CLP 中電

CLP's Climate Vision 2050

2024 edition

Powering an orderly **transition**

Contents

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Our reporting suite

For the annual updates on CLP's progress, please refer to our Annual Report and Sustainability Report.

Annual Report

Sustainability Report

Introduction

In this section

CEO's message

We are pleased to introduce our updated Climate Vision 2050 with our strengthened decarbonisation target for 2030.

As a power company operating across Asia Pacific, we fully appreciate that we are at the front end of the value chain to enable reduced emissions to address climate change across a broad spectrum of the economy.

T.K. Chiang
Chief Executive Officer

We are pleased to introduce our updated Climate Vision 2050 with our strengthened decarbonisation target for 2030. Lowering our greenhouse gas (GHG) emissions has been an imperative for CLP since we first published our Climate Vision in 2007. This update details the steps we are taking to decarbonise our portfolio and the electricity we send to customers, while acknowledging the factors to be balanced along this journey. We also offer insights into our operating environment and the evolving energy transition.

As a power company operating across Asia Pacific, we fully appreciate that we are at the front end of the value chain to enable reduced emissions to address climate change across a broad spectrum of the economy. We are striving to do our best for the communities and markets in which we operate, and, by extension, for future generations.

Accelerating our transition is also the right choice for our business: governments, regulators, capital providers, customers, our people and communities expect a company that is actively decarbonising. We acknowledge the groundbreaking declaration from the COP28 international climate talks regarding the transition away from fossil fuels. This reinforces decarbonisation as our top priority.

Our operating environment in Asia Pacific

Across our markets, there are three key areas that directly influence the pace of our decarbonisation trajectory. These are: the market context, the affordability and reliability of energy, and our level of control as a minority joint venture partner in some cases.

The markets in which we operate continue to be growth regions. The transition to a non-carbon energy system requires funding and political consensus, particularly for coal phase-out ambitions and the investment needed for maintaining power reliability. Where power demand is growing, market conditions can hold up the phase-out of coal. This offers CLP opportunities to further develop our non-carbon energy portfolio and the necessary infrastructure to support the transmission of energy.

Another key factor for the transition is the ability to offer reasonably priced and reliable energy to communities. We believe this is a critical element of a just transition. As a power provider, we have a duty to ensure that the communities we serve are not left behind, and that our workforce is ready to enable and deliver this transition.

In addition to the broader market and community context, we also face the practical limitations where we hold minority interests in joint ventures. These were given due consideration in our review of decarbonisation targets.

Our updated target in Climate Vision 2050

In early 2024, we decided to strengthen our 2030 GHG emissions intensity target to make it more closely aligned to the international climate goal of limiting global warming to 1.5°C above pre-industrial levels while taking into account our operating context. This reflects our efforts to increase our pace of transition between now and 2030. We also pledged to maintain our prior targets and commitments including phasing out coal before 2040.

Our targets are evidence-based and realistic. We can see a pathway to get there; our determination to achieve these targets has given us a laser focus across CLP. We are also committed to reviewing our decarbonisation targets within the Climate Vision 2050 at least every three years.

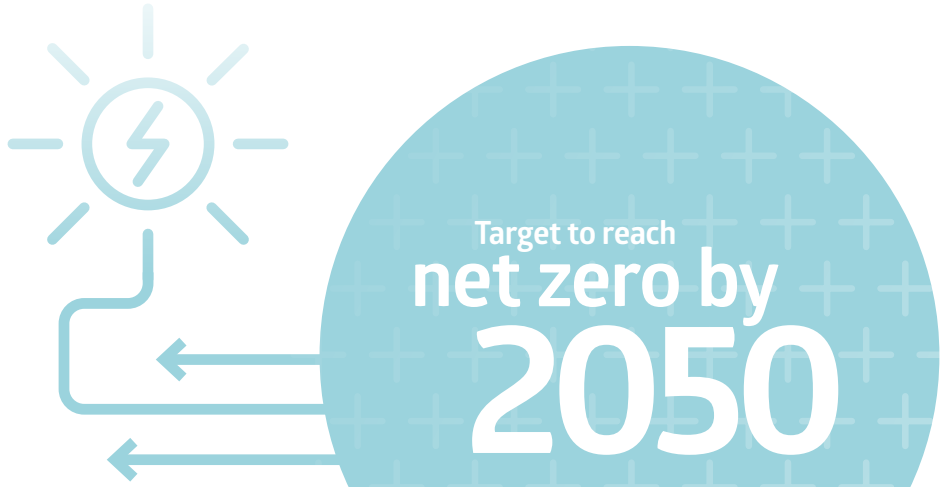
CLP's growth while decarbonising

To accelerate reductions in the world's GHG emissions, the UAE Consensus agreed at COP28 recognises the need to triple renewable energy capacity and double the average annual rate of energy efficiency globally by 2030. It also calls on countries to accelerate zero- and low-emissions technologies including renewables and nuclear. Coupled with continued electrification of various sectors, this signals significant investment opportunities to strengthen our power systems and offer energy services in the markets in which we operate. Across our retail businesses, we are dedicated to transitioning to zero-carbon electricity and to helping our customers increase their energy efficiency.

Governments and regulators, meanwhile, have a role to play in important emerging areas that need policy certainty to attract investment and require support in the early stages of transitioning to commercialisation. While COP28 highlighted that the pace of decarbonisation remains inadequate, we are encouraged by the focus and support for the technology development required to accelerate decarbonisation and bring down the costs.

CLP takes a long-term view on how we create value for our stakeholders as a responsible energy business, while taking action now to progress to a decarbonised future. With this in mind, we approach the transition in an orderly and timely manner. However, the path is not linear; the key for us is to stay focused to address the challenges and changes that lie ahead. We remain committed to making a decarbonised and reasonably priced energy system a reality, while acknowledging that we will need to be adaptable in our actions and plans as we face any uncertainties. Our people are working hard to bring this vision into practice for – and with – the communities we serve.

T.K. Chiang
Chief Executive Officer
March 2024



Increasing our pace to move closer to alignment with the goal of limiting global warming to

1.5°C

Read more about our new targets on p.8

Committed to reviewing our decarbonisation targets within the Climate Vision 2050 at least every

3 years

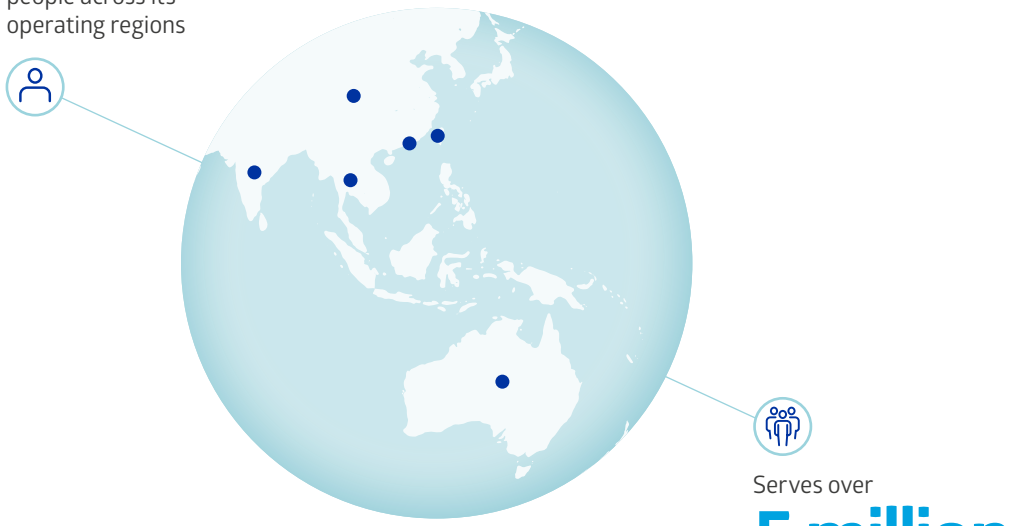
About the CLP Group

Founded in 1901, the CLP Group (CLP) has evolved into one of the largest investor-owned power businesses in Asia Pacific with investments across Hong Kong, Mainland China, Australia, India, Taiwan region and Thailand.

CLP employs more than

8,000

people across its operating regions



Serves over

5 million

customers

CLP Holdings Limited is the holding company for the CLP Group, listed in Hong Kong, with business activities ranging from power generation, transmission and distribution to retail and energy services. CLP employs more than 8,000 people and serves over five million customers.

CLP aims to meet the evolving needs of energy users in a world being reshaped by decarbonisation and digitalisation. CLP plans to do this by leveraging new and emerging technologies to aid the progressive decarbonisation of our portfolio, empower our customers in making better energy choices, enhance performance of our operations, and to evolve and grow our business in the ongoing energy transition.

Purpose

To Power Brighter Tomorrows

Vision

To be a leading responsible energy provider, from one generation to the next

About CLP's Climate Vision 2050

CLP's Climate Vision 2050 is the blueprint of the Group's transition to a net-zero GHG emissions business by mid-century. The Climate Vision has informed CLP's business strategy since it was first launched in 2007. It guides our investment decision-making and is integral to our broader climate strategy. This is the sixth edition of our Climate Vision 2050, published in March 2024.

Our initiatives to reduce our GHG emissions are set out in our net-zero ambition, which can be read on our CLP Group website. Our 2030 decarbonisation targets were validated by the Science Based Targets initiative (SBTi) in 2021. This is aligned to the Paris Agreement to limit global warming to well-below 2°C above pre-industrial levels. Through these measures and actions, CLP supports the United Nations Sustainable Development Goals (SDGs), with specific focus on SDG 7 – Affordable and Clean Energy, and SDG 13 – Climate Action.

CLP will continue to seek opportunities to accelerate the decarbonisation of its portfolio. Drivers for acceleration in decarbonisation include step changes in climate and energy policy, technology advances and support from governments in the markets where we invest.

We review our climate transition plans and targets at least every three years, taking into consideration the latest climate science, policy drivers, technological advancement, industry trends and community expectations.

See the "Reviewing our targets" section on p.10 for more details.

This new edition of the Climate Vision 2050 sets out our latest targets and commitments, with supporting action plans. It was prepared by mainly referencing guidance from the International Sustainability Standards Board's (ISSB) IFRS S2 Climate-related Disclosures.

See the "Putting our vision into action" section on p.13 for more details.

Our previous standalone Climate-related Disclosure Report, which included the recommendations of the Task Force on Climate-related Financial Disclosures, is now integrated into our Climate Vision 2050 and our Annual Report.

For annual updates on CLP's progress, please refer to our Annual Report and Sustainability Report.

Our role in the **energy** transition

In this section

Understanding the bigger picture

The global electricity market

The electricity sector plays a key role in the global economy's decarbonisation efforts as it is instrumental for other core sectors including heavy industry, transport and real estate to achieve their decarbonisation efforts. It is critical that electricity companies take upfront action towards targets in line with the 1.5°C pathway. The trajectory that CLP is working towards is outlined in our Climate Vision 2050 and we are applying international standards and industry practices to review our transition progress.

See the "Our new targets and commitments" section on p.11 for more details.

The *Net Zero Roadmap*[1] published by the International Energy Agency (IEA) in 2023 details their net-zero emissions scenario where, initially, there will be temporary growth in unabated coal production due to the energy crisis. However, the share of global electricity generation from coal needs to rapidly decrease from 36% in 2022 to 13% in 2030 – to ultimately reach a full phase-out by 2040 and beyond.

A report by the Energy Transitions Commission, a global coalition of energy leaders, also suggested that "clean electrification" (i.e. power generation from utility-scale solar and onshore and offshore wind) serves as the backbone of the transition to net zero, providing over 60% of energy consumption in 2050. To achieve this, wind and solar capacity would be required to increase by five to seven times by 2030.[2]

BloombergNEF:

80%

Percentage of new generation capacity installed in 2022 came from wind and solar

Furthermore, the key outcomes of the COP28 United Nations Climate Change Conference in 2023 highlighted global commitments to transition away from all fossil fuels in energy systems, as detailed in the UAE Consensus. The technological developments of renewables, nuclear power and storage solutions are expected to further support the world in achieving the required massive expansion of non-carbon power systems.

Globally, non-carbon electricity is increasing in its uptake. BloombergNEF states[3] that wind and solar accounted for 80% of new generation capacity installed in 2022. Non-carbon electricity, including wind, solar, hydro and nuclear, reached 46% of global installed power capacity – an increase from 33% in 2012. Utility-scale solar also accounted for 41% of renewable energy investments in 2022, while wind accounted for 36% of investments.

Non-carbon energy definition

Non-carbon is defined as energy from power sources that add no extra carbon to the atmosphere, such as wind, solar, hydro and nuclear energy. It does not include waste-to-energy and other forms of biomass.

Asia Pacific energy transition and its challenges

Among G20 countries, there have been persistent ambition and implementation gaps in their transition efforts.[4] Asia Pacific, where CLP's operations are based, is no exception. According to a FTSE Russell report, Australia's and China's Nationally Determined Contributions (NDCs) for 2030 are tracking towards a temperature rise of 3.3°C and 2.9°C respectively by the end of the century, well above the Paris Agreement goals to limit global warming to well-below 2°C and pursue efforts to limit the temperature rise to 1.5°C. Meanwhile, India's NDC is estimated to track towards the lowest temperature rise among G20 countries, of 1.7°C.[4]

According to the Asia-Pacific Network of the Glasgow Financial Alliance for Net Zero (GFANZ APAC Network), Asia Pacific accounts for approximately 50% of global GHG emissions with power generation as the largest contributor.[5] Approximately half of all power output in this region is generated from coal.[5] There are currently around 5,000 coal-fired power plants in Asia, and coal power usage is expected to continue to rise in the next few years[5], against the global trend that it would plateau through 2025 at current all-time highs.[6]

For the energy sector, the transition requires time, financial resources and careful planning. Accelerating the change in Asia Pacific is considered more challenging than in some other markets. Some contributing factors include:

- Many coal-fired power plants in the region are relatively young, with an average age of around 14 years as of January 2023.[5]
- Some of the plants in Asia Pacific are less influenced by market forces, such as through state ownership, limited open power markets, and fiscal and energy policies including fossil fuel subsidies and long-term power purchase agreements with considerable remaining time to run.[5]
- Transition of coal workers has to be well-planned and coordinated. It is estimated that the coal value chain in Asia Pacific employed around 5.4 million people in 2022.[7]
- The challenge of building renewable energy projects fast enough along with the network infrastructure required to ensure system reliability has to be considered.
- Given the stage of economic development for most Asia-Pacific countries, their transition will naturally occur later than in Western Europe and North America.

GFANZ:

~50%

Percentage of global GHG emissions that Asia Pacific accounts for

Hence, a gradual transition is more likely, given its viability along with economic, social and energy security considerations. Natural gas will also play an important role as a transition fuel towards net zero.

Meanwhile, the outcome at the 2023 COP28 UN Climate Change Conference sends policy signals that will likely attract Asian investors' capital. The final outcome agreed among countries (called the Global Stocktake) was to transition away from fossil fuels to achieve net zero by 2050.

To enable the transition, there needs to be alignment between the private sector and government with supporting policy and financing. Energy policy, supported by local policies and financing, plays an important role in offering clarity on the final energy mix, timeframe and the path needed to achieve it.

The final COP28 outcome included:

Tripling renewable energy capacity and doubling the average annual rate of energy efficiency improvements globally by 2030;

Accelerating efforts towards the phase-down of unabated coal power;

Accelerating utilisation of zero- and low-carbon fuels well before or by around 2050;

Transitioning away from fossil fuels in energy systems, in a just, orderly and equitable manner;

Accelerating zero- and low-emissions technologies including renewables and nuclear, abatement and removal technologies such as carbon capture, utilisation and storage, as well as low-carbon hydrogen production;

Accelerating the substantial reduction of non-carbon-dioxide emissions globally, including, in particular, methane emissions by 2030;

Rapid deployment of zero- or low-emissions vehicles; and

Phasing out inefficient fossil fuel subsidies.

The impact of the energy transition on our stakeholders

CLP is making an important contribution to the energy transition within Asia Pacific, given the scale of our operations across the region. We recognise the environmental impact of fossil fuel-fired power generation and, in our transition away from fossil fuels, we are striking a balance between maintaining affordability for our customers and the provision of reliable and inclusive access to electricity for all. The transition has to be managed well in order to minimise the potential negative impacts on workers, customers, the wider community and capital providers.

For our customers, suppliers and the wider community, it is important for us to understand and address the disruptions they will face in the transition to net-zero carbon energy systems, including supply chain instability and economic deprivation for some of the more vulnerable members of society. Collaboration with policymakers, the public sector, and other strategic partners is key to ensuring that the right policy environment and market designs are created to make renewables more viable and reasonably priced.

