



GENESIS ENERGY LIMITED
CLIMATE-RELATED DISCLOSURES
FOR THE REPORTING PERIOD
1 JULY 2022 TO 30 JUNE 2023

23 AUGUST 2023

Empowering New Zealand's sustainable future

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1. Message from the Chair and Chief Executive

While New Zealand’s gross emissions contribute about 0.17% of gross emissions globally, it is important that all countries play their part to limit and reduce emissions. Enabling the country’s transition to a low carbon future and reducing our emissions to help address climate change are integral to our purpose: empowering New Zealand’s sustainable future. Decarbonising our activities and helping our customers do the same is central to our business strategy.



Malcolm Johns
CHIEF EXECUTIVE

Barbara Chapman CNZM
CHAIR

This year we have experienced increased variability in weather events causing flooding and disruption to our customers and business operations. Our understanding of the risk and impact of climate change, and ways to respond and prepare, have expanded in responding to these events. We have also worked to ensure that our responses to the events have helped our communities and customers through difficulty and ensured our generation sites continue to supply available generation. And we understand the need to ensure climate change impacts are routinely considered in our business decision making processes.

Genesis plays an important role in New Zealand’s transition to a low carbon future. Through our Future-gen strategy we are reducing emissions from our own generation portfolio through renewable generation. We are focused on doing our bit, however a successful transition is dependent on how the Government and the whole industry responds. We know that the electrification of New Zealand’s lifestyles and our economy are among the most meaningful actions we can take to address climate change. As the amount of renewable energy supply grows, Genesis’ Huntly Power Station will play a unique and critical role in ensuring the uninterrupted availability of electricity. Reliable and affordable access to electricity is important in growing people’s confidence to continue to electrify more of their lives and businesses.

Just as the development of a long-term emissions reduction target has generated robust discussion on how we will operate as a business, modelling different climate change scenarios has tested our foresight. The ability to stress-test our strategy against these scenarios, and the supporting approaches that will smooth our transition, has been a valuable exercise for our Executive Leadership Team.

We know that certainty and transparency are important to our investors, insurers, and others in our value chain. The evolving legislative climate context continues to drive greater transparency and we want to ensure we are positioned to meet regulatory requirements of climate-related disclosures.

As a long-standing member of the Climate Leaders Coalition (CLC), we are committed to meaningful science-based emission reductions. Over time the CLC has contributed to Government policy and has taken a visible role leading New Zealand businesses in the transition to a low carbon economy. As a result, businesses are making inroads into emission reductions and are investing in low carbon solutions. The commitments for signatories of the CLC have also evolved over time – the bar has been raised to require independent verification of short and long-term targets, and signatories need to demonstrate that customers and suppliers are being encouraged to understand their own climate risks and take action.

We encourage this unified voice of business leaders to amplify its advocacy in the coming years to ensure there are no backwards steps. It is only through working together to tackle the next frontier of climate action that we will be best positioned to share the benefits of our low carbon future.

As a key enabler of New Zealand’s transition, with assets that provide security of supply as generation becomes increasingly renewable and intermittent, we welcome the opportunity to share our analysis of climate risks and opportunities, and how our strategy is responding to these risks and opportunities.



Barbara Chapman
Chair



Malcolm Johns
Chief Executive

2. About this report

Reporting entity

This report includes climate-related disclosures for Genesis Energy Limited, its subsidiaries, controlled entities (together, "Genesis" or "the Group") and the Group's interests in associates and joint arrangements where relevant. The scope of the reporting entity aligns with that used for Genesis Energy Limited's FY23 Consolidated Financial Statements.

Basis of preparation

This report has been prepared using the Task Force on Climate-related Financial Disclosures framework (TCFD). In addition, we have been working towards aligning our disclosures with the requirements outlined in the External Reporting Board's (XRB) Climate-related Disclosures Standards. We are on track to comply with these standards in FY24.

Date published

This report was published on 23 August 2023.

Reporting period

This report covers the period from 1 July 2022 to 30 June 2023.

Materiality

We have followed the guidance set out in the XRB's Climate-related Disclosures Standard NZ CS-3 in relation to the application of materiality. NZ CS-3 states that "information is material if omitting, misstating or obscuring it could reasonably be expected to influence decisions that primary users make on the basis of an entity's climate-related disclosures". The primary users of this report are our existing and potential investors, lenders and other creditors.

When disclosing actual impacts, we apply the same materiality as applied by our auditors for the Consolidated Financial Statements (refer to Deloitte's Audit Report in the [FY23 Integrated Report](#)). The quantitative threshold used for our Consolidated Financial Statements is not considered

appropriate when determining which climate-related risks and opportunities should be disclosed given: (i) we are considering the potential impact over multiple years out to 2100; (ii) the size of our balance sheet; and (iii) the complexity of our operations. We use our risk matrix to determine what climate-related risks and opportunities to disclose. The matrix considers not only the financial impact but also the impact on operations, reputation, compliance, the environment and our people.

Disclaimer

This report contains forward-looking statements, such as potential impacts, climate scenarios, targets, forecasts and statements of our current intentions. Forward-looking statements are statements that are based on historical experience and various other factors that are reasonable under the circumstances. They are statements regarding our intent, belief or current expectations with regard to our business and operations and other climate and sustainability related commitments, targets, projections, scenarios, risk and opportunity assessments, pathways, forecasts, metrics and other proxy data.

Words such as 'will', 'may', 'expect', 'intend', 'seek', 'would', 'continue', 'plan', 'estimate', 'potential', 'anticipate', 'believe', 'risk', 'aim', 'forecast', 'assumption', 'projection', 'target', 'goal', 'guidance' or other similar words, are used to identify forward-looking statements. These statements reflect our current views on future events and are subject to change due to certain known and unknown risks, uncertainties, assumptions and other factors which are, in many instances, beyond our control, and have been made based on management's expectations or beliefs concerning climate change and the potential impact on Genesis.

This report uses relatively long time frames and plausible scenarios to assess potential impacts. Statements in this report use a greater number of assumptions and estimates than our Consolidated Financial Statements. These assumptions and estimates are subject to change over time, and, when coupled with the longer time frames used in these disclosures, make

any assessment of materiality inherently uncertain. In addition, our climate risk and impact assessment capabilities and our strategic plan remain under development, and the data underlying these and market practice in relation to these disclosures also remain subject to evolution and change over time.

The information in this report includes non-financial metrics, estimates or other information that are subject to significant uncertainties, which may include the collection of data, and methodologies to analyse the data, which involves various estimates and assumptions, and/or underlying data that is obtained from third parties, some of which cannot be independently verified. As a result, we expect that certain disclosures made in this report may be amended, updated, recalculated, and restated in the future as the quality and completeness of our data and methodologies continue to improve. For clarity, Genesis makes no commitment to update the information in this report.

The forward-looking statements made in this report are not guarantees or predictions of future performance and there is a risk that estimates, judgements, assumptions, views, scenarios or projections may turn out to be incorrect and that these risks may cause actual outcomes to differ materially from those expressed or implied in this report. In particular, there is inherent uncertainty around future climate-related and sustainability-related policy and legislation and limits in the current scientific understanding of climate change and its impacts. Accordingly, Genesis gives no representation, warranty or assurance (including as to the quality, accuracy or completeness of any forward-looking statements set out in this report), that the occurrence of the events expressed or implied in any forward-looking statement made in this report will occur.

Enquiries

If you have any questions or comments regarding this report, please contact investor.relations@genesisenergy.co.nz.

3. Our progress

Hydro generation increased by

34%

Compared to FY22, driven by exceptionally high hydro inflows

FY22: 9% lower than FY21

Successful biomass trial resulted in

895² less tCO₂e

From the combustion of biomass compared to the combustion of coal

Sustainable finance

32%³

Of drawn debt at 30 June 23 was green debt, a further \$240m of non-green debt was repaid and issued as green debt on 10 July 2023 increasing the percentage to 51%. The proceeds were not applied directly to fund new renewable generation development.

Engagement with energy management

50%

Of residential customers

FY22: 45%

Coal burn reduced by

90%

Compared to FY22, driven by lower thermal generation and therefore more gas available

FY22: 67% lower than FY21

2025 Science Based Target

60%

Lower scope 1 & 2 emissions for FY23 compared to FY20 base year

Target = 36% annual reduction from FY20 base year by FY25

Growing renewables

Lauriston solar

First solar project with FRV Australia⁴, designed to deliver ~52 MW

Engagement with energy management

37%

Of large business electricity customers⁶

Carbon emissions reduced by

1,625 kt CO₂e

45% decrease in scope 1, 2 and 3 emissions compared to FY22¹

FY22: 2,022 kt CO₂e lower than FY21

2025 Science Based Target

49%

Lower scope 3 emissions on use of sold products for FY23 compared to FY20 base year

Target = 21% annual reduction from FY20 base year by FY25

Completed feasibility studies and secured land rights⁵ for

~400 MW

Of solar capacity across 3 North Island sites

1. The decrease is mainly due to higher hydro generation and therefore lower thermal generation and lower coal burn. Hydro generation is driven by hydro inflows and therefore can fluctuate year on year.
2. Based on emission factors issued by the Ministry for the Environment (including CO₂ which is reported separately under the GHG protocol). This was calculated by comparing the tCO₂e produced from generating 1.5GWh of electricity using biomass instead of coal as the fuel source.
3. The calculation is based on drawn debt at year end excluding lease liabilities. It excludes fair value interest rate risk adjustments, capitalised issue costs and accrued interest.
4. Subject to Overseas Investment Office approval and therefore the Final Investment Decision.
5. Signing for one of these sites occurred after year end.
6. Energy IQ for business platform was launched in July 2022.

4. About Genesis

4.1 Our purpose and vision

Empowering New Zealand's sustainable future

Genesis generates electricity from a diverse portfolio of assets in New Zealand, including hydropower, wind, and thermal generation, and sells gas and electricity to commercial and domestic customers.

Our purpose is “empowering New Zealand’s sustainable future” and we are looking to fulfil this in all aspects of our business, from the way we generate and supply energy, care for the environment in which we operate, and the way we interact with our customers, our people, iwi and wider communities.

Addressing climate-related risks are central to our business and our strategy

We recognise the impact of climate change and support meaningful, economy-wide planning to reduce emissions and transition New Zealand to a low carbon future. Climate challenges will drive New Zealand’s and global decisions on how we live and work in the years to come. We expect that the scale of change will be significant and Genesis has a role to play as a key enabler in achieving a successful transition in New Zealand. We are taking action to reduce emissions while balancing climate change considerations, managing increasing energy demand, and ensuring our customers have reliable and cost-effective energy.

We understand the importance of our role in New Zealand’s transition to a low carbon future. Decarbonising our activities and helping our customers do the same will contribute to a successful low carbon transition. This means meeting the needs of the present, without compromising the needs of future generations.



Embedding sustainability into how we do business

Our purpose is underpinned by ambitious Science Based Targets (SBT), which aim to remove 1.2 million tonnes of annual carbon emissions by FY25 (from a FY20 base), in line with the ambition to limit global warming to no more than a 1.5°C temperature rise. These SBT targets ensure we can measure our progress and hold ourselves accountable.

We seek to identify social, economic, and environmental risks and opportunities as part of our strategic decision-making processes. Through our evolving sustainability strategy, we have made significant progress in the areas that we believe matter the most to, and have the greatest impact on our mana whenua and others such as investors, customers, and community groups (for more information refer to our [FY23 Integrated Report](#)).

We understand that an ‘equitable transition’ is vital to a successful low carbon future and that for the communities connected to our assets, community support with investment in new energy, new industries and new jobs is important.

We have embedded further accountability and transparency with our Sustainable Finance Framework (Framework). Through the Framework, we aim to hold ourselves accountable for reducing our carbon emissions, increasing our renewable generation capability and creating education and employment opportunities for young people living in the communities that surround our generation sites. The Framework provides a mechanism for investors to contribute capital to projects that support more sustainable outcomes.

4.2 Our business model

Genesis is a vertically integrated energy business. Our operations include generation and wholesale procurement of energy through to the sale of energy to residential, business and wholesale customers. We supply electricity, LPG and natural gas to 483,721 customers in New Zealand through two retail brands (Genesis and Frank*Energy) and we own a 46% share of the Kupe Joint Venture, which owns the Kupe gas field⁷.

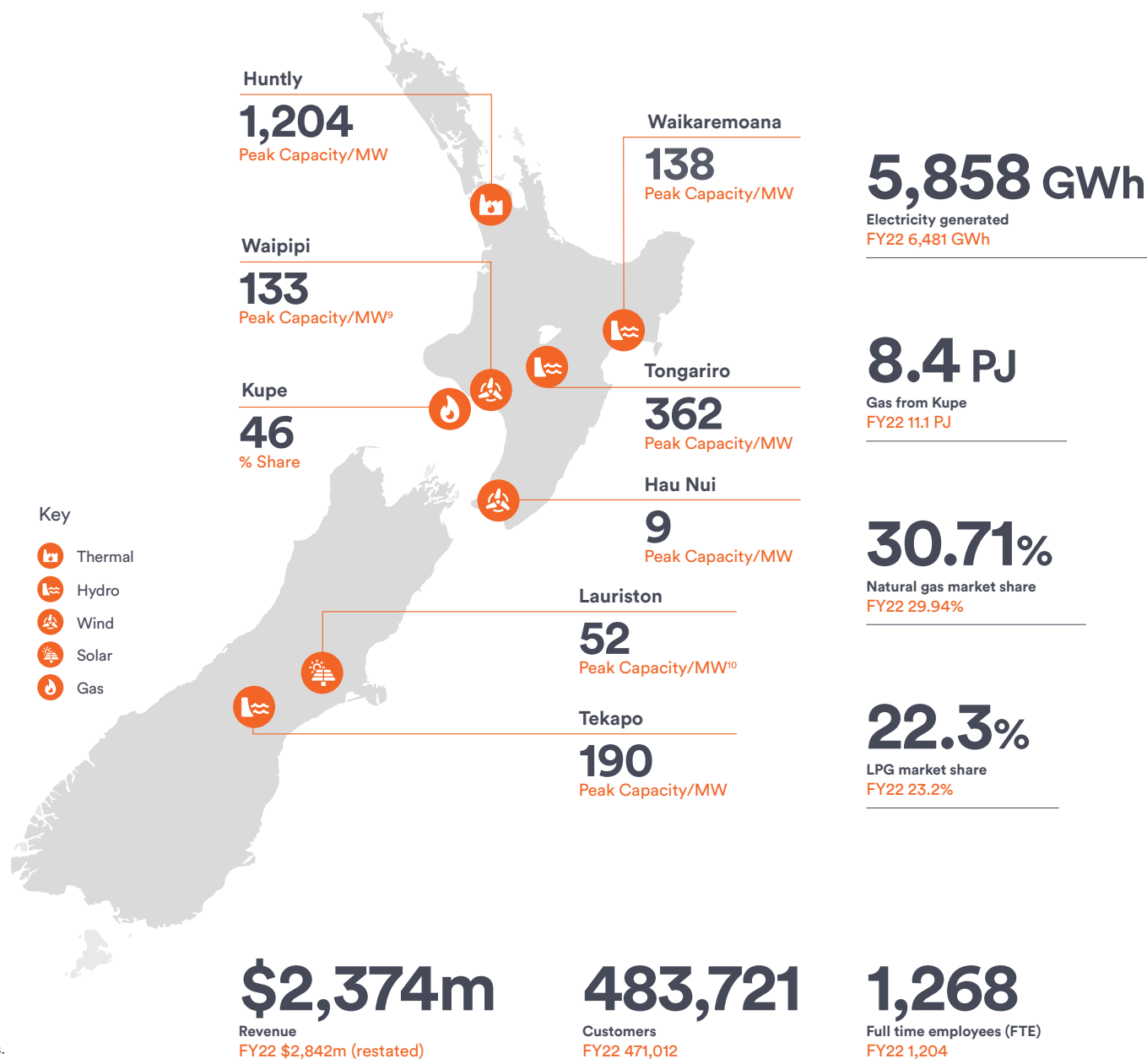
We operate a range of renewable and thermal generation sites across the country⁸. The geographic spread and diversity of our generation assets provides vital support to the country's electricity sector. Genesis sits at the intersection of supply and demand for several energy sources as well as providing back-up generation for New Zealand's electricity supply when renewable sources are unable to meet demand. This means our business is resilient to supply shocks and has historically generated consistent earnings.

Our vertically integrated gas portfolio provides flexibility, security, and price stability for our customers. Kupe gas field is also a vital part of New Zealand's energy system.

