key judgments made during modelling, greenhouse gas emission calculation, and first draft of the TCFD **	Approves Gas Asset Management Plan **
August 2023		Recommends TCFD draft to Board. ** Approves Goodwill Impairment Testing **	Approves TCFD **

* Quarterly ** Annually

Governance (continued)

Vector's Executive Oversight

The Group Chief Executive is responsible for the day-to-day leadership and management of Vector's businesses to ensure the identification and development of business objectives and strategies are delivered.

The Climate Change Steering Committee is a sub-committee of the Executive, consisting of 5 members, and normally meets monthly to identify and manage all climate change related topics including climate change risk, and decarbonisation. The Climate Change Steering Committee is chaired by the Chief Public Policy and Regulatory Officer, who holds ownership of climate change related risks. In the 2023 financial year, the Climate Change Steering Committee reported to the CEO monthly via a CEO report. Select contents from the monthly report are then reported to the Board in the monthly CEO report.

Vector's Group Oversight

The Vector Group Risk and Resilience 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 framework and the Group Risk Assessment Criteria. This 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 consults with Vector's diverse business units to drive Vector's climate change strategy. This includes carbon management, internal decarbonisation programmes (carbon footprint), external decarbonisation support (carbon handprint), climate adaptation strategies, consolidation of climate change related metrics and targets, and strategic oversight of climate change related risks and opportunities. Group Sustainability reports to the Chief Public Policy and Regulatory Officer and sets the agenda for the Climate Change Steering Committee. The risks and opportunities are financially evaluated by Group Finance, with analytics conducted by Group Insights.

Integrating TCFD with wider disclosures

Vector's TCFD is informed by a suite of inter-related disclosures.

DISCLOSURE	INTEGRATION
Electricity asset management plan	Discloses Vector's electricity asset management policy, objectives, 10 year investment plan, and the context in which those investment decisions are made. While a 10 year investment plan is provided, each investment still goes through appropriate governance processes before being committed. Information relevant to *Risk 1: Inability to efficiently Manage Peak Load*, and *Risk 3: Increase in Extreme Weather Events*, is discussed here in the context of the electricity network managed by Vector.
Gas asset management plan	Discloses Vector's gas asset management policy, objectives, 10 year investment plan, and the context in which those investment decisions are made. While a 10 year investment plan is provided, each investment still goes through appropriate governance processes before being committed. *Risk 2: Unmanaged Transition from Gas*, is also disclosed here.
Greenhouse gas emission inventory report	Discloses Vector's Greenhouse Gas Emissions, methodology, assumptions, and reduction plans. Greenhouse gas emission results and targets feed into the TCFD metrics and targets.
Vector annual report, Half yearly report, and Operational performance updates	Discloses financial and operational, and carbon information at a group level. Operational statistics disclosed in the annual report informs the TCFD metrics section.
Electricity and gas distribution information disclosures	Annual disclosures of historical financial and non-financial performance, in accordance with the information disclosure determination. This informs the TCFD metrics and targets section.
Electricity and gas distribution price quality statement	Annual assessment of performance against price path and quality standards, in accordance with distribution services default price quality path determination. This informs the TCFD metrics and targets section.

Risk and Opportunity Management

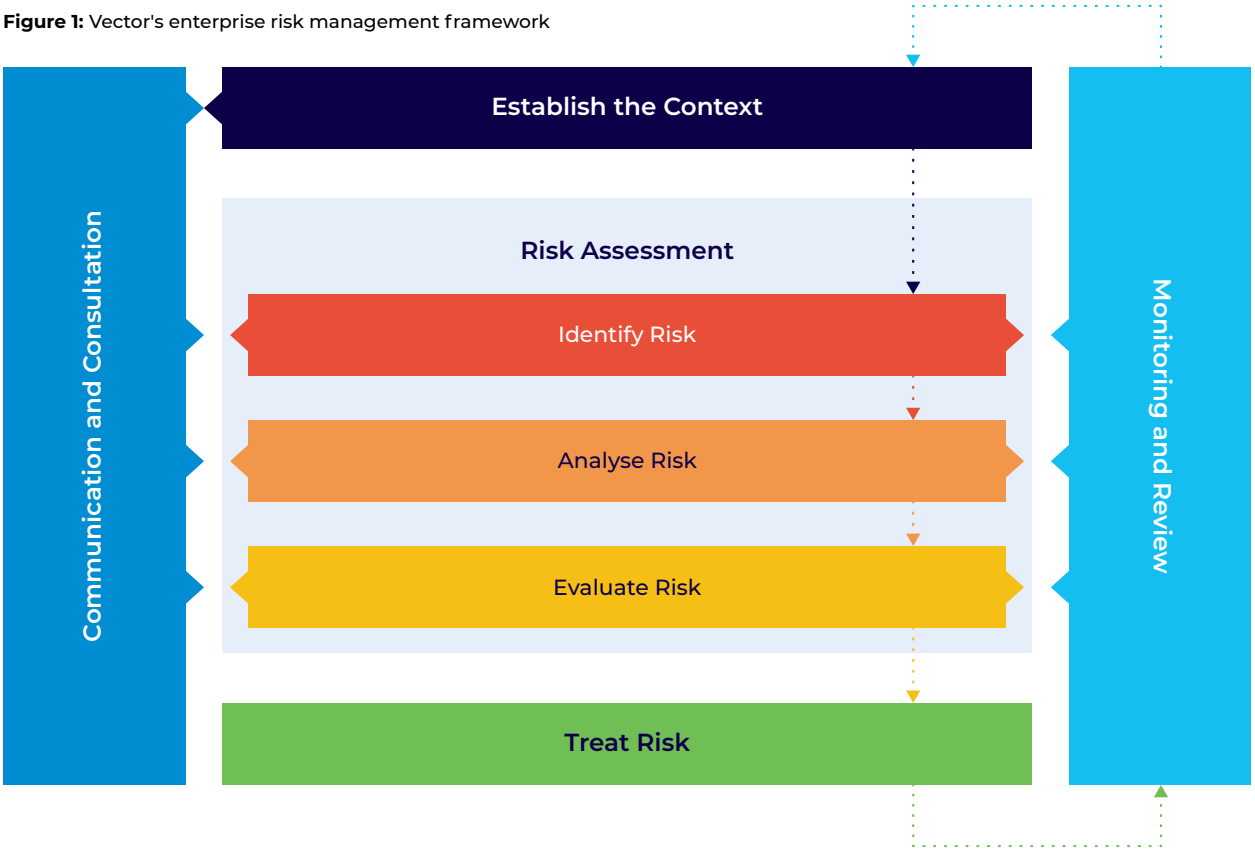
Our approach to risk management

We have a clear Group Enterprise Risk Management Framework consistent with the Risk Management Standard ISO 31000. This is embedded in our business through our risk governance, policies, guidelines and risk partnership model that Group Risk and Resilience maintains with the different business units to support Vector's risk management practice.

Using the Risk Assessment Criteria supports 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, policies, and Vector's material risks.

The impacts of climate change have featured prominently in Vector's material risk profile since 2019, reinforcing our ongoing work to understand and respond to the evolving nature of these risks, as well as the opportunity to enable our vision of creating a new energy future. 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 change risks and opportunities are overseen by the Climate Change Steering Committee.

Figure 1: Vector's enterprise risk management framework



Risk and Opportunity Management (continued)

Our process for identifying and prioritising material climate risks and opportunities

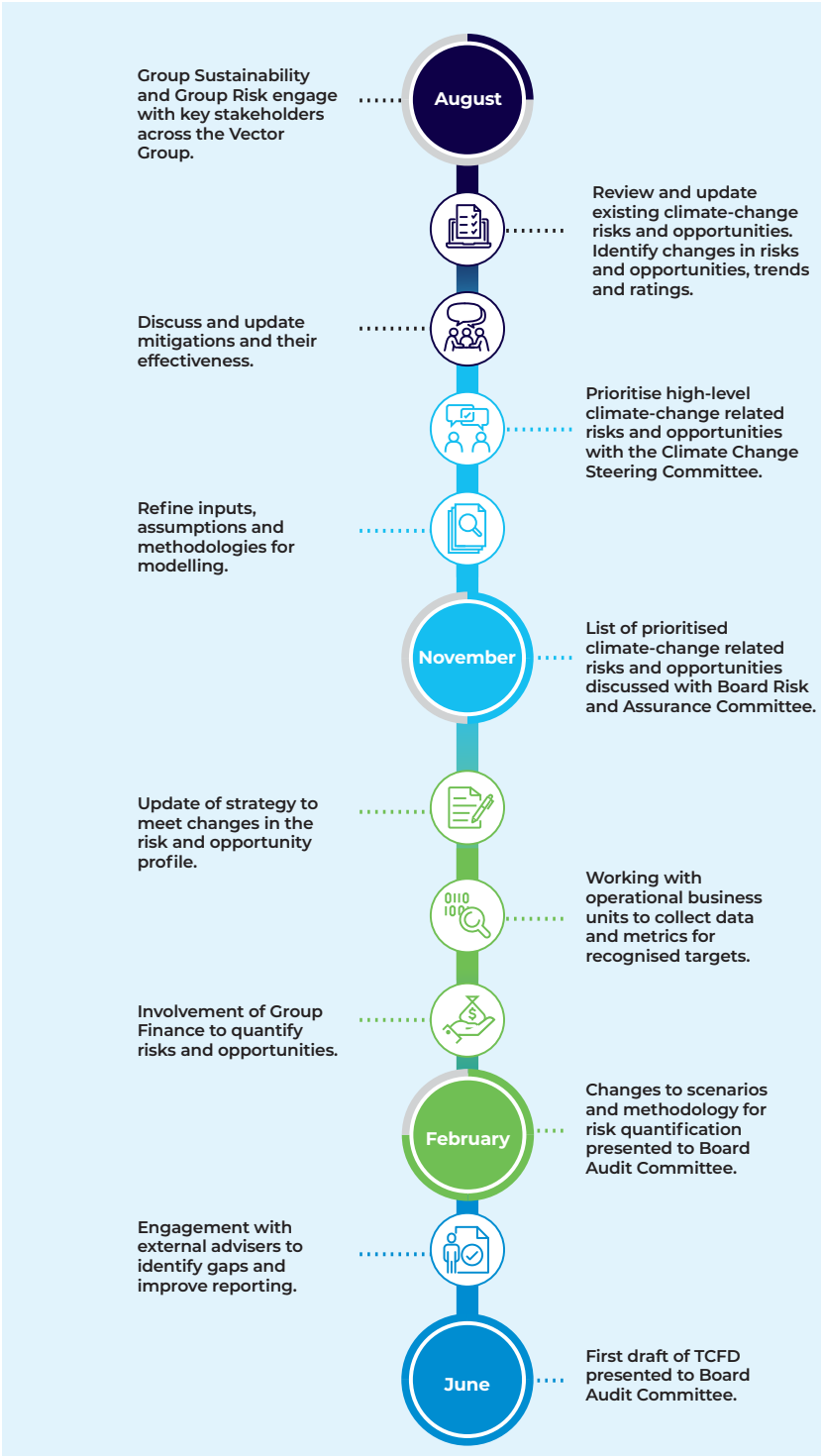
As noted in the Governance section, Vector uses a top-down and bottom-up strategy, to identify climate-related risks and opportunities. Risks and opportunities are consolidated and defined as material based on the following criteria:

- Risk or opportunity is ranked high to very high based on the Group Risk Assessment Criteria.
- Risk or opportunity meets Vector's financial materiality threshold having a potential financial impact greater than 5% of Vector's market capitalisation.
- 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 (carbon handprint).

Based on the above criteria, the risks and opportunities are then prioritised and consolidated, with oversight from the Climate Change Steering Committee, and approved by the Board.

As part of our bottom-up approach, Group Risk and Resilience works to identify new climate change risks and review existing risk records with all business units which forms a key part of the TCFD reporting process.

Vector includes its value chain when analysing risks and opportunities. This includes supply chain, downstream customer impacts, and investments. These will be discussed further in the Value Chain subsection of the Strategy Section on page 20.



Our external engagement

Vector acknowledges that the energy transition is a global challenge, and therefore works with key external partners to stay abreast of risks and opportunities. Vector collaborates with international energy partners and regulators to rethink energy systems [2] and has a strategic alliance with Amazon Web Services for a data and analytics platform. We are also continuing our strategic collaboration with X (formerly Google X). Within New Zealand, Vector initiated an electricity transmission and distribution TCFD working group, initiated the FlexForum, and was a founding member of the Climate Leaders Coalition. Vector is also part of the Northern Energy Group, and Adaptation Working Group. Vector proactively works with rating agencies due to the criticality of funding metrics and credit ratings as it incorporates Environmental-Social-Governance (ESG) and climate risk frameworks. Vector also works with climate risk experts in the academic sector to keep up to date with the latest meteorological science.

Our process for understanding the impacts of risks and opportunities

Vector maintains relationships with key subject matter experts, such as the University of Auckland's climate risk team, and the National Institute of Water and Atmospheric Research (NIWA) to qualitatively understand physical risk trends. Material risks, such as the risks of floods, are then quantitatively studied by ClimSystems, that take the latest scenarios from the Intergovernmental Panel for Climate Change Assessment Report Six and process the data into geographic information system (GIS) maps, which can be evaluated against Vector's asset base.

In FY2023 Vector analysed:

- Fluvial and Pluvial flood exposure
- Flood depth exposure at zone substations
- Extreme high water level from coastal inundation
- Projected increase in frequency and duration of high wind-speeds

To evaluate transitional risks, the Vector Insights team uses a customer scenario model to forecast the impact of energy transitions on the electricity distribution network. The model enables us to determine growth requirements, plan for network flexibility, and understand the impact this may have on our consumers. Further details, including high-level model assumptions, can be found in Section 3. We categorise the time frames for these opportunities and risks as follows:

- short term (0-5 years), to reflect our typical business planning and default price path cycles which sets Vector revenue streams;
- medium term (5-10 years), to reflect our Asset Management Plans for gas and electricity networks that detail capital and operational expenditure forecasts;
- long term (10-30 years), to account for longer impacts over existing and future planned assets.

Vector Insights team uses a customer scenario model to forecast the impact of energy transitions

Strategy

Symphony – Vector's transition plan

Vector's core corporate strategy, known as Symphony, aims to transform the traditional one-way energy chain into an intelligent, multi-directional energy system that gives the customer more choice and control. Central to our strategy is that energy is clean, reliable, and affordable and that all three elements are actively factored into our services and solutions.

Vector is committed to working alongside its stakeholders to transform the energy system, as it is not only critical to our immediate daily lives, but also to our collective future through its role in enabling the decarbonisation of transport and industry. The same applies to Vector's fossil fuel assets which require innovative regulations, and financial models to decouple de-growth with capital recovery risk.