In addressing the workforce evolution, it is critical for the energy sector to ensure that any new investments in infrastructure and operations create secure, high-quality, decent and inclusive jobs, while supporting workers at all levels with opportunities to retrain and upskill for future jobs in the zero-carbon energy industry.

For an overview of CLP's general management approach to addressing the social impacts of the energy transition, please refer to our Sustainability Report. Furthermore, the "Just transition" section in this document also provides a deeper dive into CLP's efforts in addressing the potential social impacts of its transition to net zero.

Our climate targets and commitments

In this section

CLP's key targets and commitments

By 2030

Reduce our GHG emissions intensity of electricity sold to **0.26kg CO_2e/kWh**, which represents a 59% reduction compared with our 2019 baseline of 0.63kg CO_2e/kWh

Lower our absolute Scope 3 GHG emissions from the use of sold products by **28%** from our 2019 baseline

By 2040

Reduce our GHG emissions intensity of electricity sold to **0.1kg CO_2e/kWh**

By 2050

Reach **net-zero** GHG emissions across our value chain

Emissions reduction → **0.26** kg CO_2e/kWh

0.1 kg CO_2e/kWh

Net zero

2030 — 2040 — 2050

Phasing out coal assets

Maintain our position on ceasing the development of new coal-fired power plants in CLP's portfolio

Before 2040

Phase out coal

Delivering on our targets

Our Climate Vision 2050 covers key considerations around climate mitigation and guides the Group in managing climate-related risks and opportunities. In response to our stakeholders' expectations on our progress in accelerating the decarbonisation of our portfolio, we continually review and strengthen our commitments in consideration of the latest climate science and industry best practices.

Following the launch of our Climate Vision 2050 in 2007, we met our decarbonisation targets set for 2010 and 2020 by reducing the carbon intensity of our generation portfolio to below 0.8kg CO_2/kWh and 0.6kg CO_2/kWh respectively. This downward trend has continued, and the Group's GHG emissions intensity of electricity sold was lowered to 0.54kg CO_2e/kWh in 2023. This represented a 14% decrease from the 2019 baseline of our science-based target.

Since our most recent target updates in 2021, we made a number of key operational and portfolio changes to move our decarbonisation forward. Key contributions included:

- A divestment from Fangchenggang Power Station in November 2022 and transfer of Shiheng Power Station to its local partner in Mainland China in January 2022 helped reduce the share of coal in the Group's energy sent out from 48.2% in 2021 to 44.7% in 2022, and further down to 40.8% in 2023 on an equity plus long-term capacity and energy purchase basis.

- The operation of the D1 unit at Black Point Power Station in Hong Kong since 2020 and the commissioning of the offshore liquefied natural gas (LNG) terminal in 2023 facilitated CLP in gradually phasing out coal-fired generation by increasing its gas generation capacity as a transition fuel and diversifying natural gas supplies. Following the commissioning of the D1 unit, CLP Power Hong Kong Limited's (CLP Power) GHG emissions intensity of electricity sold decreased from 0.5kg CO_2e/kWh in 2019 to 0.37kg CO_2e/kWh in 2020.
- In Mainland China, CLP invested in three more wind farms and one more solar farm since 2021, amounting to a total of 374MW in equity capacity. The latest additions of the 50MW Xundian II Wind Farm in Yunnan province and the 74MW Yangzhou Gongdao Solar Farm in Jiangsu province in 2023, together with the 150MW Bobai Wind Farm under construction in Guangxi Zhuang Autonomous Region, brought our total renewable energy capacity in Mainland China to 2,100MW on an equity basis.
- In India, Apraava Energy, a 50:50 joint venture between CLP and CDPQ, a global investment group, also accelerated its development in renewable energy projects. The sale of a 10% equity interest in Apraava Energy from CLP to CDPQ in 2022 enabled the Company to increase its investments in areas including renewable energy, transmission and smart meters, while providing funding to support CLP's strategy to invest in renewable energy growth in Mainland China.
- There has been a focus on energy infrastructure investments that support CLP's efforts to decarbonise its energy generation portfolio, along with an updated business plan dedicated to more renewable asset growth across the Group. Introducing more renewable energy into the grid opens up new opportunities in smart grid and utility-scale battery storage to maintain grid stability. CLP has been pursuing these opportunities in Hong Kong, Mainland China, Australia and India.

0.54

kg CO_2e/kWh

The Group's GHG emissions intensity of electricity sold in 2023

~14%

Percentage of reduction in the Group's GHG emissions intensity of electricity sold compared to the 2019 level

Reviewing our targets

CLP is committed to reviewing its transition plan and targets at least every three years. Changing climate and extreme weather events, as well as the rapid advancement of technology, are affecting CLP's operating regions and influencing policy decisions and market conditions. The review of our Climate Vision 2050 discusses these related physical and transition risks.

Since we strengthened our Climate Vision 2050 targets in 2021, the climate emergency has accelerated. Based on current national plans, the United Nations is predicting a 9% rise in GHG emissions by 2030, from 2010 levels. This is significantly short of the 45% drop in emissions required to reach the goal of limiting global temperature rise to 1.5°C.[8]

This review also responds to increasing calls from our stakeholders, such as capital providers, to accelerate our decarbonisation efforts, improve the transparency of our investments in decarbonisation and elaborate on our climate-related opportunities.

In our review between 2023 and early 2024, we undertook the following measures to revisit our decarbonisation targets:

- Reviewed business planning assumptions, including the projected output from each power generation plant, as well as the asset retirement plans and the renewable energy growth plans in CLP's operating markets;
- Incorporated the investment and deliverables anticipated from CLP Power's Development Plan for the period of 2024 to 2028, as announced in November 2023;
- Accounted for EnergyAustralia's Climate Transition Action Plan, unveiled in August 2023; and
- Considered Apraava Energy's science-based target, validated by the SBTi in June 2023.

We also benchmarked our updated GHG emissions intensity trajectory against industry standards. This involved comparing the trajectory of the Group's GHG emissions intensity of electricity sold against the SBTi well-below 2°C and 1.5°C pathways, to assess how our decarbonisation pathway could be aligned with the Paris Agreement goals.

We also developed a methodology to assess and indicate the implied temperature rise (ITR) of our new decarbonisation trajectory, and conducted a climate change scenario analysis of the climate-related physical and transition risks and opportunities material to CLP.

Our new targets and commitments

Following an extensive target review process, the CLP Group Sustainability Department received endorsement from the Sustainability Executive Committee and the Board-level Sustainability Committee, with final approval from the CLP Holdings Board, as follows:

1

Strengthening our 2030 near-term GHG emissions intensity of electricity sold target from 0.3kg CO_2e/kWh (which is science-based and in line with the well-below 2°C pathway following the Sectoral Decarbonisation Approach) to 0.26kg CO_2e/kWh. The target covers our emissions in Scope 1, 2 and Scope 3 Category 3 in relation to the emissions from the generation of our purchased electricity that is sold to customers.[i] It represents:

- A 59% reduction from our 2019 baseline emissions level of 0.63kg CO_2e/kWh, compared with a 52% decrease under the previous target.

2

Maintaining existing targets and commitments within our Climate Vision 2050. These include:

- Phasing out coal before 2040, and
- Ceasing the development of new coal-fired power plants in CLP's portfolio.

3

Reducing our GHG emissions as follows:

By 2030:

- Reduce our absolute Scope 3 GHG emissions from the use of sold products[ii] by 28% from our 2019 baseline emissions level, and
- Cut our Scope 1 and 2 GHG emissions intensity of electricity generated by 50% from our 2019 baseline emissions level to 0.36kg CO_2e/kWh.[iii]

By 2040:

- Reduce GHG emissions intensity of electricity sold to 0.1kg CO_2e/kWh.[i]

By 2050:

- Reach net-zero GHG emissions across our value chain.

The diagram on the next page shows our latest GHG emissions intensity trajectory indicating our projections and targets leading up to 2050.

Notes:
i) These targets cover the Group's generation and energy storage portfolio. They are set on an equity plus long-term capacity and energy purchase basis to reflect the Group's investment in energy transition and to align with the Science Based Targets initiative's *Setting 1.5°C-aligned science-based targets: Quick Start Guide for Electric Utilities*, June 2020, https://sciencebasedtargets.org/resources/files/SBTi-Power-Sector-15C-guide-FINAL.pdf.
ii) This target is based on equity and covers the Group's Category 11 of Scope 3 emissions – Use of sold products from combustion of the natural gas supplied to customers.
iii) This target covers the Group's generation and energy storage portfolio and is based on equity. Based on our latest projections, CLP's Scope 1 and 2 GHG emissions intensity of electricity generated in 2030 are estimated to move towards 0.29kg CO_2e/kWh.

Implied temperature rise of our new decarbonisation trajectory

We have developed a methodology to assess the ITR of our new trajectory. The ITR is derived by comparing our cumulative emissions starting from 2019 (the baseline year of our near-term science-based targets) with the carbon budgets under two decarbonisation pathways. The carbon budgets are defined by the 1.5°C and well-below 2°C pathways in the SBTi's Power Generation Sectoral Decarbonisation Approach, and communicate the resulting temperature rise by 2100 if all companies decarbonise to the same extent, taking into account their sectoral carbon budget.

The decarbonisation trajectory that underlies our updated 2030 target translates to an ITR of 1.73°C, which is lower than the 1.81°C included in our previous Climate Vision 2050. It also means our pace of decarbonisation is expected to be faster than what Australia and China have committed in their NDCs, which are tracking towards a temperature rise of 3.3°C and 2.9°C respectively by the end of the century.[4]

Refer to the "Understanding the bigger picture" section on p.6 for more details.

We recognise that gaps remain in reaching the 1.5°C ambition. However, we believe in taking a prudent approach to ensure all of our targets are realistic and achievable. We will also continue to review our targets and make further adjustments as appropriate in line with market and technology development.

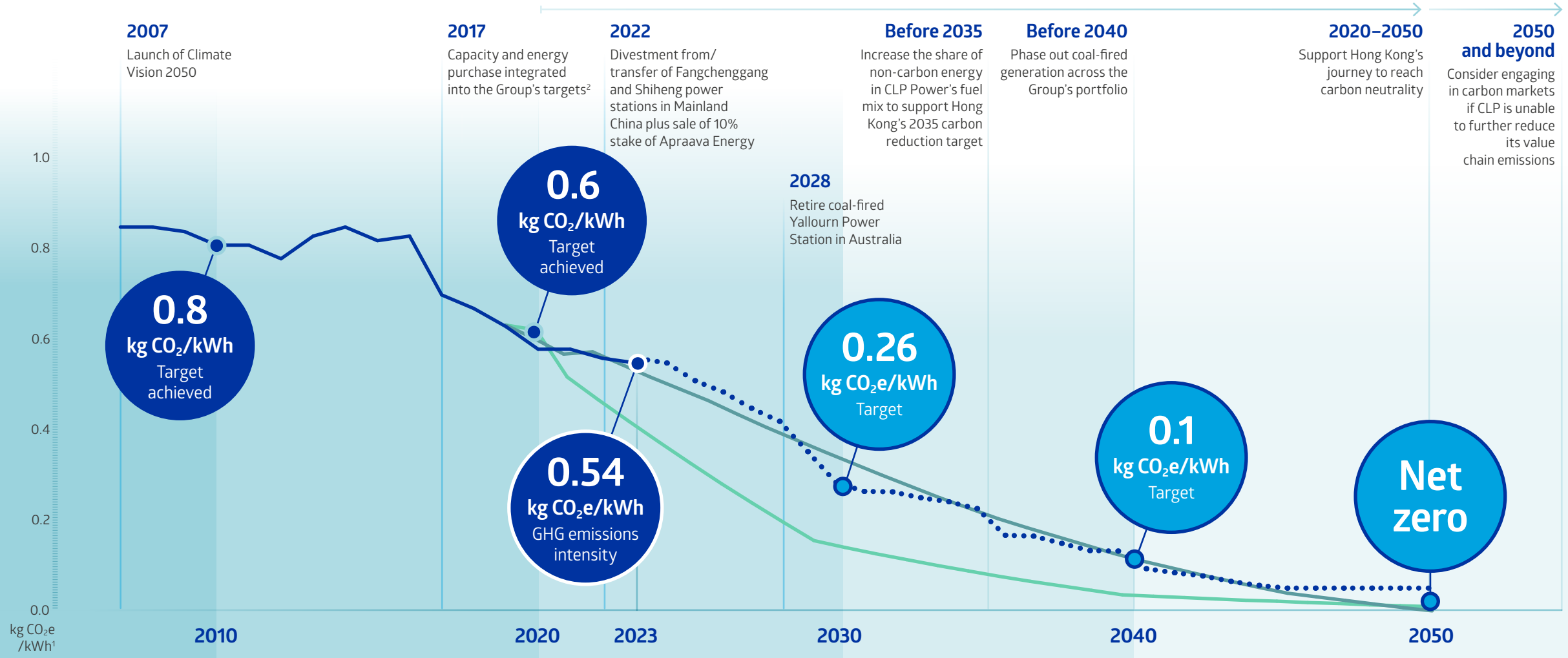
Our new 2030 target

Our 2030 near-term GHG emissions intensity of electricity sold target has been strengthened.

1.73°C

The implied temperature rise for the decarbonisation trajectory that underlies our updated 2030 target

CLP's past and projected greenhouse gas emissions intensity



Notes:
1 CLP's trajectory from 2007 to 2020 was based on the Group's carbon emissions intensity (kg CO_2/kWh). Since 2021, in line with global best practices, CLP has reported its GHG emissions intensity based on kg CO_2e/kWh.
2 CLP's trajectory from 2017 to 2050 is on an equity plus long-term capacity and energy purchase basis.

Actual greenhouse gas emissions intensity | Targets achieved | Projected greenhouse gas emissions intensity of electricity sold | Decarbonisation targets | Science-based target – well-below 2°C pathway | Science-based target – 1.5°C pathway

Putting our **vision into** action

In this section

Overview

Our operating environment

The markets where CLP is operating vary vastly in their energy policies, energy market structure and socio-economic development status. We are dedicated to adapting to the market developments and policy changes when delivering on our decarbonisation plans. The following details the energy transition landscape in the countries where we operate.

Hong Kong

As part of the Hong Kong SAR Government's pledge in its Climate Action Plan 2050 to achieve carbon neutrality before 2050, the Government will be investing a further HK$240 billion to support a series of actions to combat climate change over the next 15 to 20 years. These actions include developing distributed renewable energy; managing energy demand by means including enhancing energy efficiency in both new and existing buildings; decarbonising the vehicle fleet; and transforming the waste management system.

Due to its geographical location and population density, Hong Kong has a very limited scope to develop local renewable energy sources. For this reason, nuclear energy is currently imported from Mainland China to Hong Kong to reduce the GHG emissions intensity of electricity sold. Further import through the enhancement of regional cooperation is necessary to support the Government's target of reducing carbon emissions by half against the 2005 level before 2035.

Mainland China

China has been a major driver for a diverse set of energy sector developments in recent years. As of 2023, China is one of the major producers and consumers of coal. In addition, the nation is also a large consumer of oil and gas. Its total carbon emissions were 12.1 gigatonnes in 2022, mostly from using coal for electricity and industry.[9]

However, China is also the biggest user of non-carbon energy technologies in the world, contributing to 60% of global electric vehicle (EV) sales, 50% of wind capacity additions, 45% of global solar photovoltaic (PV) capacity additions and 30% of nuclear capacity additions in 2022. Its rapid progression puts it on course to surpass its 2030 NDC goal of 1,200GW of solar and wind capacity, five years ahead of plan.[9]

With goals to peak carbon emissions by 2030 and reach carbon neutrality by 2060, China's 14th Five-year Plan outlines its energy sector's direction until 2025, with expectations for more use of non-carbon energy in the near term. The nation's target is to raise its renewable energy production from 2,210TWh in 2020 to 3,300TWh in 2025, and for renewables to supply more than half of the additional electricity.[10]

Australia

The energy sector is at the forefront of the energy transition in Australia. Power demand is expected to rise as the population grows and as demand in areas such as EVs continue to increase. This electrification will drive significant emissions reductions if supported by a commensurate increase in renewable energy investment. However, to replace retiring coal capacity and to meet increased electricity consumption, the Australian Energy Market Operator (AEMO) estimates that there is a need for the National Electricity Market to increase its renewable energy capacity seven-fold by 2050.[11] This will require more dispatchable storage and firming assets such as hydro and gas-fired power generation, in addition to household and business technology investments such as rooftop solar and energy efficiency, to ensure reliable and low-carbon electricity is delivered equitably for all Australian customers.