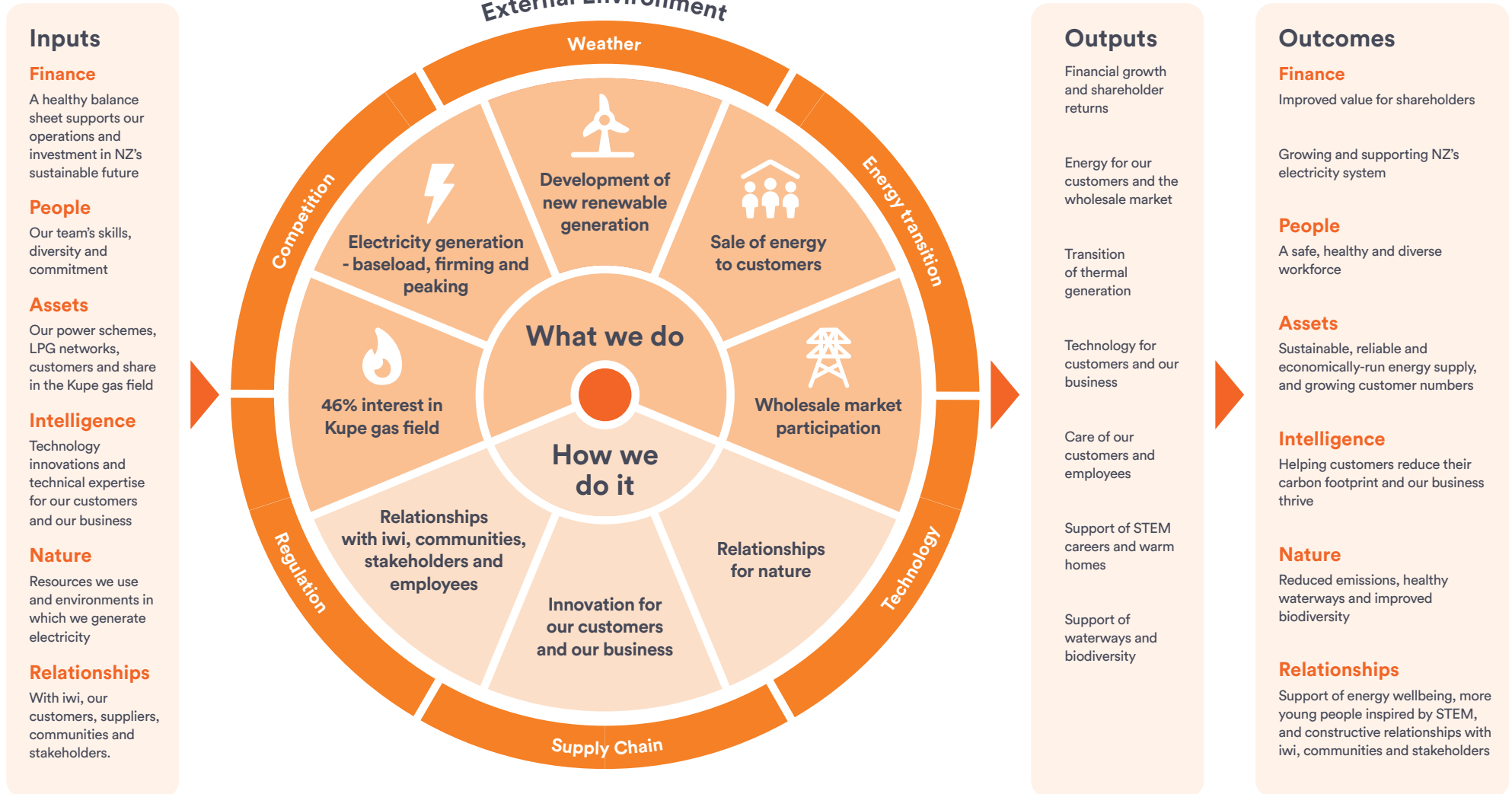
We remain focused on evolving our business model away from pure energy supply to energy management. This is being achieved by (i) continuing to develop the channels our customers use to interact with us, and (ii) developing a suite of products and services that provide knowledge and insights that our customers can act on, to manage their energy usage.

Genesis is a mixed ownership model company, listed on the New Zealand Stock Exchange and the Australian Securities Exchange and is majority owned by the Crown (51%). For further information about Genesis, refer to our [FY23 Integrated Report](#).

7. Refer to [Appendix IV](#) for a description of Kupe Joint Venture's physical assets and contractual arrangements.
 8. Huntly Power Station, Tongariro, Waikaremoana and Tekapo Power Schemes and Hau Nui Windfarm. Refer to [Appendix IV](#) for a description of our physical assets and refer to our website for further information on our generation sites.
 9. Genesis has an electricity offtake agreement for the energy from Waipipi.
 10. Subject to Final Investment Decision. Construction is expected to start late 2023 and be operational by late 2024.



4.3 How we create and capture value

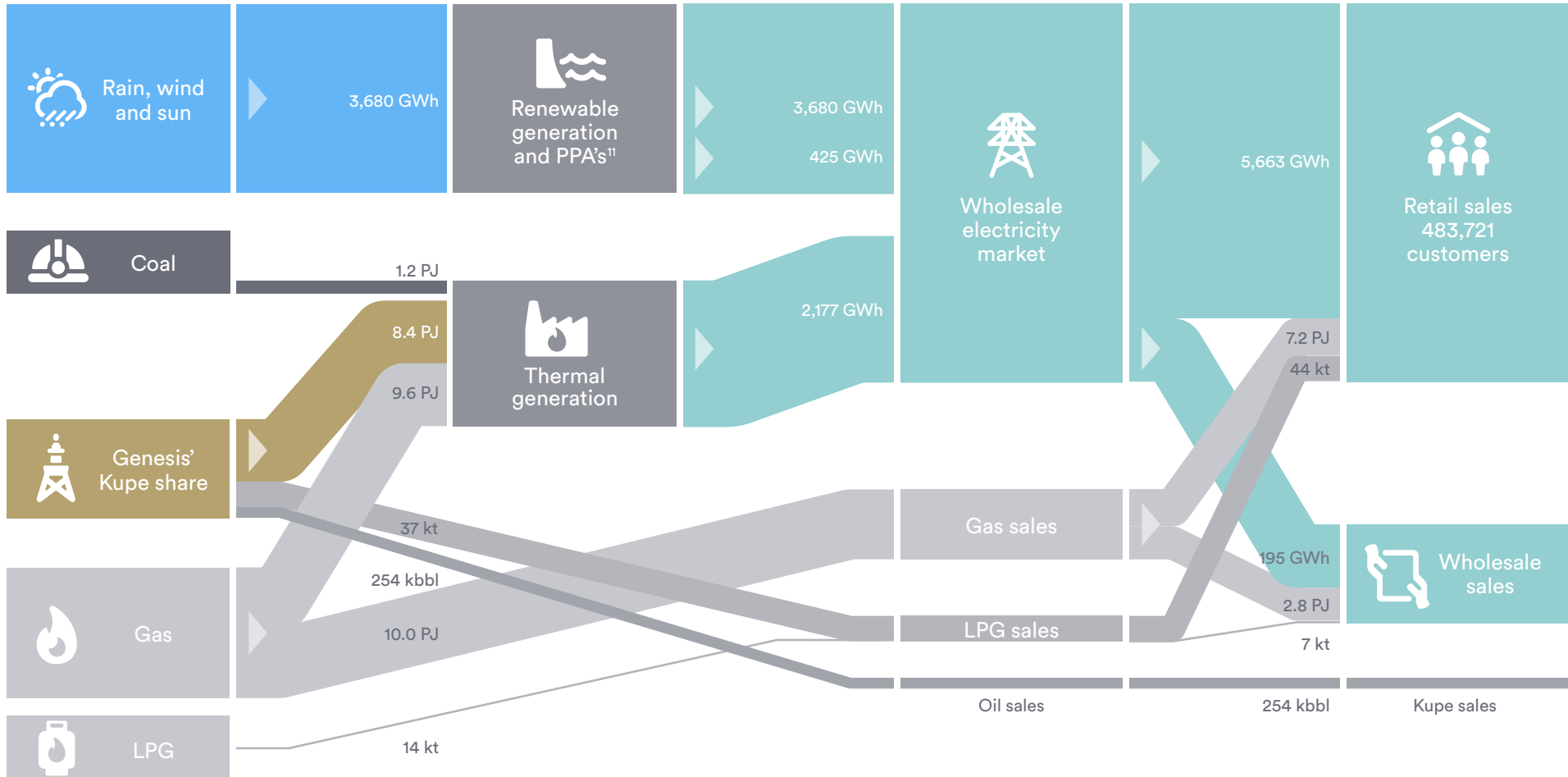


Our purpose: Empowering NZ's sustainable future

See our [FY23 Integrated Report](#) for more information

4.4 Key inputs and outputs for FY23

The diagram below provides an overview of the physical inputs and outputs of our business. The inputs are shown on the left-hand side, the process and markets we operate in are shown in the middle and the outputs and customer segments on the right-hand side. Refer to [Appendix IV](#) for a description of our physical assets.



11. Power purchase agreements

5. Governance

5.1 The role of the Board

The Board of Directors (Board) is responsible for the long-term stewardship of the Company, including the management of climate change risks and opportunities. Climate-related risks are an important consideration in long-term value creation. The members of the Board are outlined on page 56 of the [FY23 Integrated Report](#) and their profiles can be accessed on our [website](#). The Board and the Executive Leadership Team oversight of climate-related risks and opportunities is supported by embedding climate within our established governance structures and operating rhythm. The diagram to the right sets out the key responsibilities for each body which are discussed in more detail in the following sections.

Board

Responsible for:

- Establishing the purpose and overall strategic direction of Genesis including the strategy for managing climate change;
- Overseeing and approving the risk management strategy, policies, and the risk appetite;
- Setting and monitoring progress against climate-related targets; and
- Monitoring climate-related risks and opportunities through the ARC and approval of climate-related disclosures.

Audit and Risk Committee (ARC)

Assists the Board in the oversight and control of climate-related matters through its review of:

- The Risk Management Policy, Framework and Risk Appetite Statement;
- Risk reports; and
- Climate-related risks and opportunities, climate scenarios, results of scenario analysis and climate-related reporting.

The ARC reports its findings and recommendations to the Board for approval.

Executive Leadership Team (ELT)

Responsible for monitoring and managing climate-related risks and opportunities. The ELT has overall accountability for actions and commitments to embed climate change into risk management, business strategy, planning and budgeting processes and frameworks.

Climate working group

Responsible for overseeing the company-wide monitoring and review of climate-related risks and opportunities, scenarios, scenario analysis and the preparation and publication of climate-related reports.

Sustainability committee

Responsible for overseeing the delivery of the Sustainability Framework including climate-related goals.

Risk and strategy teams

Responsible for monitoring and reporting risks to the ELT and the ARC and ensuring climate-related risks are integrated into our strategy.

Individual business units

Responsible for day-to-day monitoring, management and reporting on climate-related risks and opportunities.

5.1 The role of the Board (cont'd)

Governance process and frequency

The Audit and Risk Committee (ARC), a subcommittee of the Board, is responsible for monitoring and oversight of climate-related risks and opportunities and reviewing, assessing and reporting this information to the Board.

Climate-related risks and opportunities, climate scenarios and results from scenario analysis are presented to the ARC annually. The ARC reviews and recommends these documents to the Board for approval.

Other documents associated with climate-related matters are provided to the Board for review and approval as appropriate, such as strategy and strategic initiative updates associated with our transition to a low carbon future, our Sustainability Framework, consideration of long-term decarbonisation commitments and climate-related legal matters.

Board skills and competencies

The Board continues to expand its climate-related knowledge through education sessions. The Board received the following updates during the year:

- In February 2023, the Board attended a training session on the XRB's Climate-related Disclosures Standards and was briefed on the results of the climate-related disclosures gap analysis completed by a climate reporting expert. This involved comparing the FY22 Climate-related Disclosures with the XRB Climate-related Disclosures Standards, which we are required to adopt in FY24; and
- In April 2023, industry experts joined the Board's strategy workshop to provide an overview of macro risks and opportunities, market trends, possible future market scenarios and uncertainties, and the implications of these on our strategic direction.

In FY23 the skills matrix has been updated to include sustainability which includes climate-related skills.

Refer to the [FY23 Integrated Report](#) for further information.

Integration of climate change into strategy

Given the nature of our business model, climate-related risks and opportunities are fundamental when reviewing and approving strategic direction. Subject matter experts participate in the strategy setting workshops, and the Board receives regular updates on key aspects of the strategy as the results of detailed analysis becomes available and work is completed on developing a long-term decarbonisation goal.

Monitoring progress against targets

The Board sets the tone and direction for targets through the strategy setting process and the review of risks and opportunities.

Management analyses and recommends specific targets to the ELT and Board for approval. Progress against these targets is incorporated into the reports to the Board. As targets relate to specific initiatives, the frequency of reporting on these depends on the specific initiative it is attached to. For example, progress on achievement of Science Based Targets is reported to the Board annually. It is also considered and reported on in the development and approval of the five-year operating plan and considered as part of the strategic planning process.

Incentivisation and remuneration

The Human Resources and Remuneration Committee, a subcommittee of the Board, oversees the ELT remuneration. In FY23, each Executive had a sustainability related objective representing 12% of their overall short-term incentive. We have also introduced a climate-related metric into the Long-Term Incentive (LTI) scheme. The metric represents 20% of the LTI and relates to the achievement of the FY25 Science Based Targets.



Waipipi wind farm, Taranaki

5.2 The role of Management

Executive Leadership Team

The ELT has overall accountability for actions and commitments to embed climate change into risk management, business strategy, planning and budgeting processes and frameworks. This includes:

- Ensuring the risks and opportunities in each business area are identified, understood, managed and monitored and escalated appropriately;
- Ensuring risk mitigation strategies approved by the ARC or Board are implemented;
- Monitoring emerging and developing risks. This is primarily performed by our strategy and risk teams, who report to the Chief Financial Officer and the regulatory team who report to the Chief Corporate Affairs Officer;
- Reviewing and presenting risk reports to the ARC. These reports include action taken to mitigate risks previously identified;
- Reviewing information provided by the climate working group on climate-related risks and opportunities, scenarios, scenario analysis and the climate-related disclosures; and
- Reviewing updates on the Company's progress against its sustainability goals.

The ELT also monitors and manages risks and opportunities through the strategy and operating plan setting process, attendance on the Future-gen Governance Group, Retail Performance and Strategy Oversight Committee and Wholesale Performance meetings, and through their engagement with individual business units.

The frequency of meetings and reporting depends on the nature of the risk or opportunity and how quickly it could manifest. For example, the ELT receives a monthly update on Future-gen initiatives, whereas reporting on Science Based Targets is provided annually.

The members of the ELT are outlined on page 57 of the [FY23 Integrated Report](#) and their profiles can be accessed on our [website](#).

The Chief Executive and other members of the ELT engage with the Board monthly and with the ARC quarterly.

Climate working group

The climate working group is responsible for overseeing the review and updating of climate-related risks and opportunities, scenarios, scenario analysis and the preparation and publication of climate-related reporting. The working group consists of the Group Treasurer and Risk, the Group Manager Strategy, General Manager Financial Control and Assurance, General Manager of Sustainability and other members of the risk, strategy, and financial control teams. The working group regularly engages with the ELT on the work completed during the year.

Sustainability Committee

The Sustainability Committee is responsible for overseeing implementation of the Sustainability Framework, which includes climate-related goals, developing the Sustainability Framework and associated targets beyond 2025, and identifying and executing initiatives to improve integration, engagement, and education on sustainability related matters.

Risk and strategy teams

The risk team is responsible for keeping up to date with emerging risks and providing day-to-day guidance to business units on how best to identify or manage risks. They are also responsible for monitoring and reporting risks to the ELT and the ARC each quarter.

The strategy team is responsible for ensuring climate-related risks and opportunities are considered within our strategy, and that the results of scenario analysis are considered in the strategy setting process and integrated into the operating plan.

Individual business units

The management of climate-related risks is dispersed throughout our business. Individual business units are responsible for day-to-day monitoring, management, and reporting on climate-related risks through to the risk team as well as the ELT. For example, the wholesale operations team are assigned responsibility for managing the health of the generation assets. The wholesale operations team monitor and report on this to the ELT monthly.

6. Risk management

6.1 Processes for identifying, assessing, and managing climate-related risks

Risk identification

We are cognisant of the developing effects of climate change, along with the associated environmental impacts, and operational, regulatory, and financial risks. We use the following processes, tools and methods to identify climate-related risks and opportunities:

1. Stakeholder engagement;
2. Trend analysis;
3. Exposure analysis; and
4. Scenario analysis.

The insights gained from these tools and processes are used by the risk team in their assessment, monitoring and reporting of risks, by the strategy team when developing the strategy and by the climate working group when overseeing the review and updating of climate-related risks and opportunities and climate-related scenarios.

Risk assessment

Climate-related risks are assessed and prioritised using the same risk management framework as used for other risks. The matrix considers the likelihood of occurrence and the severity of the consequence, which allows us to determine the appropriate level of response for each risk.

One key difference between climate-related risk and other risks is the 'likelihood' aspect which is difficult to accurately quantify over the long-term periods associated with climate risks. Accordingly greater weighting is placed on the 'consequence' aspect of the matrix, than the 'likelihood'.

As part of the ranking process, Management also considers vulnerability. If an asset is considered highly vulnerable to the risk, the impact rating is increased. If there are no controls in place to manage the risk, then the likelihood rating is increased. This ensures the correct level of emphasis is placed on mitigating the risks ahead of time. Climate risk assessments are incorporated into our risk management systems and processes.