Vector is well advanced with climate change related risks and opportunities, already integrated within asset management plans for capital deployment. These are focussed on developing, and operating or enabling emerging technologies with digital platforms to manage these changing requirements. As energy systems are transformed to meet a decarbonised future, our view is that many of our climate-related opportunities correspond with the role we can play in creating and enabling new solutions and driving efficient, cost-effective, sector-wide decarbonisation.

Further details on Vector's transition plan, including alignment with capital deployment can be found in Vector's Electricity [3] and Gas Asset Management Plans [4].

Vector's diverse energy portfolio

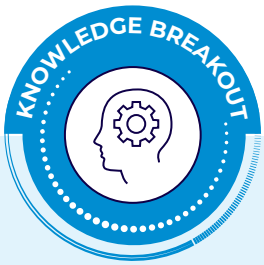
While many aspects of New Zealand's – and the world's – climate responses are evolving, the diversity of Vector's business portfolio provides us with valuable insights over a range of energy-related issues. This enables us to develop actions and plans towards financial resilience within our sector. We can also use our diverse portfolio to test and integrate multiple technologies, positioning us to create new solutions and drive sector-wide decarbonisation. However, we also recognise the carbon emissions associated with our gas infrastructure. The ability to manage the transition of these assets will be important to ensuring our long-term financial resilience in a decarbonising economy.

Launch of New Zealand's first fully electric bus depot with the capacity to charge 20 - 30 buses each. Charging at this depot occurs within a 'dynamic operating envelope', where Vector forecasts optimal charging times each day and provides this through to the depot, reducing peak demand for a more affordable charging solution.

VECTOR BUSINESS	DESCRIPTION
Electricity Distribution	Owns and operates the electricity network within the wider Auckland region. This consists of more than 19,000km of electricity lines, delivering power to more than 610,000 homes and businesses.
Vector Technology Solutions	A digital solutions business that takes products to market developed internally as part of Vector's digital transformation. Vector Technology Solutions is exploring opportunities in New Zealand and globally for key priority solutions including cyber security, and Diverge co-developed through our strategic alliance with Amazon Web Services.
Powersmart	Vector Powersmart has delivered some of the largest solar photovoltaic and energy storage systems in New Zealand and the Pacific Islands. More recently Vector Powersmart has also been providing expert consultancy for large-scale solar developments.
HRV	Provides energy efficient solutions covering home ventilation, home heating, and water filtration systems, as well as electric vehicle charging.
Fibre	Designs, builds, and maintains data networks in the wider Auckland region.
Natural Gas Distribution	Owns and operates the gas distribution network in the wider Auckland region, supplying gas to over 119,000 installed connection points, through 4650km of mains pipelines, distributing around 13.5PJ of gas per year.
Vector Ongas	Distributes and sells Liquified Petroleum Gas (LPG) to residential, commercial and industrial customers throughout New Zealand, through bottled LPG products and piped LPG networks. Vector Ongas also supplies piped natural gas to industrial and commercial businesses in the North Island including customers in the agriculture, horticulture and manufacturing sectors.

The diversity of Vector's business portfolio provides us with valuable insights over a range of energy-related issues

Thor, one of Vector Powersmart's GAYK machines that can drive piles into the ground twice as fast as traditional methods for faster assembly of large-scale ground-mounted solar farms.



Peak Power and why managing it is so critical

Significant international decarbonisation efforts have focussed on the 'energy' transition, with less focus on the 'power' transition. Sometimes, these two concepts are mixed.

Power is the amount of energy used in a set period; also known as the derivative of energy with respect to time. Power is sometimes referred to as 'capacity'. Energy is often referred to as 'volumes'.

Peak power impacts the electrical system in two ways

1. Transmission and distribution networks are generally sized to handle this peak power load. Any increase in peak power will require network infrastructure upgrades to handle this power increase.
2. The power supply through generation must equal the power demand, at all times. Any increase in power demand will require an equivalent real-time increase in power supply to match. Maintaining this delicate system balance is a core role of the transmission system operator and the wholesale electricity market.

Current Status

The graph on the next page (top-right) shows power curves between July – September 2022 in New Zealand. Note that as the x-axis is time, the area under the curve represents the total energy.

Orderly Scenario

Intermittent renewable energy sources such as solar and wind are key drivers to electricity generation decarbonisation, however the same rules of 'power supply must equal power demand' still hold.

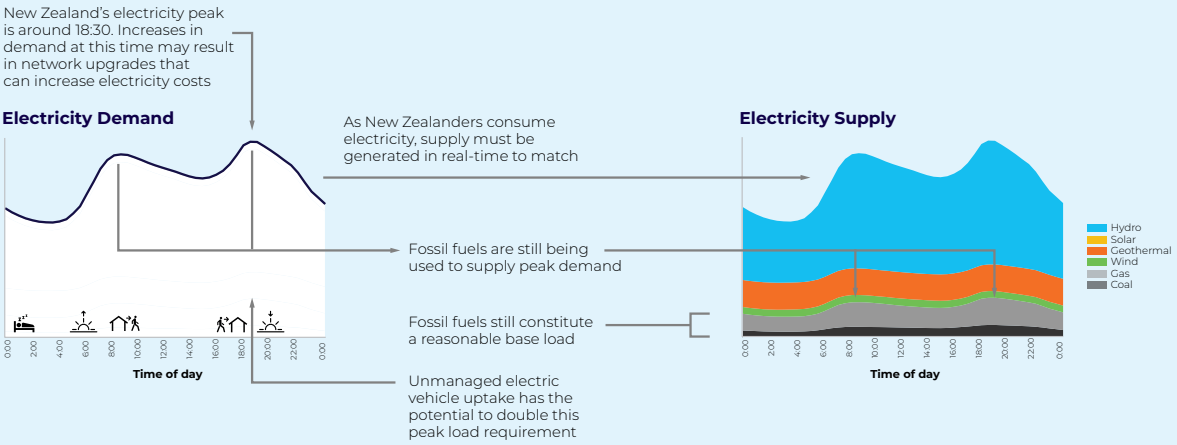
As the supply side becomes less flexible and more dependent on the weather, the traditional roles of the power system may be flipped – in future a more flexible demand side may be able to balance fluctuations in an increasingly inflexible supply side. This can occur through digital services that optimise customer power consumption to maximise consumption when renewable energy supply is available (e.g., through charging car and household batteries at off-peak times), and since the operating costs for renewable energy are low compared to fossil-fuel generation (that have additional fuel costs) it is expected that these will also be times of low wholesale prices. This is discussed in more detail in the Opportunities section.

Furthermore, and in Vector's case, flexible power management operating to alleviate network congestion can also allow for more intelligent utilisation of electricity infrastructure. Distribution networks are built to deliver a certain level of power. With a flatter power demand/supply curve over extended periods (away from peak time), more overall energy (area under the graph) can be distributed through the existing infrastructure. Accordingly, the utilisation and efficiency of the network is improved. Our Symphony Strategy envisions this orchestration capability improving, and expanding to include other large consumer loads in Auckland such as electric vehicle charging.

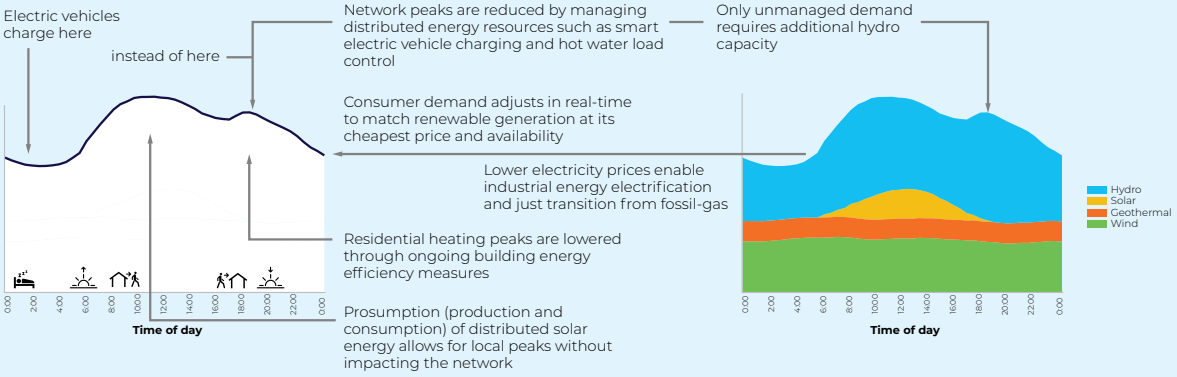
Disorderly Scenario

If the latent flexibility in consumers' demand-side assets cannot be unlocked there are risks to Vector, the customer, and the wider energy sector. New Zealand's current electricity peak occurs in winter between 6:00pm - 9:00pm. Any increases to this peak, such as from electric vehicles charging after returning from work, will require infrastructure and generation upgrades that ultimately increase electricity prices. Furthermore, the cheap renewable electricity from wind and solar may be under-utilised due to its intermittency, and a need for significant investment in grid level storage and back up fossil-fuel based generation will be required. All these contribute to an increase in electricity prices and present a material risk for Vector. This is described in more detail in the Strategy section, *Risk 1: Inability to efficiently manage peak load*.

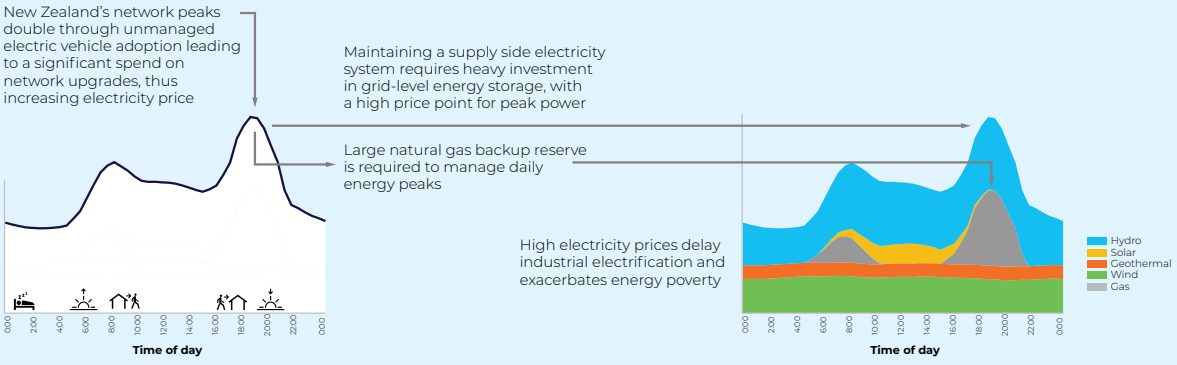
Current Status (July - September 2022)



An Orderly Decarbonised Future



A Disorderly Decarbonised Future



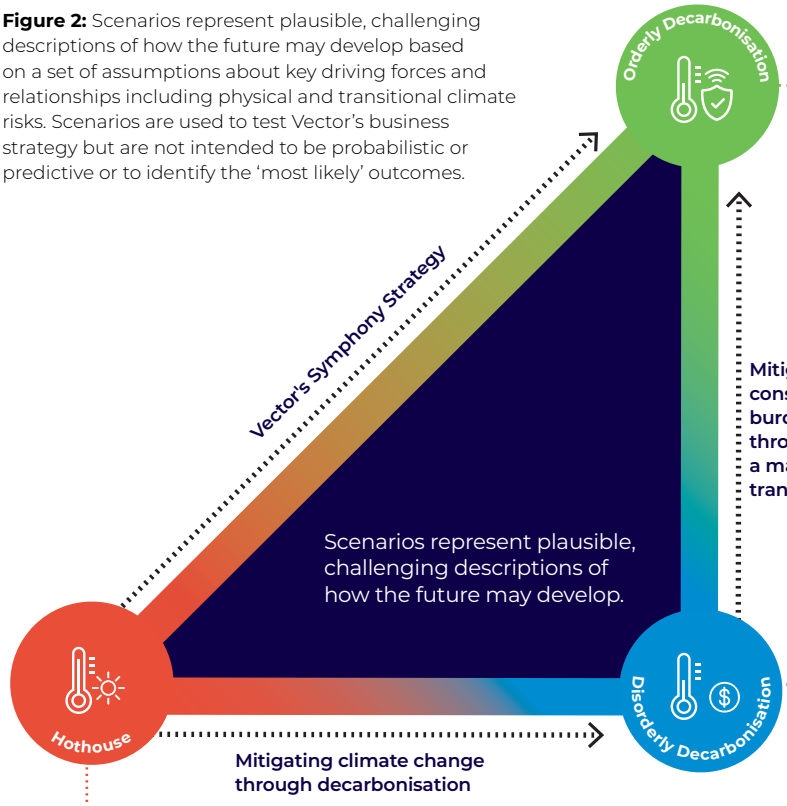
Strategy (continued)

Our approach to using climate scenarios

Vector has developed three climate scenarios that converge 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.

These scenarios were developed internally, along with engagement from the wider electricity distribution and transmission sector in New Zealand. These scenarios are integrated within Vector's strategy processes by informing the vision of Symphony. The scenario's are developed with oversight from the Climate Change Steering Committee and Board Audit Committee.

Figure 2: Scenarios represent plausible, challenging descriptions of how the future may develop based on a set of assumptions about key driving forces and relationships including physical and transitional climate risks. Scenarios are used to test Vector's business strategy but are not intended to be probabilistic or predictive or to identify the 'most likely' outcomes.



The chosen scenarios are relevant to Vector, as they show different sides of the energy transition being undertaken globally. From the perspective of Vector, it can be viewed as a triad, see Figure 2. It is important to note that we have decoupled global scenarios from local scenarios, as even if New Zealand were to reach net-zero by 2050, it does not necessarily mean that the rest of the world will. The Disorderly Decarbonisation scenario is a good example of this whereby New Zealand reaches net-zero by 2050, however the rest of the world maintains existing emissions leading to weather impacts that will affect the Vector electricity network. We consider that the IPCC scenarios [5] are best suited for New Zealand physical risk impact analysis due to their data availability, especially for SSP 2-4.5 from Assessment Report Six. We expect our scenario modelling, and therefore risk impacts to change as climate science research continues to develop. The boundary for Vector's scenario analysis was the whole of the organisation, including our subsidiaries.