India

India's energy demand is expected to grow rapidly in the next three decades, driven by population growth, urbanisation, industrialisation and rising incomes. India has made remarkable progress over the past few decades to expand its power generation capacity, providing reasonably priced energy access and ensuring supply security. This provision of energy often plays a critical role in providing a stable energy supply to the communities it serves. However, it still faces challenges in areas including its dependence on fossil fuel imports, its high carbon emissions, and low per capita energy consumption.

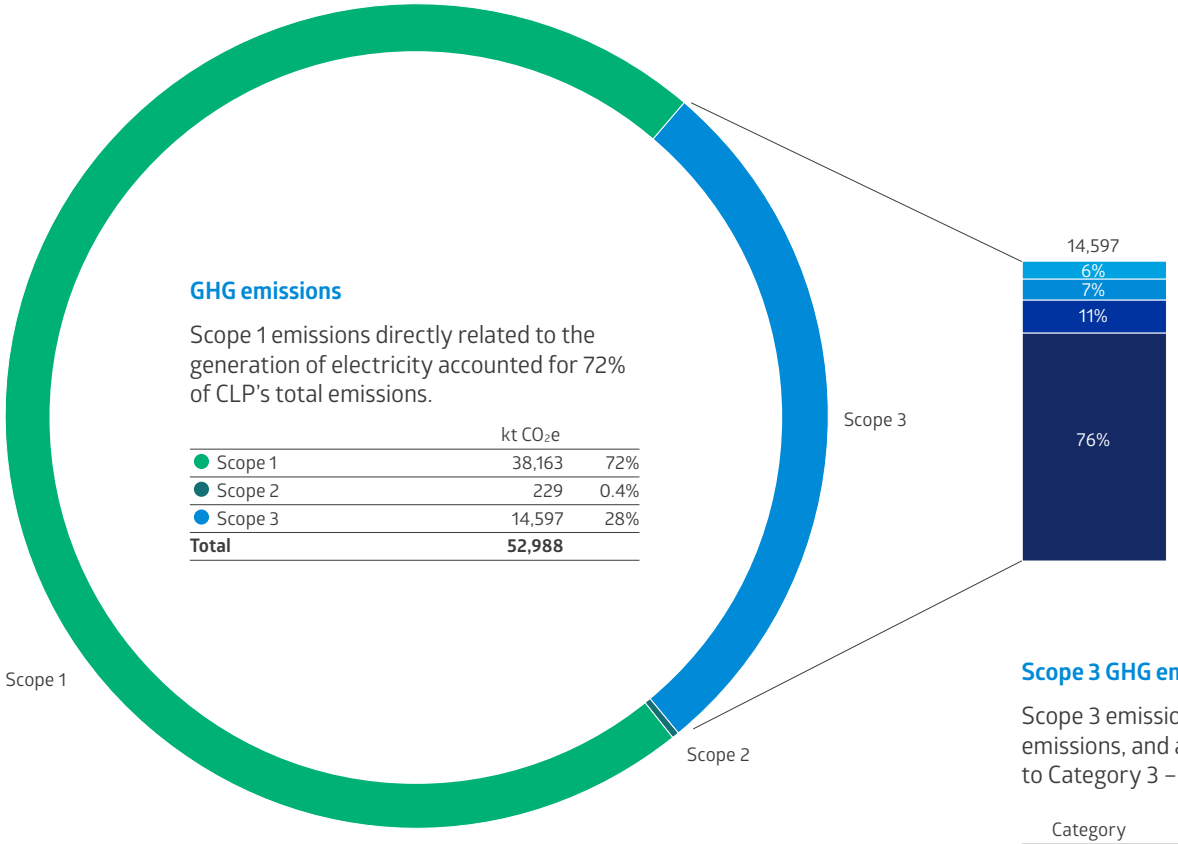
Despite these challenges, India's 2022 updated NDC under the Paris Agreement sets out targets to achieve about 50% cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2030, and to implement policies to boost non-carbon energy production and consumption. It aims to develop domestic non-carbon energy technology industries – a key step in achieving its long-term goal of reaching net zero by 2070.[12]

Taiwan region

In 2023, the Taiwanese authorities set a legally binding target of net-zero GHG emissions by 2050 by passing the Climate Change Response Act. The new law may impose carbon fees in stages on direct and indirect emissions.[13] More clarity on its impact on fossil fuel assets is expected when the mechanism is announced. Other key elements of the law include emissions reduction measures, climate change adaptation, and establishing climate response-related authority and responsibility among government agencies. Furthermore, the region's Renewable Energy Development Act was also amended in 2023 to further encourage renewable energy use and promote energy diversification.[14]

CLP's GHG emissions profile 2023

CLP's total GHG emissions have reduced steadily. Compared to 2019, a 26% drop was recorded.



GHG emissions

Scope 1 emissions directly related to the generation of electricity accounted for 72% of CLP's total emissions.

	kt CO_2e	
Scope 1	38,163	72%
Scope 2	229	0.4%
Scope 3	14,597	28%
Total	**52,988**	

Notes:

1 The emissions are on an equity basis.

2 Numbers have been subject to rounding. Any discrepancies between the total shown and the sum of the amounts/percentages listed are due to rounding.

3 In accordance with the Greenhouse Gas Protocol, the West New Territories Landfill Gas Power Generation Project, which makes use of landfill gas from waste for power generation, is not included in CLP's Scope 1 CO_2 emissions and is reported separately. Its non-CO_2 GHG emissions (i.e. CH_4 and N_2O) are included in CLP's Scope 1 CO_2e emissions.

Scope 3 GHG emissions by category

Scope 3 emissions accounted for 28% of CLP's total emissions, and a majority 76% of which was related to Category 3 – Fuel and energy-related activities.

Category	kt CO_2e	
3 – Fuel- and energy-related activities	11,053	76%
11 – Use of sold products	1,617	11%
1 – Purchased goods and services	1,056	7%
2 – Capital goods	816	6%
5 – Waste generated in operations	46	0.3%
6 – Business travel	4	0.03%
7 – Employee commuting	4	0.03%

Understanding our GHG emissions

Based on our latest GHG emissions profile in 2023, Scope 1 emissions directly related to the generation of electricity accounted for 72% of our total emissions. Hence, our focus is on reducing Scope 1 emissions. This will directly help our customers decarbonise by reducing their Scope 2 emissions.

For CLP, Scope 2 emissions result primarily from the purchase of energy for use by some of our offices and power plants across our operating regions. These represented less than 1% of our total GHG emissions in 2023.

Scope 3 emissions, meanwhile, accounted for 28% of our total emissions, and a majority 76% of which was related to Category 3 – Fuel- and energy-related activities. The generation-related emissions in Scope 1 and Scope 3 Category 3 together cover the electricity generation within CLP's organisational boundary and electricity purchased that is sold to customers.[15]

Details on how we compile our GHG emissions profile and our GHG accounting methodology are included in CLP's Sustainability Report.

This reflects the efforts we have taken to lower the emissions of electricity sold to customers by procuring renewable and nuclear energy. However, it also includes emissions from net electricity generated from waste-to-energy facilities in Hong Kong and net electricity purchased by EnergyAustralia from the National Electricity Market, both of which have associated GHG emissions beyond CLP's direct control.

72%

Share of Scope 1 emissions (directly related to our generation of electricity) in 2023

28%

Share of Scope 3 emissions in 2023

How we are decarbonising

We focus on six key levers where we can manage our emissions and support the energy transition in our markets in Asia Pacific.

Our key focus is on reducing our generation-related emissions and building infrastructure that enables such a transition.

Refer to the "Decarbonising CLP's power supply" section on p.18 for more details.

— **Phase out coal-fired power plants**
This requires retiring coal assets or shifting them to a peaking capacity, which means only drawing on their capacity to meet peak load where necessary, and then retiring them as coal plants before 2040. CLP is constrained in driving an earlier transition in cases where we have a minority stake in a coal asset, or where there is a market need to maintain base load capacity.

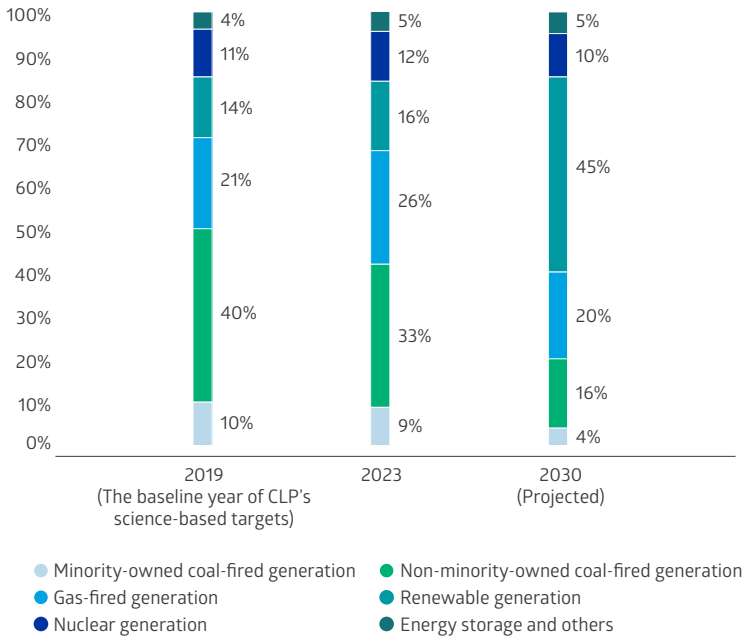
— **Enable a fuel switch for power generation**
This involves switching from coal to gas as a transition fuel, and eventually to a cleaner fuel such as hydrogen produced from non-carbon emitting sources. This requires building new, efficient gas-fired generation, or refurbishing or upgrading existing gas turbines to ensure they are hydrogen-ready or can be retrofitted with carbon capture technology.

— **Grow non-carbon energy**
Growing non-carbon energy includes increasing the use of nuclear energy as a base load and growing our renewable energy portfolio, particularly where it aligns with a market's national plan.

— **Build infrastructure to support non-carbon energy import and renewable energy growth**
Grid infrastructure is essential for incorporating more energy from different sources into the system and making it accessible to more customers.

Grid infrastructure includes a range of components that do not contribute to significant GHG emissions, such as power transmission and distribution systems, energy storage solutions such as pumped hydro storage, utility-scale battery storage, and advanced metering infrastructure (AMI).

CLP's past and projected power generation and energy storage capacity by asset type



Notes:
1 The figures are on an equity plus long-term capacity and energy purchase basis.
2 Any minor discrepancy in the total is due to rounding of percentages.

At the other end of our value chain, technology is enabling our customers to manage their energy use more efficiently. At CLP, we see opportunities in two key areas:

— **Enable greater electrification**
According to the IEA, replacing technologies or processes that use fossil fuels, like internal combustion engines and gas boilers, with electrically powered equivalents results in improved efficiency and reduced energy demand.[16] Electrification also enables customers to benefit from the decarbonisation of the power supply without additional investment. Many jurisdictions have enacted policies to encourage the electrification of transport, heating and cooling, as well as other industrial processes. While the move to greater electrification may increase our Scope 1 emissions as an energy provider, the shift leads to an overall emissions reduction for the community.

— **Increase energy efficiency**
We are building energy efficiency capabilities in areas such as Energy-as-a-Service and Cooling-as-a-Service as part of our business service evolution. We are collaborating with different business partners and have invested in new technologies to broaden our offerings to suit the unique needs of all our customers.

See the "Accelerating the energy transition across sectors" section on p.23 for more details.

Decarbonisation levers across our operating regions

Hong Kong

- **Phase out coal-fired power plants**
  - Castle Peak A Power Station to retain a reserve capacity role and eventually retire in the next few years
  - Castle Peak B Power Station to progressively reduce coal-fired generation and phase out coal by 2035
- **Enable a fuel switch for power generation**
  - Continue to replace coal-fired generation with lower-carbon fuels such as natural gas in the interim
  - Black Point Power Station is exploring conversion to hydrogen produced by non-carbon emitting sources or carbon capture retrofits before 2050
- **Grow non-carbon energy**
  - Continue to facilitate renewable energy development by supporting the connection of distributed renewable energy systems to the CLP grid and offering feed-in tariff to eligible customers under the Scheme of Control Agreement
  - Explore development of new local renewable energy projects

- **Build infrastructure to support non-carbon energy import and renewable energy growth**
  - The Clean Energy Transmission System to be upgraded by end-2025
  - Develop utility-scale battery systems to complement increasing non-carbon energy
  - Develop plan to increase non-carbon energy import through enhancing regional cooperation
- **Enable greater electrification**
  - Facilitate broader electric vehicle adoption
- **Increase energy efficiency**
  - Provide a range of energy service solutions

Mainland China

- **Phase out coal-fired power plants**
  - Minority-owned coal assets to be phased out before 2040
- **Grow non-carbon energy**
  - Approximately 1,130MW of renewable energy projects planned to start construction in 2024
- **Build infrastructure to support non-carbon energy import and renewable energy growth**
  - Approximately 160MW of storage capacity planned to start construction in 2024
- **Increase energy efficiency**
  - Provide a range of energy service solutions

India

- **Phase out coal-fired power plants**
  - Jhajjar Power Station's power purchase agreement to expire in 2037
- **Grow non-carbon energy**
  - New projects in non-carbon energy business equivalent of approximately 1.2GW planned for 2024
- **Build infrastructure to support non-carbon energy import and renewable energy growth**
  - Target for projects in power transmission and advanced metering infrastructure to support energy infrastructure development

Taiwan region

- **Phase out coal-fired power plants**
  - Minority-owned Ho-Ping Power Station to be phased out before 2040

Australia

- **Phase out coal-fired power plants**
  - Yallourn Power Station to close in 2028
  - Mount Piper Power Station to shift to a reserve capacity role which EnergyAustralia anticipates being in the early to mid-2030s
- **Enable a fuel switch for power generation**
  - Tallawarra B Power Station has been designed to be able to run on a blend of gas and hydrogen
- **Grow non-carbon energy**
  - Up to 3GW of renewable energy capacity to be added by 2030 through direct investments and power purchase agreements
- **Enable greater electrification and increase energy efficiency**
  - A range of service and product offerings including home electrification, electric vehicle and energy efficiency initiatives

Key

- Decarbonising CLP's power supply
- Accelerating the energy transition across sectors

Decarbonising CLP's power supply

Phase out coal-fired power plants

CLP remains committed to ceasing investment into new coal-fired generation capacity, and to phasing out all its coal-based assets before 2040. This means shifting the portfolio away from fossil fuel generation, in particular coal, towards non-carbon emitting energy. The phase-out of our coal-fired generation assets has the greatest decarbonisation benefit on our portfolio by reducing Scope 1 emissions.

CLP's decision-making process focuses on managing the pace of change, while balancing financial sustainability, environmental best practices and social responsibility. These are illustrated in the progressive retirement of Castle Peak A Power Station in Hong Kong and Yallourn Power Station in Australia. Our approach ensures a stable power supply, maintains reasonably priced electricity, and sustains employment opportunities for workers and the community. Market needs and regulatory changes are also considered. We closely collaborate with a wide range of partners including government, affected employees, local communities and industries to ensure a smooth and just transition.

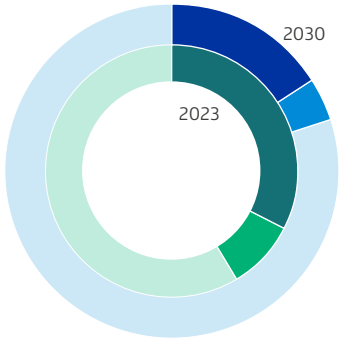
See "Just transition" section on p.19.

Coal power plant assets often play a critical role in providing a stable energy supply to the communities they serve, offering us limited options to accelerate decarbonisation. Many of CLP's coal-fired plants are often relatively new and efficient, and replacement capacity is not available yet. In addition, we have an obligation to protect the interests of our shareholders and capital providers by not selling these plants at a loss, which in itself would also not benefit climate change mitigation efforts.

However, in some cases, we take the view that divestment to another party is a viable option to decarbonise the portfolio, as in the case of the Fangchenggang Power Station from which CLP divested in 2022. We carefully select new owners to ensure the plants will continue to be operated efficiently and responsibly, with consideration given to community impacts and employment conditions. These divestments provide CLP with capital to accelerate investment in non-carbon energy projects.