Frequency of risk assessment

A formal process to review and update climate-related risks is completed annually. This is led by the climate working group. The risks and opportunity analysis are provided to the ELT and ARC for review and approval on an annual basis.

Climate-related risks can also be identified outside this process (i.e., identified as part of operational or strategic planning). Where new risks arise or should changes to existing risks be identified outside the annual process, these are considered by the risk team and where relevant reported to the ARC through the quarterly risk updates.

Process of risk management

Climate-related risks are managed through our Risk Management Policy and Framework and are managed throughout the business. The management response applied to each risk depends on the characteristics and impact of the risk. Management chooses to either accept, accommodate, protect or share the risk.

The frequency of risk reporting depends on the nature of the risk and how quickly it is likely to manifest. Operational and market risks are reported quarterly, key business risks are reported half yearly and strategic and climate-related risks are reported annually to the ARC.

Time horizons

The time horizons used for risk management are the same as those used for scenario analysis as outlined in [section 7.1](#). The only exception to this is the length of time considered for long-term risks. The impact of long-term physical risks is considered through to 2100 to align with the useful lives of our generation assets.

Value chain exclusions

No significant parts of the value chain have been excluded from the analysis.



Risk identification tools

1. Stakeholder engagement

The risk and strategy teams work with subject matter experts across the business to identify and assess climate-related risks across our value chain (both upstream from suppliers and supply chains, and downstream for customers).

A series of climate-related training sessions were run by a climate reporting expert to increase awareness and understanding of climate-related issues. The training was completed by the risk and strategy teams, subject matter experts, the climate working group, ELT and the Board.

2. Trend analysis

Trend analysis is undertaken by risk and strategy specialists to monitor our risk landscape and identify current and emerging risks within the industry, the wider economy, and across international markets. STEEP (Social, Technological, Economical, Environmental and Political) analysis is used within the scenario analysis to identify driving forces and critical uncertainties.

3. Exposure analysis

We have engaged an external consultant to undertake exposure analysis to identify physical risks for generation assets and Kupe onshore oil and gas assets. The analysis will use multiple scenarios and time horizons.

4. Scenario analysis

The climate working group work with subject matter experts (both internally and externally) to identify, review and assess the impact of climate-related risks using three scenarios over three time horizons. The scenario analysis process is described further in [section 7.1](#).

7. Strategy

7.1 Scenario analysis undertaken

We perform scenario analysis to (i) help identify climate-related risks and opportunities over the short, medium and long-term, (ii) aid in the development of our strategic direction and (iii) test the resilience of our strategy.




Scenario development process

In undertaking scenario analysis, we followed a robust process to identify climate-related risks and opportunities and understand strategy resilience.

1. Key internal stakeholders from across the business were brought together to identify and prioritise climate-related risks and opportunities.
2. The focal question and scope were defined. How could climate change plausibly affect our business, what should we do and when?
3. Driving forces and critical uncertainties were identified using the STEEP framework (used to identify current and emerging risks). Driving forces were prioritised according to their influence and uncertainty.
4. Three scenarios were developed and structured on an axis of physical versus transition risk. These scenarios included a 1.5°C climate-related scenario, a 2.0°C climate-related scenario and a 3°C climate-related scenario.
5. The implications of different pathways with different warming outcomes were explored and prescribed to each scenario ([refer to Appendix I](#) for a list of source data used to construct each scenario).
6. The scenarios were reviewed by climate experts and business stakeholders to ensure coherency, plausibility and that they present a challenge to the organisation.
7. The scenarios were reviewed by the ELT and the ARC who then recommended them to the Board for review and approval.

7.1 Scenario analysis undertaken (cont'd)

Overview of our three scenarios

	 Green tape	 Energy transformation	 Hot house
Key assumption	Transformation driven by government legislation and more sustainable choices by consumers	Transformation driven by private sector innovation and consumer pressure. Government responds but lags	Greenhouse gas emissions continue to increase. Government response based on adaptation, not mitigation
Policy ambition	1.5°C	2.0°C	>3.0°C
Pathways	RCP ¹² 2.6 SSP ¹³ 1 Orderly (Net Zero 2050)	RCP 4.5 SSP 2 Disorderly (Delayed transition)	RCP 8.5 SSP 5 Hot house (Current policies)
Policy reaction	Immediate and smooth	Delayed to 2030's	None
Access to financial services (eg. some forms of capital and insurance)	Easily accessible for those with sustainability credentials, no access for others	Available for most at a higher cost	Still available to those that exploit natural resources
Demand change	Fast	Moderate	Slow/Moderate
Technology change	Fast - mid 2020's	Moderate - early 2030's	Slow - not focused on climate
Customer preference change	Fast	Moderate - early 2030's	Slow - not front of mind
Physical risk severity	Moderate	Moderate	Extreme
Transition risk severity	Moderate	High	Low ¹²

12. Representative Concentration Pathway

13. Shared Socio-economic Pathway

Green tape

A series of extreme environmental events raises climate risk awareness and spurs global agreement on climate action, limiting temperature rise to 1.5°C (Paris Agreement). This requires stringent government legislation as well as more sustainable choices by consumers.



Swift and stringent mitigation has restricted carbon emissions and ensured a minimal temperature increase. Adaptation is carried out strategically to achieve long term goals, improve resilience, and prosperity. By 2050, New Zealand has reached net zero emissions and is using 90 percent renewable energy. Energy is accessible, affordable and has supported an equitable transition to a low-carbon economy. Energy supply is secure, reliable, resilient and includes distributed alternative generation.

Consumers prefer sustainable options, supported by government incentives. This includes greater uptake of public transport, cycling and electric scootering, leading to less private car ownership.

From the mid-2020's, the focus shifts towards technology that reduces emissions, mandated by government restrictions, which results in acceleration of industry electrification. As a result, the total demand for electricity increases rapidly (to 60,000 GWh by 2050) and new generation and transmission must be built.

Strong investment in innovation and energy storage drive technology improvements that reduce costs and increase efficiency, resulting in increased demand for skilled employees. Fossil fuels are almost phased out and renewables dominate, but stranded assets are minimised through careful government policy.

New Zealand meets much of its own energy needs, with a good uptake of low emissions fuels, such as biofuels and green hydrogen. By 2050, biomass makes up 15% of the country's total primary energy.

Severe weather events including rainfall increase but less than in other scenarios. Most severe impacts are mitigated. The South Island experiences higher levels of rainfall, particularly on the West Coast. The North Island experiences less precipitation, but more severe weather around the North and East coasts. Snowfall declines, but at a slower rate than globally. Communities are impacted, leaving some cut-off in severe storms. Increased reliance on battery power storage and higher network resilience is expected.

By 2050, New Zealand has reached net zero emissions and is using 90 percent renewable energy.

Energy transformation

Increasingly severe weather events and a lack of government action led to a loss of faith in political leaders. Private sector-driven technology advances and consumer choices succeed in keeping climate change within the 2.0°C goal of the Paris agreement (with overshoot). Innovation takes off in the 2030's including: electric vehicle adoption, distributed solar and batteries, and demand response. Commercial propositions and business models enable new choices for consumers and paths to energy sector decarbonisation. There is less government mandated or subsidised action taken to restrict carbon emissions.



Around 2030, weather events cause significant property damage and fatalities across New Zealand, resulting in political tension and a loss of faith in government to take effective action on climate change. Behavioural change, while slow up until this point, is spurred by international action and expectations. A delayed transition means consumers help to drive rapid change. The private sector responds to consumer wants and needs and leads the transition through innovative technology uptake. The government responds with supportive policy post-2030, but it is not the driver of the transition. Delays in effective policy implementation result in a more inequitable and expensive transition.

Up to the 2030's, recent historical global trends continue, followed by rapid technology and behaviour change, spurred by worsening climate change impacting communities. The cost-of-living increases, putting economic and social pressure on people for a time, due to operational costs increasing from uptake of new technology.

Post 2030 there is high uptake of public transport, cycling and electric scootering, leading to reduced private car ownership.

High rates of innovation in the energy sector include electrification of end-use sectors; electric vehicle adoption; distributed solar and batteries; utilisation and storage, including removing CO₂ from the atmosphere; the use of low carbon

gases such as hydrogen and demand response. Global coal demand falls rapidly during the 2030's and halves between 2018-2040 for the Asia-Pacific region. New commercial propositions enable new choices for consumers and new paths to decarbonise the energy sector.

Rain increases by up to 30% over a year but falls on fewer days with heavier rain and less snow (snow days per year reduce by 30 days). These heavier intense rainfall days are frequent in winter. This increases the likelihood of rivers flooding and flash flooding. Although precipitation increases, there are more dry days.

Increases in mean temperature and longer summers (higher temperatures and lower rainfall over a longer time period) means increased water demand. Droughts intensify and become more frequent over time. The number of hot days doubles by the end of the century. River flows are lower in summer and higher in winter. Lower river flows in summer raises water temperatures and aggravates water quality problems.

Global coal demand falls rapidly during the 2030's and halves between 2018-2040 for the Asia-Pacific region.



Hot house

Economic and social development is paired with the continued exploitation of fossil fuel resources and the continuation of resource and energy intensive lifestyles around the world. Restricting carbon emissions becomes a lower priority for both the government and public leading to severe physical climate change impacts and a global temperature rise of $>3^{\circ}\text{C}$ by 2100.



Global climate policy ambition dwindles during the mid-2020's. Fossil fuel use and resource exploitation continues, with weak, reactive and localised adaptation to avoid near-term costs. By 2050 the economy has experienced strong growth but with increasing emissions and worsening physical climate impacts.

Scaled action on climate change is traded for robust economic growth, driven by reliance on fossil fuels. Sustainability is still valued by consumers; however, this is not always reflected in purchasing decisions or consumption patterns. Population wellbeing decreases.

Technology continues to evolve but is not focused on climate solutions. Countries and sectors fail to coordinate in this scenario, leading to a lack of reduction in emissions and geopolitical tension. Despite electrification of some areas, and further uptake of electric vehicles, reliance on fossil fuels continues. Coal demand for energy generation remains flat. For the Asia-Pacific region, coal demand increases from 2018-2040 by 10%.

Extreme events occur (precipitation of up to 1 metre of rainfall in 48 hours localised to one area in the country). The largest changes in precipitation occur on the West Coast in winter season, with an average increase up to 40% by 2090. Snow days per year reduce by 30 days or more by 2090. Flooding occurs in many areas across the country, creating landslides and disrupting transportation and communications.

Average wind speeds increase, common (monthly) wind events see 22–27 knots. Most significant increases occur in the southern half of the North Island, and throughout the South Island. 'Extreme' wind events present the capability to damage/disrupt infrastructure. Tropical cyclones become more intense and common and push south, often causing flooding in the North Island. The South Island is pummelled by the extratropical storm track.

Coal demand for energy generation remains flat.

For the Asia-Pacific region, coal demand increases from 2018-2040 by 10%.

7.1 Scenario analysis undertaken (cont'd)

Why these scenarios?

The Green tape (1.5°C) and the Hot house (>3°C) scenarios were chosen as they align with the requirements of the XRB's Climate-related Disclosures Standard. The Energy transformation (2.0°C) scenario is considered the most challenging and plausible scenario for our business because it has high transition risks and moderate physical risks. In comparison the Green tape scenario focuses on transitional risks and the Hot house scenario focuses on physical risks. The Energy transformation scenario is considered relevant, as it aligns with International Energy Agency (IEA) reference scenarios. By utilising these three scenarios, we tested the resilience of our business strategy with a broad range of climate-related risks and opportunities.

Time horizons

The scenarios, scenario analysis and risks were considered over the following time horizons:

Term	Period	Rationale
Short	1-5 years (2028)	Aligns with the time horizon used for Genesis' operating plan
Medium	6-15 years (2038)	Aligns with the time horizon used for Genesis' corporate strategy
Long	16-27 years (2050)	Aligns with the Intergovernmental Panel on Climate Change (IPCC) findings that to limit the temperature increase to 1.5°C above pre-industrial levels, emissions would have to peak now and reduce by around half by 2030, and globally net zero emissions need to be attained by 2050.

Capital deployment plans can be short, medium or long-term depending on the nature of the project, the expected return on investment period and the expected useful life of any assets that are created. Some capital deployment plans such as our investment in solar generation assets use slightly longer time periods (35 years rather than 27 years). In addition, the expected useful lives of our hydro generation assets have much longer time horizons than used in our scenarios analysis. While this is the case the physical impact of climate change on these assets has been considered out to 2100 using the three Representative Concentration Pathways used in our scenarios (refer to [section 6.1](#)).

Scenario analysis process

The resilience of our business model and strategy was tested against the three climate scenarios. We engaged PwC and West Nine Consulting Limited to guide and support the development of the scenarios and the scenario analysis. The results of the testing were reviewed by the ELT, the ARC and the Board.

Scenario analysis was completed through the development of risks and opportunities, risk mapping and qualitative analysis. No quantitative modelling was undertaken.




This year the scenario analysis process was completed as a standalone process due to the timing of the work being undertaken. Management is working to integrate this work into the annual strategy review process going forward.



7.2 Material climate-related risks and opportunities

The table below outlines the most significant climate-related transition and physical risks, and opportunities that could impact our business over the short, medium and long term. These climate-related risks and opportunities have been identified and assessed using the processes discussed in [section 6.1](#) and [section 7.1](#). The risks and opportunities have been grouped based on the scenario which is considered

to result in the highest impact on our business model and strategy. It is likely that the risk and opportunities below will manifest in more than one scenario. The classification represents our current assessment of the risk landscape. The risks and opportunities are discussed in more detail on pages 19-27. Given the future is unknown actual results may differ from those noted on pages 19-27.

Scenario	Risks	Opportunities	Time horizon						
 Green tape	1. Shift in customer preferences 2. Retail's transition to a low carbon future 3. Speed of wholesale transition to a low carbon future	5. Development of solar generation 6. Electrification increases electricity demand	<table border="0"> <tr> <td>Short</td> <td>Medium</td> <td>Long</td> </tr> <tr> <td>0 – 5 Years</td> <td>6 – 15 Years</td> <td>16+ Years</td> </tr> </table>	Short	Medium	Long	0 – 5 Years	6 – 15 Years	16+ Years
	Short	Medium	Long						
0 – 5 Years	6 – 15 Years	16+ Years							
4. Restricted ability to sell LPG and gas	<table border="0"> <tr> <td>Short</td> <td>Medium</td> <td>Long</td> </tr> <tr> <td>0 – 5 Years</td> <td>6 – 15 Years</td> <td>16+ Years</td> </tr> </table>	Short	Medium	Long	0 – 5 Years	6 – 15 Years	16+ Years		
Short	Medium	Long							
0 – 5 Years	6 – 15 Years	16+ Years							
 Energy transformation	7. Blackout and/or supply resilience risk 8. Supply constraints impacting the transition to a low carbon future 9. Changes to the Emissions Trading Scheme (ETS) 10. Gas storage for dry year events	12. Technological developments create new customer propositions 13. Development of onshore wind generation	<table border="0"> <tr> <td>Short</td> <td>Medium</td> <td>Long</td> </tr> <tr> <td>0 – 5 Years</td> <td>6 – 15 Years</td> <td>16+ Years</td> </tr> </table>	Short	Medium	Long	0 – 5 Years	6 – 15 Years	16+ Years
	Short	Medium	Long						
	0 – 5 Years	6 – 15 Years	16+ Years						
11. Ability to access some forms of capital	<table border="0"> <tr> <td>Short</td> <td>Medium</td> <td>Long</td> </tr> <tr> <td>0 – 5 Years</td> <td>6 – 15 Years</td> <td>16+ Years</td> </tr> </table>	Short	Medium	Long	0 – 5 Years	6 – 15 Years	16+ Years		
Short	Medium	Long							
0 – 5 Years	6 – 15 Years	16+ Years							
14. Improved alignment of hydro inflows and electricity demand	<table border="0"> <tr> <td>Short</td> <td>Medium</td> <td>Long</td> </tr> <tr> <td>0 – 5 Years</td> <td>6 – 15 Years</td> <td>16+ Years</td> </tr> </table>	Short	Medium	Long	0 – 5 Years	6 – 15 Years	16+ Years		
Short	Medium	Long							
0 – 5 Years	6 – 15 Years	16+ Years							
 Hot house	15. Ability to access insurance	<table border="0"> <tr> <td>Short</td> <td>Medium</td> <td>Long</td> </tr> <tr> <td>0 – 5 Years</td> <td>6 – 15 Years</td> <td>16+ Years</td> </tr> </table>	Short	Medium	Long	0 – 5 Years	6 – 15 Years	16+ Years	
	Short	Medium	Long						
	0 – 5 Years	6 – 15 Years	16+ Years						
16. Weather events impacting gas supply	<table border="0"> <tr> <td>Short</td> <td>Medium</td> <td>Long</td> </tr> <tr> <td>0 – 5 Years</td> <td>6 – 15 Years</td> <td>16+ Years</td> </tr> </table>	Short	Medium	Long	0 – 5 Years	6 – 15 Years	16+ Years		
Short	Medium	Long							
0 – 5 Years	6 – 15 Years	16+ Years							
17. Warmer temperatures and longer dry spells impacting hydro generation 18. Intense rain and floods impacting hydro generation	<table border="0"> <tr> <td>Short</td> <td>Medium</td> <td>Long</td> </tr> <tr> <td>0 – 5 Years</td> <td>6 – 15 Years</td> <td>16+ Years</td> </tr> </table>	Short	Medium	Long	0 – 5 Years	6 – 15 Years	16+ Years		
Short	Medium	Long							
0 – 5 Years	6 – 15 Years	16+ Years							

Green tape risks

1. Shift in customer preferences

R Transition risk – Products and services

Potential impact

Increased consumer awareness of carbon intensive businesses as well as mitigations such as green products (i.e. green energy certificates) increases the risk that customers migrate to other retailers.