VECTOR SCENARIOS

Orderly Decarbonisation

- Limits warming to 1.5°C (SSP 1-1.9) 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 system costs
- Ongoing efforts with energy efficiency to reduce demand
- Managed transition away from fossil fuel gas

Disorderly Decarbonisation

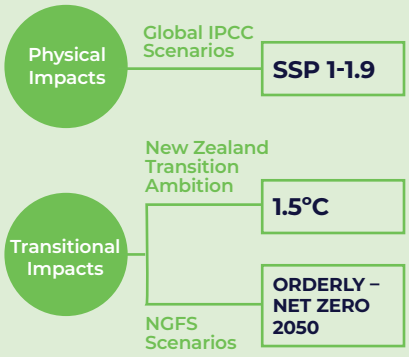
- 2.7°C world by 2100 (SSP 2-4.5)
- New Zealand still achieves net-zero by 2050 but via a disorderly transition
- World maintains current emissions until 2050 and net-zero by 2100
- Transition focuses on large-scale renewable supply with no demand side or digitalisation
- Rapid unmanaged electrification
- 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

Hothouse

- 4.4°C world (SSP 5-8.5) by 2100
- Emissions grow until 2080
- Policies revert New Zealand back to the fossil fuel era
- Consumers bear the cost of expensive fossil fuel energy
- Regulations block decarbonisation spending

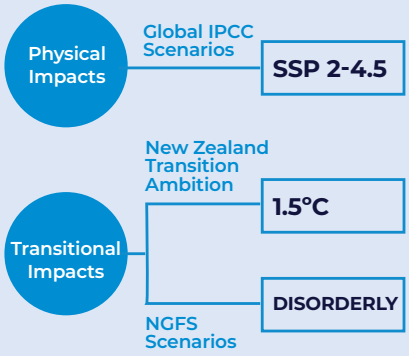
New Zealand
The orderly decarbonisation scenario pushes for net zero emissions in New Zealand and globally by 2050 through clear and early actions that integrate a whole of systems approach. Regulations and policies are aligned with decarbonisation, and pricing models incentivise measures that not only reduce carbon but also long-term costs for consumers. This means that demand side management solutions, distributed generation, and energy efficiency are prioritised so that the energy sector can manage large-scale electrification and renewable generation variability. Demand-side participation by consumers optimises the use of the network to reduce unnecessary capital expenditure and optimises the wholesale market to leverage the low cost of renewable power. The combined effect keeps electricity prices low, and thus enables an easier transition from fossil fuels to electricity. Natural gas networks undergo a managed transition, where capital asset costs are recovered through early regulatory changes, and consumers are supported throughout their transition to electricity.

Global
The world shifts gradually, but pervasively towards a more sustainable path leading to a global net-zero by 2050. Global temperatures are expected to peak around 1.6°C by 2050 and then decline to 1.4°C by 2100. This will still result in an increase to the extreme weather impacts that Vector is already experiencing.



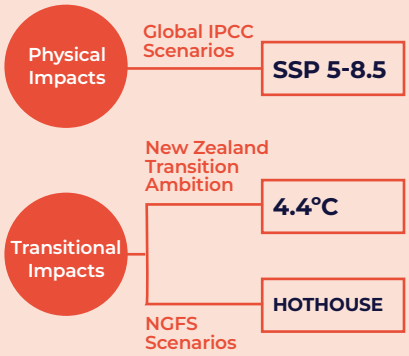
New Zealand
The disorderly decarbonisation scenario achieves net-zero emissions in New Zealand by 2050, but the failure to coordinate policy stringency across sectors results in a high burden on consumers, exacerbates existing societal inequalities, and creates energy reliability issues. Policies are only focused on large-scale renewable electricity generation and rapid electrification of transportation. The absence of demand-side management on electric vehicle charging and industry results in high peak load power requirements, needing large infrastructural upgrades with costs largely passed on to consumers. The absence of demand-side management also limits consumers' ability to leverage the low price point of renewable electricity. This increases strain on the wholesale market, with dependence on large-scale back-up fossil fuel generation keeping electricity prices high. Such high electricity prices not only intensify energy poverty but also create dependency on government subsidies to achieve the 2050 targets. Natural gas networks are shut down early, without a managed transition, and with no support for consumers to replace their gas appliances and manage the cost implications of alternative energy supply.

Global
The world follows a path where 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 2050 and then fall by 2100 causing global temperatures to reach 2.0°C by 2050, and 2.7°C by 2100. This would cause even more significant weather impacts in New Zealand.



New Zealand
The hothouse scenario represents an unlikely, but worst-case scenario, where public frustration at a disorderly transition result in policy changes that revert New Zealand back to the fossil-fuel era. 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 expensive fossil fuel energy and ongoing climate change adaptation.

Global
The rest of the world pushes for economic and social development, coupled with the exploitation of abundant fossil fuel resources and energy intensive lifestyles around the world. Emissions are expected to triple by 2075. Global temperatures are expected to reach 2.4°C by 2050 and 4.4°C by 2100 leading to catastrophic weather impacts.



Strategy (continued)

Physical Scenario Modelling

Vector's electrical infrastructure has the highest exposure to the physical impacts of climate change within the Vector Group, and therefore is a focus point for physical risk analysis. Flood modelling, and wind-speed projection modelling were chosen as appropriate initial models as these climate change weather events are hypothesised as having the highest material impact. In FY2023 Vector commissioned ClimSystems to analyse flood and wind-speed projections in the Auckland Region using the latest results from the Intergovernmental Panel for Climate Change – Assessment Report Six [5]. These geospatial maps of wind-speeds and floods can then be mapped against Vector's asset base to understand asset exposure to these weather events. The results of this modelling will be detailed in *Risk 3: Increase in extreme weather events*.

These scenarios integrate with Vector's overall strategy via our engineering and asset management processes. For example, the one zone substation that is exposed to coastal inundation in our climate models is due for decommissioning in FY2025. It is important to note the time-lag between climate scenario modelling, and asset management. Once an asset is identified as having an anticipated risk, detailed modelling and engineering studies are required before an appropriate action is taken. As our capability in climate change modelling is still nascent, our methods and internal processes will be continually refined as our scientific understanding of climate change impacts develop.

Transitional Scenario Modelling

Electrification of transport and industry, combined with enhanced renewable generation, will form a key approach to decarbonising New Zealand's economy. These changes in behaviour and technology affect how and when electricity is used, which in turn impact the requirements of the electrical distribution network. The chosen models are considered appropriate as they inform our network planning and inform wider policy and regulatory stakeholders around the electrification transition. It is important to note that the physical impacts of climate change do not materially feed into the transitional scenario models. We also do not model the hothouse transitional scenario as this would infer an absence of transition.

Through our internal modelling, we consider elements of an orderly and disorderly transition to understand if and how they impact the drivers of future demand on our electricity network. The outputs from our models are used to inform both our Asset Management Plan and broader business strategy.

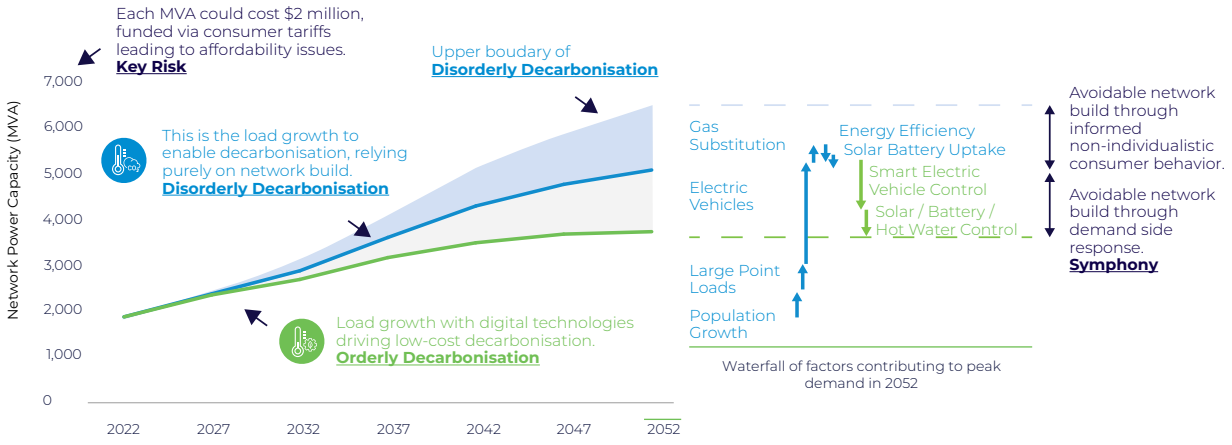
In our modelling, the elements of a disorderly decarbonisation scenario that we consider, are centred around the misalignment of passive and active signals to consumers which ultimately result in load being clustered at peak periods. The converse is true of the orderly decarbonisation scenario, where incentives and behaviours are aligned to minimise peak load. *See Knowledge Breakout: Peak Power and why managing it is so critical* for more background information.

An example of this would be electric vehicle uptake. In a disorderly scenario we model a greater proportion of electric vehicles charging around peak periods which ultimately increases the capacity requirements on the network. In an orderly scenario, we have fewer electric vehicles charging at peak times due to a combination of consumer behaviour (they either choose or are incentivised to charge off peak) and flexibility services operating – for example third party aggregators or Vector itself accessing smart charging services and other demand-side loads to shift load out of peak periods.

Vector's Asset Management Plan dated April 2023, presents a detailed discussion on the scenarios that Vector has used for planning purposes. We clearly demonstrate through these scenarios the benefits of having aligned incentives and capabilities to manage and incentivise shifting of load outside of peak times without negatively impacting consumers.

Our diverse portfolio presents a strong business advantage for supporting this cost-effective and orderly energy transition. Several of the products and services developed by our businesses can play a key role in directly enabling an orderly decarbonisation transition, such as our support through data, digital platforms, and connectivity. To this end, we are working closely with policymakers and regulatory bodies, both in New Zealand and internationally, to advocate that decarbonisation cannot merely focus on adding more large-scale renewable generation. In our view, it must give equal importance to optimised demand-side management, energy efficiency, and distributed low-carbon generation. All of this is in the long-term interest of our customers. We are also working to scale the influence of our response through partnerships and collaborations with leading energy and technology partners. Many of these products and services appear as top climate-related opportunities for Vector, which is expanded on in the next section.

Figure 2: Forecasted peak growth on the Vector Network for the disorderly and orderly decarbonisation scenarios.



Strategy (continued)

Better energy and regulatory policy alignment across government is becoming increasingly urgent, and we note steps that the United Kingdom has taken in establishing the Department of Energy Security & Net Zero

Regulatory and Policy Reform

A critical feature in many of Vector's risks and opportunities are regulatory and policy frameworks that govern the energy industry. Energy sector governance is upheld by a vast array of ministries and regulators including but not limited to: the Ministry for Business Innovation and Employment, the Ministry for the Environment, Ministry of Transport, the Electricity Authority, Commerce Commission, Energy Efficiency and Conservation Authority, and the Climate Change Commission. Coordinating decarbonisation across these numerous governing bodies is a challenge due to dispersed capability and blurred accountability leading to outcomes that risk driving New Zealand towards a disorderly transition. Better energy and regulatory policy alignment across government is becoming increasingly urgent, and we note steps that the United Kingdom has taken in establishing the Department of Energy Security & Net Zero. Establishing an equivalent aligned policy agency would be effective in ensuring strategy development, regulation, policy, market design and oversight, and resilience are all centrally coordinated with the necessary expertise and resources.

Value Chain

Vector is beginning to explore its value chain when analysing risks and opportunities. These extend to its energy supply chain, downstream customer impacts, and investments.

Vector's electricity supply chain is vulnerable to increases in drought impacting hydropower electricity supply. Furthermore, as electricity becomes more renewable and therefore intermittent, the risk of demand exceeding supply (a generation shortfall) increases. A recent draft report from Transpower identifies the potential for a generation capacity shortfall in the North Island as fossil fuel generators retire [7]. While not material to Vector's assets or direct business, these impacts can interrupt electricity supply which directly impacts our customers.

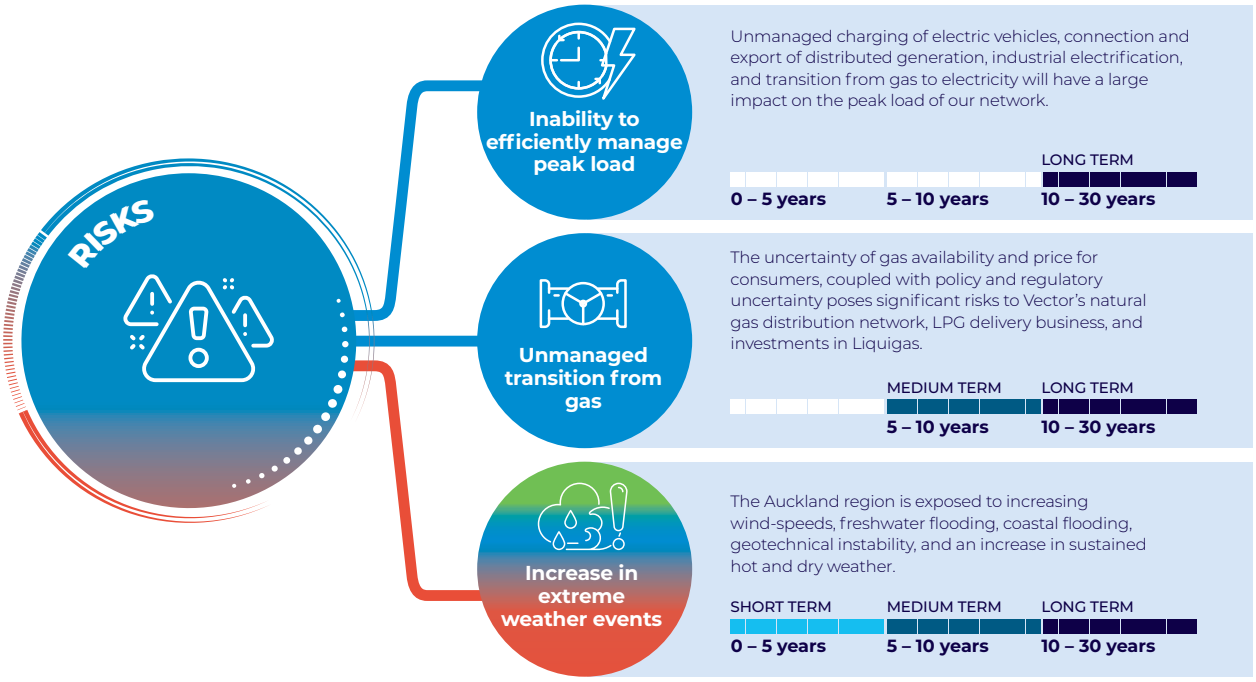
These customer impacts are strongly considered in our climate related disclosure. *Risk 1: Inability to efficiently manage peak load*, is an example of such considerations. See the *knowledge breakout: Is growth in electricity networks a risk or an opportunity* for a detailed narrative on this topic.