In 2019, the baseline year of our science-based targets, we had a total of 11,997MW of coal-fired generation capacity on an equity plus long-term capacity and energy purchase basis, representing 50% of our portfolio. The share decreased to 42% as of the end of 2023 and is expected to be further reduced to 20% in 2030.

Share of coal in CLP's generation and energy storage capacity



2023	
Non-minority-owned coal-fired generation	33%
Minority-owned coal-fired generation	9%

2030 (Projected)	
Non-minority-owned coal-fired generation	16%
Minority-owned coal-fired generation	4%

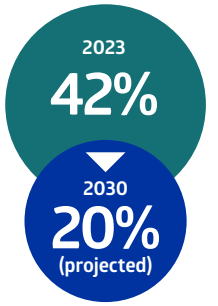
Plans are in place to retire or reduce the use of the remaining coal-fired power plants, as listed below:

- In Hong Kong, Castle Peak Power Station is the largest coal-fired power station. Output from the four 350MW coal-fired generation units at Castle Peak A Power Station has been progressively reduced. They will be retired gradually in the next few years, as we develop reliable supply from natural gas and non-fossil fuels to allow the replacement of coal.

  We also plan to progressively reduce coal-fired generation at the four 667MW units at Castle Peak B Power Station and phase out coal completely for CLP's operation in Hong Kong by 2035 at the latest.
- In Australia, EnergyAustralia's planned closure of Yallourn Power Station in 2028 is progressing as scheduled. Yallourn has played a critical role in ensuring the energy supply of Victoria since 1974. Its closure will reduce CLP's Scope 1 GHG emissions by 29% based on the 2023 level, but it must be carried out carefully to ensure a just transition.

See the case study on Yallourn Power Station's just transition on p.20 for more information.

Share of coal in CLP's generation and energy storage capacity

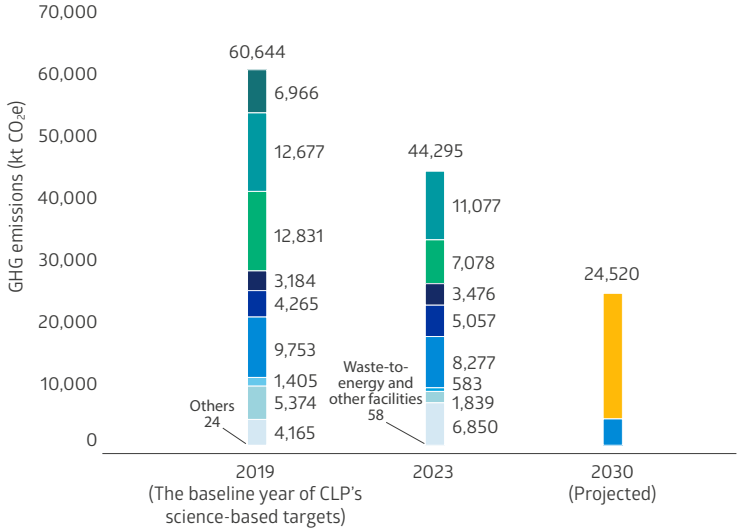


— The Mount Piper Power Station is the newest coal-fired power station of the Australian National Electricity Market (NEM) in New South Wales. While it was initially planned to meet base load demand, its role will be shifted to serving as a back-up source of energy to support renewable energy intermittency. The goal is to reduce the overall volume of electricity generated at Mount Piper in the lead-up to its retirement by 2040. The timing at which Mount Piper can transition to a reserve role is dependent on the speed of the NEM decarbonisation, including the deployment of infrastructure, renewables and renewables firming.[17]

— For CLP's minority-owned coal-fired power plants in Mainland China and the Taiwan region, we have limited flexibility to accelerate their decarbonisation given our non-controlling shareholding. In Mainland China, CLP is exploring divestment of its minority-owned coal-fired assets before 2040. In the Taiwan region, CLP has a 20% equity interest in Ho-Ping Power Station, which was commissioned in 2002. It operates under a 25-year power purchase agreement with Taiwan Power Company. CLP plans to also seek exit from this investment before 2040.

— In India, Jhajjar Power Station remains a major emitter in CLP's portfolio, accounting for around 9% of CLP's Scope 1 GHG emissions. The plant has played a critical role for the community in meeting electricity demand over the last few years. Its current power purchase agreement contract runs until 2037.

CLP's past and projected absolute greenhouse gas emissions of electricity sold and phase-out schedule of fossil fuel assets



- **Fangchenggang Power Station**
  Divested in 2022
- **Yallourn Power Station**
  To be phased out in mid-2028
- **Castle Peak Power Station**
  A Units to be phased out before 2030; and B Units to phase out coal by 2035
- **Jhajjar Power Station**
  To be phased out in mid- to late 2030s
- **Mount Piper Power Station**
  To be phased out before 2040
- **Minority-owned coal-fired assets in Mainland China and Taiwan region**
  To be phased out before 2040
- **EnergyAustralia's gas-fired assets**
  Operate the assets for their technical lives to support a net-zero grid
- **EnergyAustralia's purchase from the National Electricity Market**
  Subject to market developments
- **Black Point Power Station**
  Studying decarbonisation options including the use of hydrogen produced from non-carbon emitting sources
- **Purchased energy and assets other than minority-owned coal-fired assets (2030 only)**

Note: The figures are on an equity plus long-term capacity and energy purchase basis.

Just transition

CLP is committed to the principle of a just transition for our workforce, customers and the community. We are continually balancing the interests of different stakeholders, while considering the reliability, affordability and sustainability of our power supply. We recognise the importance of putting people at the centre of our climate agenda and addressing the potential social impacts that the net-zero transition could entail for its different operating regions.

Adhering to corporate policies in respective areas, we develop a specific transition plan for each asset, catering to the circumstances and needs of the stakeholders concerned. Comprehensive support is provided to employees whose jobs are affected by business change or restructuring. This includes support tailored to individual needs, such as training and skills development, career planning, assistance for redeployment and financial counselling.

We also actively engage with local stakeholders, including employee representative organisations or local educational institutions to ensure that study opportunities are developed to help meet both the needs of our people, and the region's new and emerging industries.

For example, in March 2021, EnergyAustralia announced its plans to retire Yallourn Power Station in 2028. This timeframe of seven years' notice of closure represented more than double the minimum notice period required under regulatory rules. Its closure is expected to reduce EnergyAustralia's Scope 1 GHG emissions by 60% on 2019–2020 levels in 2028–2029.

To ensure a just transition for the workforce of the power station and the community of the Latrobe Valley, EnergyAustralia has planned a series of business actions that place people at the heart of Yallourn's exit.

Case study

Yallourn power station in Australia: ensuring a just transition for our workforce and community

In 2022, EnergyAustralia launched an AUD$10 million Yallourn Transition Program, providing tailored support to help the workforce plan, prepare and reskill for the future beyond Yallourn. This includes personalised career plans, support for all reasonable training identified by the employee, individual career coaching, financial advice and planning, small business seed funding, links to employment opportunities and redeployment assistance.

In October 2023, EnergyAustralia announced a programme to support Yallourn Power Station workers to undergo retraining for work in a proposed offshore wind project and secure future employment. The Job Upskilling and Matching Program matches interested Yallourn workers to roles in offshore wind projects located off the Gippsland coast and provides the necessary training to upskill them for a successful future career in offshore wind.

Besides support for its workforce, EnergyAustralia also continues to engage its workers and local communities through forums and meetings with local groups and unions, and through community investments.

As for the Yallourn site, EnergyAustralia acknowledges that the power station operates on traditional lands of the indigenous Australian Braiakaulung people and understands that their culture and traditions are intrinsically linked to the land. As part of its closure plan, EnergyAustralia intends to remediate the surrounding area to enable future community use, with areas dedicated to amenity and enriching environmental outcomes.

EnergyAustralia's objective is to deliver a positive legacy by supporting the repurposing of the site to provide both community assets and opportunities for future economic development and jobs in the region. The company is also actively investing resources into exploring credible repurposing opportunities.

While finalising the parameters for rehabilitation is some years away, governments, local communities and industries will be engaged to determine the use of the land post-closure. EnergyAustralia's ambition for Yallourn is to work towards the creation of a multi-purpose useable community space by converting the mine into a lake interconnected with the adjacent Morwell and Latrobe Rivers. This approach will be designed to deliver a safe and stable landform which minimises impacts to the environment through the prevention of uncontrolled fires and major mine failures.

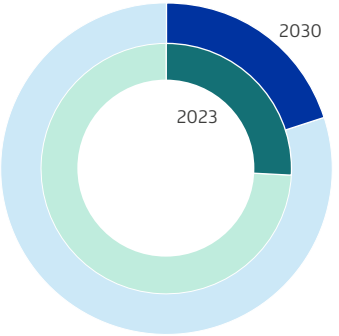
During the past 20 years, more than 300,000 plants of 100 different species at Yallourn have been planted with the goal of creating an environment that attracts native birdlife and, in the lake, aquatic species. Part of the site, which will be surrounded by native bush, woodland and wetlands, could provide recreational access and amenity to the community.

For further details, please read the Yallourn case study in the World Business Council for Sustainable Development's (WBCSD) *Achieving a just transition in the energy system* report.

Enable a fuel switch for power generation

Centralised fossil fuel generation will continue to have a vital role in providing a stable energy supply in many markets. Fossil fuel generation assets have another advantage over renewable energy in that they can be deployed when needed, for instance, to meet peak load demand. With its role as a transition fuel, gas-fired generation capacity, on an equity plus long-term capacity and energy purchase basis, has increased during 2019 to 2023. However, its proportion in our generation portfolio will reduce from 26% in 2023 to 20% in 2030, when more non-carbon sources of energy become available.

Share of gas in CLP's generation and energy storage capacity



Gas-fired generation	
2023	26%
2030 (Projected)	20%

In Hong Kong, CLP will seek to replace coal-fired generation with lower-carbon fuels such as natural gas in the interim. Our key initiatives include:

- A new combined-cycle gas turbine (CCGT) generation unit at Black Point Power Station (D2) is expected to go into full service in 2024. It is one of the most efficient gas-fired power generation units in the world and will enable a further increase in the proportion of natural gas as a transition fuel in Hong Kong's fuel mix for power generation.
- A new offshore LNG terminal using floating storage and regasification technology also went into service in July 2023. The terminal enhances Hong Kong's fuel supply stability by adding a new supply source for natural gas and enables Hong Kong to source competitively priced natural gas from international markets.

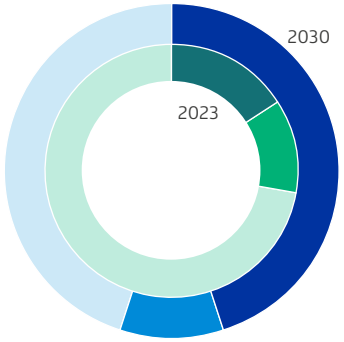
CLP will also continue its efforts to pave the way for a switch to hydrogen produced from non-carbon emitting sources as a main fuel replacing natural gas in the long run once the technology becomes commercially viable. The progress and plans are as follows:

- In Australia, Tallawarra B Power Station, which came into commercial operation in February 2024, has been designed to be capable of being powered by a blend of gas and hydrogen. Subject to the commercial viability of the supply of renewable hydrogen in the region, it is targeted to have a 5% blend of renewable hydrogen from 2025, which is equivalent to around 2% GHG emissions reduction measured against Tallawarra B Power Station. EnergyAustralia will assess the feasibility of incrementally higher renewable hydrogen blends over time.[18]
- CLP Power is also in discussions with major turbine suppliers on hydrogen technology development and the feasibility of repurposing existing natural gas-fired power generation units in Hong Kong to run on hydrogen. We are now also delivering a five-year pilot project in Hong Kong that will use hydrogen in combination with natural gas at Black Point Power Station. In parallel, we are assessing the feasibility of retrofitting Black Point Power Station in the longer term with carbon capture facilities as an alternative decarbonisation option.
- However, progress in global development of hydrogen production and transmission remains slow. Therefore, investment in its supply will depend on demand confirmation, while investment on preparation works for its adoption will need to be ramped up. Nevertheless, we continue to see hydrogen playing a key role in our long-term decarbonisation plan. This is because Mainland China has been a forerunner in hydrogen production over recent years and is potentially one of the main suppliers of hydrogen produced from non-carbon emitting sources for CLP's Hong Kong operations.
- In support of development in hydrogen, CLP has joined H2Zero, a global initiative launched by the WBCSD and the Sustainable Markets Initiative in 2021. H2Zero aims to increase market confidence in the growth of decarbonised hydrogen by 2030 and accelerate the use and production of hydrogen as an essential part of the future net-zero energy system.

Grow non-carbon energy

Growing the supply of non-carbon energy has been a focus of CLP's investment since we launched the Climate Vision 2050. As the cost of renewable assets continues to fall and different markets commit to increase the share of renewables in their energy supply, new non-carbon generation capacities are essential to fill the supply gaps from increasing energy demand and retirement of fossil fuel assets.

Share of non-carbon energy in CLP's generation and energy storage capacity



2023	
Renewable generation	16%
Nuclear generation	12%
2030 (Projected)	
Renewable generation	45%
Nuclear generation	10%

We have been growing our non-carbon energy fleet steadily and the proportion of generation and energy storage capacity from nuclear and renewable sources is expected to grow significantly from 28% in 2023 to 55% in 2030 on an equity plus long-term capacity and energy purchase basis:

- Aligned to Mainland China's decarbonisation pathway for a low-carbon future, CLP has been expanding its renewable energy portfolio and currently has over 40 renewable energy projects, either in partnership or full ownership as of the end of 2023. In the same year, the construction of the 150MW Bobai Wind Farm began while the 50MW Xundian II Wind Farm and the 74MW Yangzhou Gongdao Solar Farm entered into operation. CLP expects the momentum in the growth of wind and solar assets to continue in the next few years, and it already has around 1,130MW of renewable energy projects planned to start construction in 2024.
- EnergyAustralia's Climate Transition Action Plan (CTAP), published in 2023, set out its plan to achieve net zero by 2050 across Scope 1 and 2 emissions, along with its intention to develop a decarbonisation pathway for Scope 3 emissions by the end of 2024. A key focus is to expand its renewable portfolio to include up to 3GW of renewable energy by 2030, with a focus on large-scale wind-generation assets. EnergyAustralia has been working with partners and participating in a range of government-led processes to achieve this goal.

~1,130 MW

The capacity of CLP's renewable energy projects in Mainland China which are planned to start construction in 2024

55%

The projected proportion of CLP's generation and energy storage capacity from nuclear and renewable sources in 2030

— India aims for ambitious renewable energy goals. Apraava Energy is one of the few players in the power sector in India to have its target validated by SBTi. The target consists of reducing generation-related GHG emissions intensity (Scope 1 and Scope 2) (t CO_2e/MWh) by 46.3% by 2027, from its 2022 base year. An ambitious growth plan in renewable energy, which covers the next five years in particular, underpins Apraava Energy's ambition to achieve this target.

— In our home market of Hong Kong, nuclear energy, as a zero-carbon energy source, continues to play a key role in energy supply. Since 1994, about a quarter of the city's electricity has been imported from Daya Bay Nuclear Power Station in Guangdong province. To meet Hong Kong's 2035 decarbonisation target, CLP will explore importing more nuclear energy and renewable energy in a manner that is acceptable to the community. We also continue to monitor offshore wind farm technology development and review its feasibility for Hong Kong with the Government.

Waste-to-energy development in Hong Kong

CLP Power supports the Hong Kong Government's energy policy and explores practical local renewable energy opportunities despite limited natural resources and land scarcity. Since 2020, we have used landfill gas from the West New Territories Landfill for power generation. Over the years, a number of large-scale renewable energy projects have also been connected to our grid, including the solar farm at Siu Ho Wan Sewage Treatment Works, and waste-to-energy facilities at Organic Resources Recovery Centre Phase 1 (O · PARK1) and the T · PARK, a sludge treatment facility in Tuen Mun. Going forward, we will continue to engage with the Government on the development of waste-to-energy facilities.

The waste-to-energy process generates heat or electricity using waste as a fuel source. GHG is emitted from combustion of non-biogenic wastes – for example, plastic and synthetic rubber derived from petroleum.

The emissions from waste-to-energy facilities depend on the composition and quantity of the waste, as well as the technology, efficiency and emissions control measures of the facilities.

Waste-to-energy is considered as renewable energy by the Hong Kong Government[19] as waste is constantly replenished by human activities. However, it does not meet the criteria for non-carbon energy. With the city continuing to develop waste-to-energy facilities, more electricity is expected to be sent to CLP's power grid. The I·PARK1, Hong Kong's first municipal solid waste treatment facility, is scheduled for commissioning in 2025. This is forecast to increase CLP's Scope 3 Category 3 GHG emissions, given these are indirect emissions from the purchased electricity that CLP sells to customers. As more waste-to-energy facilities start to operate in Hong Kong, we expect that their emissions will become increasingly significant in CLP's GHG emissions profile, subject to the technology used in the process.