Actual impact¹⁴

No material events occurred during the reporting period.

Business unit / asset impacted

Retail business unit – reduced customer numbers impacting earnings.



Time horizon



Strategy to manage risk

This risk is managed through our decarbonisation transition plan Future-gen, adoption of Science Based Targets and brand diversification (Ecotricity).

2. Retail's transition to a low carbon future

R Transition risk – Products and services

Potential impact

The strategy to adopt and deploy new technology, emerging services and products to support customers to decarbonise and transition to a low carbon economy could either increase or decrease market share, revenue, and if not executed successfully could result in the loss of multi-fuel customers.

Actual impact

No material events occurred during the reporting period.

Business unit / asset impacted

Retail business unit – reduced multi-fuel customers numbers impacting earnings.



Time horizon



Strategy to manage risk

This risk is managed through dedicated teams focused on identifying emerging customer and market needs, developing the technology and partnerships required to deploy future products and services to market and development of strategic initiatives focused on decarbonisation.

14. Actual impact refers to the impact identified in the current reporting period (1 July 2022 to 30 June 2023).

Green tape risks (cont'd)

3. Speed of wholesale transition to a low carbon future

R Transition risk – Adaptation and mitigation activities

Potential impact

The speed of transition to a low carbon future and achievement of the Future-gen strategy is impacted by:

- Competitors and new market entrants adopting new technologies and developing new generation earlier than us;
- Unavailability of Power Purchase Agreements (PPAs) with renewable developers due to heightened competition or reluctance to transact with us and delays to developers' projects caused by challenges with consenting, network connections and other project development requirements; and
- The approval of the Lake Onslow project which could impact the return on investment of renewable asset investments.

How the strategy is executed could either increase or decrease financial performance.

Actual impact

The work on our Future-gen strategy is progressing. No new PPAs were entered into in FY23. Competition in the renewable space remains strong with many of the larger renewable projects in the development stage. The construction of some commercially feasible renewable projects in New Zealand in the near term has been delayed as a result of supply chain constraints, rising material costs and ability to access to local civil and electrical contractors as a result of flood remediation work. Renewable projects have also been impacted by delays in network connection applications due to the volume of proposed projects being submitted.

Business unit / asset impacted

Wholesale business unit – reduced earnings from new renewable generation / increased exposure to wholesale electricity prices.



Time horizon



Strategy to manage risk

To manage this risk, we (i) have partnered with FRV Australia, a leading utility-scale solar farm developer; (ii) continue to develop a pipeline of development and contractual options which is more than the target we are trying to achieve; and (iii) manage delay risks through contractual terms.

4. Restricted ability to sell LPG and gas

R Transition risk – Products and services

Potential impact

If the Government prohibited the sale of gas and LPG, we would be unable to sell these products which would have a negative impact on financial performance.

Actual impact

The Climate Change Commission is consulting on draft advice on the development of the next emissions reduction plan. The Commission is consulting on a recommendation to prohibit the installation of gas in buildings where there are viable and affordable alternatives. The Government is not obliged to adopt the Commission's recommendations (although they may be persuasive towards further action). The recommendations are to be finalised at the end of 2023.

The Government is developing a gas transition plan which is expected to be completed by the end of 2023. This will feed into the national energy strategy currently under development for introduction at the end of 2024.

Business unit / asset impacted

Retail business unit – reduced customer numbers and earnings / carrying value of LPG assets (fixed and intangible assets).

Kupe business unit – reduced earnings / carrying value of Kupe assets (oil and gas assets and intangible assets associated with customer contracts and relationships).

Wholesale business unit – reduced earnings.



Time horizon



Strategy to manage risk

We are actively working to develop products and tools to help customers manage and reduce their reliance on these products.

Green tape opportunities

5. Development of solar generation

Opportunity – Adaptation and mitigation activities

Potential impact

Technology advancements are decreasing the cost of renewable technologies making it more viable to invest in these assets and transition away from thermal generation. Investment in renewable assets will replace thermal generation revenue and reduce operating costs.

Actual impact

During FY23 we:

- Announced the first joint solar development project with FRV Australia for approximately 52 MW. The project is expected to be operational in late 2024;
- Completed feasibility studies for three solar project sites across the North Island with approximately 400 MW of capacity and secured land rights for two of these sites prior to year-end and one after year-end. We are now focused on consenting and connection development activities for these projects;
- Continued to assess a range of development opportunities as part of a growing pipeline of generation development options; and
- Lodged two applications in relation to the resource consent for Castle Hill. One was to reduce the size of the windfarm (this was approved in April 2023). The other application was to extend the consent for a further 8 years. No decision has been made for the development of this site.

Business unit / asset impacted

Wholesale business unit – increased investment in new renewable generation / reduced operating costs.



Time horizon



Strategy to manage risk

This is managed as part of our Future-gen strategy.

6. Electrification increases electricity demand

Opportunity – Products and services

Potential impact

Increased electrification of industry, transport and heating, including use of incentive schemes (i.e., electric car subsidy) creates an opportunity to provide new services to customers and increases demand and load on the grid, leading to increased retail and wholesale revenue.

Actual impact

Significant focus in FY23 has been to drive electric vehicle uptake through our first-in-market plan. Our EV Plan has grown by 158% to 4,153 customers and 2,173 customers have subscribed to our EVerywhere offer. We have also focused on increasing residential customer engagement with energy management tools in Energy IQ.

Business unit / asset impacted

Retail and wholesale business units – increased earnings / carrying value of generation assets.



Time horizon



Strategy to manage risk

This opportunity is managed through dedicated teams focused on identifying emerging customer and market needs, developing the technology and partnerships required to deploy future products and services to market and development of strategic initiatives focused on decarbonisation.

Energy transformation risks

7. Blackout and/or supply resilience risk

R Transition risk – Operations

Potential impact

Blackouts and/or threats to supply resilience could result in government intervention which has the potential to:

- Impact the Group structure, assets held or contracts entered into;
- Require us to maintain and run thermal assets, despite a potential costs imposition and reduced profitability or increased electricity prices for consumers; and
- Compromise New Zealand’s and our climate change mitigation goals.

Actual impact

The Electricity Authority is introducing a suite of amendments to the Electricity Industry Participation Code to manage risks to electricity supply during peak demand periods in winter 2023. The options seek to improve market information and incentives, consistent with the Authority’s statutory objectives. These changes did not impact our financial performance. Further, more impactful changes are expected ahead of winter 2024.

Business unit / asset impacted

Group structure or the Wholesale business unit depending on the level of government intervention – changes could impact earnings / carrying value¹⁵ of thermal generation assets.



Time horizon



Strategy to manage risk

We actively engage with regulators and industry groups to support the sector to align on the direction and effective regulations that will help the country move quickly and safely towards a sustainable future.

15. Generation assets are recorded at fair value in the balance sheet. The valuation is based on a discounted cash flow model. Refer to note B1 of the Consolidated Financial Statements for more information.

8. Supply constraints impacting the transition to a low carbon future

R Transition risk – Adaptation and mitigation activities

Potential impact

Increased global demand for key minerals used in the manufacture of renewable technologies or land for solar and capacity issues in relation to connecting new generation to local and national grids is expected to result in supply chain constraints. This creates a risk that we will not achieve our Future-gen strategy, or the cost of the transition will increase.

Actual impact

During the reporting period we experienced difficulties sourcing biomass for the biomass trial which resulted in the trial being delayed until February 2023.

Supply chain constraints (sourcing turbines and civil work delays due to resources being diverted to flood repair work) has delayed the construction of one of the wind farms that we have a signed PPA for.

Business unit / asset impacted

Wholesale business unit – reduced earnings from new renewable generation / increased exposure to wholesale electricity prices.



Time horizon



Strategy to manage risk

To manage supply constraints we have partnered with FRV Australia, a leading utility-scale solar farm developer who has established supply chain networks and we continue to develop a pipeline of development options in different locations, with different land uses, connections and consenting risks.

Energy transformation risks (cont'd)

9. Changes to the Emissions Trading Scheme (ETS)

R Transition risk – Supply chain and/or value chain

Potential impact

Regulatory intervention or the inclusion of NZ Emissions-Intensive Trade Exposed industries (EITE's) in the ETS would increase demand for carbon units (driving up prices) and increase the risk of industrial load decline which could impact retail sales.

Actual impact

The spot price of carbon decreased significantly during the year and has not fully recovered after the carbon auction in March 2023 failed to reach its reserve price. The change in price did not have a material impact on our financial performance for the year as we hedge our operational exposure to carbon price risk, it did however, impact the carrying value of emission units held for trading and the margin made on trading these units.

On 25 July 2023 the Government announced an increase to the floor and reserve prices for quarterly carbon unit auctions with effect from the 6 December 2023 auction and a change to the overall limit of carbon units available over 2023-2028.

The ETS is currently being reviewed by government officials. The outcome of the review is not expected to be known until the end of 2023. Any changes will be effective in FY24.

Business unit / asset impacted

Wholesale business unit – increased operating costs / carrying value of thermal generation assets.

Retail business unit – reduced earnings.



Time horizon



Strategy to manage risk

We hedge our exposure to carbon price increases primarily through forward contracts and our forestry investments.

10. Gas storage for dry year events

R Transition risk – Adaptation and mitigation activities

Potential impact

Constraints on the development of oil and gas projects discourages investment in gas storage, thereby, reducing alternatives to replacing coal for electricity generation. This has the potential to impact the strategy and solutions to address dry year risk.

Actual impact

No material events occurred during the reporting period.

Business unit / asset impacted

Wholesale business unit – reduced earnings / carrying value of thermal generation assets.



Time horizon



Strategy to manage risk

We continue to work actively to secure gas storage, as well as potential alternatives (biomass and batteries).

Energy transformation risks and opportunities (cont'd)

11. Ability to access some forms of capital

R Transition risk – Access to capital

Potential impact

Shifting investor preferences has the potential to reduce access to some forms of capital and/or funding options or increase the cost of capital.

Actual impact

No material events occurred during the reporting period.

Business unit / asset impacted

Corporate business unit – increased finance expense / reduced ability to fund new projects.



Time horizon



Strategy to manage risk

We manage this risk through our decarbonisation transition plan Future-gen, adoption of Science Based Targets, active engagement with investors and our Sustainable Finance Framework.

12. Technological developments create new customer propositions

O Opportunity – Products and services

Potential impact

Technology advancements and products create new opportunities for integrating into the electricity system. These include: distributed solar, virtual power plants and batteries. Electric vehicle and other smart and connected devices also enable new customer propositions which have the potential to increase Retail revenue.

Actual impact

No material events occurred during the reporting period.

Business unit / asset impacted

Retail business unit – increased earnings.



Time horizon



Strategy to manage risk

This opportunity is managed through dedicated teams focused on identifying emerging customer and market needs, developing the technology and partnerships required to deploy future products and services to market and development of strategic initiatives focused on decarbonisation.

Energy transformation opportunities (cont'd)

13. Development of onshore wind generation

Opportunity – Adaptation and mitigation activities

Potential impact

Generation of electricity using onshore wind turbines. Investment in renewable assets is expected to replace thermal generation revenue and reduce operating costs.

Actual impact

No material events occurred during the reporting period.

Business unit / asset impacted

Wholesale business unit – increased investment in new renewable generation / increased earnings and reduced operating costs.



Time horizon



Strategy to manage risk

This opportunity is managed as part of our Future-gen strategy.

14. Improved alignment of hydro inflows and electricity demand

Opportunity – Operations

Potential impact

As weather patterns shift, warmer temperatures and longer dry spells become more likely. This is expected to alter catchment inflows (i.e. less snowpack and more irregular and intense rainfall) creating more volatile hydrology. This is a risk as well as an opportunity as hydro flows may better align with electricity demand which could increase generation revenue.

Actual impact

Severe weather events in FY23 resulted in increased hydro generation (refer to risk 18 in the Hot house section for more information). No other material events occurred during the reporting period.

Business unit / asset impacted

Wholesale business unit – increased or decreased earnings depending on outcome.



Time horizon



Strategy to manage risk

Our strategy is to maintain a diverse and flexible portfolio of renewable generation through our Future-gen strategy. We continue to track and forecast the impacts of climate change on our generation assets, and where necessary make generation decisions based on these impacts.

Hot house risks

15. Ability to access insurance

R Transition risk – Supply chain and/or value chain

Potential impact

The number of entities willing to insure thermal generation and oil and gas assets is expected to reduce and the cost of insurance is expected to increase over the medium term as more insurers adopt ESG objectives.

Actual impact

No material events occurred during the reporting period.

Business unit / asset impacted

Wholesale and Kupe business units – increased insurance costs.



Time horizon



Strategy to manage risk

We manage this risk through our decarbonisation transition plan Futuregen, adoption of Science Based Targets, and active engagement with insurers.

16. Weather events impacting gas supply

R Physical risk – Supply chain and/or value chain

Potential impact

Storms and stronger sea currents have the potential to impact Kupe's umbilical cord or access to the platform. Intense rain could result in landslides impacting the gas pipeline used to transport gas from Taranaki to Huntly and other gas distribution networks. These weather events have the potential to impact thermal generation and gas supply to retail and wholesale customers, thereby reduce revenue and increase operating costs.

Actual impact

The severe weather during the reporting period did not have a significant impact on gas supply.

Business unit / asset impacted

Kupe business unit – reduced earnings / carrying value of oil and gas assets.

Wholesale business unit – reduced earnings / carrying value of thermal generation assets / increased operating costs.

Retail business unit – reduced earnings.



Time horizon



Strategy to manage risk

We manage the risk to thermal generation by actively pursuing a diverse fuel portfolio, keeping options for multiple fuel options, and by investing in a diverse generation portfolio. Current forecasts see Kupe depleted in the medium term and will therefore not be exposed to long-term weather related risks.

Hot house risks (cont'd)

17. Warmer temperatures and longer dry spells impacting hydro generation

R Physical risk – Operations

Potential impact

As weather patterns shift, warmer temperatures and longer dry spells may become more frequent. This could:

- Alter catchment inflows (i.e., less snowpack and more irregular and intense rainfall) creating more volatile hydrology. This is a risk as well as an opportunity as hydro flows may better align with electricity demand;
- Create water restrictions and therefore impact water flowing into our catchments (water may be required for other uses such as agricultural irrigation). This would reduce hydro generation and therefore wholesale revenue; and
- Elevate weed proliferation which would increase maintenance costs and could reduce generation capacity if not well maintained.

Actual impact

Overall temperatures and rainfall were well above average in FY23 particularly in the North Island which enabled a 34% increase in hydro generation and a 42% decrease in thermal generation compared to FY22. Our GHG emissions also reduced by 52% compared to FY22 as a result of lower thermal generation and the ability to reduce coal burn (90% lower than FY22). Refer to [section 8.1](#) for more information.

Business unit / asset impacted

Wholesale business unit – reduced / increased earnings and carrying value of thermal generation assets depending on the outcome / increased operating costs.



Time horizon



Strategy to manage risk

Our strategy is to maintain a diverse and flexible portfolio of renewable generation through our Future-gen strategy. We continue to track and forecast the impacts of climate change on our generation assets, and where necessary make generation decisions based on these impacts.

18. Intense rain and floods impacting hydro generation

R Physical risk – Operations

Potential impact

Intense rain and floods have the potential to cause:

- Loss of civil integrity of generation and ancillary infrastructure (e.g., dams, spillways, storage ponds) resulting in loss of generation revenue;
- Increased sediment load in rivers and storage lakes, increased sediment removal activities and therefore operating costs; and
- Damage to electricity transmission lines, communication networks or road access which could impact generation revenue and increase operating and capex costs.

Actual impact

The severe weather events in FY23 resulted in more hydro generation being dispatched and higher storage levels than anticipated. Hydro generation for the third quarter in FY23 was 202 GWh higher than the third quarter in FY22. While hydro generation volumes increased quarter on quarter, the average wholesale price received was down \$37 a MWh for the same period. The severe weather events in FY23 caused minor delays to some projects but did not have a material impact on our hydro generation operations.

Business unit / asset impacted

Wholesale business unit – reduced earnings as a result of increased operating or capex costs and reduced revenue / carrying value of hydro generation assets.



Time horizon



Strategy to manage risk

Our strategy is to maintain a diverse and flexible portfolio of renewable generation that is geographically spread, thereby reducing the risk that all sites are impacted at the same time. We continually assess our infrastructure for improvements and actively review and update our asset management plans which are prepared in accordance with best practice.