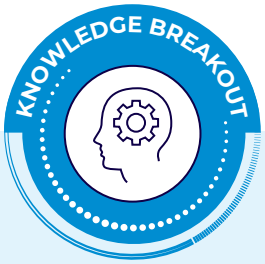
In 2023 Vector concluded the deal to sell 50% of the metering operations. As Vector no longer has direct operational control of its metering operations, we have removed the Advanced Metering opportunity from our list of key opportunities. Nevertheless, advanced meters and the data services they provide remain a key enabler of data-driven decarbonisation.

Vector's owns a 60.25% share of Liquigas, New Zealand's leading company for tolling, storage and distribution of bulk LPG. As a fossil fuel asset, this risk will be captured within *Risk 2: Unmanaged transition from gas.*

Vector excludes tier 2 and 3 suppliers, such as copper mining, from its value chain analysis.

Risks





Is a growth in electricity network assets a risk or an opportunity?

An orderly transition should ensure that only the right amount of capital, being a scarce resource, is deployed. Assuming regulatory settings provide the right investment incentives (for example returns are commensurate with risk) then an orderly transition will ensure that contributors of capital receive appropriate returns and consumers pay appropriate prices. Therefore, the growth in electricity assets under an orderly transition can be considered an opportunity.

A disorderly transition results in more scarce capital being deployed than is required under the orderly transition, which is inefficient. While contributors of capital may still earn appropriate returns under a disorderly transition the same cannot be said for consumers. Consumers would pay higher prices under a disorderly transition when compared to an orderly transition to effectively fund the returns required on the excess deployed capital. This is a risk as it could result in intervention by regulators and/ or government.

Vector also has a unique ownership model, where it is 75.1% owned by Entrust, a consumer trust which represents more than 356,000 households and businesses in central, east and south Auckland (as at 2023 roll date). It is therefore in the interests of our majority shareholder to ensure that energy prices remain low, and consumer burden is mitigated through an orderly transition.

Vector, therefore, considers this unmanaged growth a climate-related risk, and is striving to enable mass electrification, while minimising network impacts through an orderly transition. This is described in more detail in *Risk 1: Inability to efficiently manage peak load*.

Risk 1:
Inability to efficiently manage peak load

Efficiently is defined as the ability to maximise network utilisation, minimise network investment, and therefore supply electricity at the most affordable price.

Risk Description

As highlighted in Figure 2, forecasting suggests that 70% of peak demand growth by 2052 will be due to the electrification of transport causing a significant increase in Vector's future peak demand. If this load growth is managed solely through traditional poles and wires investment, Vector risks creating a future network that cannot grow and contract to accommodate load profile flexibility, therefore imposing increased costs on all customers, disconnecting itself from stakeholder values and adversely impacting Vector's brand and reputation. Vector will also be creating a network that limits innovation towards more resilient and decarbonised energy solutions for communities.

KEY SCENARIO OUTCOME

Type: Transitional - Policy Risk

Disorderly Decarbonisation: Policy and regulatory frameworks are misaligned, limiting the utilisation of demand side management during times of peak network congestion, leading to excess deployment of capital to cater for this future peak. Consumers would pay higher prices under a disorderly transition to fund the returns required on the excess deployed capital. This is a risk as it could result in intervention by regulators and/ or government.

LONG TERM
10 – 30 years

The tipping point of rapid electric growth is forecasted to occur at 2032.

Current impacts

Growth in electric vehicle uptake, industrial decarbonisation, and population growth in the Auckland region is already having an impact on Vector's Network. Vector is forecasting additional investment of $537m capital expenditure before inflation over the next five years compared to our forecasts last year.

Anticipated Impact

Existing regulatory frameworks encourage Vector to expand its physical asset base to meet this forecasted peak load, and pass on costs to consumers. The forecasted growth over the next 30 years in a disorderly scenario is unprecedented and will incur significant costs for our consumers.

Financial Impact

Uncertainty around the direction of New Zealand's energy strategy, regulatory reforms, and the sensitivity of variables such as electric vehicle uptake and charging patterns pose challenges for the meaningful financial quantification of this risk. Further work is required to quantify the cost of demand side orchestration taking a whole of systems approach.

For now, Vector has taken a long run marginal cost assumption in which each mega-Volt-Ampere (MVA) of network build costs approximately at $2million/MVA based over a 40 year investment cycle [8].With this assumption, the impact of a disorderly decarbonisation could cost an additional $2.7 billion by 2050 which could otherwise have been deferred. Further work is ongoing to develop more comprehensive financial quantification that also includes the full costs of orderly decarbonisation.

Strategy to address this risk

The medium-term period to 2033 is a critical decade for unlocking longer term affordability. Vector believes the way to achieve this is through increasing deployment of non-wires alternatives and effective orchestration of distributed energy resources, over the long term.

This includes an increase in our ability to manage distributed energy resources, the capability to manage these resources (either directly ourselves, or to orchestrate via third parties), and the alignment of market, regulatory and policy settings/mandates to enable this. Most importantly Vector needs certainty and confidence that consumers' flexible demand will be shifted outside peak periods with sufficient certainty to defer investment, especially when under management of third parties. At a high level, it includes key focus areas:

- Development of dynamic operating envelopes.
- Practical deployment of third-party demand side orchestration, including through advanced pricing incentives.
- Customer experience initiatives to onboard distributed energy resources.
- Network modernisation to enable whole of system planning, distributed energy resource integration and detection.
- Enabling digital systems, integration protocols, cyber security, and new data platforms.
- Visibility of the low voltage network, including distributed transformer and distributed energy resource visibility.
- Distribution system operator capabilities.
- Industry collaboration, operating protocols, and common industry standards.
- Ongoing development of demand side tariffs.
- Further development and refinement of cost-reflective pricing.

These pathways are directly integrated into Vector's financial planning processes through our Asset Management Plan, and are also discussed in *Opportunity 2: Distributed Energy Resources*. Examples of successful actions to date to drive this includes:

- Actively engaging in public policy and regulatory consultations such as the Emissions Reduction Plan Discussion Document [9].
- Our strategic alliance with Amazon Web Services to develop innovative new data management capabilities, and strategic collaboration with X, the moonshot factory (formerly Google X), which is developing technology and tools to accelerate clean and renewable power onto the grid. See *Opportunity 1: Energy Platforms*.
- Building capability to on-board consumers onto Vector's Distributed Energy Resource Management System (DERMS platform) for demand response.
- Supporting and participating in an industry FlexForum to take practical steps towards optimising the system flexibility benefits of distributed energy resources.
- Increasing low voltage network visibility via existing smart meters.
- Assessing the role of pricing structures to incentivise customers to charge large-scale electric vehicles outside the period of peak demand on the network, and the efficient orchestration of DER under the control of third parties.

Based on the above measures, Vector's Symphony Strategy is currently considered to be well placed to manage this risk over the long term. Changes to this strategy may emerge in response to regulatory, technology and market changes, and scientific developments.

Risk 2:
Unmanaged Transition from Gas

Risk Description

The uncertainty of gas availability and price for consumers, coupled with the country's trend towards decarbonisation in the midst of policy and regulatory uncertainty poses significant risks for Vector's natural gas distribution network, LPG delivery business, and investment in Liquigas.

Current impacts

Vector's gas network has been experiencing a steady decline in natural gas volumes since 2019. This is largely due to industrial decarbonisation and phase-out of other industrial players. However, gas is still heavily relied upon by many industrial, commercial and residential consumers.

Type Transitional: Policy Risk, Market Risk

Both the orderly and disorderly scenarios involves a transition away from fossil natural gas with increasing carbon prices, changing consumer attitudes towards gas, and supply volatility. This was explicitly stated in the Climate Change Commissions recommendation to government whereby the use of fossil-gas would need to reduce [11], and was restated in the government's national Emission Reduction Plan [10]. The Government is currently developing its Gas Transition Plan, a key input into the forthcoming national energy strategy.

MEDIUM TERM
5 – 10 years

LONG TERM
10 – 30 years

Anticipated Impact

Vector anticipates further reduction in gas volumes as customers continue to decarbonise. The uncertainty of the future asset life utilisation (capacity and longevity) of gas networks changes the regulatory compact – on which gas network owners invest. Under the disorderly scenario, this introduces a stranded asset risk, as also recognised in the government's Emission Reduction Plan [10], whereby investment recovery is not achieved over the long term.

Vector's LPG business and investment in Liquigas will also be impacted through increasing prices (carbon, commodity and supply chain prices), changing customer attitudes towards gas, and possible policy changes such as a ban on gas connections as highlighted in The Climate Change Commissions 2023 draft advice [11]. This could lead to a decline in customers, volumes and profit margins resulting in asset rationalisation. Unlike natural gas supply, LPG is not constrained by local supply as Liquigas has the facilities to import all of New Zealand's LPG requirements if necessary.

Financial Impact

The carrying value of the natural gas network in Auckland is $607 million, onGas LPG business throughout New Zealand is $70.4 million, and investment in Liquigas is $72.7 million.

The trajectory and the extent of the financial impact on the value of our business will remain highly uncertain until the gas transition plan is published at the end of 2023, and the outcomes may remain uncertain for several years following that.

While not included in Vector's costs, it is worthwhile mentioning that the cost to customers throughout the country to transition from gas to electrical appliances comes at an estimated cost of $5.3 billion [12].

Strategy to address this risk

In 2021 Vector, along with Firstgas and Powerco, and with support from the Ministry of Business Innovation and Employment, formed the Gas Infrastructure Future Working Group. The purpose was to explore scenarios for the end state and transition options for gas infrastructure along with solutions to achieve the objectives of government, infrastructure owners, and consumers [13]. This first report explores:

1. A controlled wind-down (contraction) of gas consumption where gas businesses, like Vector's, recover capital through early regulatory changes, and gas pipelines are systematically shut down as consumers transition to Vector's electricity network.
2. Network re-purposing, by transitioning to low carbon alternatives such as bio-methane.

The Gas Infrastructure Future Working Group has continued to operate through 2022-23, updating its modelling and undertaking further, targeted studies on specific transition issues, in order to inform the Gas Transition Plan.

Network re-purposing, by a transition to renewable gases, is technically feasible, but heavily constrained by feedstock availability and price. In the case of biomethane, a recent study showed that biomethane at a price of $35 - $40 (which is approximately four times the current gas wholesale price) could supply 4% of the national natural gas supply [14]. Research currently shows that green-hydrogen also comes at a high price, as it is bound to the price of electricity. A residential consumer would use six times as much renewable electricity creating the green hydrogen required to heat their home, as they would using electricity directly via a heat-pump [15].

Vector already works with large commercial customers to understand their intent around transitioning from the gas network to the electricity network.

However, as customers disconnect from the gas network, under current settings, the network's ongoing operational, maintenance, and capital recovery costs will be shared amongst the customers that remain. Many of these customers reported that any significant changes in the cost of energy would have a significant impact on their business or household costs. We are concerned about these impacts – for our gas customers, the value of our assets, and the potential wider economic impact.

Mitigating capital recovery risk requires action by suppliers and regulators to make timely changes that ensure the recovery of capital before an accelerated rate of disconnections puts that capital recovery at risk. Vector has been engaging with the Commerce Commission to ensure regulatory settings support capital recovery. Examples of successful actions taken to reduce the capital recovery risk include:

- Vector requiring 100% customer contributions for new gas connections and associated network growth costs.
- Vector not proceeding with some previously forecast capital projects, such as future proofing ducting e.g. Penlink bridge crossing.
- The Commerce Commission implementing accelerated depreciation from the start of the third default price / quality path commencing 1 October 2022.
- Maintaining reduced system growth expenditure as detailed in Vector's most recent gas Asset Management Plan.

This risk serves as an input into Vector's financial planning process via Vector's Gas Network Asset Management Plan [4]–Section 9.

These examples highlight Vector's strategy to actively manage resilience to this risk through regulatory engagement. We note that the strategy may be updated in 2023 in response to the Gas Transition Plan.

Risk 3:
Increase in extreme weather events

Risk Description

The Auckland region has high exposure to increasing wind-speeds, freshwater flooding, coastal flooding, land erosion, and an increase in sustained hot and dry weather.

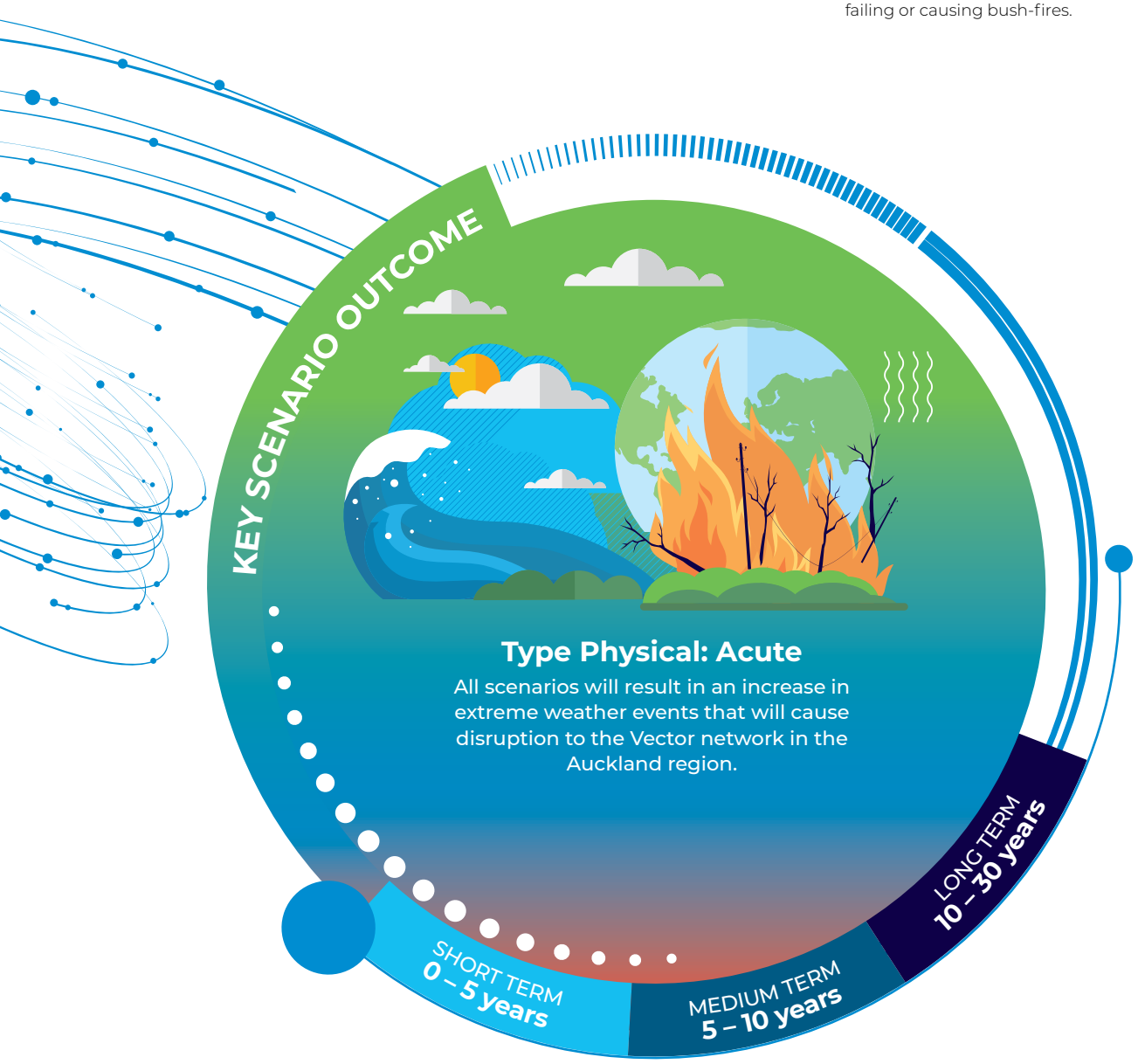
Current impacts

Vector has faced significant impacts due to the increase in extreme weather events. These include:

High wind-speeds, storms, and cyclonic events: Responsible for significant power outages on the Vector network.