IEA:

~2 million

The amount of kilometres that transmission and distribution grids need to reach globally per year to 2030 to meet net-zero emissions

Build infrastructure to support non-carbon energy import and renewable energy growth

As the proportion of renewable energy integrated into the grid increases, the power system needs to be simultaneously upgraded to enable greater adoption of net-zero energy. A modern power system includes a transmission and distribution network, energy storage solutions and AMI. These are key enablers for the energy transition. Energy storage solutions, such as pumped hydro storage and battery energy storage systems (BESS), are pivotal to the successful integration of additional renewable energy, while maintaining the balance between power supply and demand.

An IEA report in 2023 indicated that for the electricity sector to meet net-zero emissions, until 2030, the global investment to transmission and distribution grids needs to be doubled and reach around 2 million kilometres per year.[1] In the first instance, the transmission and distribution network needs to be available so that new energy supply is accessible to customers. It is also important to enable power systems that integrate centralised and decentralised generation, and balance demand against different generation profiles to optimise cost efficiency, reliability and environmental performance.

CLP has been investing significantly into transmission and distribution:

- In Hong Kong, CLP Power will need to continue to invest in our networks to support the city's infrastructural and economic growth with new towns and area developments. In addition, the upgrade of the Clean Energy Transmission System (CETS), connected to Daya Bay Nuclear Power Station and the power network of the China Southern Power Grid in Mainland China, is planned to be completed in 2025. The project is replacing cross-border overhead line conductors to increase transmission capacity. Once completed, it will enable CLP to support the Government's plan of importing more non-carbon energy to the city and help phase down coal. Furthermore, a new 100MW utility-scale BESS at Castle Peak A Power Station is expected to be commissioned in 2028 to complement the increase in non-carbon energy. In the medium term, to meet the 2035 decarbonisation target, additional quantities of non-carbon energy will be required for Hong Kong through regional cooperation and additional interconnection infrastructure. CLP will continue to work with stakeholders to develop the best approach for our customers.
- In Mainland China, CLP has been expanding its investment in BESS to align and support its growth of renewable energy, including in Qian'an III, Xundian II, Gongdao, Huai'an Caoyun, Yixing and Sandu II power stations. The inclusion of BESS is expected to be a requirement for future new wind and solar projects.
- EnergyAustralia's energy storage portfolio will be further strengthened on completion of the Kidston pumped hydro energy storage facility in Queensland in 2024 for which EnergyAustralia is the energy off-taker. Another pumped hydro-electricity storage project is proposed for Lake Lyell in New South Wales. The Victoria State Government has given planning approval for a new 350MW Wooreen battery energy storage system. This will support a continued reliable power supply in the region from 2028 once Yallourn Power Station is retired.
- In India, while renewable energy remains a priority, Apraava Energy is expanding into non-generation businesses such as transmission and advanced metering infrastructure. The acquisition of two greenfield transmission assets in FY 2022–23 has increased its footprint across five states in India. Power transmission will remain a focus for the business.

Accelerating the energy transition across sectors

Enable greater electrification

The IEA considers electrification as one of the most important strategies for reducing carbon emissions from energy, where the majority of emissions reductions come from the shift towards electric transport and the installation of heat pumps.[16] CLP has been pursuing opportunities to enable greater electrification across sectors such as transport, buildings and industries.

As part of our efforts in accelerating eMobility, our key initiatives include the following:

- We support the Hong Kong Government's electrification of all transport sectors including public transportation and commercial vehicles. We support our customers, both residential and commercial, in planning and delivering their EV charging infrastructure within various premises.
- Smart Charge (HK) Limited, a joint venture of HKT and CLP, has been providing a one-stop service for EV charging, with a focus on residential home charging. The services range from charging infrastructure building to charger installations, maintenance and rentals.
- CLP*e*, a subsidiary of CLP Holdings, launched a business for eMobility charging solutions focusing on the commercial vehicle market. This business offers engineering, procurement and construction capability for charging infrastructure as well as Charging-as-a-Service covering investment, installation and operations for commercial needs.
- In 2023, we teamed up with 14 like-minded businesses and organisations to launch a cross-sector partnership called the eMobility Network to promote the adoption and use of electric commercial vehicles in Hong Kong.
- CLP*e* expanded its presence in Mainland China's EV sector through a joint venture with TELD. TELD is a subsidiary of smart power equipment manufacturer Qingdao TGOOD Electric Company Limited, and is the nation's largest operator of EV charging services with business spanning more than 300 cities. As of the end of 2023, our joint venture operated 181 charging stations with more than 5,500 chargers in Shenzhen, Dongguan and Zhuhai.

To help address GHG emissions from buildings, CLP has been working with property developers to encourage emissions reduction projects and electrification of residential buildings in Hong Kong. We also offer solutions and appliances to help customers save energy and increase their energy efficiency, such as promoting the use of induction stoves and electric water heaters.

The construction industry in our home market of Hong Kong has traditionally relied on diesel generators to provide power supply at construction sites. We have been supporting the industry to switch to BESS as an economical and lower-carbon option.

CLP launched a cross-sector partnership called the

eMobility Network

in 2023 in collaboration with 14 organisations.

EnergyAustralia intends to develop capabilities and product offerings to assist customers along their energy transition journeys. For instance, the Solar Home Bundle initiative helps customers in New South Wales to install rooftop solar and battery systems that effectively reduce their emissions from electricity use. EnergyAustralia is also developing trials for prioritising the deployment of energy-efficient heat-pump water heaters to help customers gradually replace gas water heaters with more efficient use of electricity.

Increase energy efficiency

Improving energy efficiency is crucial for reducing near-term emissions as it mitigates the increase in peak demand partly due to electrification and reduces stress on electricity networks. As demand for more energy solutions and services that empower customers to manage their energy consumption continues to increase, CLP envisions a future where we are not only providers and generators of electricity, but also facilitators of high-quality services to assist customers in fulfilling their energy requirements, making informed energy decisions, and pursuing their own sustainability objectives.

Currently, CLP's Energy-as-a-Service business model offers a one-stop solution package for low-carbon technology, demand-side and efficiency management services, renewable energy and demand-supply balancing solutions. Customers pay only for the energy they use under this model, without a need to own or maintain any hardware devices.

Avoided emissions

Avoided emissions are GHG emissions that are reduced outside an organisation's value chain, based on the organisation's products or services that enable lower emissions for its customers or the broader society. They are an important indicator of an organisation's contribution to climate action and the energy transition.

CLP is supporting its customers and the community to decarbonise through the development and scaling of low-carbon energy solutions. This includes our energy solutions that support customers to improve their energy efficiency, or to electrify. However, these solutions also increase the demand for electricity, and shift emissions from end users to electric utilities such as CLP.

As we expand our energy service offerings, these avoided carbon emissions will be reflected in the GHG profile of our customers, but not in CLP's GHG account.

With reference to WBCSD's *Guidance on Avoided Emissions*[20], we have developed a methodology and will start piloting its implementation. The assessment of the avoided emissions in our energy solutions measure their climate-related benefits and provide a more holistic picture of our role as a responsible energy provider. This is complementary to our tracking of GHG emissions reduction in our own portfolio.

Finding the right innovation partners

We continue to look at opportunities to expand our access to innovations and technologies available globally. We explore new business models and technologies that are driving the energy transition and have the potential to enhance CLP's core business and enable long-term growth. This is done through venture investing or by crowd-sourcing innovations. Over the last few years, we have been actively participating in accelerator programmes including Free Electrons and the Phoenix Programme, run by Mainland China's CYZone.

CLP is also committed to supporting our ecosystem partners in developing decarbonisation technology such as hydrogen. For example, in 2023, CLP sponsored a technology pilot with Hydro X, an Israeli hydrogen transportation and storage technology company, which successfully demonstrated that Hydro X units can safely store and extract hydrogen at high quality as an initial step to scale up its technology platform. In 2021, Hydro X received an investment from CLP-OSEG, CLP's joint venture with Other Sources Energy Group in Israel.

CLP is also expanding its research capabilities to identify emerging ideas and technologies that could critically impact the business over the long term. This includes working across our broad network of partnerships with international associations, research institutes and universities to share knowledge.

For example, we are an executive member of IERE (formerly the International Electric Research Exchange), an international electric power technology platform. Through this, we participate in a variety of research and development projects together with leading utilities and research institutes.

We also established the CLP Research Fellowship Programme in 2023 in collaboration with two Hong Kong universities. The programme supports research for energy-related projects including transport electrification and customer insights into energy consumption.

The role of carbon markets

Our participation in carbon markets

The Kyoto Protocol in 1997 cemented the idea that carbon markets are a viable mechanism to allocate capital towards projects that enable emissions reductions. Since then, compliance and voluntary carbon markets have evolved such that they are now pivotal for delivering emissions reductions at scale to meet the challenge of a net-zero future.[21] Standard setters agree that the carbon markets have become a legitimate mechanism for companies to address emissions outside their own operations and value chain.[22] While COP28 did not yet deliver the required consensus to launch a global carbon trading market, the International Emissions Trading Association (IETA) states that "there cannot be net zero without international carbon market mechanisms".[23]

For CLP, the mitigation of our direct climate change impacts remains our highest priority. Our current approach is to use credible carbon offsets as a last resort to offset emissions in our value chain, but only after having reached a decarbonisation rate aligned with a 1.5°C pathway. If we are unable to further reduce our emissions in 2050 and thereafter, we will consider how we engage in carbon markets. In the meantime, our investments will go directly towards reducing our Scope 1 emissions that support our customers to reduce their own Scope 2 emissions, and into investments that support customer energy efficiency in the markets where we operate.

At EnergyAustralia, Tallawarra B Power Station has committed under its funding arrangements with the New South Wales Government to purchase offsets over the asset's life, including an undertaking to use Australian Carbon Credit Units until at least the end of 2030. This is to account for residual emissions where the plant is run using non-hydrogen gas.

CLP supports efforts of the Integrity Council for the Voluntary Carbon Market (ICVCM) and the Voluntary Carbon Markets Integrity Initiative (VCMI) to improve the integrity of the voluntary carbon markets and establish related governance initiatives and guidance. We will continue to monitor the implications of their work as a seller and a buyer of carbon credits, including the application of the ICVCM *Core Carbon Principles*[24] and VCMI *Claims Code of Practice*[25] in the CLP context.

In response to the changes in our operating environment, we are undertaking a carbon market strategy review. This includes an evaluation of investment opportunities in carbon markets and our ability to issue carbon credits from new projects. It will also consider our potential role in the development of voluntary carbon markets in Hong Kong and other regions in which we operate, as well as the deployment of transition credits[26] as a financing tool to accelerate the phase-out of coal from CLP's asset fleet. We are also monitoring the risk of existing and anticipated regional compliance markets, and the potential impacts of international agreements on carbon markets under Article 6 of the Paris Agreement.

Our role in enabling customers to offset their emissions

CLP has been issuing carbon credits through its renewable assets at Apraava Energy in India and at a wind farm in Mainland China, presenting options for its customers to offset their Scope 1, 2 and 3 emissions.

EnergyAustralia, meanwhile, has been offering options to customers to offset their carbon emissions generated from household electricity and gas use under its Go Neutral programme.

As carbon markets continue to evolve, other instruments such as Renewable Energy Certificates (RECs) and Green Electricity Certificates (GECs) have also become available, providing customers with more options of decarbonisation products.

Further details are available in the information box on the right.

Presenting a range of decarbonisation options for customers

CLP complements its energy services with energy attribute certificates including long-term REC contracts in Hong Kong and GECs in Mainland China to support customers in achieving their own decarbonisation goals.

In Hong Kong, CLP Power's RECs allow business and residential customers to support local renewable energy development while reducing their own Scope 2 emissions. The RECs represent the environmental attributes of electricity produced by local renewable energy sources, including solar, wind and landfill gas power projects.

In Mainland China, CLP's renewable assets issue GECs. These are the only officially recognised renewable energy certificates on the Mainland, and can be used by Mainland China-based customers. The environmental benefits of renewable energy generation in Mainland China can be claimed to reduce Scope 2 emissions and meet obligations under China's mandatory Renewable Energy Portfolio Standard, or to support voluntary renewable electricity procurement.

GECs are conditionally recognised by RE100.[27] CLP's new wind and solar projects in Mainland China are eligible to sell their GECs alone or bundle them with corresponding electricity. This means that project developers own the environmental attributes of these projects, which can create an environmental premium.

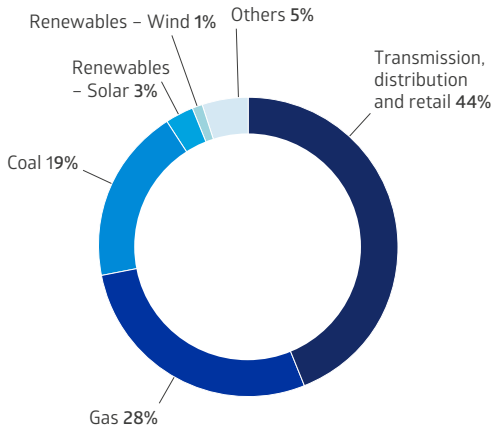
For customers with higher sustainability commitments, renewable power purchase agreements are also offered as an option for companies who wish to secure long-term energy supply from our Mainland assets. Direct investments into CLP's renewable energy projects through equity investment are also available for customers who wish to have higher stakes in renewable energy development and consequently secure direct offtake agreements for zero-carbon electricity from Mainland China.

Financing our future

To support our strategy to decarbonise our business, we plan to allocate a larger share of capital to physical or fixed assets outside of fossil fuel generation business.

The following charts demonstrate how we allocate resources to invest in different asset types to diversify our energy business. Our capital investment in coal assets is for maintenance, upgrades and efficiency improvements only and will not be used for the development of new coal-fired power plants.

CLP's 2023 capital investment by asset type



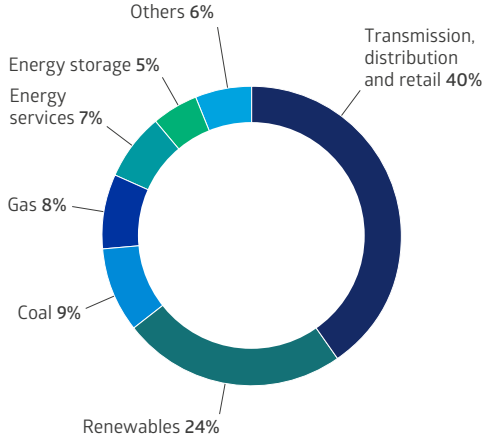
Notes:

1 Capital investment includes: i) capital expenditure in fixed assets, right-of-use assets, investment property, intangible assets; ii) changes in investments and advances to joint ventures and associates; and iii) acquisitions of asset/business. Any minor discrepancy in total is due to rounding of percentages.

2 Others include oil, other businesses outside of power generation, transmission, distribution and retail, as well as corporate or enterprise items.

Our total planned capital investment for the coming five years (2024–2028) will focus on power transmission, distribution and retail assets (40%) and renewable energy assets (24%), with a reduced share of fossil fuels (17%). Meanwhile, our total investment in energy services and energy storage is planned to take up 12%.

CLP's total planned capital investment for 2024–2028 by asset type



Notes:

1 Capital investment includes: i) capital expenditure in fixed assets, right-of-use assets, investment property, intangible assets; ii) changes in investments and advances to joint ventures and associates; and iii) acquisitions of asset/business. Any minor discrepancy in total is due to rounding of percentages.

2 Renewables include wind, solar, hydro and waste-to-energy.

3 Others include oil, other businesses outside of power generation, transmission, distribution and retail, as well as corporate or enterprise items.

Climate Action Finance Framework

CLP's Climate Action Finance Framework (CAFF) was first published in 2017, and updated in 2020, to reinforce CLP's sustainability leadership and commitment to driving a low-carbon economic transition, and to respond to increasing investor awareness on the climate change imperative.

The Framework details our methodology in raising climate action finance, including bonds, export credit loans, bank facilities and other forms of finance, and details its usage of financial transactions that support CLP's Climate Vision 2050 targets and commitments. Adequate resources are required to support CLP's strategy, in particular to decarbonise its portfolio, as it often involves capital-intensive infrastructure projects.