7.3 Transition aspects of our strategy

In this section we discuss how we are:

1. Transitioning our thermal generation portfolio;
2. Managing our exposure to carbon prices;
3. Helping our customers manage their own transition;
4. Engaging with industry and regulators;
5. Managing our assets; and
6. Managing our debt through our Sustainable Finance Framework.

1. Transitioning our thermal generation portfolio

Our Future-gen strategy identifies renewable opportunities to transition away from baseload thermal generation at our Huntly Power Station, while seeking to ensure a reliable and affordable supply of electricity is maintained to support other sectors to decarbonise through electrification. Our Future-gen strategy aims to reduce emissions through to 2030, on a pathway consistent with limiting global warming to 1.5°C.

Our Future-gen strategy has three areas of focus

Growing renewables



Contract for new renewable generation



Partner to build a pipeline of solar options

Creating value from flexibility and reliability



Contract for fuel flexibility



DrylandCarbon and Forest Partners partnerships



Sell contracts that support market reliability (Market Security Options)

Transitioning Huntly Power Station



Trial biofuels as a fuel option for Huntly



Plan for emerging technologies (batteries)

7.3 Transition aspects of our strategy (cont'd)

Growing renewables

The economics of renewable baseload electricity generation have now reached the tipping point where it has become cost-effective to build geothermal, wind and solar, which economically displaces baseload thermal generation.

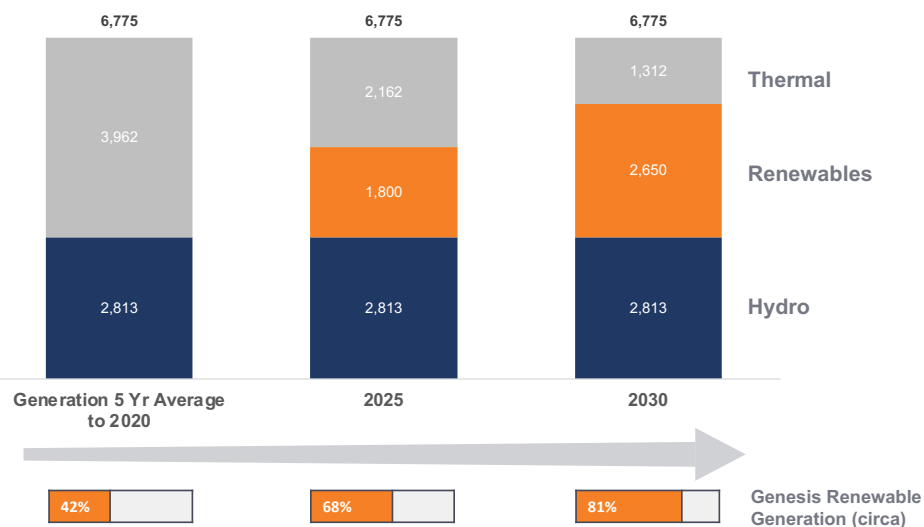
We are aiming to secure 2,650 GWh a year of renewable electricity generation by FY30, with 1,800 GWh of that by FY25. To date we have signed power purchase agreements for 1,200 GWh of new renewable generation and are actively working with our solar joint venture partner to deliver a further 740 GWh of utility-scale solar farms.

In February we announced the solar joint venture with FRV Australia had secured a fully consented, 93-hectare site near Lauriston on the Canterbury Plains. The site will hold approximately 80,000 solar panels with a capacity of approximately 52 MW and generate around 80 GWh of renewable electricity annually – enough to power nearly 11,400 houses. First generation is expected in late 2024.

Solar is uniquely suited to our flexible generation portfolio and will support the transition towards a decarbonised future. Refer to [section 8.7](#) for progress against our goal.

Future-gen strategy will displace baseload thermal

Portfolio changes assuming flat demand



Creating value from flexibility and reliability

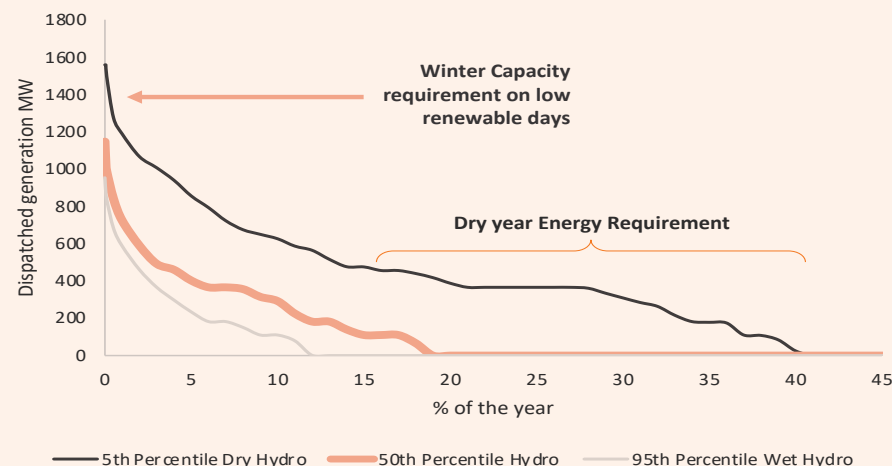
The wholesale electricity market will become increasingly tested as the country becomes more reliant on renewable generation. The pressure on the wholesale market is likely to increase as seasonal and intra-day weather patterns change with climate change.

Currently, there are limited commercially feasible zero-carbon options to manage the challenges posed by seasonal demand variability and hydro variability (dry-year risk) in New Zealand.

Thermal generation will need to be used to fill the shortfall from time to time until zero-carbon options become economically viable. The Rankine units will continue to be critical to the country's electricity system in the short-term. We are committed to continuing to explore more renewable fuel options such as biomass.

The diversity of our generation assets and our position at the intersection of the electricity and gas markets, positions us well to coordinate energy deals and fuel supply to help manage security of supply.

A highly renewable grid draws on backup generation to cover infrequent peak capacity needs and dry-year firming



- More than 750MW of peaking capacity is required in less than 1% of hours in typical hydrology (50th percentile) to maintain security of supply.
- 1,650GWh of energy storage is drawn on 40% of the time in dry-years (5th percentile) compared with 700GWh in normal years (50th percentile).

7.3 Transition aspects of our strategy (cont'd)

Transitioning Huntly Power Station

Emissions from Huntly Power Station are expected to continue to decrease through this decade.

While the future is focused on renewable generation, the country continues the search for storage alternatives to offset dry-year risk. New Zealand faces the challenge of needing about 7,000 GWh of energy storage to meet seasonal shifts in demand. Existing hydro lakes provide about 4,000 GWh of energy storage. Huntly Power Station fills the gap of 3,000 GWh.

This seasonal risk is unique to New Zealand and alternative solutions to fossil fuels that could form part of the solution to the dry-year

risk / seasonal demand challenge are currently being investigated.

We successfully completed a biomass burn trial at Huntly Power Station on 14 February, a significant step in our search for alternative fuel options for the Rankine units. Biomass is seen internationally as a viable alternative to fossil fuels, in manufacturing and some industrial processes.

We believe that using renewable biomass in the Rankine units could potentially form part of a portfolio of options that stand as a viable alternative to the Government's proposed 'pumped storage' hydro scheme at Lake Onslow.

We have signed:

- An agreement with Fonterra to work together in exploring the viability of a sustainable local supply chain of biomass; and
- A Memorandum of Understanding with [NZ Bio Forestry](#) to investigate the technical and economic viability of bio-fuels and bio-pellets as alternative fuel options for Huntly Power Station.

Kupe gas field, providing fuel through the transition

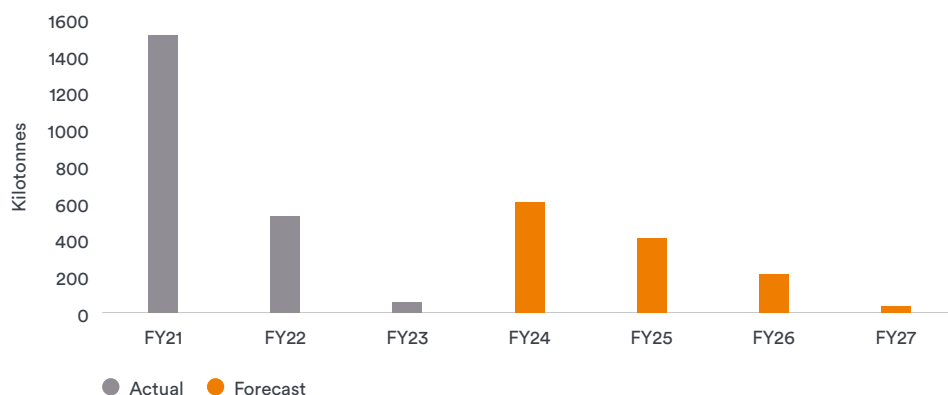
We have confirmed our investment into a well development programme at the Kupe gas field (KS-9). Gas is expected to continue to play a role through the energy transition in providing both back-up generation for dry periods and support for increased intermittent wind and solar generation. Without this additional gas, it is expected that emissions would be higher due to a greater need for coal generation.

Kupe gas field remains an important asset in New Zealand's energy transition. While production is anticipated to reduce (in line with our Science Based Targets) as Kupe gas field approaches end of life in the 2030's, a secure supply of gas is currently required to support the energy needs of New Zealand businesses and homes. We are mindful of balancing our decarbonisation efforts with the need to ensure our customers have reliable and cost-effective energy.

2. Managing our exposure to carbon prices

We have a policy to manage the price risk associated with carbon over the short to medium term. Prices are managed using forward swaps and options. We are also involved in two forestry partnerships that help remove carbon from the atmosphere and provide emission units that enable us to meet our obligations under the ETS. These units help manage the future costs of thermal generation or can be sold to other emitters.

Coal consumption forecast¹⁶



16. The forecast uses 90 years of historical hydro inflow data to calculate the average thermal generation forecasted to occur and assumes expected plant and gas availability as at 30 June 2023 (this includes Unit 5 outage through to May 2024). Actual thermal generation may differ to this.

7.3 Transition aspects of our strategy (cont'd)

3. Helping our customers manage their own transition

While New Zealand’s net zero goal points towards a world without fossil fuel in homes and businesses, we recognise these fuels are a necessary choice for many of our customers. Significant improvements to technologies and importantly the cost-profile of changing fuels is required before it will be practical for many New Zealanders to transition away from gas and LPG to renewable options.

We see this transition as an opportunity to support our customers towards more sustainable choices in homes and businesses. Our retail strategy has been developed to mitigate transition risks.

Helping our residential customers manage their energy

Empowering New Zealand’s sustainable future includes providing tools and insights to help customers make informed decisions to reduce their carbon footprint. We do this through Energy IQ, electric vehicle charging technology and the Climate Change Hub (refer to our [FY23 Integrated Report](#): A low carbon future for more information).

Reducing transport emissions is a focus for the country. We have developed unique offerings for the growing population of electric vehicle owners that provides flexibility and simplicity when charging their vehicles at home and on the road. More than 4,153 customers have taken up our EV Plan and we have plans to continue evolving this offering. Our customers can also access data on their charging, costs and savings, even whether they are charging during a low carbon generation period through our Energy IQ platform.

Helping our business customers reduce emissions

We continue to investigate emerging technology options that can help our customers transition to lower carbon options. Through this effort, we are positioning ourselves to identify early opportunities which might be ready to scale into offerings that are appealing to a broad customer base in the near term. To support our business customers, we have:

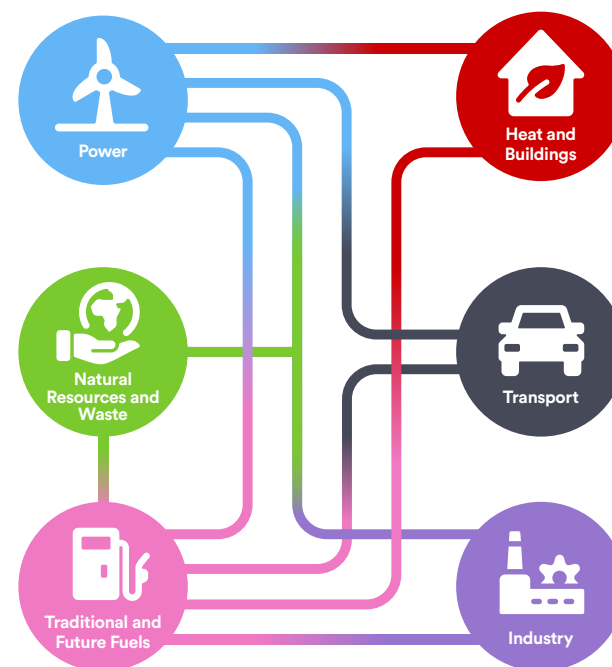
- Delivered energy management services to our commercial and industrial customers to support decarbonisation through energy audits, energy monitoring and decarbonisation roadmaps;
- Provided free decarbonisation workshops for Government agencies; and
- Launched a new digital platform for our large industrial and commercial customers to measure energy consumption, costs, and emissions from electricity usage. We can then work with them to help them achieve the actions they want to take to reduce emissions.

4. Engaging with industry and regulators

We sit at the intersection of supply and demand for several energy sources as well as providing back-up generation for New Zealand’s electricity supply when renewable sources are unable to meet demand. This places us in a unique position to see the interdependencies, opportunities and risks that lie ahead for the country, our customers, and our business. It helps us to understand the transition from non-renewable fuels that will enable New Zealand to meet its Nationally Determined Contribution (NDC) to the Paris Agreement, and its first three emissions budgets, without creating negative economic consequences.

With one of the most renewable electricity systems in the OECD, New Zealand has an opportunity to lead the world in electrification. However, this transition is subject to its own climate-related risks. For example, poor regulatory or policy settings could disincentivise electrification through a higher-cost and less reliable electricity system.

We work with regulators and industry groups to support the sector to align on the direction and effective regulations that will help the country move quickly and safely towards a sustainable future. Refer to the [FY23 Integrated report](#): A sustainable business for a summary of submissions made in FY23.



7.3 Transition aspects of our strategy (cont'd)

5. Managing our assets

As New Zealand transitions to a low carbon future the way in which some electricity generation assets are required to operate will change. The intermittent nature of renewable generation will require existing electricity generation assets to be more flexible to fill the gaps. These assets will also operate in a more physically challenging environment where they could potentially be exposed to periods of intense rain and flooding, changing weather patterns impacting catchment inflows and river temperatures, or damage from storms and cyclones. How we prepare and manage our assets for these changes is critical.

Our asset management process, which is based on the principles of ISO 55000, includes lifecycle management and strategies to manage and track performance over time.

Regular monitoring and inspections are completed to understand the health and performance. Asset health, criticality, risks, and improvement opportunities are all considered when making decisions for the ongoing safe and reliable operation of these assets.

We incorporate relevant industry best practice and guidance to assess our portfolio against various performance criteria including natural hazards such as flooding, as well as considerations of future changes to these hazards.

When developing asset management plans we consider the existing asset specifications, the current and anticipated efficiency, flexibility, capacity, and reliability of the asset and future resilience requirements.



 Huntly Power Station, Huntly

6. Managing our debt through our Sustainable Finance Framework

In November 2021 we developed a Sustainable Finance Framework (Framework) to recognise our commitment and investment in climate change and more broadly sustainability. The Framework sets out the process by which we intend to issue and manage bonds and loans on an ongoing basis to support our sustainability objectives, to contribute towards the Sustainable Development Goals, and to create positive environmental and social outcomes.

Our sustainable finance programme includes \$410 million of green bonds and \$250 million of sustainability-linked loan facilities (linked to achievement of our sustainability targets). The sustainability targets include annual targets to encourage us to deliver on our Science Based Targets, increase our renewable generation capability (either through PPAs or investment in new generation) and create education and employment opportunities for young people living in the communities that surround our generation sites. We pay a lower interest rate and availability fee on the loans if we achieve our sustainability targets but we pay a higher interest rate and availability fee if we don't. Refer to our [FY23 Sustainable Finance Report](#) for more information.

Subsequent to year end, on the 10th July 2023, \$240 million of Green Capital Bonds were issued, replacing existing Capital Bonds which were not green. For the avoidance of doubt, the net proceeds will not be applied directly to fund new renewable generation development. This bond issue increases the percentage of sustainable finance to 51% of total borrowings¹⁷.

The Framework and the green bonds both align to the Green Bond Principles 2021 and the Climate Transition Finance Handbook, as issued by the International Capital Markets Association. Through this Framework, we aim to support the industry's response to helping New Zealand achieve its net zero emissions goals, address social challenges, and provide a mechanism for investors to contribute capital to achieve their sustainability goals.

17. Based on drawn debt at year end. It excludes fair value interest rate risk adjustments, capitalised issue costs and accrued interest.