Flooding: Results in flood damage, asset relocation costs, operational costs to disconnect and reconnect power for the safety of our customers, and geotechnical instability leading to landslips and increased vegetation fall.

Hot and dry weather: Reduces current capacity in underground cables, and increases risk of electrical equipment failing or causing bush-fires.



Anticipated Impact

Vector anticipates further significant impacts as extreme weather events increase. The current impacts are expected to continue and worsen. In relation to flooding, an example scenario of a 1 in 500 year pluvial and fluvial flood event for the central Auckland region can be seen in Figure 3. Detailed water depth analysis has been conducted on Vector's 119 zone-substations. Further engineering evaluation is now required to determine its financial exposure and capital spend required to mitigate this exposure. This will then inform our Asset Management Plan. Regarding coastal flooding, only one zone-substation is flood exposed across all three Vector scenarios. This substation is planned for decommissioning in FY2025.

Hours of heavy wind-speeds per year are also expected to increase as detailed in Figure 4. As heavy wind-speeds are responsible for most damage on the Vector network, an increase in wind speed frequency would increase unplanned outages, and additional expenditure for network repair. Furthermore, the cascading effects of floods with high wind speeds can weaken the geotechnical stability of the ground, leading to increased tree fall, landslips and delay network repair until the water has subsided.

Climate modelling also predicts the length and severity of sustained hot and dry weather to increase, thus increasing bush-fire risk and decreasing underground cable-current capacity.

The customer impacts of climate change, especially from flooding and geotechnical stability are also significant. This may result in a managed retreat from certain zones resulting in a localised stranded asset.

Financial Impact

Vector spends $15.8m on service interruptions and emergencies per year which also includes non-weather events such as cars hitting power poles. Vector is working on updating our data collection processes which would segregate weather-related and non-weather-related costs. By doing so, we can assume that weather-related interruptions are proportional to the hours of high wind-speeds per year, thus allowing for a crude forecast of operational expenditure into the future. This work is ongoing.

The 2023 floods and cyclone have amassed a total cost to date of $15.6 million for the electricity network and $1 million for the gas network - with finalised costs to be determined once the repair work assurance process is completed. This can be compared to the 2018 category 2 tropical cyclone that cost $6.1 million. With increasing temperature, there is a trend of tropical cyclones moving further southward at an average of 62km per decade, which increases the frequency and size of major cyclones hitting Auckland [14]. Note that an increase in cyclone category would result in magnitude increases in damage and therefore financial impact.

Strategy to address this risk

Early and preliminary forecasts for the next 10 years have set an additional investment of around $27m per year from 2025 through till 2030 for network resilience [3]. Beyond this, there are other core strategies that still remain to mitigate weather related impacts:

Vegetation Management: The majority of Vector's outages during extreme weather events are a result of vegetation falling on power-lines. Vegetation management remains a critical control to minimise storm-related damage, of which $5.5 million is budgeted for privately owned trees in FY2024, increasing to $7m from FY2026 onwards [3]. However, the overall effectiveness of vegetation management is directly influenced by the 'Electricity (Hazards from Trees) Regulations 2003' which Vector has taken a strong role to reform.

Microgrids: Microgrids are small, self-sustaining local power systems that are effective in remote communities. A battery energy storage system can power a micro-grid, such as the one in Tapora for about 4 hours, whereas diesel generators can provide sustained power. Higher capital costs and limited energy storage of battery systems has discounted their installations in favour of diesel generators. Because these systems are only used in emergencies, we forecast an increase in emissions of just 8 tonnes CO_2e per year for the South Head System, or 0.27% increase in total

Figure 3: Freshwater (Fluvial and Pluvial) flood projections for Auckland in a 1 in 500 year event.

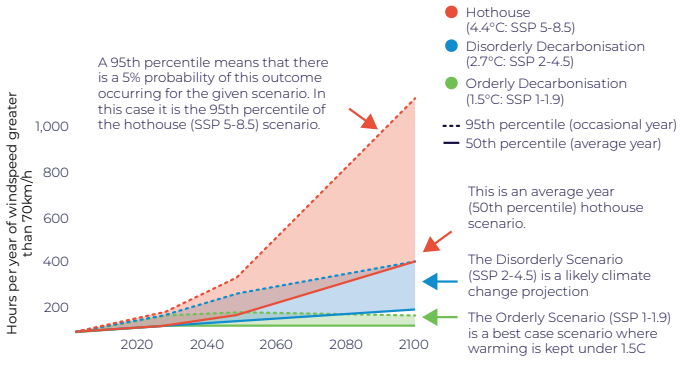


Figure 4: Projections of hours per year of wind-speeds greater than 70km/h

diesel generation emissions. Vector envisions a future where communities such as Piha can have their own energy independence via distributed solar-batteries, thus reducing reliance on diesel back-up generation.

Network Isolation and Automation: Reduces the impact of outages on customers through switches for remote control.

Zone substation relocations: Ngataringa zone substation is the only substation at risk of coastal inundation. Ngataringa is planned for decommissioning in 2025 and will be supported with network reinforcement from the nearby Belmont zone substation.

Raising control equipment above flood zones: Where practical, the re-engineering and relocation of outdoor installed transformer management systems, into switchgear rooms which have floor levels elevated above flood path levels.

Composite Crossarms: Do not break as easily when impacted by falling vegetation, improve lightning resistance, and higher fire resistance. Trials of composite cross arms have been successful and will be utilised as a 11kV network standard.

Lightning Arrestors: Has become standard for overhead installation, and in areas of high lightning activity will be proactively retrofitted.

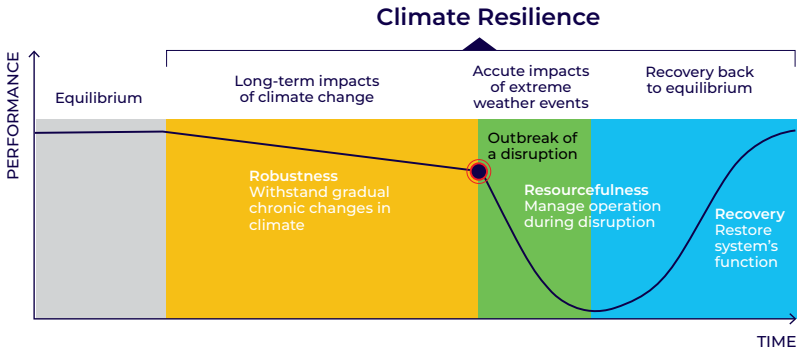
Overhead conductor renewals: A holistic replacement approach to conductor renewals incorporates the impacts of increasing wind and storms in general as well as lightning.

Ongoing Trials

Covered Conductors: A thicker overhead conductor that can withstand bark and branches rubbing against the conductor for sustained periods. Trials have been conducted in five sites.

Current limiting expulsion drop out fuses: Expulsion drop-out fuses can emit hot particles during operations to clear a fault. To reduce this risk Vector will install current limiting fuses. The performance will be closely monitored during this trial period, and if successful will be installed network wide.

These strategies are directly integrated into Vector's financial planning processes through our Asset Management Plan [3] – Section 11. Early and preliminary forecasts have set an additional investment of around $216m over the next 10 years above what we currently spend.



KNOWLEDGE BREAKOUT

Undergrounding Power Lines

Vector's electricity network consists of more than 19,000km of electricity lines, which is approximately the distance from New Zealand to England. Currently, 60% of the network is underground, with 40% of the network remaining above ground.

As vegetation fall on power lines is the largest cause of weather-related outages, undergrounding the remaining network appears at first thought to be an effective strategy for storm resilience. However, undergrounding comes at significantly higher costs than overhead power lines, which would substantially increase electricity tariffs. Underground cables are also susceptible to landslips, and tree-root damage from falling trees. Faults on underground cables are also costly to locate and repair, and can take longer to repair than faults on the overhead network.

It is due to these potential increases to electricity prices, that we consider the various risks and alternative options before deciding on the best network solution, such as power-line strengthening, and proactive vegetation management.

Nevertheless, all new developments in the region have power lines undergrounded as the site works for construction and road building typically provides easy and cost-efficient access to install the lines.

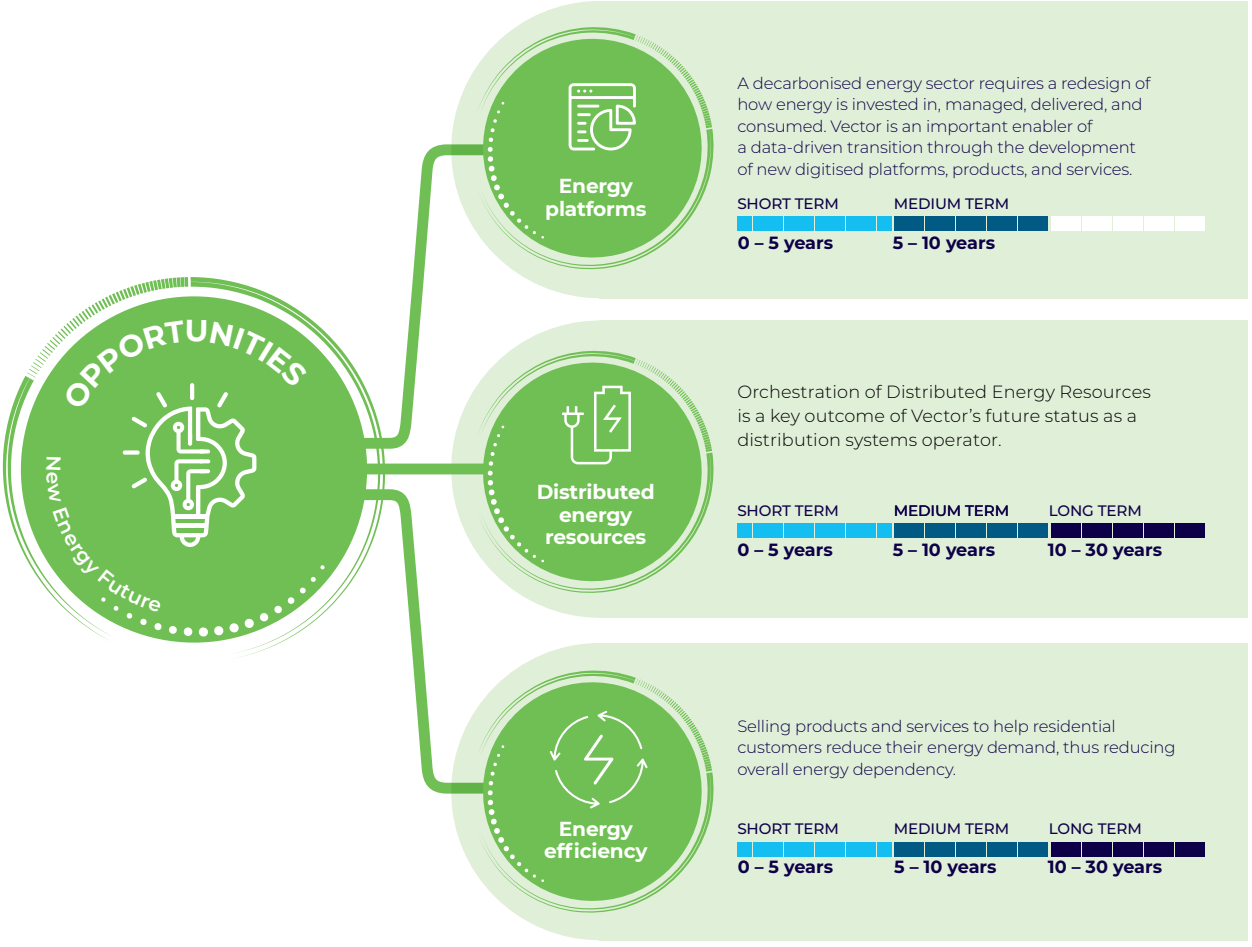
Vector's undergrounding programme is funded as part of an agreement with our major shareholder Entrust, that requires an average of $10.5m to be invested every year in projects in the Entrust region.