There are two types of Climate Action Finance Transactions under the CAFF:

— **New Energy Finance Transactions** are used to develop renewable energy, energy efficiency and low-emissions transport infrastructure projects; and

— **Energy Transition Finance Transactions** are used to fund projects that are supported by governments to deliver valid and significant emissions reductions.

Governance of the CAFF aligns with the Green Bond Principles and Green Loan Principles, which are a set of voluntary guidelines issued by the International Capital Markets Association that recommend transparency and disclosure and promote integrity in the development of the international green bond and green loan markets.

The four pillars under the CAFF include:

— the use of proceeds;

— process for project evaluation and selection;

— management of proceeds; and

— reporting.

Castle Peak Power Company Limited (CAPCO), a key subsidiary of CLP in Hong Kong, has entered into a series of Climate Action Finance Transactions since the establishment of CAFF in 2017. These include HK$18 billion of Energy Transition Finance Transactions to finance/refinance the construction of two CCGT generation units at Black Point Power Station, and the construction of an offshore LNG terminal and its associated subsea infrastructure. The transactions also include a HK$170 million New Energy Bond to fund the construction of a landfill gas power generation project at West New Territories Landfill. In 2021, CLP Power also issued a US$100 million New Energy Bond to finance the rollout of smart meters for its customers.

Since 2021, CLP has also further expanded its sustainable financing portfolio for its Scheme of Control (SoC) businesses to include sustainability elements in bank facilities. These facilities in part link to the annual aggregate emissions of sulphur dioxide, nitrogen oxides and respirable suspended particulates from our power stations in Hong Kong. As of 31 December 2023, CLP Power and CAPCO arranged a total of HK$13.2 billion emissions reduction-linked bank facilities with multiple tenors. This represents 73% of the total outstanding general purposes bank facilities arranged as of the end of that year.

For details on CAFF and annual reporting, please refer to the CLP Climate Action Finance Framework and download the latest Climate Action Finance Report.

Financing the managed phase-out of coal-fired assets

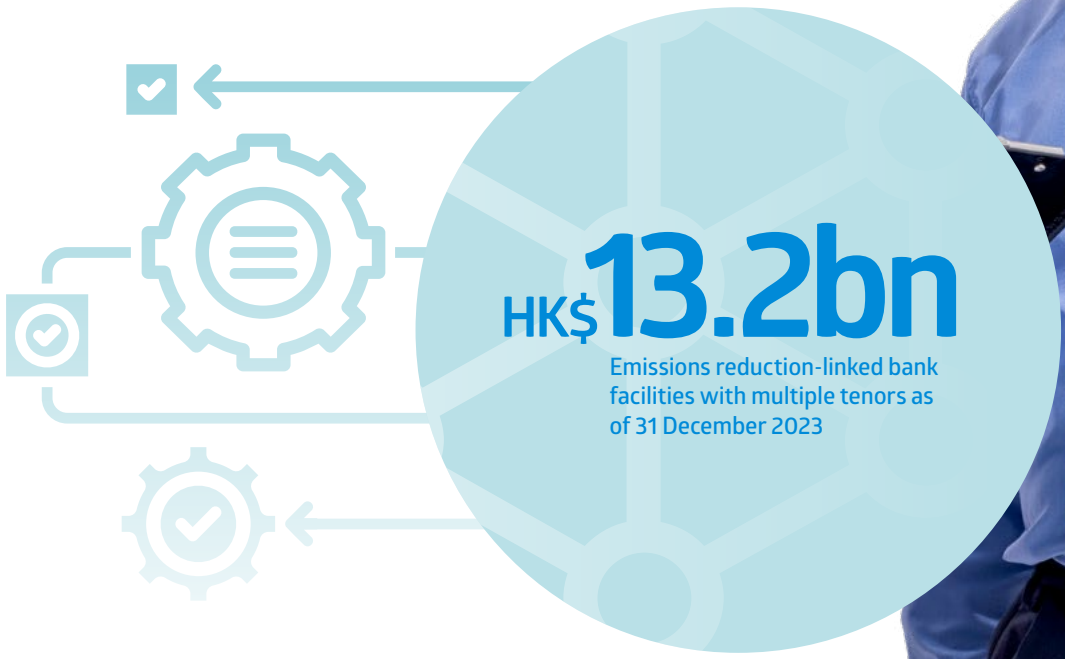
With more capital flowing into renewable energy development, financial support to accelerate the phase-out of coal would also play a crucial role in fuelling the energy transition.

As discussed in the "Understanding the bigger picture" section, phasing out coal generation in Asia Pacific could be more challenging than in some other regions.

In 2023, the GFANZ APAC Network developed a guide for financial institutions regarding the managed phase-out of coal-fired power plants in Asia Pacific.[5] It has called for a systems approach to address climate, energy security and socio-economic concerns. The proposed financial levers include:

- **Reducing cost of capital:** This might be achieved in part by making use of blended finance, such as refinancing that draws on public, multilateral development bank or Development Financial Institution sources that have significantly lower cost of capital, and/or through credit enhancements.
- **Alternative cash flows:** Coal-fired power plant owners may choose to diversify earnings and reduce dependency on coal through other income streams, such as through bundling with renewable energy projects, solar-for-coal swaps, and leasing site and grid connection to renewable energy developers.
- **Asset revaluation and pricing:** A reduced value of a coal asset may support the economics of a transaction, given the reduced operating period and associated cash flows.

CLP will continue to engage with the capital markets to support our Climate Vision 2050 and explore options to further accelerate our decarbonisation pathway.



HK$13.2bn

Emissions reduction-linked bank facilities with multiple tenors as of 31 December 2023

Embedding our Climate Vision

In this section

Sustainability governance

Sustainability is integrated into our business strategy and corporate governance. The CLP Board has overall responsibility for CLP's sustainability performance and reporting. This ensures that climate change, social impact and other sustainability issues are always considered as part of the corporate agenda.

As part of overall sustainability management, the Sustainability Committee and the Audit & Risk Committee have separate but complementary roles in climate change management. They are supported by the Sustainability Executive Committee.

The **Sustainability Committee's** responsibilities are to review, endorse and report to the Board on CLP's sustainability standards, priorities and goals. It also oversees the CLP Group's strategies, policies and practices on sustainability matters to ensure that those standards and goals are attained. The Committee is also responsible for reviewing sustainability-related disclosures in both the Annual Report and Sustainability Report, as well as monitoring compliance with any applicable laws and regulations of the jurisdictions in which CLP operates in regard to sustainability-related disclosures. The Terms of Reference for the Committee was updated on 1 January 2024, and is published on the CLP Group website.

The CLP Board Directors are provided with regular training and information sessions on sustainability-related topics to ensure they are kept up to date with the latest developments in sustainability (such as trends and regulatory changes) and are equipped with core competencies to oversee the management of climate-related issues.

CLP's sustainability governance structure

The **Audit & Risk Committee** (ARC) ensures that adequate risk management and internal control systems are in place and followed. Where deficiencies are found, appropriate remedial actions are undertaken in a timely manner. The ARC receives and reviews management's periodic internal control reports and the Group's quarterly risk management reports, which cover topics including those related to climate-related risks.

The ARC is also responsible for reviewing the assurance of the sustainability data in CLP's Sustainability Report. This includes the GHG emissions intensities and profiles of CLP's portfolio, all of which track the Group's progress towards its decarbonisation targets.

The latest Climate Vision 2050 received

final approval from the CLP Holdings Board

in February 2024.

The **Sustainability Executive Committee** (SEC) has the strategic responsibility to assess and manage sustainability issues at Group level. The SEC is supported by the **Group Sustainability Department** that is headed by a director. This department manages the Group's climate change strategy, which includes reviewing and reporting on progress on CLP's Climate Vision 2050; implementing sustainability reporting standards that are considered applicable to the Group; climate scenario analysis; assessing climate implications of new investment projects or of different energy services; and monitoring changes in the climate-related regulatory landscape. The department also assesses the implications of evolving stakeholder expectations in terms of sustainability and climate action, such as the voluntary carbon markets and the management of the Group's GHG inventory and performance.

CLP's Senior Management Remuneration Policy determines incentive payments and total remuneration for the senior management by considering a broad range of performance indicators including financial, operational, safety, environmental, social, business sustainability (taking response to climate change into account), governance and compliance-related factors linked to CLP's strategy.

Further details on these committees are available in our Annual Report and Sustainability Report.

Stakeholder engagement and advocacy

CLP is committed to open, transparent, regular and timely communication with its stakeholders and offers a readiness to address their concerns to build trust and confidence. This is delivered through our CLP Stakeholder Engagement Framework.

We act as a trusted partner to governments and regulators in shaping practices and services that contribute to developing sound government energy policies and laws that balance social, economic and environmental needs. Our Sustainability Report offers further details on the framework and discloses engagements with our stakeholders and their key areas of interest.

The transition to a net-zero energy economy remains one of the critical agenda items for governments around the world. We engage with governments and regulators in formulating decarbonisation policies and plans to deliver sustainable low-carbon energy systems and infrastructure investment that drives economic growth. Our participation in a range of industry and professional bodies enables us to provide input to the major issues deemed crucial to the energy sector's ongoing viability and success, advocating as a thought leader of the industry.

For instance, we have been a longstanding member of the WBCSD, IETA and the World Energy Council. In Hong Kong, CLP became a founding sponsoring partner for the Hong Kong chapter of the Climate Governance Initiative, while CLP Power has also been a supporter of the Business Environment Council in Hong Kong since its launch in 1992. Meanwhile, EnergyAustralia regularly contributes to the work of the Australian Energy Council and the Business Council of Australia.

We aim to engage in sponsorships with organisations that have a climate position aligned to our own. Our memberships to organisations are reviewed by the respective Corporate Affairs teams based on business objectives and engagement purposes. All membership proposals are subject to the final approval of senior management of the Group or relevant business units.

Managing climate-related risks and opportunities

Risk management

Proactive and effective risk management is a foundation of our Group's long-term growth and success. Risk management is integrated into all our business and decision-making processes, as well as our day-to-day operations. The assessment of our climate-related risks follows our enterprise risk management process, which is detailed in the Risk Management Report of the Annual Report.

Climate-related transition risks and climate-related physical risks are included as Group top tier risks. The assessment, review and management of these risks are supported by a multi-level process, in line with our governance structure:

1. We conduct the assessment to understand the Group portfolio's exposure to climate-related risks in the long term, based on asset types and locations. References are drawn from the latest climate science and policy outlooks proposed by published, third-party scenarios. The assessment is conducted every few years as new climate data and/or policies become available.
2. Business units analyse and evaluate the risks in their markets and assets, including any mitigation or adaptation measures that are in place. They also review and develop appropriate risk management measures.
3. The Group Risk team manages an integrated top-down and bottom-up risk review process and compiles a Quarterly Group Risk Management Report. This process enables thorough review by the Group Executive Committee and provides assurance for the Board through the Audit & Risk Committee.

Scenario analysis

We use scenarios to assess the resilience of our climate strategy. This involves assessing and understanding how the identified climate-related risks and opportunities will play out in different climate scenarios. CLP uses three scenarios to help us understand risks, and test the resilience of our strategy.

Details of our selected scenarios are included in the "Our scenario analysis and exposure to climate-related risks and opportunities" section of the Appendix on p.35.

- **High-emissions scenario –** where economic growth is strong and carbon emissions continue to increase. Physical risks are higher under this scenario and it is used as the "worst case" for physical risks in our assessment.
- **Low-emissions scenario –** where countries are meeting their commitments to a specific net-zero policy and limiting global warming in line with the Paris Agreement. Transition risks are higher under this scenario, as regulatory changes, technology advancement and behavioural changes are required.
- **Deferred transition scenario –** a bespoke scenario that focuses on the more likely pathway in CLP's markets. This is similar to a High-emissions scenario in which GHG accumulates to have severe climate-related physical effects. Meanwhile, delayed policy changes lead to more abrupt shifts, requiring more investment with high transition risks.

In 2023, we updated our analysis for risks and opportunities related to climate change to:

- Focus on CLP's major markets of Hong Kong, Mainland China and Australia;
- Update the scenarios based on the latest international agreement on climate change. Specifically, the High-emissions scenario now incorporates the latest update from the United Nations Intergovernmental Panel on Climate Change (IPCC) in 2022, and the Low-emissions scenario is now adopting a 1.5°C scenario (previously, a well-below 2°C scenario was used); and
- Review the exposure of CLP's portfolio by using a High-emissions scenario, a Low-emissions scenario and a bespoke CLP scenario.

>4°C

Our High-emissions scenario used for climate-related risks and opportunities analysis has a temperature rise of >4°C by 2100.

1.5°C

Our Low-emissions scenario has been updated from a well-below 2°C scenario to a 1.5°C scenario.

Climate-related risks and opportunities

The changing energy landscape is the backdrop to CLP's strategy. We need to understand both the physical and transition risks – societal and economic trends emerging from the world's shift to a low-carbon future – that impact our business.

We define risk as the effect of uncertainty on objectives, in line with international standards and best practices. The effect can be positive, negative, or both, and can result in opportunities and threats. Physical risks are highest in the High-emissions scenario, while transition risks and opportunities are generally more apparent for the Low-emissions scenario, compared to the Deferred transition scenario where risks and opportunities become more pronounced from the medium term onwards.

Understanding physical risks

Climate-related physical risks have the potential to compromise the integrity of CLP's assets or disrupt service delivery. For example, CLP has experienced multiple large-scale extreme weather events in recent years in regions where it has assets. Such weather events include super typhoons, forest fires, rainstorm-induced flooding and landslides. Chronic weather pattern changes, such as warmer average ambient temperature and changing wind patterns, are also taking place globally at a gradual pace.

While such events are expected to occur more frequently, the change in weather and climate will not be experienced uniformly around the world. There is also considerable variance within countries such as in Mainland China and Australia. The impact of different extreme weather events on different asset types also varies. Therefore, we assess climate-related physical risks by understanding how different climate hazards (such as extreme heat, extreme wind or water stress) will affect individual assets, and then examine the overall risks to CLP, with consideration to how the portfolio will change.

Understanding transition risks

Transition risks typically refer to the risks associated with transitioning to a low-carbon economy. Our transition plans are aligned to the pace of markets where we operate. Policy, regulatory changes and technology are some of the strongest drivers – and enablers – for decarbonisation.

The long asset life of electric utilities means that we need to closely monitor the changes in these drivers and continually engage with stakeholders, including policymakers, to understand their expectations. We monitor regulatory changes, market structures, technological development and public sentiment to reduce the Group's exposure to transition risks.

	Risks	Opportunities
Short term (0–1 year)	Extreme weather events compromising the integrity of CLP's assets or that of the power system	Demand for cooling and associated energy service and energy efficiency offerings creates new revenue streams
	Potential stranded fossil fuel asset risks	Growth in battery storage
	Stigmatisation of carbon intensive sectors	
Medium term (1–5 years)	Tightening national decarbonisation policies	Demand for low-carbon electricity presents business growth opportunities
	Emerging carbon pricing mechanisms increase compliance costs	
Medium to long term (5+ years)	Chronic climate pattern changes affect the performance of renewable assets	Further electrification increases energy demand
	Increase in energy demand strains our current assets	

Physical risks | Transition risks and opportunities

At the same time, the transition to a low-carbon economy offers an opportunity to make energy systems more efficient and resilient by providing low-carbon electricity to customers amid growing electricity demand. Decentralised energy solutions give us the opportunity to upgrade and expand the electricity grid and diversify revenue streams. The deployment of digital technologies also opens previously unavailable opportunities in system management.

Climate-related risks and opportunities relevant to our assets and services across key markets are summarised in the table above. While some of these risk events may happen for different reasons, only those driven by climate change are considered climate-related risks and opportunities and included in this discussion.

See Appendix – "Our scenario analysis and exposure to climate-related risks and opportunities" on p.35 for details.

Appendix

In this section

Key assumptions underlying the GHG emissions projections

CLP's Climate Vision 2050 aims to achieve a net-zero energy transition that balances reliability, affordability and decarbonisation objectives. CLP recognises the challenges and uncertainties in achieving the goals set out under its Climate Vision, especially given the multi-decade time span of targets and commitments, during which the operating environment could change.

Our transition plan closely aligns with our business planning. Reasonable assumptions were used in preparing the corresponding GHG emission trajectory. Yet, considerable risks and uncertainties which may impact the delivery of our goals remain. This section outlines the key assumptions.

Forecast on asset plans

For the coal and gas-fired power plants in which CLP has operational control, we assume that they will run until the end of their planned operating period, or the end of their contractual offtake arrangements, unless there is an agreement between CLP, its subsidiaries, and/or its joint venture partner(s), and the respective authorities on the early closure or reduced use of any specific assets. Certain assets may also need to be repurposed and/or to have their operating period extended to provide reserve capacity. The impact of such use is assumed to be minimal and has not been accounted for in the GHG emissions projections.