8. Metrics and targets

8.1 Our GHG emissions

Total scope 1 and 2 greenhouse gas (GHG) emissions¹⁸ for the year ended 30 June 2023 were 1,076,150 tCO₂e. This is 52% less than FY22. The decrease is mainly driven by lower thermal generation (42% lower than FY22) as a result of exceptionally high hydro inflows which enabled a decrease in the volume of coal burnt (90% lower than FY22). We estimate that scope 1 emissions could have been between 1,200,000 and 1,300,000 tCO₂e higher had hydro inflows been more in line with the historical average and had the fuel blend been more in line with the last five years.

Scope 3 emissions for the year ended 30 June 2023 were 949,997 tCO₂e. This is 33% less than FY22. The decrease is mainly driven by the decrease in wholesale gas sales (62% lower than FY22) and lower fuel and energy related emissions as a result in the reduction of thermal generation (42% lower than FY22). Emissions in FY21 were higher than all the other years due to increased thermal generation as a result of below average hydro inflows.

Scope	Category	FY23 tCO ₂ e	FY22 tCO ₂ e	FY21 tCO ₂ e	FY20 tCO ₂ e
Direct emissions (Scope 1)	Attributable to customers	1,072,507	1,934,978	3,132,879	2,539,863
	Attributable to supply contracts (swaptions)	–	286,398	805,398	149,491
	Stationary combustion attributable to thermal generation	1,072,507	2,221,376	3,938,277	2,689,354
	Mobile combustion	1,738	1,733	1,624	579
	Fugitive emissions	1,745	17	162	80
	Total scope 1	1,075,990	2,223,126	3,940,063	2,690,013
Indirect emissions (Scope 2)	Electricity consumption	160	217	262	240
	Total scope 2	160	217	262	240
Indirect emissions (Scope 3)	Purchased goods and services	16,480	15,492	14,898	15,348
	Fuel and energy related activities (upstream emissions)	234,351	410,177	438,837	412,475
	Waste generated in operations	16	21	26	19
	Business travel	409	146	215	1,975
	Employee commuting [^]	1,748	–	–	–
	Use of sold products	692,204	994,686	1,269,957	1,366,852
	Investments	4,789	7,184	8,547	8,080
	Total scope 3	949,997	1,427,706	1,732,480	1,804,749
Total scope 1, 2 & 3		2,026,147	3,651,049	5,672,805	4,495,002

Items excluded from scope 1-3 in accordance with the GHG protocol

Biomass – CO₂	Stationary combustion of biomass attributable to thermal generation	857	–	–	–
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[^] FY23 is the first year that employee commuting has been disclosed. The comparative periods have not been restated for this change.

18. Throughout this document 'emissions' means greenhouse gas emissions.

8.1 Our GHG emissions (cont'd)

How we calculate our GHG emissions

Our GHG emissions have been calculated in accordance with the Greenhouse Gas Protocol: *A Corporate Accounting and Reporting Standard (revised edition)* and the *Corporate Value Chain (Scope 3) Accounting and Reporting Standard*. We use the operational control consolidated approach. The Ministry for the Environment's (MFE) 2023 Greenhouse Gas Reporting factors are used for all scopes and categories except for scope 3 purchased goods and services which uses the Department for Environment Food and Rural Affairs (DEFRA) lifecycle emission factors and scope 3 fuel and energy related activities which uses Agrilink lifecycle emission factors. The MFE emission factors are based on 100-year global warming potential values from the IPCC's Fifth Assessment Report (AR5) and Agrilink emission factors are based on 100-year global warming potential values from the IPCC's Fourth Assessment Report (AR4). Refer to [Appendix II](#) for a summary of the significant uncertainties, [Appendix II](#), Table 2 for a summary of scope 3 items which have been excluded from the GHG inventory and [Appendix II](#), Table 3 for the methods and assumptions applied.

Assurance of GHG emissions

EY has provided an unqualified limited assurance opinion on the FY23 GHG inventory (refer to [Appendix III](#)). Limited assurance opinions were issued on the FY20, FY21, and FY22 GHG inventories. New scope 3 categories were however added in FY22¹⁹. The comparatives for the new scope 3 categories were restated back to FY20 but were not subject to limited assurance.

GHG emissions intensity	FY23	FY22	FY21	FY20
Generation emissions intensity				
Thermal generation (GWh)	2,177	3,736	5,501	4,461
Thermal generation emissions intensity (tCO ₂ e* / GWh of thermal generation)	493	595	716	603
Total generation (GWh)	5,858	6,481	8,027	6,805
Total generation emissions intensity (tCO ₂ e* / GWh of total generation)	183	342	491	395
Retail emissions intensity				
Retail revenue (\$m)	1,656	1,565	1,575	1,558
Retail emissions (ktCO ₂ e)^	962	1,192	1,207	1,218
Emissions intensity of retail revenue (kg of CO ₂ e/ \$ of net revenue)	0.58	0.76	0.77	0.78

* Scope 1 stationary combustion attributable to thermal generation.

^ Emissions from electricity purchases is based on factors published by the Ministry for the Environment (MFE) so that the metric is comparable with other entities.

The emissions intensity of thermal generation is influenced by the mix of fuels used. Gas produces half the emissions of coal. Thermal generation intensity was higher in FY21 due to higher use of coal (54%) whereas almost all the thermal generation was from gas (95%) in FY23. Total generation intensity is also significantly down in FY23 due to the reason noted previously and higher-than-normal hydro generation as a result of exceptionally high hydro inflows.

Retail emission intensity continues to trend down. The significant decrease in FY23 is largely due to a decrease in the MFE emission factor for electricity. Had we used the 2022 MFE factor the retail carbon intensity would have been 0.73.

19. Three new categories (purchased goods and services, fuels and energy related activities and investments) were added to the FY22 GHG inventory. The FY21 and FY20 GHG inventories were restated to include these. These categories were not included in the FY20 and FY21 limited assurance reviews undertaken at that time.

8.2 Transition risk metrics

Thermal generation assets

The Rankine units and Unit 5 are carried at fair value, calculated using a discounted cash flow model based on a finite period (FY23: 7 years for the Rankine units and 9 years for Unit 5). The change in fair value is mainly driven by changes in the wholesale electricity price path, discount rate and the passage of time given these assets have finite lives. The FY23 valuation of Unit 5 has been impacted by an unexpected outage on 30 June 2023. The unit is anticipated to be unavailable until May 2024. This impacts the valuation of the Rankine units as additional volume is forecasted to be generated through these units because of the outage.

Kupe

Kupe assets are carried at historic cost and most of the assets are depleted on a units of use basis using proved remaining reserves (1P). The carrying value of the assets have declined over the last four years due to annual depletion and amortisation charges. The carrying value is expected to increase in FY24 because of the new well development programme (KS-9) and then continue to decline in line with field depletion. Kupe's end of life is expected to be in the 2030's.

LPG

LPG assets are carried at historic cost and depreciated over their useful lives. This balance includes LPG depots, reticulated networks and customer installs. The carrying value of these assets have declined due to annual depreciation and amortisation charges. This trend is expected to continue.

Emission units held for trading

The fair value of emission units held for trading is impacted by the spot price of carbon and the volume of units held.

Assets vulnerable to transition risk*	FY23	FY22	FY21	FY20
Carrying value net of deferred tax*				
Thermal generation assets (fair value)				
Rankine units (gas and coal fired) (\$m)	78.1	44.2	40.8	24.1
Unit 5 (gas fired) (\$m)	272.4	464.6	295.5	335.6
Thermal generation assets as a % of total generation fixed assets	15%	20%	14%	16%
Kupe assets				
Oil and gas and intangible assets (\$m)	207.1	222.3	228.9	240.1
Retail & wholesale assets				
LPG (\$m)	74.2	77.3	80.9	82.1
Emission units held for trading (fair value) (\$m)	7.3	14.2	10.4	5.0
Total carrying value of assets vulnerable to transition risks net of deferred tax (\$m)*	639.1	822.6	656.5	686.9

* Assets vulnerable to transition risks are defined as assets that have the potential to become stranded or where their carrying value could be materially impacted (either through reduction in fair value or impairment) because of the transition risks outlined in [section 7.2](#). Deferred tax includes the movement associated with a change in fair value or impairment but excludes the impact arising from disposal of assets.

8.2 Transition risk metrics (cont'd)

Thermal generation

Thermal generation was lower in FY23 due to lower wholesale electricity prices, primarily due to higher hydro inflows. The percentage of retail purchases covered by thermal generation is decreasing mainly due to declining retail volumes relative to hydro generation and the notional purchase of renewable electricity under the Waipipi PPA from November 2020.

Kupe

Kupe sales and EBITDAF have declined due to field decline, reduced gas demand in FY23 and changes in selling prices.

Gas

Retail gas sale volumes have remained relatively consistent year on year. Wholesale gas sales have declined due to our strategy to move away from long term wholesale gas sale contracts. The gas gross margin has increased over time mainly due our focus on selling gas into higher value retail channels.

LPG

Retail LPG sale volumes have remained relatively consistent year on year. Wholesale LPG sales increased in FY21 and FY22 due to the Wholesale segment acquiring and on-selling more LPG from Kupe. The decrease in FY23 was mainly due to the decrease in Kupe's production as noted above. LPG gross margin has grown over time due to increased sale volumes and improved retail pricing. The reduction in FY23 is mainly due to reduced sale volumes and an increase in LPG and transportation costs.

Retail customers

The increase in customers numbers in FY23 was due to improved product offerings and successful marketing campaigns.

Earnings vulnerable to transition risk*	FY23	FY22	FY21	FY20
Thermal generation				
Thermal generation (GWh)	2,177	3,736	5,501	4,461
Thermal generation as a % of total generation	37%	58%	69%	66%
Percentage of retail purchases covered by thermal generation^	31%	48%	58%	64%
Kupe				
Gas sales (PJ)	8.4	11.1	10.6	10.7
Oil sales (kbbbl)	254	292	306	366
LPG sales (T)	36,520	47,413	45,798	46,751
Kupe EBITDAF (\$m)	66.6	77.4	87.4	93.8
Retail and Wholesale				
Retail gas sales (PJ)	7.2	7.4	8.0	7.8
Wholesale gas sales (PJ)	2.8	7.4	11.9	14.1
Gas gross margin (\$m)~	47.3	38.4	(6.7)	(23.0)
Retail LPG sales (T)	43,874	44,341	43,542	42,347
Wholesale LPG sales (T)	7,262	17,094	15,458	5,360
LPG gross margin (\$m)~	45.7	54.0	45.4	38.6
Retail customers (count)	483,721	471,012	474,325	484,687
Gas only	2%	3%	3%	3%
LPG only	7%	7%	7%	7%
Multi fuel	30%	28%	27%	25%

* Earnings vulnerable to transition risks are defined as earnings from business activities that have the potential to be materially impacted by the transition risks outlined in [section 7.2](#).

^ Wholesale electricity generation is usually higher than retail electricity purchases (i.e., long). As we are disclosing the vulnerable portion of retail electricity purchases to spot prices, we have calculated the thermal portion as being the difference between total retail electricity purchases and renewable electricity generation including PPA's divided by total retail electricity purchases.

~ Gross margin is the lowest level of earnings reported for gas and LPG.

8.2 Transition risk metrics (cont'd)

Emission units held for trading

Active trading of emission units is impacted by the spot price of carbon and the volume of units sold. The loss in FY23 is primarily driven by the decrease in the spot price since March 2023.

Carbon hedging

The duration of carbon hedging is impacted by median hydrology, expected gas conditions and renewable development.

Cost of capital

The weighted average interest rate has increased in line with floating interest rates.

Earnings vulnerable to transition risk*	FY23	FY22	FY21	FY20
Emission units held for trading				
Gain / (loss) on emission units held for trading+	(12.0)	13.6	5.0	4.7
Carbon hedging				
Forecast number of full years of carbon hedging in place at year end	6 [^]	5	4	7
Cost of capital				
Weighted average interest rate	5.2%	4.2%	4.5%	5.5%

* Earnings vulnerable to transition risks are defined as earnings from business activities that have the potential to be materially impacted by the transition risks outlined in [section 7.2](#).

+ This includes realised and unrealised gains and losses.

[^] The forecast uses 90 years of historical hydro inflow data to calculate the average thermal generation forecasted to occur and assumes expected plant and gas availability as at 30 June 2023. Actual thermal generation may differ to this.

8.3 Physical risk metrics

Hydro generation assets

Hydro generation assets are carried at fair value, calculated using a discounted cash flow model. The fair value is mainly impacted by long-term wholesale electricity prices and discount rates.

FY23 had higher hydro generation due to increased inflows.

Assets and earnings vulnerable to physical risk	FY23	FY22	FY21	FY20
Carrying value net of deferred tax*				
Hydro generation assets (fair value) (\$m)	2,040.4	2,028.2	2,016.4	1,925.3
Earnings vulnerable to physical risks[^]				
Hydro generation (GWh)	3,669	2,733	2,507	2,321
Hydro generation as a % of total generation	63%	42%	31%	34%

* Assets vulnerable to transition risks are defined as assets that have the potential to become stranded or where their carrying value could be materially impacted (either through reduction in fair value or impairment) because of the physical risks outlined in [section 7.2](#). The main reason that hydro generation assets have been included here is because they are carried at fair value in the Consolidated Financial Statements. Hydro generation assets are unlikely to become stranded or written off as a result of the physical risks however the earnings from these assets could be impacted, which would in turn impact their fair value. For this reason, they have been disclosed as assets vulnerable to physical risks. Refer to [section 8.2](#) for Kupe asset values. Deferred tax includes the movement associated with a change in fair value or impairment but excludes the impact arising from disposal of assets.

[^] Earnings vulnerable to physical risks are defined as earnings from business activities that have the potential to be materially impacted by the physical risks outlined in [section 7.2](#). Refer to [section 8.2](#) for Kupe earnings.

8.4 Climate-related opportunity metrics

Electricity consumption and generation

National electricity consumption and Genesis' share have remained relatively constant. National electricity generated from hydro's dipped in FY21 due to below average hydro inflows. Genesis' share of hydro generation has remained relatively consistent. We continue to invest in hydro assets to improve efficiencies.

Customer offerings

Our EV plans have had a strong uptake in FY23, as national EV sales increased and we have improved product offerings. Energy management services uptake continues to increase as customers look for solutions to mitigate rising energy costs and carbon prices. The Energy IQ for business platform was launched in July 2022.

	FY23	FY22	FY21	FY20
Electricity consumption				
New Zealand electricity sales (consumption) (GWh)~	<	39,126	39,842	39,852
Genesis retail electricity sales (GWh)	5,663	5,806	6,241	6,244
Genesis % share of New Zealand electricity sales	<	15%	16%	16%
Electricity generation				
New Zealand electricity generation from hydro (GWh)~	<	24,683	23,179	24,693
New Zealand hydro generation as a % of total electricity sales (consumption)	<	63%	58%	62%
Genesis % share of New Zealand hydro generation	<	11%	11%	9%
Cumulative increase in renewable energy generation from plant efficiencies (GWh)+	29	27	+	+
Products or services that support a low carbon future				
Number of customers on an EV plan at 30 June	4,153	1,610	332	–
Large business customers using an energy management service	32%	29%	20%	6%
Increase engagement with energy				
Residential customers engaging with energy management tools through Energy IQ	50%	45%	40%	21%
Large business electricity customers engaged with Energy IQ for business	37%	>	>	>

~ As published by the Ministry of Business, Innovation and Employment (electricity.xlsx (live.com)).

< FY23 quarter four information for New Zealand electricity sales (consumption) and hydro generation had not been released by MBIE at the time of writing this report, as a result Genesis % share is unable to be disclosed.

+ From an FY20 base year. Comparatives for FY20 and FY21 are unable to be reported as efficiencies from capital work were not reported for these years. In addition to the GWh efficiencies reported for FY22 and FY23, work has also been completed which increased the individual capacity of two generators at Tuai by 2 MW each with the third generator to be upgraded in FY24. The total GWh efficiency gained depends on whether all three generators are run at the same time. Due to constraints on the station the full impact of the efficiency is only gained when the station is operating below the maximum output of 60 MW. For this reason, this efficiency gain has not been included in the FY22 and FY23 numbers.

> The Energy IQ for business platform was launched in July 2022.

8.5 Capital deployment metrics

Genesis entered into a partnership with FRV Australia in FY22 to establish up to 500 MW of solar generation and has also invested in two forestry entities. Genesis also investigated the viability of biomass at Huntly in FY23. Capital commitments on unit upgrades to improve efficiencies have declined as projects have been completed. A significant program of unit upgrades at Tuai, Piripaua and Tekapo were undertaken over the last four years. Refer to our [FY23 Integrated Report](#) for more information.

	FY23	FY22	FY21	FY20
Capital committed to climate-related initiatives at 30 June*				
Solar joint venture (\$m)	1.9	–	–	–
Forestry partnerships (\$m)	48.4	71.7	14.1	24.4
Unit upgrades and efficiencies (\$m)	3.8	7.0	8.1	7.3
Capital contributions/expenditure on climate-related initiatives during the year				
Solar joint venture (\$m)	2.8	–	–	–
Forestry partnerships (\$m)	23.3	17.4	10.3	5.7
Unit upgrades and efficiencies (\$m)	11.6	16.4	2.8	6.6
Research and development on climate related initiatives during the year (\$m)	1.8	1.7	–	–
Investments held at 30 June				
Solar joint ventures and partnerships (\$m)	1.9	–	–	–
Forestry partnerships (\$m)	53.7	32.0	15.1	5.3

* This represents the amount of funding committed to joint ventures, partnerships or projects but not yet spent at 30 June. This is a broader definition than the commitments in our Consolidated Financial Statements which are based on the contractual commitments of each of our associates or joint ventures in accordance with New Zealand Equivalents to International Accounting Standard 16.