Opportunities

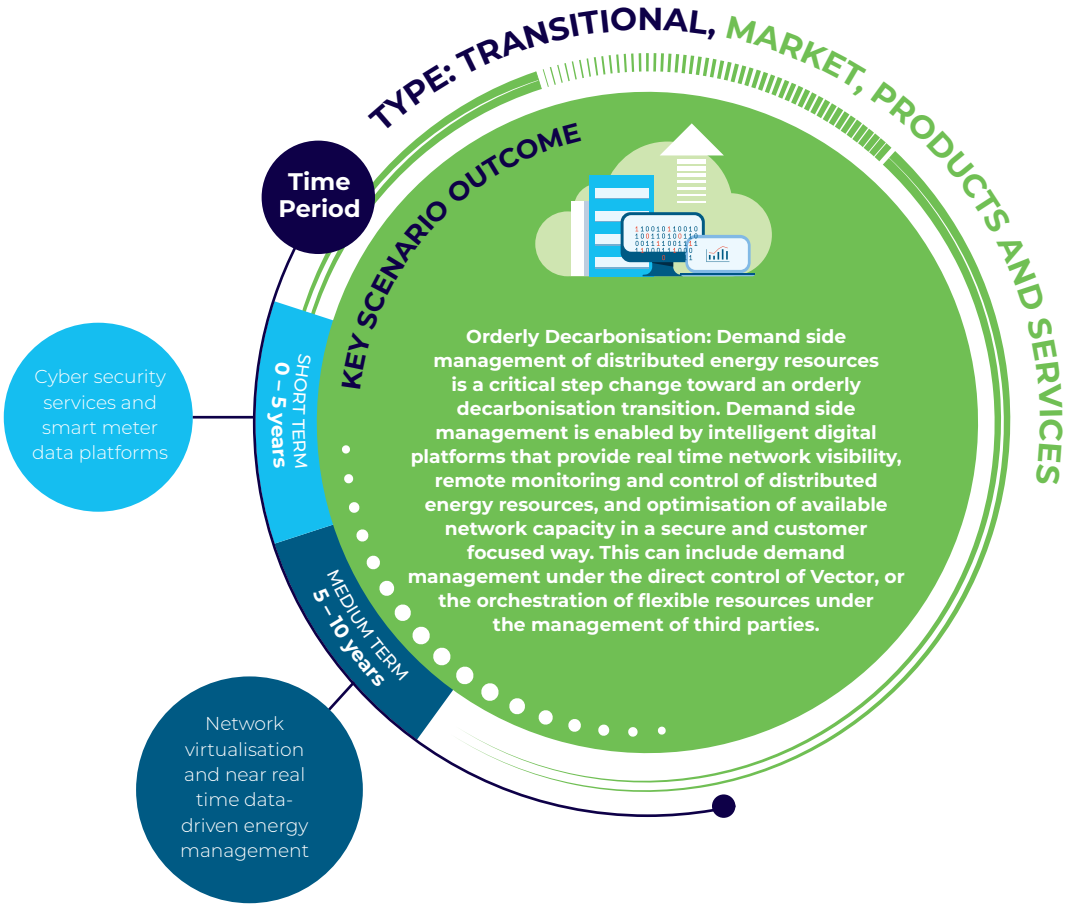
Our innovations enable the transformation of energy systems

Consumers are demanding cleaner, more reliable, affordable energy. We are taking critical steps to transform how the energy industry operates to support these changes, including by using data to redesign how energy is managed, delivered and consumed. We are actively developing solutions to enable this transformation, partnering with other organisations where we see opportunities to help achieve our goals. This customer-led transformation can displace legacy systems, leveraging a step-change in digital capabilities, flexibility, and accuracy, addressing the rapidly-changing requirements of customers, energy retailers, network operators, and other energy market participants. We see this as a critical building block for the transformation of energy systems.

This transformation can be broken down into three opportunities that form part of the future energy value chain.



Opportunity 1: Energy Platforms



Opportunity Description

Vector Technology Solutions (VTS) has been established to take to market solutions developed as part of Vector's own digital transformation journey. Vector's Symphony Strategy and commitment to addressing climate change related energy industry challenges have created opportunities to work with industry-leading partners to provide innovative energy platforms to support the orderly decarbonisation scenario. We are exploring national and global opportunities for key priority solutions including cyber security, and Diverge (formerly known as the New Energy Platform) created through our strategic alliance with Amazon Web Services (AWS) for the energy industry. We expect this opportunity to evolve alongside new advances in cloud infrastructure and software.

This opportunity is further supported by Vector's 50% joint venture in its metering operations, which will remain a customer of Diverge. Advanced meters and the data they provide are a key enabler of data-driven decarbonisation, and can be used for improvements in network operations, customer service and the enablement of new products and services.

Current Impact

Associated with the provision of the digital tools, is a critical need to ensure cyber security. Vector is now providing cyber security services to other critical infrastructure providers through Vector Technology Solutions, leveraging Vector's 24/7 security operations centre.

Diverge provides a Meter Data Management software platform for the collection, processing, storage and delivery of smart meter data. This is supporting the Five-Minute-Settlement rule change in the Australian energy market; where the higher frequency 5 minute data enables more efficient integration of renewables in the transition away from fossil fuels.

Anticipated Impact

Energy platforms have a significant potential global opportunity. The need for more, higher quality, and faster energy data is increasing as more electric vehicles, and intermittent renewable generation capacity enters the electricity system. Decarbonisation, decentralisation and democratisation of the energy supply chain are creating global opportunities for energy data platforms that provide higher performance and more flexible processing capability like that offered by Diverge.

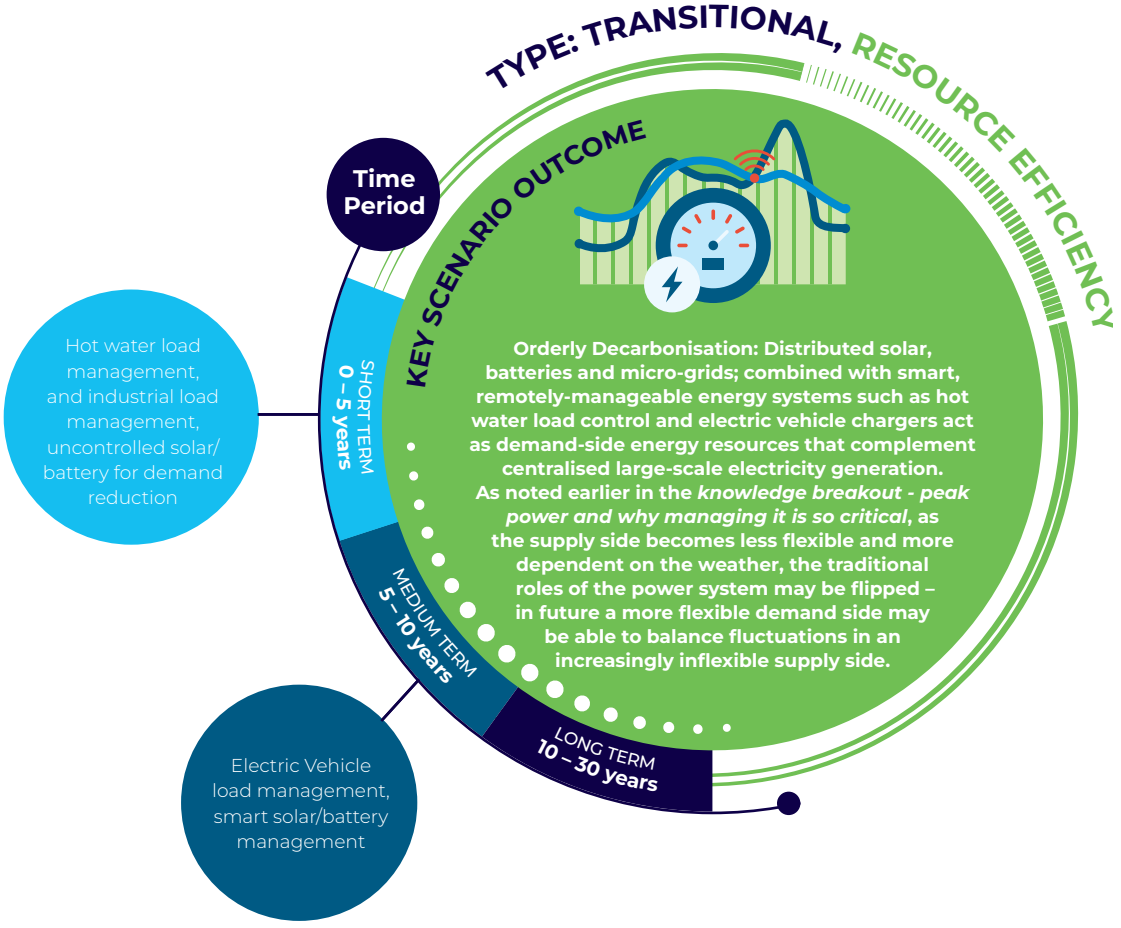
Financial Impact

The financial quantification of this opportunity is not possible due to the significant breadth of this global opportunity, high sensitivity of key variables such as market competition, and commercial sensitivity of key inputs.

Strategy to address the opportunity

Vector holds strategic alliances both locally and internationally including with Amazon Web Services, to develop Diverge for data-driven energy management, and a strategic collaboration with X, the moonshot factory (formerly Google X), which is developing technology and tools to accelerate clean and renewable power onto the grid. Vector also maintains relationships with local distributors, retailers, government, and regulators, seeking to ensure that the platforms align across the whole ecosystem to benefit the end consumer and enable widespread decarbonisation. Vector Technology Solutions are actively pursuing global opportunities for Diverge with large utilities and operators of smart meters and Vector Group are ready to support the pursuit of these opportunities as they emerge. This includes seed funding from the Vector Group annual budget, along with out-of-cycle requests from the Board when specific opportunities arise such as through a successful tender.

Opportunity 2: Distributed Energy Resources



Opportunity Description

Orchestration of distributed energy resources is a key outcome of Vector's future status as a distribution systems operator. This has the added benefit of mitigating *Risk 1: Inability to efficiently manage peak load*. See *knowledge breakout – The forgotten side of demand side management – bringing things back on*.

Current Impact

Distributed energy resources in Auckland are beginning to be managed directly via Vector's Distributed Energy Resource Management System, enabled through bespoke agreements, such as Vector's orchestration of electric bus charging infrastructure in Auckland. Vector's trial of managing the charging for 200 electric-vehicles across the network proved the concept can work at a household level too. Increasing penetrations of distributed energy resources over the coming decades, managed either directly by Vector or third parties such as retailers, create significant opportunity to achieve an orderly decarbonised outcome.

Anticipated Impact

Affordable decarbonisation will hinge on realising the benefits of load management across the electricity system. Efficient management and orchestration of third party distributed energy resources allows an electricity distributor to utilise their flexibility to reduce peak congestion on the network, thereby avoiding unnecessary capital deployment, and promoting more competitive outcomes (and lower prices) in the national wholesale electricity market.

Financial Impact

The financial quantification of this impact is not currently possible due to the nascent state of regulatory frameworks surrounding Vector as a distributed systems operator. This opportunity is nevertheless disclosed due to the important role it plays in the national energy decarbonisation transition, and its resilience benefits to customers.

Strategy to address the opportunity

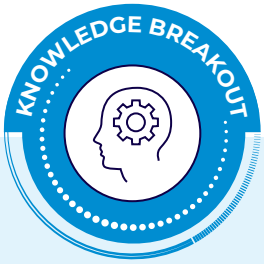
When establishing distributed systems operator frameworks, more focus needs to be given to the load pickup of distributed energy resources – refer to *knowledge breakout – The forgotten side of demand side management – bringing things back on*.

Three key pillars for distributed systems operator strategies are:

- Interoperability. Most distributed energy resources will last over 10 years. To achieve interoperability, utilities cannot pick a single winner, but need to promote several established protocols (for example: IEEE 2030.5, OpenADR, Open Smart Charging Protocol) by making them part of the local standard.
- Low-voltage visibility. Advanced metering infrastructure data is available and can provide full low-voltage visibility if network companies can access the data. While this is standard in some jurisdictions, in others, network companies face regulatory or commercial barriers.
- Distributed energy resource management systems will combine network asset information (ratings, live topology, and switch status) with granular load forecasts and distributed energy resource information to orchestrate fleets of controllable loads and their aggregators.

In FY2022 Vector co-founded the FlexForum to coordinate market participants to take practical steps towards optimising the system flexibility benefits of distributed resources. The forum recognises that distributed energy resources can provide benefits to multiple parts of the electricity system, but that efficient orchestration to realise those benefits will require coordination between a wider range of parties – including consumers, distributors, retailers and other enabling providers.

Beyond this, we're continuing our strategic collaboration with X. The work we're doing with X is contributing to their Tapestry project, which is all about accelerating the decarbonisation of electric power systems. Tapestry aims to create highly accurate visualisations and simulations of the grid that can predict how it will behave from nanoseconds to years into the future.



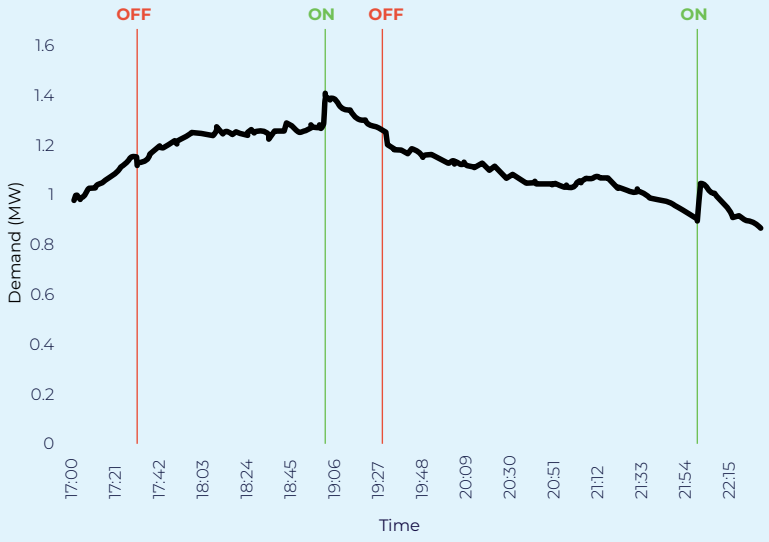
The forgotten side of demand side management – bringing things back on

Without demand side management, electrical load is naturally diversified as people's daily routines differ and are not synchronised. For example, some people need power straight after work, whereas others may take longer to get home.

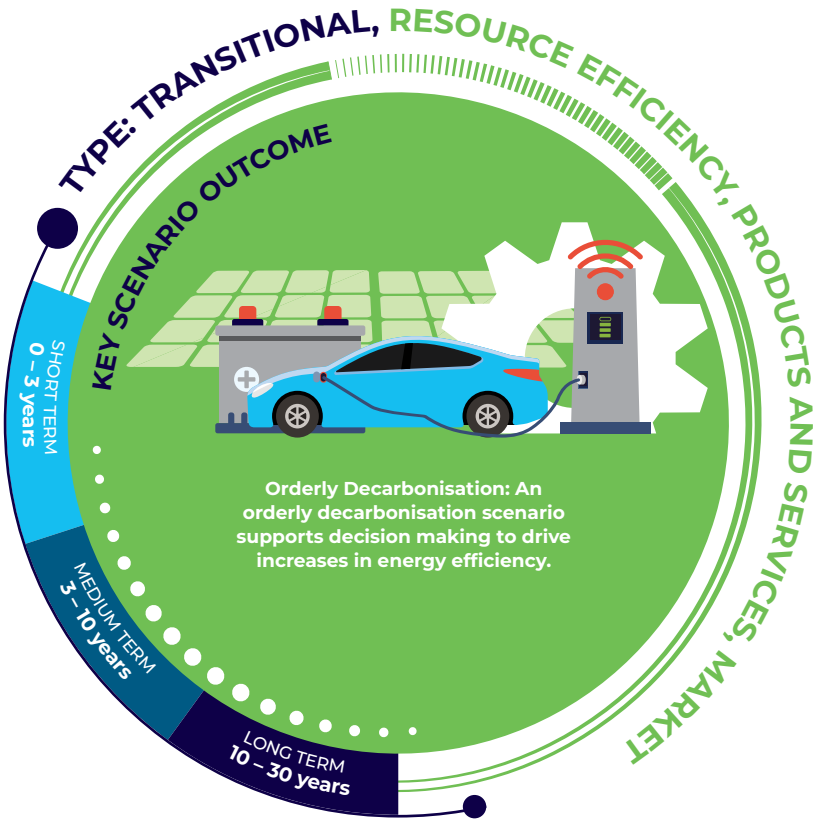
Turning distributed energy resources off, like electric vehicles or hot water heating, is simple as those loads were naturally in a diversified state. However, when those resources are brought back on, their demand is synchronised. Depending on timing, the pickup could be bigger than the natural load without any load management, creating a secondary peak. The figure below exemplifies this, with electric hot water load management across 100 homes on a single network feeder. Poorly coordinated load pickup, such as retail models that run on 'free hour of power' will create such peaks that stress the local network with potential reliability implications for customers.