For the coal-fired assets in which CLP has a minority stake, we intend to honour the current contractual arrangements and phase out these assets from CLP's portfolio before 2040. For the renewable energy assets in which CLP has an equity ownership, we assume that they will be repowered towards the end of their design life as needed to continue to operate.

Energy demand projection

As Hong Kong is our core market, GHG emissions from our electricity supply operation by CLP Power constitute a large part of the Group's emissions. CLP Power is regulated by the Hong Kong SAR Government under the SoC Agreement. It defines our role as an electricity provider and CLP Power's obligation to provide sufficient and reliable electricity. Accordingly, our transition plan is based on the energy demand forecast in territories currently served by CLP Power.

In formulating the decarbonisation approach for our Hong Kong operation, continuation of the SoC Agreement or an equivalent regulatory framework is assumed throughout the planning timeline. In the other markets in which CLP and its subsidiaries operate, CLP is one of many electricity providers. CLP's growth potentials in these markets have also been incorporated in our assumptions and as part of the Group's transition plans.

Generation capacity factors and GHG emissions factors

Our GHG emissions projections also depend on the capacity factors and the GHG emissions factors of our assets. These factors will affect the projected amount of our electricity generation and GHG emissions. For the existing assets in our portfolio, we project the electricity generation and emissions based on the Group's 2024–2033 business plan and/or the 2020–2022 average capacity factors and GHG emissions factors of the assets where appropriate.

For longer-term periods beyond the 2024–2033 business plan, we assume that the capacity factors of our non-carbon generation assets will remain constant while the capacity factors of our fossil fuel assets will gradually decline.

For any new assets planned to be added to our portfolio, we consider the design specifications and performance of similar assets when estimating their capacity factors and GHG emissions factors.

Pace of renewable energy project development
As an electric utility and renewable project developer, one of our levers to decarbonise is by expanding our renewable portfolio. While acknowledging the challenges facing Hong Kong, there is ample growth potential for renewable assets in our markets.

Our Climate Vision 2050 decarbonisation trajectory relies on key assumptions, such as the policy and regulatory environment remaining supportive, stable and conducive to new renewable energy development, renewable energy resources and sites being available, sufficient and suitable, and grid infrastructure being able to integrate more renewable energy. The expansion of our renewable fleet is also dependent on enough viable projects coming to market and us being successful in bids for new projects or development opportunities.

Availability of non-carbon electricity from Mainland China to Hong Kong
CLP Power currently draws electricity from Mainland China through its CETS, connected to Daya Bay Nuclear Power Station and the power network of the China Southern Power Grid. It is assumed that the CETS enhancement project specified in the Development Plan will boost transmission capacity to enable more non-carbon energy being imported to Hong Kong.

Further nuclear and renewable energy imports are assumed to meet the city's 2035 decarbonisation targets. We assume that power transmission capacity between Hong Kong and Guangdong province will have corresponding enhancement in this case. The energy imports are also assumed to be non-carbon, achieved through contractual arrangements with dedicated power generation plants which assure CLP of their safe and reliable provision of zero-carbon electricity.

Availability of hydrogen produced from non-carbon emitting sources
Hydrogen produced from non-carbon emitting sources is expected to play a critical role in decarbonising the electricity that CLP provides. Its development and deployment are also in line with *Hong Kong's Climate Action Plan 2050*. We are assuming that it will be commercially viable for full-scale hydrogen power generation in Hong Kong starting in the 2040s. EnergyAustralia, meanwhile, assumes to use a renewable hydrogen-gas blend at its Tallawarra B Power Station as soon as practically and commercially possible.[18]

Non-biogenic GHG emissions from waste-to-energy facilities
The amount of GHG emissions from waste-to-energy facilities depend on the non-biogenic components and the technology adopted for the waste treatment. In Hong Kong, the Integrated Waste Management Facilities (IWMF) will go into service in phases starting from 2025, and the amount of surplus electricity generated annually will increase progressively upon completion. In our GHG emissions trajectory, we have assumed an averaged GHG emissions intensity for the IWMF, with reference to the United States Environmental Protection Agency.[28]

We have also assumed that limited carbon capture and removal from IWMF Phase 3 will be developed after 2040. The estimated GHG emissions from these facilities will be included in CLP's Scope 3 emission, under Category 3.

GHG emissions intensity of the NEM in Australia
Falling under the scope of our GHG intensity, emissions from the generation of purchased electricity that is sold to CLP's customers also include the emissions from the net electricity purchased by EnergyAustralia from the NEM. Total GHG emissions depend on the changes in the grid emission factor and the net electricity purchased from the NEM, which in turn is affected by the decentralised renewable generation assets and storage solutions installed by our customers and the electricity generated by EnergyAustralia's assets. It is difficult to project how these will change until 2050 with certainty at this stage. In our current projection, the absolute GHG emissions from the net electricity purchased are assumed to remain at the 2022 level, which is the latest full-year data available at the time of the publication.

Our scenario analysis and exposure to climate-related risks and opportunities

Selected scenarios

The three scenarios that we use to help us assess climate-related risks and opportunities are described in the table below:

Scenarios and their temperature alignment	Referenced scenarios for physical risks	Referenced scenarios for transition risks and opportunities
Sources of scenarios	**Shared Socioeconomic Pathways (SSP) trajectories under IPCC's AR6 (2021):** The SSPs reflect potential changes in net CO_2 emissions, by combining qualitative storylines of societal features and quantified measures of development alongside climate data to create plausible scenarios for how quickly humans can curb emissions.	**Network for Greening the Financial System (NGFS) (2023):** These are climate scenarios for central banks and supervisors, as well as financial institutions, to use in stress testing and scenario analysis exercises. The NGFS scenarios are chosen for the assessment of transition risks for their extensive analysis on policy, economic and technology trends. Scenarios from the **IEA** and **AEMO** are also referenced, where relevant.
High-emissions scenario – with temperature rise of >4°C by 2100	**Fossil-fuelled Development (SSP5-8.5):** This scenario represents the high end of the range of future pathways with the highest economic growth and highest anthropogenic radiative forcing. It points to a continued rise in carbon emissions in the 21st century, which would lead to global warming of 4.4°C. **This is considered as a "stress test" scenario of climate-related physical risks.**	**NGFS Current policies:** This scenario assumes that only current implemented policies are preserved and no further climate action is taken, leading to global warming of approximately 2.8°C by 2100. The temperature rise is already the highest among all NGFS scenarios. We also draw reference from the **IEA STEPS scenario (2023)**, to supplement the NGFS scenario on their carbon price assessment. Carbon prices are restricted to the regions with existing or scheduled initiatives.
Low-emissions scenario – an immediate, strong transition that limits temperature rise to 1.5°C by 2100	**Sustainability (SSP1-2.6):** This scenario belongs to the family of radiative forcing scenarios for the lowest anthropogenic carbon emissions. Although SSP1-1.9 is more aligned with 1.5°C, it has less data available to support our analysis. SSP1-2.6 projects instant global warming of 1.3–2.4°C by 2100. This pathway is considered to be a transitive scenario towards the 2°C target. It reflects a scenario where global carbon emissions peak between 2020 and 2025 and hits net zero by 2075.	**NGFS Net Zero 2050:** This scenario foresees global carbon emissions to be at net zero in 2050. Furthermore, countries with a clear commitment to a specific net-zero policy target before February 2023 are assumed to meet this target. This scenario assumes steeper increases in carbon price programmes to reach global net-zero carbon emissions around 2050. This is supplemented with the **IEA Net Zero Emissions by 2050 scenario (below 1.5°C scenario) (2023)**, where carbon prices are in place in all regions.
Deferred transition – a bespoke scenario that is aligned better with the decarbonisation pathway in CLP's key markets, and is considered more "probable".	**Fossil-fuelled Development (SSP5-8.5)**, following the High-emissions scenario.	**NGFS Delayed transition:** Annual emissions do not decrease until 2030. Strong policies are needed to limit global warming to below 2°C. Negative emissions are limited. This is in line with China's carbon neutrality commitment. **AEMO's Step change scenario** was used to inform our assessment for EnergyAustralia. It assumes a rapid and significant investment in consumer energy resource, strong transport electrification, as well as electrification of industries. It showcases a scale of energy transformation supporting Australia's contribution to limiting global warming to below 2°C compared with pre-industrial level.

Physical risks

Our assessment of physical risks was conducted based on the following steps:

1. **Understand the most affected asset types**
   The physical risk exposures of different asset types were considered. This included the impact of climate-related hazards such as extreme heat on the operation of each asset type and their associated infrastructure. This initial screening was not specific to CLP and did not consider the location of these assets.
2. **Determine the vulnerable CLP markets**
   We assessed the risk of different CLP markets based on their asset types, as well as the spatial and temporal variation of climate-related hazards. For example, the magnitude of water stress is considered high in Hong Kong in some datasets. However, as all of CLP's thermal plants in Hong Kong use seawater cooling, water stress is not considered as a high risk. In this assessment, the mitigation or adaptation measures that have been put in place were not considered.
3. **Percentage of assets with risk exposure level of "High" or above**
   It represents the percentage of CLP's generation and storage capacity (on an equity basis) as of 31 December 2023 that were considered to have a "High" or "Very high" exposure to a hazard, as determined by the asset type and its location. The assessment covered Hong Kong, Mainland China and Australia, and the percentage equity was calculated on the same basis.
4. **Change of risk exposure level over time**
   We considered the combined effect of temporal changes in climate patterns and CLP's portfolio. Climate pattern changes are informed by the assessment of physical risk scenarios that cover a timeframe up until 2080. This timeframe provides better clarity on the potential impacts and changes to our identified risks. The expected changes to CLP's portfolio, on the other hand, are in line with the assumptions used in the GHG emissions projections under CLP's Climate Vision 2050. The resultant risk exposure level represents CLP's risk exposures to different climate-related physical hazards over time.

Our current portfolio is assessed to have higher risk exposure to

extreme wind and storms,

as well as

water stress and drought

CLP's long-term exposure to physical risks

Risk exposure level Limited Low Moderate High Very High

	Asset type most affected	Most vulnerable CLP markets: Hong Kong	Most vulnerable CLP markets: Mainland China	Most vulnerable CLP markets: Australia	Percentage of CLP's generation assets with risk exposure level of "high" or above in 2024 (based on equity capacity in MW as of end-2023)	Risk exposure level of CLP's physical risk exposure over time based on current and projected percentage of assets relevant
Extreme heat Chronic / Long-term	Coal, Oil, Gas, Nuclear, Solar	✓	✓		0%	Baseline 2030 2050 2080 *See discussion on impact to CLP below.*
Flooding Acute / Short-term	Coal, Oil, Gas, Nuclear, Hydro	✓	✓		30%	Baseline 2030 2050 2080
Rainfall-induced landslides Acute / Long-term	Hydro, Transmission and distribution	✓	✓		0%	Baseline 2030 2050 2080
Extreme wind and storms Acute / Short-term	Coal, Oil, Gas, Nuclear, Hydro, Wind, Transmission and distribution	✓			40%	Baseline 2030 2050 2080 *See discussion on impact to CLP below.*
Water stress and drought Chronic / Short-term	Coal, Oil, Gas, Nuclear, Hydro		✓	✓	32%	Baseline 2030 2050 2080 *See discussion on impact to CLP below.*
Wildfires Acute / Short-term	Coal, Oil, Hydro, Nuclear, Solar, Energy storage		✓	✓	7%	Baseline 2030 2050 2080 *See discussion on impact to CLP below.*
Changes in wind speed impact wind assets Chronic / Medium- to Long-term	Wind		✓	✓	7%	**Variable, uncertain** Surface wind speed has been decreasing in Asia, but there is large geographical variance. The outlook for the future trend is uncertain. *See discussion on impact to CLP below.*

Regions affected · Coal · Oil · Gas · Nuclear · Solar · Hydro · Transmission and distribution · Wind · Energy storage

The table on page 37 summarises CLP's long-term exposure to physical risks. The impact of physical risks that have a moderate or high risk level are discussed further below:

Extreme heat

Extreme heat affects CLP in different ways:

- Solar assets may operate sub-optimally in high temperatures or when there is insufficient sunlight, reducing output.
- Reduced operational efficiency of thermal generation plants may lead to lower electrical output and revenue.
- In sub-tropical regions such as Hong Kong, increased cooling demand from customers could increase revenue, but at the same time also increase pressure on the power system, thereby leading to the need for new capital investments.
- Increased exposure to health and safety risks particularly for those working outdoors.

Based on CLP's generation portfolio as of the end of 2023, no asset was assessed as exposed to a high-level risk of extreme heat or above. However, as climate patterns change, the percentage of CLP's equity capacity exposed to this risk is estimated to rise significantly from 0% in 2024 to 45% in 2050.

Extreme wind and storms

Extreme wind and storms, as measured by maximum windspeed, are manifested as tropical storms including cyclones and typhoons.

Although the average risk from extreme wind and storms to CLP's generation assets remains moderate until 2080, extreme wind and storms may significantly impact Hong Kong, where CLP operates an extensive transmission and distribution system that is prone to typhoons. The increased frequency and severity of extreme typhoons has already been observed.

The potential effects of tropical storms include:

- Direct damage to infrastructure, or indirect damage to infrastructure from falling trees, towers and poles, resulting in additional capital investment due to severe damage to generation infrastructure, power lines, transformers or substations;
- Operating expenditure caused by repair works, additional labour and insurance costs;
- Revenue loss due to power supply and business interruptions; and
- Safety risks to personnel.

In Hong Kong, under the worst-case scenario in which multiple power stations are being severely damaged, leading to a prolonged period of power supply disruption, the capital investment loss could be over HK$300 million. However, with resilience measures in place, the property damage incurred by CLP from Mangkhut in 2018, one of the most severe typhoons in recent years, was below HK$10 million.

Water stress and drought

Water shortage may disrupt an asset's water supply and adversely impact output from hydropower stations. It could also disrupt operational efficiency in coal, gas and nuclear power stations by hindering steam generation and cooling. Reduced output has an implication on revenue. Thermal plants that use seawater cooling are less affected.

While the hazard remains at a high level for the assessed locations over the time horizon until 2080, the overall risk exposure level of CLP's portfolio will gradually decrease as fossil fuel assets are phased out over time. The equity capacity exposed to water stress and drought is assessed to reduce from 32% in 2024 to 17% in 2050 based on the currently identified portfolio changes.

Wildfires

Wildfires can damage different asset types in similar ways. This may include damages to equipment and infrastructures or damage to access roads, leading to disruptions on commodity supply. It also poses significant health and safety risks to personnel.
The key financial implications are from capital investment for repairs and maintenance, and reduced revenue from service disruption.

Risk from wildfire is largely determined by asset locations. It is considered to be high for assets in Mainland China and in Australia.

17%

Our equity capacity exposed to the risk of water stress and drought is assessed to reduce to 17% in 2050.

45%

Our equity capacity exposed to the risk of extreme heat is estimated to rise to 45% in 2050.

Changes in wind speed impact wind assets

The performance of renewable generation is highly influenced by weather patterns. Reduced wind speed, an ongoing trend in some territories over recent years, may result in reduced load factors and generation sent out.

On the other hand, increased mean wind speed could improve asset performance. Changing wind patterns due to climate change is introducing uncertainty when planning for future investments.

However, output from wind turbines does not necessarily correlate to revenue directly. Revenue is affected by factors such as electricity demand and supply at a specific point in time, as well as the contractual agreement of each wind farm.

Using 2023 figures as an example, where operating earnings from wind assets were at HK$615 million, if this is influenced by a 5% downside, the financial impact would be at roughly HK$31 million. The decentralised and diversified nature of CLP's renewable energy portfolio and diversification into a range of technologies should assist with managing CLP's revenue risk as not all assets will be affected by changes in wind speed in the same manner at the same time.

Transition risks and opportunities

The assessment was based on the following steps:

1. **Identify relevant transition risks and opportunities, and the business activities being impacted along the value chain**
   We assessed the exposures in each of CLP's business activities.
2. **Determine the relevance to CLP markets**
   Different types of assets and business activities that CLP has in each market were considered.
3. **Prioritise risks and opportunities based on likelihood and commercial consequence**
   These are the internal factors that affect the risk/opportunity level. We assessed the relative importance of different risks and opportunities qualitatively. Only our prioritised transition risks and opportunities were included in this section and discussed in detail.
4. **Level of CLP's transition risk exposure over time**
   Scenario analysis helped us consider how external factors may affect CLP. A shift from business-as-usual to a rapidly transitioning world may require CLP to deploy additional investment compared with what is currently anticipated, and lead to transition risks. We used the High-emissions scenario as the baseline, business-as-usual scenario, as it included climate change policies that are already in place. Transition risk levels were then determined by assessing the differences between this baseline and both the Low-emissions and Deferred Transition scenarios.