8.6 Remuneration metrics

Sustainability metrics were introduced into the short-term incentives in FY21 and achievement of Science Base Targets was incorporated into the long-term incentives in FY23.

	FY23	FY22	FY21	FY20
Short-term incentives linked to sustainability objectives	12%	18%–36%	12%	–
Long-term incentives linked to Science Based Targets	20%	–	–	–

8.7 Our targets to decarbonise

Science Based Targets (SBT)

We have set ambitious emission reduction targets aligned with limiting global warming to 1.5°C above pre-industrial levels to support New Zealand’s commitments under the Paris Agreement. The targets have been verified by the internationally recognised Science Based Targets initiative (SBTi). The targets do not rely on the use of offsets.

We have committed to (i) reduce absolute scope 1 and 2 emissions by 36% by FY25 from a FY20 base year and (ii) reduce absolute scope 3 emissions from use of sold products by 21% by FY25 from a FY20 base year. Through our Science Based Targets we have committed to reduce our annual emissions by more than 1.2 million tonnes by FY25.

Scope 1 and 2 emissions in FY23 were 60% lower than FY20 (base year) which equates to a reduction of 1,614,103 tonnes of CO₂e. As noted in [section 8.1](#) the reduction in scope 1 and 2 emissions is mainly driven by lower thermal

generation (51% lower than FY20) as a result of exceptionally high hydro inflows which enabled a decrease in the volume of coal burnt (93% lower than FY20). Scope 3 emissions from use of sold products were 49% lower than FY20 (base year) which equates to a reduction of 674,648 tonnes of CO₂e.

Growing renewables

We are aiming to secure an additional 2,650 GWh a year of renewable electricity generation from a FY20 base year²⁰ by FY30, with 1,800 GWh of that by FY25.

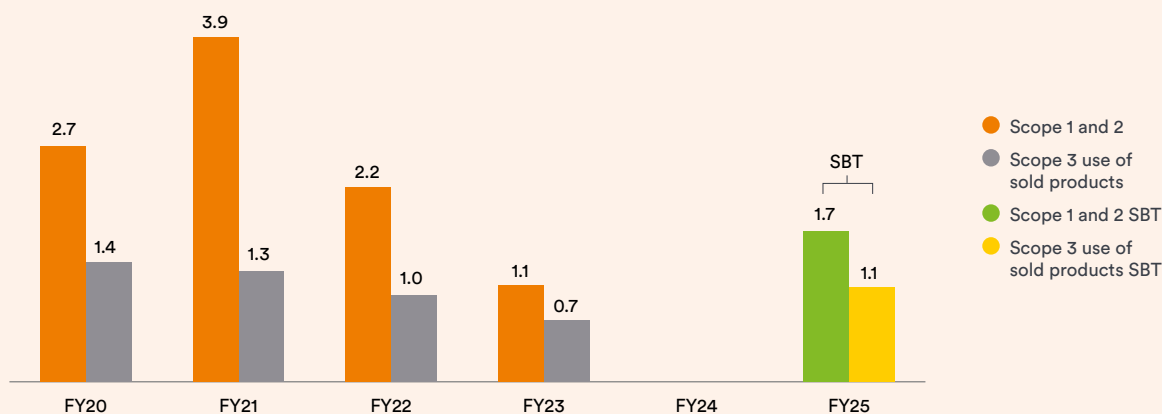
To date we have signed power purchase agreements for approximately 1,200 GWh²¹ of new renewable generation. As noted in [section 7.2](#) supply chain constraints (sourcing turbines and civil work delays due to resources being diverted to flood repair work) has delayed the construction of one of the wind farms that we have a signed PPA for. The site is projected to be operational by mid 2025. No new PPA’s were entered into in FY23.

We are actively working with our solar joint venture partner to deliver 500 MW (740 GWh) of utility-scale solar farms. During the year we:

- Announced our first joint solar development project with FRV Australia for approximately 52 MW (approximately 80 GWh) which is expected to be operational in late 2024. This is subject to Final Investment Decision and approval by the Overseas Investment Office; and
- Completed feasibility studies for three solar project sites across the North Island with approximately 400 MW of capacity and secured land rights for two of these sites prior to year-end and one after year-end. We are now focused on consenting and connection development activities for these projects.

Progress towards the 1,800 GWh in the first target year is likely to be delayed due to extenuating circumstances impacting the development of renewable generation in New Zealand. International events have resulted in a significant increase in interest in building renewable generation globally and as a result, supply chain constraints and access to materials have contributed to increasing development costs. New Zealand has been significantly impacted by natural disasters (flooding) which has increased the demand for and cost of local civil and electrical contractors. Renewable projects have also been impacted by delays in network connection applications due to the volume of proposed projects being submitted. The combination of the aforementioned impacts has resulted in a delay in commercially feasible renewable projects being built in New Zealand in the near term.

Performance compared to Science Based Targets (MtCO₂e)



20. The target includes 450 GWh for Waipipi PPA which was signed in FY19 but was operational in FY21.

21. Refer to [Appendix IV](#) for a list of PPAs and their estimated commencement dates. The Waipipi PPA (450 GWh) was signed in FY19 prior to the base year however it is included in the results because the target included this contract.

Appendix I: Climate scenario data and reference models

This Appendix outlines the data and reference material used to construct each scenario.

[Climate Change Commission](#). (2021). *Scenarios Dataset Final Advice*.

[Coal in Net Zero Transitions \(2022\)](#). *Global Energy and Climate Model*.

[Intergovernmental Panel on Climate Change](#). (2021). *Sixth Climate Change Assessment Report*.

[International Energy Agency](#). (2022). *Global Energy and Climate Model*.

[Ministry for the Environment](#). (2018). *Climate change projections for New Zealand*.

[Ministry for the Environment](#). (2022). *Emissions reduction plan*.

[Ministry for the Environment](#). (2022). *Interim guidance on the use of new sea-level rise projections*.

[Ministry of Business, Innovation and Employment](#). (2022). *Carbon capture and storage*.

[Ministry of Business, Innovation and Employment](#). (2022). *New Zealand Energy Strategy*.

[Ministry of Business, Innovation and Employment](#). (2016). *Shared-climate Policy Assumptions for New Zealand in Exploring Options for New Zealand under Different Global Climates. Synthesis Report RA5. Climate Changes, Impacts and Implications*.

[International Energy Agency/Net Zero by 2050](#) (2022). *Climate Change Commission. (2021). Scenarios Dataset Final Advice: Global Energy and Climate Model*.

[International Institute for Applied Systems Analysis](#). (2018). *SSP Database (Shared Socioeconomic Pathways) Scenario Explorer*.

[StatsNZ](#). (2022). *National Population Projections 2022 (base)-2073*.

[Treasury New Zealand](#). (2022). *CBAx Tool User Guidance*.

[XRB \(External Reporting Board\)](#). (2022). *Climate-related disclosure. NZ CS1: Guidance for all sectors*.

Appendix II: GHG inventory methods, assumptions and uncertainties

Purpose

The GHG inventory has been prepared in accordance with the requirements of the *Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (revised edition)* and the *Corporate Value Chain (Scope 3) Accounting and Reporting Standard* (GHG Protocol) which is an internationally recognised framework for carbon reporting. Using a recognised and widely adopted framework ensures transparency, robustness and consistency in approach across the energy sector.

Organisational boundaries

Organisational boundaries determine the parameters for emissions reporting and ensure consistency when determining which factors to include. Genesis' boundaries have been set in accordance with the methodology outlined in the GHG Protocol.

The GHG Protocol allows two distinct approaches to consolidate emissions: the equity share approach or the control approach (control can be defined in either financial or operational terms).

Genesis has applied the **operational control consolidation approach**, which ensures we focus on those emission sources that we have control over and therefore the ability to manage. Operational control is defined in the GHG Protocol as having the full authority to introduce and implement operating policies at the operation under consideration. Under the operational control approach, an entity accounts for 100% of emissions from operations over which it or one of its subsidiaries has operational control.

The organisation boundary includes Genesis and all its subsidiaries (refer to our [FY23 Integrated Report](#) for a list of subsidiaries).

Business units excluded

All of Genesis' joint ventures, joint operations and associates are excluded from scope 1 and 2 emissions on the basis that Genesis does not have operational control of these entities. Refer to our [FY23 Integrated Report](#) for a list of entities.

Kupe Venture Limited sells its 46% share of gas and LPG produced from Kupe Joint Venture to Genesis. These products are either used in the generation of electricity or sold to customers, as a result these products are included in either scope 1 or scope 3 depending on how they were used. The sale of oil produced by the Kupe Joint Venture is managed by the Operator, Beach Energy, and as a result has not been included in scope 3 emissions on the basis that Genesis does not have operational control.

Operational boundaries

The emission sources included in this report were identified with reference to the methodology outlined in the GHG Protocol.

Scope 1 – Direct emissions

Scope 1 includes emissions from sources that are owned or controlled by Genesis. This includes electricity generation, fuel used in vehicles owned or leased by Genesis and any fugitive emissions released.

During the year we successfully completed a biomass burn trial at Huntly Power Station. The CO₂ from combustion of the biomass has been excluded from scope 1 emissions and has been reported separately in accordance with the GHG Protocol.

Scope 2 – Indirect emissions, electricity

Scope 2 includes emissions from purchased electricity consumed by Genesis and therefore brought into our organisational boundary. It includes electricity that is consumed at LPG branches and depots, corporate offices and office buildings at generation sites where the electricity is drawn from the grid. It excludes electricity consumed at generation sites where the electricity was not drawn from the grid.

Scope 2 emissions have been calculated using location-based emissions factors.

Scope 3 – Other indirect emissions

Scope 3 emissions are a consequence of Genesis' activities but occur from sources not owned or controlled by us. Reporting on these emissions is optional under the GHG Protocol.

The Corporate Value Chain (Scope 3) Accounting and Reporting Standard (a supplement to the GHG Protocol) categorises scope 3 emissions into 15 distinct categories. Genesis has determined which scope 3 categories are relevant using the following criteria:

- (a) relevance to our operations;
- (b) a significant contributor to overall emissions;
- (c) availability of data; and
- (d) able to be influenced/reduced.

Table 1 details which categories have been included and the boundary applied and **Table 2** details which categories have been excluded and why.

Table 1: Scope 3 inclusions

Category	Boundary applied
Purchased goods and services	This category includes goods and services purchased in the financial year and that are not disclosed in another category noted below.
Fuel and energy related activities	This category includes upstream emissions on fuels purchased for use in the generation of electricity as well as fuels sold to customers. Upstream emissions on coal and LPG are accounted for when the fuel is purchased rather than when it is burnt or sold to customers. Coal purchases in transit at year end are recognised as purchases in the financial year the coal is recorded on the coal stockpile.
Waste generated in operations	This category includes waste for Auckland, Hamilton, and Christchurch corporate offices. Waste from operational sites is not included in the reported numbers. The main source of operational waste is the ash produced from burning coal to generate electricity. The ash produced each year is either recycled or held onsite until it can be disposed of. Disposal to landfill ceased in FY20. We are working on developing a methodology to calculate the emissions on recycled ash. Refer to our ESG datasheet and GRI Index for information on the volume of ash generated and recycled. General waste produced at operational sites is not currently measured. Given the nature of operations, emissions from general waste are not expected to be material.
Business travel	This category includes air travel, accommodation and taxi services used during the financial year.
Employee commuting	This category includes emissions associated with employee's transportation to and from work and working from home.
Use of sold product	This category includes gas and LPG sold to customers during the financial year. The sale of oil produced by the Kupe Joint Venture is excluded because this process is managed by the Operator, Beach Energy, and therefore is outside Genesis' operational control.
Investments	This category includes 46% of Kupe Joint Venture's scope 1 and 2 emissions relating to the production of oil. The 46% share of Kupe Joint Venture's scope 1 and 2 emissions relating to the production of gas and LPG have been included in scope 3 fuel and energy related activities category. The 46% share of Kupe Joint Venture's scope 3 emissions have been excluded because this information is not currently reported by the joint venture. The GHG protocol does not require scope 3 emissions from investments to be included in this category. Emissions from the DrylandCarbon One Limited Partnership, the Forest Partners Limited Partnership and the Ecotricity Limited Partnership have been excluded as emissions reporting is not currently completed by these entities. Given the nature of these entities, the scope 1 and 2 emissions from these activities are not expected to be material.

Table 2: Scope 3 exclusions

Category	Justification for excluding
Capital goods	Based on initial screening this category is not considered material. Further work will be undertaken to verify the initial screening results with the aim of reporting this category in the future.
Upstream transportation and distribution	Emissions on transportation are included in scope 3 fuel and energy related activities or scope 1.
Upstream leased assets	Emissions from upstream leased assets are included in scope 1 and 2.
Downstream transportation and distribution	There is no transportation or distribution of products after the point of sale.
Processing of sold products	Genesis does not sell intermediate products therefore there is no processing of sold products.
End of life treatment of sold products	Sold products are consumed by customers therefore there are no end-of-life emissions to account for.
Downstream leased assets	Emissions from downstream leased vehicles are included in the fuels and energy related activities category and emissions associated with leased LPG bottles and tanks are included in use of products sold category.
Franchises	Genesis does not have anything that falls within this category.

Base year

The base year is 1 July 2019 to 30 June 2020 (FY20), which is consistent with the base year used for our Science Based Targets. Total scope 1 and 2 emissions for FY20 were 2,690,253 tCO₂e and scope 3 were 1,804,749 tCO₂e.

Methodologies

This GHG inventory has been calculated using activity data multiplied by emission factors. We have used emission factors published by the Ministry for the Environment (MFE)²² for all scopes and categories except for scope 3 purchased goods and services which uses the Department for Environment Food and Rural Affairs (DEFRA) lifecycle emission factors, and scope 3 fuel and energy related activities which uses Agrilink²³ lifecycle emission factors. The MFE emission factors are based on 100-year global warming potential values from the IPCC's Fifth Assessment Report (AR5) and Agrilink emission factors are based on 100-year global warming potential values from the IPCC's Fourth Assessment Report (AR4).

Uncertainties

Quantification of emissions is subject to inherent uncertainty because the scientific knowledge and methodologies used to determine the emission factors and processes to calculate and estimate quantities of emissions are still evolving. As a result, the GHG inventory is subject to more inherent limitations and uncertainties than financial information.

All material emission calculations are prepared by our financial reporting system using data collated for financial reporting purposes. There are however inherent limitations when using published emission factors as they:

- are not specific to individual entities, they are based on industry averages;
- are often inferred using data collated for other purposes and assumptions are required where scientific data is incomplete; and
- are based on data collected in previous years, countries or use studies performed a number of years ago. This particularly impacts the Agrilink and DEFRA lifecycle emission factors which is discussed further in the significant uncertainties section.

These inherent limitations mean that the GHG inventory represents our best estimate of our emissions using the best data available at the time the information is reported. It is possible disclosures made in this report may be amended, updated, recalculated, and restated in the future if the scientific knowledge and methodologies used to determine emission factors are found to materially change previously reported numbers. The methods, data sources and assessment of their reliability are shown in **Table 3**.

Significant uncertainties

Certain scope 3 emission categories are required to be measured using lifecycle analysis (LCA) methodology. There are currently a limited number of New Zealand specific lifecycle emission factors available mainly due to the ability to access information and the process involved in calculating the emission factors, as a result lifecycle emissions factors are often based on data collected in previous years, countries or use studies performed a number of years ago.

As outlined in **Table 3**, the calculation of scope 3:

- purchased goods and services are calculated using DEFRA lifecycle emission factors which are based on 2011 data. Purchased goods and services makes up less than 1% of our emissions; and
- fuel and energy related activities (upstream emissions) relating to thermal generation and use of sold products are calculated using Agrilink lifecycle emission factors which are based on 2010 data published by the Ministry of Economic Development. These subcategories make up approximately 11% of our emissions.

The application of these emission factors creates a significant uncertainty in relation to the calculation of scope 3 emissions as they may be out of date. A reasonableness test was performed on the Agrilink emission factors in FY22 using data from other sources. Based on this testing we determined that Agrilink emission factors were the most representative lifecycle emission factors to use given the activities they were being applied to.

22. Measuring emissions: A guide for organisations: 2023 detailed guide and the 2023 Emission Factors workbook have been used to calculate the FY23 emissions.