Electricity distributions networks are currently evolving towards being a distributed systems operator to manage these risks, which comprises of two new tasks:

1. Use the load management of third party distributed energy resources to optimise the need for traditional network capacity, thus mitigating inefficient allocation of capital – as discussed in *Risk 1: Inability to Efficiently Manage Peak Load*
2. Ensure that distributed energy resource owners or aggregators can operate load management to optimise their market position or provide ancillary services without negatively affecting the distribution network assets – as discussed further in *Opportunity 2: Distributed Energy Resources*



Opportunity 3: Energy Efficiency



Opportunity Description

There are significant opportunities to reduce demand through energy efficiency measures. New Zealand's peak load is currently driven by residential evening heating during the winter months.

Current Impact

At a consumer level, HRV installs heat recovery and ventilation systems, as well as heat pumps with a strategy to expand to all-of-home efficiency solutions. HRV also participates in the government 'Warmer Kiwi Homes' programme which supports low-income households in obtaining energy-efficient heating solutions.

Anticipated Impact

With the utilisation of digital energy platforms, Vector envisages a future where an 'energy efficient' model does not just reduce energy consumption at the device level but looks at whole system efficiency including the utilisation of electricity when there is network capacity availability. HRV is already grasping this opportunity, by selling residential heating systems with demand response capability, and smart electric vehicle chargers.

Financial Impact

The financial impact of energy efficiency does not meet Vector's financial materiality threshold. However, it is still disclosed as a key opportunity due to the important role it plays in the national energy decarbonisation transition, reduction of peak loads on Vector's electricity network, and improvement of public health outcomes through warmer homes.

Strategy to address the opportunity

Ongoing product innovation of efficiency systems keeps Vector at the forefront of new technology, and new channels or services to market. Vector also strongly advocates for government initiatives such as 'Warmer Kiwi Homes', which provides subsidies for low-income households to gain access to energy efficiency solutions.

KNOWLEDGE BREAKOUT

Energy hardship

Energy hardship can be divided into three key inputs

1. Price of energy – costs of primary energy. This includes electricity, natural gas, LPG, and petroleum
2. Energy Efficiency – which can be defined as the thermal condition of the home, and the mode of transportation.
3. Household disposable income – increasing inflation and costs of living (including that of energy costs), outstripping increases in real incomes, can result in energy expenditure being sacrificed

Each input contributes to the compounding impact of energy hardship yet require different, often unrelated strategies.

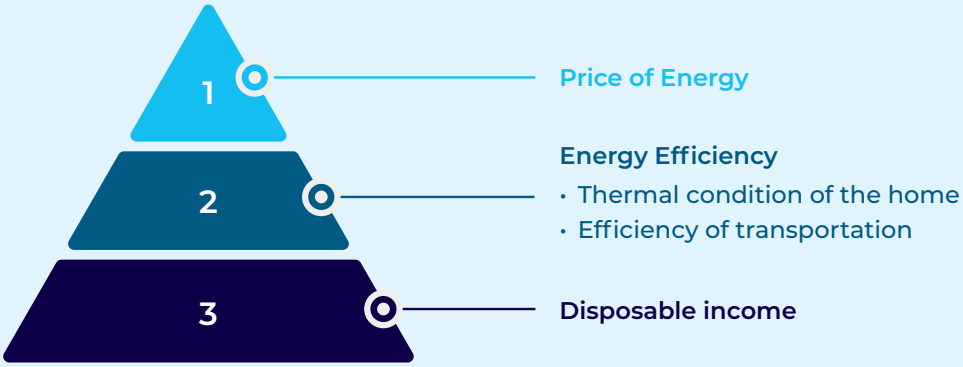
At the surface is the **price of energy**, in particular electricity, petroleum, and natural gas. In the case of electricity this is broken down by generation, transmission, distribution and retail costs. New Zealand's market and economic regulation has the overarching aim of minimising the costs of energy, subject to meeting certain reliability standards. Vector's Symphony strategy, and the overarching narrative of this TCFD focuses on the price of energy, and how the decarbonisation transition can be achieved in the most intelligent manner with stacked co-benefits, thus reducing unnecessary capital expenditure across the system.

However, this surface-level treatment doesn't address further fundamental societal issues. Beneath the direct price of energy, are **energy inefficiencies**. Low quality building insulation, heating systems, and transportation based on expensive fossil fuels lead to economically inefficient utilisation of energy, and lowers wellbeing. Increasing the thermal conditions of the home is driven in New Zealand by building standards and the 'Warmer Kiwi Homes' programme which Vector's HRV business is active in.

Likewise efficiency of transportation is mostly achieved through enhancements of public transportation and active modes of transport. Electric vehicles ultimately come at cheaper energy costs; however the capital expense of an electric car is often a barrier for low-income households.

Household disposable income, which includes tenancy status and number of people per household, sits at the foundation of energy hardship. Vector advocates for living wage via our Supplier Code of Conduct, and is the first corporate in New Zealand to be a living wage employer.

When combating energy hardship, it is important that we approach it from a holistic all-of-systems approach. Simply assessing it from a price-of-energy perspective, while important, can lead to perverse short-term outcomes that may inhibit energy sector decarbonisation transitions without addressing the fundamental issues of poverty.



Metrics and Targets

Metrics and targets are used to measure and manage the 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 the targets used to reduce select emissions.

Greenhouse gas emissions

Vector measures and reports its greenhouse gas emissions in accordance with the Greenhouse Gas Protocol - Corporate Value Chain Standard. This splits emissions into three categories:

Scope 1 – Emissions we directly control such as vehicle fleet fuel combustion, diesel backup generators, methane leaks, and SF_6 leaks.

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

Scope 3 – All other indirect value chain emissions, such as customer energy consumption, and supply chain emissions.

The Greenhouse Gas Value Chain Standard 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 reduction efforts to focus on emissions over which Vector has the greatest control, and thereby can influence most with emissions reductions measures.

Vector's base year for emissions reporting is FY2020 (1 July 2019 to 30 June 2020). This was the first year that the greenhouse gas inventory included most material Scope 3 emissions, and it forms the base year for Vector's science-aligned reduction target. In FY2023, we included emissions from purchased goods and services, and recalculated previous years emissions to exclude Scope 1 and 2 emissions from the 50% sale of the Vector Metering business and reinstate Vector's share in Scope 3 – Category 15 – Investments.

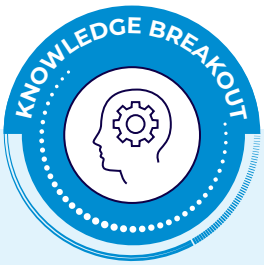
Additional information on organisational boundaries including the treatment of investments, operational boundaries, emission factors, exclusions, summary of changes to previous years, methodologies, and results can be found in Vector's Greenhouse Gas Inventory Report [17].

Emissions Reduction Target

Vector has set an absolute emissions reduction target, aligned with a methodology by the Science Based Target initiative (SBTi), of reducing 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 the Science Based Targets initiative guidance at the time on reductions required to be consistent with keeping global warming to 1.5C°. A recalculation of the target is triggered by a recalculation of base year emissions included in the target. The emissions reduction target does not rely on any offsets.

We have achieved a greenhouse gas emission reduction of 14.5% in FY2023 towards this target against the FY2020 baseline. This is largely due to reductions in our fugitive natural gas emissions through an increase in pipeline monitoring as well as a reduction in diesel generation. Nevertheless, this is short of our internal target of 16.1% for FY2023. The shortfall is largely attributable to a four-fold increase in SF_6 emissions due to two switchgear defects which have now been repaired.

Vector's total emissions across all scopes have decreased 14.7% since FY2020. A breakdown of emissions split by Scope and a comparison of emissions per Scope since Vector's base year in FY2020 can be found in Table 1. These summaries of emissions have been extracted from Vector's Greenhouse Gas Emissions Inventory FY2022 Report [17]. The report is 'reasonably assured' by our third-party assurer.



Electricity Distribution Losses

Electricity distribution losses are not like a water or gas leak. They are a characteristic of the electricity distribution network. 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. They are largely an unavoidable by-product of electrical conduction, and therefore excluded from our targets.

The increase in electricity distribution losses in FY2023 is due to an increase in the electricity emissions factor.

Vector, along with other New Zealand distribution companies and Transpower have engaged the Science Based Target initiative regarding the exclusion of line losses from its target and this discussion is ongoing.

Table 2: Emission intensities for business unit specific emission sources.

Emissions intensity	FY20	FY21	FY22	FY23
• **Gas fugitive emissions per length of gas pipelines (Gas Distribution)**				
$kgCO_2e$ per gas pipeline length in m	2.40	1.77	2.08	1.70
kg CO_2e per main lines	0.92	0.98	1.21	0.69
kg CO_2e per service lines	4.71	2.76	3.26	3.16
• **Electricity emissions per MWh delivered (Electricity Distribution)**				
$kgCO_2e$ per MWh delivered – ex. losses	0.51	0.46	0.66	0.68
$kgCO_2e$ per MWh delivered – incl. Losses	4.42	4.50	5.33	5.66
• **Emissions per kg of LPG sold (Ongas LPG)**				
$kgCO_2e$ per kg of LPG sold	0.036	0.039	0.041	0.043

Table 3: Summary of Vector's total greenhouse gas emissions inventory. FY2020 was Vector's carbon baseline. Emissions highlighted in green indicate a reduction since the baseline, whereas emissions in red show increases.

Emissions category	FY20	FY21	FY22	FY23
Scope 1	**22,388**	**17,887**	**21,816**	**19,485**
Natural Gas Distribution Fugitive Emissions	16,368	12,074	14,493	11,908
SF_6 Fugitive Emissions [1]	426	592	1,859	2,180
Other Fugitive Emissions	141	142	134	141
Stationary Combustion	3,558	2,971	3,348	3,183
Vehicle Fleet	1,895	2,108	1,982	2,073
Scope 2*:	**33,148**	**34,449**	**39,486**	**42,810**
Electricity Consumption (location-based) [2]	*815*	*801*	*891*	*1,210*
Electricity Consumption (market-based)	643	826	408	220
Electricity Distribution Losses	32,505	33,622	39,078	42,590
Scope 3	**1,843,262**	**1,628,207**	**1,539,706**	**1,558,026**
C1: Purchased Goods & Services				
Upstream purchased Natural Gas	227,569	170,442	136,821	152,290
Upstream purchased LPG	46,555	47,609	52,806	58,140
Fuel used by Field Service Providers	6,475	6,822	6,456	7,235
Upstream purchased Products & Materials	15,266	11,733	13,874	11,783
Upstream purchased Other Goods & Services	75,939	71,465	75,080	79,559
C3: Fuel- and energy-related activities	1,405	1,312	1,450	1,456
C4: Upstream Transportation	2,717	2,557	3,225	2,891
C5: Waste Generated in Operations				92
C6: Business Travel	332	103	95	271
C7: Employee Commuting and Working from Home				933
C11: Use of Sold Products				
Distributed Natural Gas AKL	*772,265*	*760,185*	*711,337*	*735,048*
Sold Natural Gas - AKL	151,603	115,578	57,149	66,376
Shipped Natural Gas - AKL	-	-	55,245	66,265
Other Distributed Natural Gas - AKL	620,662	644,607	598,943	602,407
Sold Natural Gas – non-AKL	562,567	381,871	231,127	223,568
Shipped Natural Gas – non-AKL	-	47,002	183,614	160,293
Sold LPG	131,385	126,245	122,904	123,542
C15: Investments				
Liquigas	87	89	108	105
Metering	700	771	809	821
Total Scope 1, 2*, 3	**1,898,798**	**1,680,543**	**1,601,008**	**1,620,321**

* Includes market-based emissions for electricity consumption.
1. Two major leaks were responsible for SF_6 emissions over the past two years. These have now been repaired.
2. Vector's electricity consumption has increased due to increased use of Vector's public electric vehicle chargers.
3. Electricity distribution losses are excluded from our targets, see *knowledge break-out - Electricity Distribution Losses* on page 36.

Metrics and Targets (continued)

Marginal Carbon Abatement Cost Curve

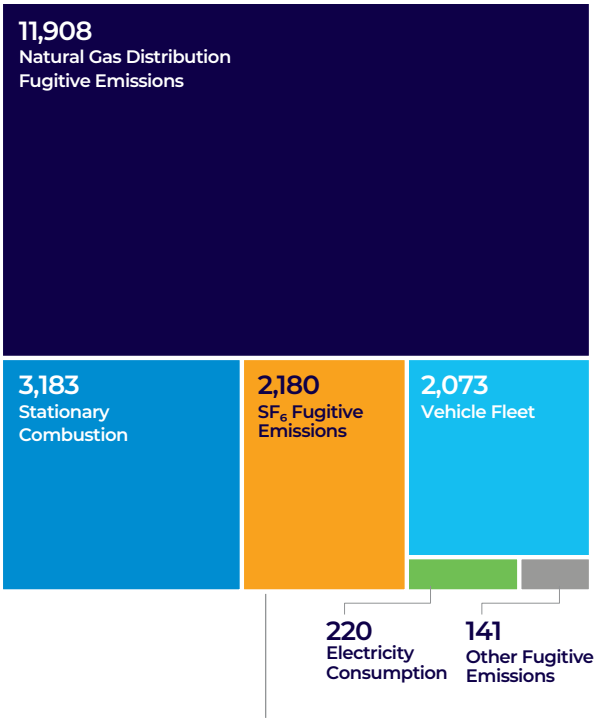
In FY2022, Vector developed a carbon abatement cost curve to help achieve our reduction targets (Scope 1 and 2 excluding electricity distribution losses). This work identifies the financial impact of potential carbon reduction activity across Scope 1 and 2 emissions, using a carbon cost of $140 per tCO_2e as a comparative "do nothing" cost. $140 was chosen to align with Climate Change Commission recommendations to Government [12].