CLP's long-term exposure to transition risks

Risk exposure level Limited Low Moderate High

	Relevant business activities along the value chain					Relevant market(s)			Risk exposure levels considering change of transition indicators	
Transition Risks	Supply chain	Generation	Transmission and distribution	Retail	Energy services	Hong Kong	Mainland China	Australia	Low-emissions scenario	Deferred Transition scenario
Emerging national decarbonisation policies	✓	✓	✓	✓	✓	✓	✓	✓	2030 2040 2050	2030 2040 2050
Stranded asset risks		✓	✓			✓	✓	✓	2030 2040 2050	2030 2040 2050
Carbon pricing	✓	✓		✓			✓	✓	2030 2040 2050	2030 2040 2050
Potential exposure to litigation		✓	✓	✓	✓	✓	✓	✓	2030 2040 2050	2030 2040 2050
Stigmatisation of the carbon intensive sectors		✓		✓	✓	✓	✓	✓	2030 2040 2050	2030 2040 2050

✓ Relevant business activities and regions affected

Risks and opportunities are generally more apparent for the Low-emissions scenario, compared to the Deferred Transition scenario where risks and opportunities become more pronounced from the medium term onwards. The risks and implications to CLP are discussed further below:

Emerging national decarbonisation policies

National decarbonisation policies include each country's NDC under the Paris Agreement, and other regulatory decarbonisation requirements for selected sectors. CLP faces higher transition risk if our GHG emissions reduction falls behind the change in these policies.

Both China's and Australia's commitments under the Paris Agreement are insufficient to meet the 1.5°C ambition.[4] However, as CLP's decarbonisation pathway is ahead of the national plan, transition risk remains limited until 2050, by when it would reach a "low" level.

Stranded asset risk

This refers to unanticipated or premature write-downs, devaluation or retirement of fossil fuel assets. Over time, stranded fossil fuel assets will lose their asset value as the market transitions to non-carbon energy sources. Compared to gas plants, coal plants are subject to a more rapid loss. There are significant costs related to shutting down and transitioning away from existing fossil fuel-based assets. These include decommissioning expenses, lost income from asset sales or transition payments from governments.

CLP takes a prudent approach when assessing exit strategies for its coal assets and engages with relevant stakeholders when ensuring an orderly transition. The risk from stranded assets to CLP's portfolio is managed through the phasing out of fossil fuel assets over time.

Carbon pricing

Among CLP's markets, as of the end of 2023, 8% of CLP's equity capacity was subject to some form of carbon price. This constitutes the fossil fuel generation assets in Mainland China where CLP has a minority stake. They are subject to the mandatory national emissions trading scheme. A compliance assessment of the 2022 emissions from CLP's minority-owned coal-fired assets in Mainland China was completed in 2023. There is no mandatory carbon price applied to assets in Hong Kong. In Australia, the Safeguard Mechanism includes grid-connected electricity facilities in the combined sectoral baseline. However, the baseline is not expected to be exceeded and EnergyAustralia is not subject to any mandatory carbon pricing mechanism.

These will change under the Low-emissions and Deferred Transition scenarios. In the High-emissions scenario, the 2050 carbon prices in Mainland China and Australia are expected to be US$53 and US$89 per tonne respectively. Under the Deferred Transition scenario, they will increase to US$160 in Mainland China and US$200 in Australia, and to even higher levels under the Low-emissions scenario, to US$200 in Mainland China, and US$250 in Australia.

Even though CLP is progressively phasing out and reducing the use of fossil fuel assets, the resultant impact remains high in the long term if CLP is required to pay a carbon price for the residual emissions along its value chain.

Potential exposure to litigation

This refers to the risk of facing legal claims from various parties over perceived climate-related issues. These issues may include the involvement of carbon intensive projects, the adequacy and accuracy of climate-related disclosures, or claims of "greenwashing" being a form of misleading or deceptive conduct where inaccurate or misleading statements about sustainability attributes are used to create a false impression of a company's activities, services or products.

Climate change poses a significant legal challenge for electric utilities like CLP. Stakeholders may seek to pursue legal actions against electric utilities for damage associated with climate change, or to try to force them to take more aggressive actions to mitigate or adapt to its impacts. These legal actions may incur substantial financial losses and costs in defending unsubstantiated claims, as well as reputational damage.

Stigmatisation of carbon intensive sectors

Climate change awareness and concern among customers may drive them to seek cleaner and more sustainable energy options, such as renewable energy. This may stigmatise utility companies that operate fossil fuel assets, as they may be seen as responsible for GHG emissions and environmental degradation, thereby leading to reputational damage.

Policy, regulatory changes and technology are some of the strongest drivers – and enablers – for decarbonisation.

The opportunities and implications to CLP are discussed further below and in the "Putting our vision into action" section.

Increased demand in low-carbon electricity

Low-carbon electricity generation is crucial for meeting the growing demand from electrification while replacing carbon intensive sources of power generation. Opportunities include, among others, increased corporate customer demand for renewable power purchase. Gas-fired generation, which it is hoped will in time transition to hydrogen-firing, and nuclear power remain as core options to deliver low-carbon electricity and shape the energy transition in CLP's markets. While new investments require capital investment, the transition will also create new revenue sources. We have seen the CLP Group's operating earnings from non-carbon assets growing in the last few years.

Demand for energy storage

As more renewable energy is integrated into the grid, storage solutions will become more important in addressing the intermittent nature of renewable energy. Storage solutions such as battery or pumped storage hydropower provide back-up power that can be deployed quickly. In particular, utility-scale battery storage has strong growth potential as it has fewer geographical constraints. Whether standalone or integrated with renewables, this storage demand offers opportunities for CLP.

Increased use of energy storage creates economic opportunities across its manufacturing and installation processes, and provides new revenue streams for electric utilities. As CLP increases its pumped hydro and battery storage capacities, there will be implications on capital investment and revenue throughout the design life of the equipment.

Demand for electrification of the transportation and industrial sectors

Electrification is an important decarbonisation lever. CLP has a proven track record in the areas of EV charging infrastructure planning and design in Hong Kong. CLP will continue to play a key role in promoting the adoption of EVs, in line with the Hong Kong Roadmap on Popularisation of Electric Vehicles. CLP Power has been proactively pursuing opportunities by expanding its business to support the shift of commercial vehicle fleets to EVs and to enable industrial electrification in Hong Kong. EnergyAustralia is assisting their commercial and industrial customers to achieve electrification with access to renewable electricity in replacement of natural gas use.

Energy services and energy efficiency offerings

Across our markets, regulations or stakeholder expectations on building energy efficiency are increasing. In Hong Kong, the Government is expanding the scope and strengthening the energy audit requirements under the Buildings Energy Efficiency Ordinance.

In Australia, the National Construction Code was updated in 2022 to raise the minimum energy efficiency standards for new residential buildings. Energy efficiency standards for commercial buildings include provisions for on-site renewable energy and electric vehicle charging.

Under the scenarios analysed, we see new revenue opportunities from energy efficiency offerings, including Energy-as-a-Service and Cooling-as-a-Service, especially for commercial buildings. This also provides long-term partnership opportunities for CLP. In addition, capital investment would be required for the installation of equipment as well as for covering the operating expenditure for provision of services and maintenance during the course of each contract period.

Transition opportunities presented to CLP

Opportunity level Limited Low Moderate High

Transition Opportunities	Relevant business activities along the value chain					Relevant market(s)			Opportunity level considering change of transition indicator	
	Supply chain	Generation	Transmission and Distribution	Retail	Energy services	Hong Kong	Mainland China	Australia	Low-emissions scenario	Deferred Transition scenario
Increased demand in low-carbon electricity		✓	✓	✓		✓	✓	✓	2030 2040 2050	2030 2040 2050
Demand for energy storage	✓	✓	✓			✓	✓	✓	2030 2040 2050	2030 2040 2050
Demand for electrification of the transportation and industrial sectors		✓		✓	✓	✓		✓	2030 2040 2050	2030 2040 2050
Energy services and energy efficiency offering				✓	✓	✓		✓	2030 2040 2050	2030 2040 2050

✓ Relevant business activities and regions affected

Limitations on forward-looking statements

CLP's Climate Vision 2050 has not been prepared as financial or investment advice or to provide any guidance in relation to the future performance of CLP Holdings or any entity within the Group. This Climate Vision 2050 contains climate-related and other forward-looking statements which are based on the expectations, best estimates and assumptions of CLP's management as at the date of publishing this Climate Vision 2050. However, these may be affected by a range of factors which could cause actual results to differ materially. These include, but are not limited to, actual energy demand, market, regulatory and policy changes, technological development and general economic conditions. The risks outlined in the "Our scenario analysis and exposure to climate-related risks and opportunities" section provide a further indication of the range of factors and assumptions that may impact future performance.

Forward-looking statements are not guarantees, predictions or forecasts of future performance or outcomes, and are subject to both known and unknown risks, other uncertainties and may involve elements of subjective judgement and assumptions.

These statements may be affected by limitations in data or methodologies, inaccurate assumptions or known and unknown risks, many of which may be beyond CLP Group's control. As such, you are cautioned not to place undue reliance on these statements, particularly considering significant uncertainty in relation to economic, social or geopolitical conditions, policy and regulation, climate-related risk analysis and reporting requirements, which may cause actual results to differ materially from those expressed or implied by the statements. These statements are considered to be made on, and are applicable as at, the date of publication and no representation is made as to their accuracy, completeness or reliability after this date. Other than as required by applicable regulations or law, CLP does not undertake any obligation to publicly update, release or review any revisions whether as a result of new information or future events, after this date.

Past performance cannot be relied on as a guide to future performance. No representation or warranty, express or implied, is given as to the accuracy, completeness or correctness, likelihood of achievement or reasonableness of any forward-looking information contained in this Climate Vision 2050.

Glossary

Term	Definition
Air emissions	The emission of air pollutants such as sulphur dioxide, nitrogen oxides and particulate matter.
Capacity purchase	Additional third-party-owned power generation capacity contracted by CLP under long-term agreements to meet customer demand. Some of these agreements may confer CLP rights to use the generation assets and exercise dispatch control as if they belonged to the Group.
Carbon neutral	The condition in which GHG emissions associated with an activity or entity's carbon footprint are reduced as much as possible and any remaining hard-to-abate emissions are counterbalanced by offsetting through measures such as the use of carbon credits, carbon sinks or storage.
Climate Action Finance Framework (CAFF)	Launched in 2017, CAFF supports the transition to a low-carbon economy by attracting socially responsible, sustainable financing to fund CLP's investments, and to supporting CLP's investments to reduce carbon emissions and increase efficiency of energy usage. The CAFF formalises and governs project evaluation, usage and management of proceeds, as well as reporting for Climate Action Finance Transactions, including bonds, loans and other forms of finance.
Climate Vision 2050	CLP's Climate Vision 2050 is the blueprint of the Group's transition to a net-zero GHG emissions business by mid-century. Since its launch in 2007, the Climate Vision has informed CLP's business strategy. It guides CLP's investment decision-making and is integral to the broader climate strategy.
Combined-cycle gas turbine (CCGT)	A power generation technology that uses dual turbine design, comprising of a gas turbine and steam turbine. During the process, the heat from the gas turbine is captured and transported to heat up water in a boiler. Steam is then produced to drive the steam turbine for power generation. The combined-cycle design enables significantly higher efficiency by allowing for greater output without the use of additional fuel.

Term	Definition
Decarbonisation	The action of lowering GHG emissions. For the power sector, this primarily refers to the reduction of GHG emissions from electricity generation and providing energy efficiency services and solutions which reduce carbon footprint for customers.
Demand response	Demand response programmes encourage participating customers to commit to short-term reductions in electricity demand, helping energy suppliers to keep the grid running optimally during high load periods.
Development Plan	CLP Power's Development Plan, which is part of the Scheme of Control (SoC) Agreement, covers capital projects for the provision and future expansion of electricity supply systems under CLP's operation. It is implemented over a given five-year period, and is subject to the review and approval by the Executive Council of Hong Kong.
Digitalisation	The application of new information technologies, including artificial intelligence and data analytics, to help electricity utilities develop new customer-centric services and improve operations.
Energy-as-a-Service	Evolution in the business strategy of energy companies to provide a more diverse range of value-adding energy services such as energy management and distributed energy resources, enabling customers to benefit from sustainable energy solutions through a schedule of regular payments, minimising upfront costs.
Energy purchase	Electricity purchased by CLP to meet customer demand under long-term agreements from power plants not owned by CLP, and without existing capacity purchase agreements with the Group.
Energy security	The uninterrupted availability of energy sources.
Energy transition	Transformation of the global energy sector from fossil fuel-based energy systems to low- or zero-carbon sources.
Generation capacity	The maximum amount of power that a generator is rated to produce. Also known as installed capacity or nameplate capacity.

Glossary continued

Term	Definition
Green Electricity Certificates (GECs)	GECs refer to the energy attribute corresponding to the electricity sold by renewable energy projects. In Mainland China, the origin of GECs is certified by National Energy Administration.
Greenhouse gas (GHG) emissions	The emission of gases that contribute to the greenhouse effect, causing a changing climate. CLP's GHG emissions inventory covers the six GHGs specified in the Kyoto Protocol. Nitrogen trifluoride (NF_3), the seventh mandatory gas added under the second Kyoto Protocol, was deemed immaterial to CLP's operations after evaluation. (See also Scopes)
Just transition	According to the Just Transition Alliance, just transition is a principle, a process and a practice. The principle of just transition is that a healthy economy and a clean environment can and should co-exist. The process for achieving this vision should be a fair one that should not cost workers or community residents their health, environment, jobs or economic assets.
National Electricity Market (NEM)	Australia's NEM is a wholesale spot market connecting six regional market jurisdictions: Queensland, New South Wales, the Australian Capital Territory, Victoria, South Australia and Tasmania.
Net-zero greenhouse gas (GHG) emissions	When GHG emissions are reduced, and the residual emissions are balanced by the removal of an equivalent amount of GHGs from the atmosphere.
Non-carbon energy	Energy from power sources that add no extra carbon to the atmosphere, such as wind, solar, hydro and nuclear energy. It does not include waste-to-energy and other forms of biomass.
Offshore liquefied natural gas (LNG) terminal	Offshore LNG terminals receive cargos of LNG for processing into fuel. The Floating Storage and Regasification Unit (FSRU) is where the LNG cargo is unloaded, stored and regasified for transport to a power station or other users.

Term	Definition
Power purchase agreement (PPA)	A long-term electricity supply agreement specifying deliverables such as the capacity allocation, the quantity of electrics of electricity to be supplied and financial terms.
Pumped hydro energy storage	A method used for large-scale storage of power. During non-peak times, electricity is used to pump water to a reservoir. During peak times, the reservoir releases water for hydroelectric generation.
Renewable energy	Energy that is generated from renewable resources, which are naturally replenished on a human timescale, including sunlight, geothermal heat, wind, tides, water, waste-to-energy and various forms of biomass.
Renewable Energy Certificates (RECs)	In Hong Kong, RECs represent the environmental attributes associated with electricity produced by applicable renewable sources in Hong Kong including solar, wind and landfill gas, purchased or generated by CLP Power.
Scheme of Control (SoC) Agreement	The SoC Agreement sets out the electricity regulatory framework, procedures and policies for the 1 October 2018 – 31 December 2033 period. It governs and applies to the financial affairs of CLP Power and CAPCO, the manner in which CLP Power and CAPCO is responsible for providing, operating and maintaining sufficient electricity-related facilities and supplying electricity to meet demand in Hong Kong over the term of the Agreement.
Science-based target (SBT)	A target for GHG reductions that is in line with the goals of the Paris Agreement to limit global temperature increase to well-below 2°C above pre-industrial levels and pursue efforts to limit warming to 1.5°C. The SBTs are managed by the Science Based Targets initiative (SBTi).
Scopes	The GHG Protocol categorises GHG emissions into three "scopes". Scope 1 emissions are direct emissions from owned or controlled sources. Scope 2 emissions are indirect emissions from the generation of purchased energy. Scope 3 emissions include other indirect emissions (not covered in Scope 2) that occur in the value chain of the organisation.

Endnotes

Our role in the energy transition

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Our climate targets and commitments

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