23. New Zealand fuel and electricity total primary energy and life cycle greenhouse gas emission factors 2022.

Table 3: Summary of emissions source inclusions

	Category	Emission source	Calculation method	Emission factor source	Data source	Reliability of data
Scope 1	Stationary combustion	Fuel used for electricity generation (includes gas, coal, LPG and diesel)	Average-data method ²⁴	MFE	Fuel records used for financial and Emissions Trading Scheme (ETS) reporting	Data quality is good. Reliable due to use of financial records.
	Mobile combustion	Fuel used in plant vehicles and distance travelled for all other vehicles (owned and leased vehicles)	Average-data method	MFE	Fuel or kilometre usage from financial records and/or fleet manager	Data quality is good. Does not account for missing information such as when an employee does not make a claim. Estimations are necessary where information is missing.
	Fugitive emissions	Fugitive emissions of Sulphur Hexafluoride (SF6)	Average-data method	MFE	Maintenance reporting system	Calculated at sites where reliable information available. Fugitive emissions excludes any potential emissions from Genesis' LPG business based on immateriality of the emissions from this source.
Scope 2	Electricity	Electricity consumed at LPG branches and depots, corporate offices and office buildings at generation sites where the electricity is drawn from the grid	Average-data method	MFE	Records from billing system	ICP points were used to measure consumption at various sites. Where auxiliary power is consumed it is excluded as it has not yet gone to the grid.
Scope 3	Purchased goods and services	Extraction, production, and transportation of goods and services acquired but not included in the other categories	Spend-based method ²⁵	DEFRA ²⁶	Purchased goods and services from financial records	Data quality is good. Susceptible to accounting treatment.
	Fuel and energy related activities	Extraction, production, and transportation of fuel and energy acquired and consumed in the generation of electricity or sold to customers	Average-data method	Agrilink for activities associated with generation and use of sold products and MFE for transmission and distribution and net retail electricity purchases	Fuel records used for financial and ETS reporting	Data quality is good. Reliable due to use of financial records.
	Waste generated in operations	Disposal and treatment of waste	Waste type specific method ²⁷	MFE	Waste data as measured by our waste company	Data quality is good. Reliant on accuracy of waste company.

24. The average-data method estimates emissions by collecting data on the quantity (e.g., kilograms, gigajoules, litres) of product used multiplied by an appropriate emission factor.

25. The spend-based method estimates emissions by collecting data on the cost of goods and services purchased multiplied by an appropriate emission factor.

26. The DEFRA emission factors have been adjusted for inflation and converted to NZD using the foreign currency conversion rate as at 30 June 2023.

27. The waste type specific method estimates emissions by collecting data on the quantity of waste produced multiplied by emission factors for specific waste types and waste treatment methods.

Table 3: Summary of emissions source inclusions (cont'd)

	Category	Emission source	Calculation method	Emission factor source	Data source	Reliability of data
Scope 3	Business travel	Employees travelling nationally and internationally for business purposes	Distance based method ²⁸ for air travel, spend-based method for taxis and ubers and average-data method for accommodation	MFE	Air travel, hotel stays, and rental cars from our corporate travel manager	Data quality is good. Reliant on accuracy of travel manager record system.
	Employee commuting	Employees travelling to and from work and working from home	Distance-based method for travel and average-data method for working from home	MFE	Employee surveys	Data quality is impacted by how employees interpret and respond to survey questions and by the number of responses received.
	Use of sold products	Usage of LPG and gas sold to customers	Direct use-phase method ²⁹	MFE	LPG and gas sales data from financial records	Data quality is good.
	Investments	Scope 1 and 2 information for Kupe Joint Venture	Investment-specific method ³⁰	Field specific factors for scope 1 and MFE for scope 2	Information submitted under ETS requirements and electricity consumption from financial records	Data quality is good. Reliable due to use of financial records.
Excluded items	Biomass	Biomass used for electricity generation	Average-data method	MFE	Fuel records used for financial reporting	Data quality is good. Reliable due to use of financial records.

28. The distance-based method estimates emissions by collecting data from service providers and employees on the volume, distance and mode of transport used multiplied by an appropriate emission factor.

29. The direct use-phase method estimates emissions by collecting data on the products sold to customers multiplied by an appropriate emission factor.

30. The investment-specific method estimates emissions by collecting scope 1 and scope 2 emissions from the investee company and allocating the emissions based upon Genesis share of the investment.

GHG inventory summary

Table 4: GHG inventory

Scope	Category	FY23 tCO ₂ e	FY22 tCO ₂ e	FY21 tCO ₂ e	FY20 tCO ₂ e
Direct emissions (Scope 1)	Attributable to customers	1,072,507	1,934,978	3,132,879	2,539,863
	Attributable to supply contracts (swaptions)	–	286,398	805,398	149,491
	Stationary combustion attributable to thermal generation	1,072,507	2,221,376	3,938,277	2,689,354
	Mobile combustion	1,738	1,733	1,624	579
	Fugitive emissions	1,745	17	162	80
	Total scope 1		1,075,990	2,223,126	3,940,063
Indirect emissions (Scope 2)	Electricity consumption	160	217	262	240
	Total scope 2	160	217	262	240
	Total scope 1 & 2	1,076,150	2,223,343	3,940,325	2,690,253
Indirect emissions (Scope 3)	Purchased goods and services	16,480	15,492	14,898	15,348
	Fuel and energy related activities (upstream emissions)				
	– Related to thermal generation	139,479	286,017	279,781	239,840
	– Related to sold products	86,759	124,140	159,031	172,611
	– Transmission and distribution losses on electricity purchases	19	20	25	24
	– Net retail electricity purchases (after deducting generation)	8,094	–	–	–
	Waste generated in operations	16	21	26	19
	Business travel	409	146	215	1,975
	Employee commuting [^]	1,748	–	–	–
	Use of sold products				
	– LPG Retail	129,230	130,372	128,665	121,802
	– LPG Wholesale	21,578	51,773	46,838	52,820
	– Gas Retail	390,937	406,308	441,033	429,893
	– Gas Wholesale	150,459	406,233	653,421	762,337
	Investments	4,789	7,184	8,547	8,080
	Total scope 3		949,997	1,427,706	1,732,480
Total scope 1, 2 & 3		2,026,147	3,651,049	5,672,805	4,495,002

Items excluded from scope 1-3 in accordance with the GHG protocol

Biomass – CO₂	Stationary combustion of biomass attributable to thermal generation	857	–	–	–
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[^] FY23 is the first year that employee commuting has been disclosed. The comparative periods have not been restated for this change.

Table 5: Emissions by gas component

Component gas	Scope 1 tCO ₂ e	Scope 2 tCO ₂ e	Scope 3 tCO ₂ e	Total tCO ₂ e
CO ₂	1,072,530	156	700,474	1,773,160
CH ₄	790	4	1,859	2,653
N ₂ O	925	–	367	1,292
SF ₆	1,745	–	4,512	6,257
Unknown*	–	–	242,785	242,785
Total tCO₂e	1,075,990	160	949,997	2,026,147

* The breakdown by gas component is not published for cradle to gate lifecycle emission factors and therefore this information is unable to be disclosed by gas component for some scope 3 emissions.

Preparation and approval

Prepared by: Aileen Garnett, Senior Manager – Financial Control

Reviewed by: Jacki Farman, General Manager Financial Control and Assurance

Approved by: James Spence, Chief Financial Officer

Appendix III: GHG inventory assurance report



Independent Limited Assurance Statement to the Management and Directors of Genesis Energy Limited

Assurance Conclusion

Based on our procedures and the evidence obtained, we are not aware of any material modifications that should be made to total greenhouse gas emissions inventory including scope 1, scope 2 and scope 3 emissions for the year ended 30 June 2023, disclosed in the Genesis FY23 Climate Related Disclosures Report, in order for it to be in accordance with the Criteria.

Emphasis of Matter

We draw attention to the section on page 44 titled Uncertainties within Genesis’s FY23 Climate Related Disclosures Report. In this section, Genesis describes the significant uncertainties in the calculation methodology for the material scope 3 emissions, specifically in relation to the application of the Agrilink and DEFRA emission factors. Our conclusion is not modified in respect to this matter.

Scope

We have undertaken a limited assurance engagement of the accompanying GHG statement of Genesis Energy Limited (“Genesis”) as of 1 July 2022 to 30 June 2023 (the “Report”), comprising GHG emissions inventory for the year ending 30 June 2023 (the “Subject Matter”) included in the Report.

Criteria

In preparing GHG emissions inventory for the year ending 30 June 2023, Genesis’ applied the Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard, and the Greenhouse Gas Protocol: Corporate Value Chain (Scope 3) Accounting and Reporting Standard (“Criteria”). Where appropriate, emissions factors from the New Zealand Ministry for the Environment, Measuring Emissions: A Guide for Organisations (2023) (“MfE”) were applied. Emissions factors from Department for Environment, Food and Rural Affairs and AgriLink were used where MfE factors were not available.

Subject Matter	Criteria
Genesis’ total greenhouse gas emissions inventory including scope 1, scope 2 and scope 3 emissions for the year ended 30 June 2023, disclosed in Genesis’ FY23 Climate Related Disclosures Report.	Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard Greenhouse Gas Protocol: Corporate Value Chain (Scope 3) Accounting and Reporting Standard Emissions factors sourced from: <ul style="list-style-type: none"> ▶ New Zealand Ministry for the Environment’s guidance for voluntary corporate greenhouse gas reporting 2023 ▶ UK Department for Environment, Food & Rural Affairs - Indirect emissions from the supply chain 2007-2011 ▶ AgriLink’s New Zealand fuel and electricity total primary energy and life cycle greenhouse gas emission factors 2022

Genesis’s responsibilities

Genesis management (“management”) is responsible for selecting the Criteria, and for presenting the GHG emissions inventory for the year ending 30 June 2023 in accordance with that Criteria, in all material respects. This responsibility includes establishing and maintaining internal controls, maintaining adequate records and making estimates that are relevant to the preparation of the GHG statement, such that it is free from material misstatement, whether due to fraud or error.

EY’s responsibilities

Our responsibility is to express a conclusion on the presentation of the Subject Matter based on the evidence we have obtained.

Our engagement was conducted in accordance with the *International Standard on Assurance Engagements ISAE (NZ) 3000: Assurance Engagements Other than Audits or Reviews of Historical Financial Information* and *ISAE (NZ) 3410 Assurance Engagements on Greenhouse Gas Statements* and the terms of reference for this engagement as agreed with Genesis on 12 May 2023.

Those standards require that we plan and perform our engagement to obtain limited assurance about whether, in all material respects, the Subject Matter is presented in accordance with the Criteria, and to issue a report. The nature, timing, and extent of the procedures selected depend on our judgment, including an assessment of the risk of material misstatement, whether due to fraud or error.

We believe that the evidence obtained is sufficient and appropriate to provide a basis for our limited assurance conclusion.

Our Independence and Quality Control

We have maintained our independence and confirm that we have met the requirements of the *Code of Ethics for Professional Accountants* issued by the International Ethics Standards Board for Accountants, and have the required competencies and experience to conduct this assurance review.

EY also applies *International Standard on Quality Control 1, Quality Control for Firms that Perform Audits and Reviews of Financial Statements, and Other Assurance and Related Services Engagements*, and accordingly maintains a comprehensive system of quality control including documented policies and procedures regarding compliance with ethical requirements, professional standards and applicable legal and regulatory requirements.

Description of procedures performed

Procedures performed in a limited assurance engagement vary in nature and timing from, and are less in extent than for a reasonable assurance engagement. Consequently the level of assurance obtained in a limited assurance engagement is substantially lower than the assurance that would have been obtained had a reasonable assurance engagement been performed. Our procedures were designed to obtain a limited level of assurance on which to base our conclusion and do not provide all the evidence that would be required to provide a reasonable level of assurance.

Although we considered the effectiveness of management’s internal controls when determining the nature and extent of our procedures, our assurance engagement was not designed to provide assurance on internal controls. Our procedures did not include testing controls or performing procedures relating to checking aggregation or calculation of data within IT systems.



Independent Limited Assurance Statement to the Management and Directors of Genesis Energy Limited

Building a better working world

The GHG quantification process is subject to scientific uncertainty, which arises because of incomplete scientific knowledge about the measurement of GHGs. Additionally, GHG procedures are subject to estimation (or measurement) uncertainty resulting from the measurement and calculation processes used to quantify emissions within the bounds of existing scientific knowledge.

The engagement consists of making enquiries, primarily of persons responsible for preparing the GHG emissions inventory for the year ending 30 June 2023 and related information, and applying analytical and other relevant procedures.

Our procedures included, but were not limited to:

- ▶ Conducting interviews with personnel to understand the business and reporting process
- ▶ Checking that the flow of information from site metering or monitoring through to calculation spreadsheets is accurate
- ▶ Identifying and testing assumptions supporting the calculations
- ▶ Comparing year on year activity-based greenhouse gas and energy data
- ▶ Checking organisational and operational boundaries to test completeness of greenhouse gas emissions sources
- ▶ Tests of calculation, aggregation and controls
- ▶ Checking that emissions factors and methodologies have been correctly applied as per the criteria
- ▶ Reviewing the appropriateness of the presentation of disclosures.

Conclusion

Based on our procedures and the evidence obtained, we are not aware of any material modifications that should be made to Genesis's GHG emissions inventory, including scope 1, scope 2 and scope 3 emissions for the period 1 July 2022 to 30 June 2023 in order for it to be in accordance with the Criteria.

Restricted use

This report is intended solely for the information and use of Genesis and is not intended to be and should not be used by anyone other than those specified parties.

A handwritten signature in black ink that reads 'Ernst & Young'.

Ernst & Young Limited
New Zealand
21 August 2023

Appendix IV: Description of physical assets

Asset	Description
Kupe	<p>We have a 46% interest in the Kupe Joint Venture, which owns the Kupe gas field situated off the south Taranaki coast.</p> <p>Kupe's assets comprise three wellheads, an unmanned offshore platform, a 30 km pipeline and subsea utilities umbilical cable to an onshore production station near Hawera, oil storage facilities at New Plymouth, and an onshore gas pipeline.</p> <p>Reflecting our interest in the JV, we receive 46% of the natural gas produced. We have also entered long-term contracts with the other JV partners to purchase the remainder of the current natural gas produced and have rights in respect of all future production from the field.</p> <p>LPG and oil are secondary products of the field. We receive 46% of the LPG and oil produced by the JV.</p>
LPG depots and networks	<p>We own and operate a network of LPG distribution hubs across New Zealand and two reticulated LPG networks (piped LPG) in the South Island: Dunedin and the Faringdon development.</p>
Huntly Power Station	<p>Huntly (Raahui Pookeka) is on the banks of the Waikato River and is close to both Auckland and Hamilton. Several types of thermal generation operate at the site.</p> <p>Rankine Units</p> <p>Three Rankine cycle units are the original plant, built to be able to operate on either natural gas or coal. Each unit has a nominal capacity of 250 MW. Water cooling for the units from the Waikato River is limited at higher river temperatures, however cooling towers enable one of the Rankine Units to operate even when river temperatures are approaching limits.</p> <p>Unit 5</p> <p>This Combined Cycle Gas Turbine (CCGT) is the most efficient gas generator in New Zealand and has a capacity of up to 403 MW.</p> <p>Unit 6</p> <p>This is a 50.8 MW open cycle gas turbine, which can burn 100% gas or diesel to generate electricity.</p>

Asset	Description
Waikaremoana Hydro scheme	<p>The Waikaremoana Power Scheme is a hydro-electric power development in northern Hawke's Bay and consists of three power stations fed from Lake Waikaremoana. The scheme is located between Te Urewera and Wairoa, along the upper 7 km of the Waikaretaheke River. The 138 MW hydro scheme comprises three power stations – Kaitawa (36 MW), Tuai (60 MW) and Piripaua (42 MW).</p>
Tongariro Hydro scheme	<p>The Tongariro Power Scheme comprises three hydro power stations – Rangipo (120 MW, underground), Tokaanu (240 MW) and Mangaio (1.8 MW) and has a catchment area of more than 2,600 km² in the North Island's central volcanic plateau.</p>
Tekapo Hydro scheme	<p>The Tekapo Power Scheme is at the head of the Waitaki Valley in the Mackenzie District of the South Island. It has been owned and operated by us since June 2011 and has a generation capacity of 190 MW and uses water from the glacial-fed Lake Tekapo/Takapō to generate electricity through two power stations – Tekapo A and Tekapo B. Tekapo B sits in the bed of Lake Pūkaki.</p>
Hau Nui Wind farm	<p>Hau Nui Wind Farm is in the hills south of Martinborough in the Wairarapa. Its 15 turbines have a combined capacity of 8.65 MW.</p>
Power Purchase Agreements	<p>Waipipi</p> <p>We have a 20-year electricity offtake agreement for the energy from Waipipi's 31 wind-turbines. The generation capacity of the site is 133.3 MW and it produces approximately 450 GWh per year. Waipipi commenced operations in November 2020.</p> <p>Tauhara</p> <p>We have a 15-year electricity offtake agreement which starts at 62.5 MW of the energy generated from the Tauhara geothermal project. The contract is anticipated to provide up to 520 GWh per year commencing on 1 January 2025.</p> <p>Kaiwaikawe</p> <p>We have a 20-year electricity offtake agreement for the energy from Kaiwaikawe wind farm. The proposed generating capacity of the site is 72 MW which is anticipated to produce approximately 230 GWh per year. The site is projected to be operational mid 2025.</p>