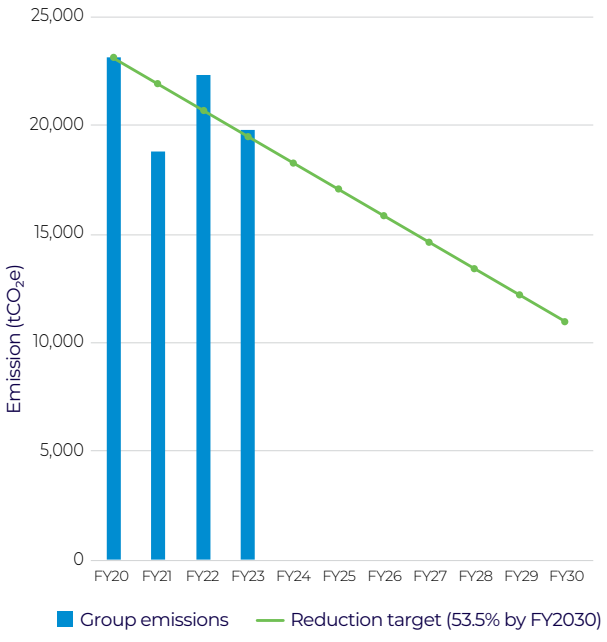
Through this work, we identified emissions that could be reduced while saving money for the group (those with negative abatement cost), others that were close to cost neutral (those with bars close to $0/$tCO_2e$/year), with the balance assessed as being more complex to abate given the availability of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

The curve was updated in FY2023 to include newly identified initiatives, reflect project cost changes, highlight completed projects, and exclude Vector Metering. The curve also highlights some key challenges that Vector faces in meeting its carbon targets. For example, transitioning to electric trucks is an initiative to achieve a 2030 decarbonisation target, and yet is highly dependent on the availability of suitable heavy electric vehicles which are not yet available. A summary of 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 Inventory Report [17]. We expect this curve to change annually as new technologies enter the market, new business innovations are trialled, and the costs of the abatement strategies change.

Figure 5: Emissions included in vector's science-aligned target - Scope 1 and 2 excluding distribution losses. (left) Emission breakdown in tCO_2e. (right) Vector's trajectory towards its 53.5% emission reduction target.





Sulfur Hexafluride (SF_6) is an electrical insulating gas used in medium and high voltage switchgear. Failures in electrical switchgear, or damage can release this gas to the atmosphere. As SF_6 has an emission factor 22,800 times that of CO_2, even small leaks of SF_6 have material impacts on our emissions inventory.

Figure 6: Vector's marginal carbon cost abatement curve. The x-axis corresponds to Vector's total annual emissions. Each bar details a carbon abating initiative where the thickness of the bar details the carbon abated. The y-axis represents the cost, with negative values indicating cost-savings. Initiatives are ordered left to right, from the most cost-saving to the most expensive.

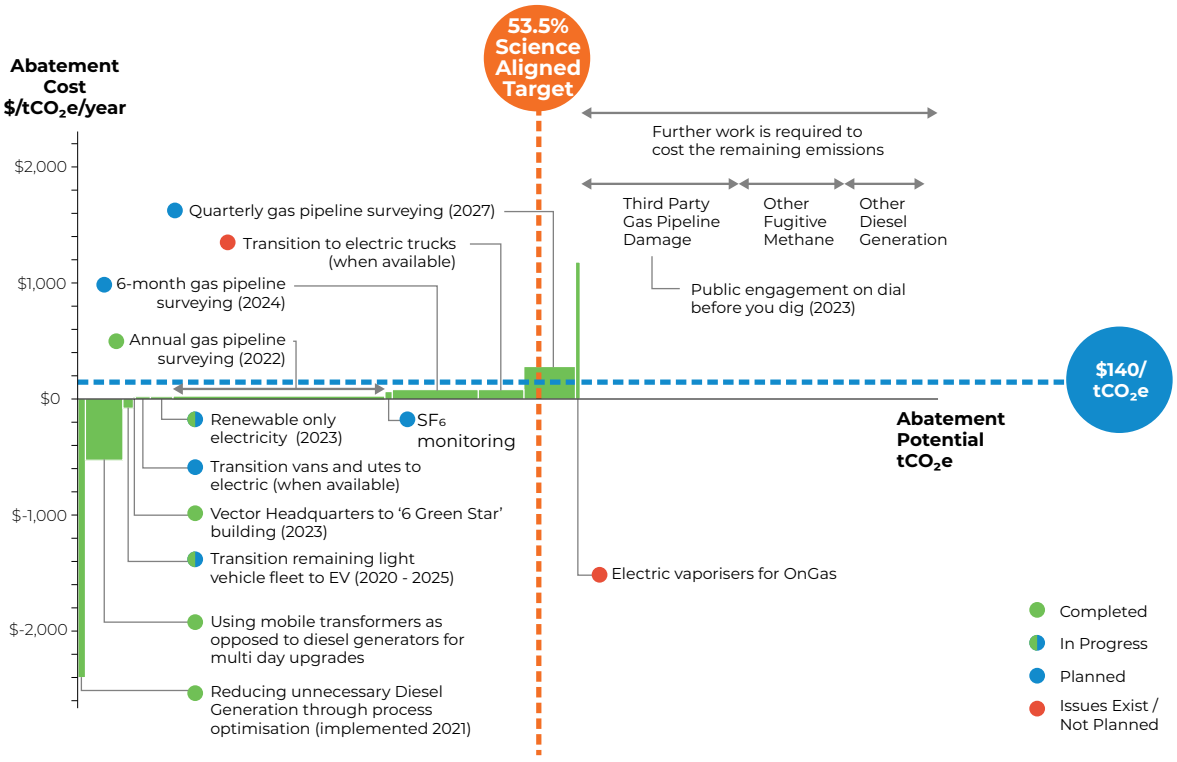


Table 4: Identified risks that may form a barrier to Vector achieving Vector's Science Aligned Target

Carbon Abatement Risk	Description
Dependency on electric truck manufacturers for heavy vehicle fleet decarbonisation	Vector has a fleet of 86 trucks. Currently there is no suitable electric heavy vehicle available for this transition. Whilst Vector trialled a pre-production electric truck in 2022, its range is not sufficient to transition the remaining fleet. We expect market ready trucks with sufficient range to enter the market before 2030, however there is no guarantee that they will be available in New Zealand in that time.
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 released 3,040 tCO_2e from those two incidents alone. Whilst Vector can reduce emissions overtime 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 network	Many Vector SF_6 assets have a lifetime beyond 2030. It is not possible to replace all these assets before FY2030, and leaks are largely unpredictable. While we have installed monitoring devices that alert us of leaks quickly, there is still a risk that leaks could increase and keep reoccurring. SF_6 has an emission factor 22,800 times that of CO_2 so even small leaks of SF_6 can have material impacts on our emissions inventory.

Metrics and Targets (continued)

Value of assets vulnerable to transition risks

This table highlights key Vector businesses that are 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.

	Carrying Value ($m)
	30-Jun-23
Gas Network	607.0
OnGas	70.4
Natural gas Trading	13.3
(Liquigas)	72.7

Value of assets vulnerable to physical risks

Vector has to date modeled the electricity network assets vulnerable to flood impacts. Zone substations highlighted in the modelling are now under technical engineering investigation to identify financial exposure.

Asset Type	Total net asset value ($m)	Potential value exposed to floods	Potential value exposed to storms
Zone Substations	Number: 119 Value: $333.6	In development	

Assets and capital expenditure in line with climate related opportunities

The values listed here represent the total carrying value, revenue, and capex invested towards businesses in line with climate related opportunities. Note that capital expenditure and revenues in line with the Energy Platforms opportunity has been excluded due to commercial sensitivity.

	Carrying Value ($m)	Revenue ($m)	Annual Capex ($m)
	30-Jun-23	FY2023	FY2023
Electricity Distribution	4,580.1	902.9*	422.2

* including capital contributions

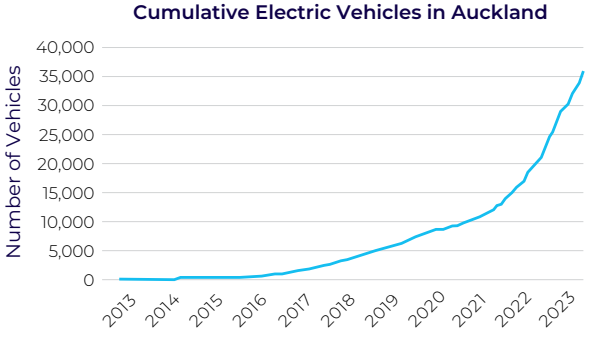
Electric vehicle uptake in Auckland

Related to Risk 1:
Inability to efficiently manage peak load

Related to Opportunity 1:
Energy Platforms

Related to Opportunity 2
Distributed Energy Resources

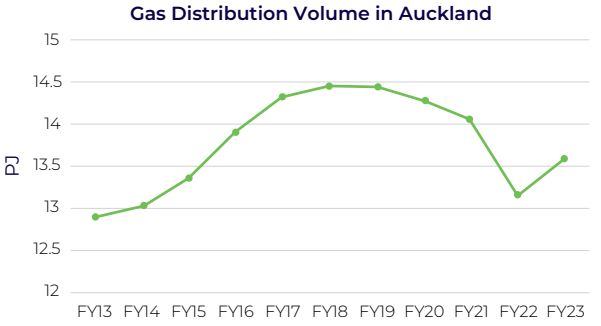
Vector is closely monitoring electric vehicle uptake in Auckland to understand their impact on the network and emerging charging behaviours. We are working towards getting further information on when and where electric vehicles charge, to optimise our asset management planning for electricity distribution, and to understand the percentage that are controlled by smart chargers.



Actual gas volumes

Related to Risk 2: Unmanaged transition from gas

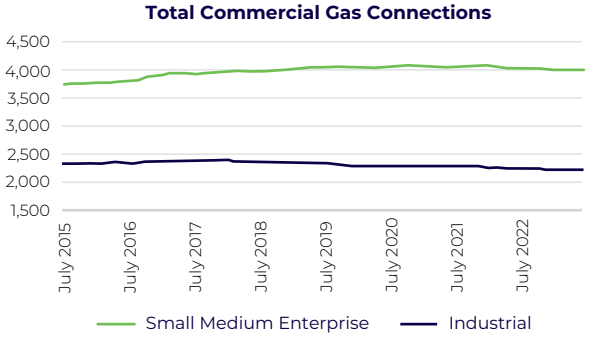
Gas distribution volumes in Auckland have been trending down since FY2018. Note that COVID impacts caused a decrease in activity in 2022.

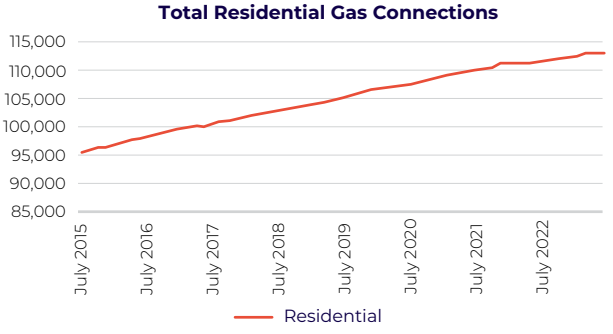


Net Gas Connections and Disconnections

Related to Risk 2: Unmanaged transition from gas

Industrial and small commercial gas connections continued to decline in FY2023, which matches the downward trends in gas volumes distributed. Nevertheless, total residential gas connections continue to increase.

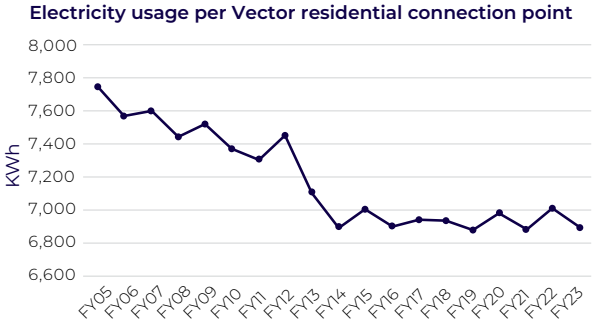




Average Household Electricity Consumption

Related to Opportunity 3: Energy Efficiency

Average household energy consumption decreased rapidly through till 2014, at which point it has plateaued.



Metrics and Targets (continued)

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

In FY2022 Vector disclosed cumulative solar uptake. We have changed this metric to a distributed generation metric to align with our electricity information disclosures.

Vector registers distributed generation uptake in the Auckland region. Connected capacity has greatly increased in RY2023.

	RY2020	RY2021	RY2022	RY2023
New Capacity Connected (MVA)	1.8	4.8	4.1	15
Number of New Connections	219	901	582	1799

Remuneration: Senior staff Performance goals

A yearly decarbonisation measure makes up five percent of overall short-term incentive payments to the executive team and their direct reports. In FY2023 this consisted of two components: a 16.1% emission reduction compared to a FY2020 baseline, and the development of a methodology for calculating supply chain Scope 3 emissions. The goal was designed to show progress towards the Science Aligned Target, and also align to the Corporate Value Chain Standard for greenhouse gas reporting.

Industry Based Metrics/Targets

Electrical power outages

Related to Risk 3:
Increase in extreme weather events

An indirect consequence of extreme weather events is an increase in customer outages, due to weather-induced damage to the electricity network. Two of the measures the Commerce Commission uses to monitor a reliable standard of service to customers, relates directly to power outages:

SAIDI (System Average Interruption Duration Index) – Average outage duration for each customer served over the course of a year.

SAIFI (System Average Interruption Frequency Index) – Total number of interruptions per customer per year.

Major Event SAIDI – Days of severe weather impacts that breach the SAIDI unplanned boundary value of 4.83 SAIDI minutes. While Major Event SAIDI does not have a target, it's a metric that can indicate an increase in extreme weather events, such as cyclones.

Vector monitors these three metrics throughout the year with the aim of being under the regulatory limits currently set at 104.83 and 1.337 for SAIDI and SAIFI respectively. SAIDI and SAIFI incorporate all causes of power outages, including non-weather-related outages such as car accidents on power lines. Nevertheless, weather-related impacts still contribute to the majority of outages. This is evident in the near five-fold increase in major event SAIDI, attributed to major weather events in 2023.

Normalised unplanned SAIDI/SAIFI	RY 2020	RY 2021	RY 2022	RY 2023	Regulatory limit from RY2021 to RY2025
SAIDI	116.7	86.3	92.4	118.7	104.8
Major Event SAIDI *	3	0	59.7	292.3	-
SAIFI	1.36	1.07	1.05	1.19	1.337

* Remaining raw SAIDI that was excluded due to normalisation

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