CLP 中電

2022
Climate-related Disclosures Report

Towards a Sustainable Energy Future

Stock Code: 00002

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Executive Summary

Amid a global energy crisis, governments and business leaders internationally have continued to keep the climate emergency high on the agenda.

The 27th United Nations Conference of the Parties (COP27) closed with the launch of the Sharm-El-Sheikh Adaptation Agenda outlining 30 adaptation outcome targets to enhance the resilience of the world's most climate-vulnerable communities by 2030. The World Economic Forum Global Risks Report 2023 highlights that climate and environmental risks will remain at the core of global risk perception over the next decade.

Electric utilities have a particularly important role to play to enable zero-carbon electrification across industries. The energy transition is simultaneously an opportunity but also a challenge to CLP.

Opportunities arise from the need to scale up renewables and the demand for new energy solutions. Transitioning away from coal poses financial risks to those electric utilities with legacy coal assets. The risks posed by extreme weather on existing infrastructure has resulted in mounting pressure on utilities to set up safeguards for protecting critical assets. Recent energy shortages and fluctuations in fuel prices in many countries have also highlighted the importance of an energy transition that does not compromise the reliability and stability of the electricity grid, and also maintains a reasonable price for electricity.

As more investors are concerned about climate risk and how these may affect returns, many institutional investors are taking a robust stewardship approach urging for improvements in environmental, social and governance (ESG) practices, performance and disclosures.

This 2022 Climate-related Disclosures Report (the Report) serves as a tool for investors and stakeholders to understand CLP's approach in responding to climate change and the impacts on its business. The Report adopts the four pillars as recommended by the Task Force for Climate-related Financial Disclosures (TCFD). This provides a consistent structure to facilitate analysis and comparison with disclosures from other companies.

The four pillars and CLP's approach to each are outlined below:

- Governance — This section of the Report describes how climate change issues are integrated into CLP's Corporate Governance system, with oversight from the Board, through senior management to different functional and regional units. It also describes the provision of incentives for the management of climate-related issues.
- Strategy — This section describes CLP's decarbonisation commitment and roadmap. The Climate Vision 2050 includes CLP's commitment to achieving net-zero emissions throughout its value chain by 2050 and other interim targets. This year's report discusses CLP's decarbonisation strategy in detail, in particular the considerations when phasing out coal-fired generation plants. It discusses significant actions taken in 2022 to accelerate its decarbonisation. It also features an assessment of different climate-related opportunities, and how CLP mobilises resources to deliver its strategy.
- Climate-related risks — This section discusses how climate issues are managed through an integrated enterprise risk management framework. Using the three climate scenarios developed in the previous year – business-as-usual, a well-below 2°C aligned with the Paris Agreement, and a bespoke market scenario – CLP evaluates the physical and transition climate risks it faces and how to build resilience. This year's disclosures discuss the most material issues and their relevance to different asset types and geographies, with an enhanced discussion of financial implications.
- Metrics and Targets — This section includes quantitative targets and metrics that demonstrate CLP's progress in its transition to net-zero emissions.

References are drawn from the CLP 2022 Annual Report and CLP 2022 Sustainability Report, and recommendations from the TCFD are aligned to contextualise CLP's climate-related response in this Report. The proposed requirements in the *IFRS S2 Climate-related Disclosures* issued by the International Sustainability Standards Board (ISSB) were also considered as part of the preparation of this Report.

CLP's climate commitments and achievements in 2022

On track to further strengthen Climate Vision 2050
✓ The Group's greenhouse gas (GHG) emissions intensity of electricity sold in 2022 is 0.55kg CO_2e/kWh, reduced from 0.57kg CO_2e/kWh in 2021.
✓ Identified opportunities to accelerate the decarbonisation of CLP's portfolio with a review of the Climate Vision 2050 targets underway and aiming to set 1.5°C-aligned targets.
✓ Continued to monitor emerging guidance on net-zero target setting, including the consideration of using carbon offset units if appropriate.
Phase out of coal-fired power assets is accelerating as part of an orderly, and just, transition
→ Completed exit from its entire 70% share in the Fangchenggang Power Station and 29.4% share in the Shiheng Power Station in 2022, both of which are coal-fired power stations in Mainland China.
→ Phasing out of the coal-fired Yallourn Power Station in Australia in mid-2028.
→ Phasing out of the coal-fired Castle Peak A Power Station in Hong Kong around the mid-2020s.
→ Ceasing daily coal-fired power generation in Castle Peak B Power Station in Hong Kong by 2035.
→ Maintained commitment to phase out coal-based assets before 2040, and accelerate the phase-out where possible, of: • CLP's minority-owned coal-fired assets in Mainland China and Taiwan before 2030; • Jhajjar Power Station in the mid- to late 2030s; and • Mount Piper Power Station by 2040 at the latest.
→ Supporting a just transition for workers and communities in CLP's phase-out of coal-fired power stations.
Continue to invest in clean energy assets and services
✓ • Commenced operations at the 100MW Qian'an III Wind Farm in Jilin province and began construction of the 50MW Xundian II project in Yunnan province.
✓ • Partnered with DBS Hong Kong to offer flexible and innovative financing loan solutions to business based on energy-saving services.
✓ • Continued support for the Hong Kong Government's Climate Action Plan 2050 via investment in electric vehicle charging infrastructure.
✓ • Signed a Memorandum of Understanding with the Longhua District People's Government of Shenzhen Municipality in the Greater Bay Area (GBA) to develop digitalised energy projects and support the digital transformation of the district.
✓ • Established joint venture with TGOOD Electric Company Limited on electric vehicle charging infrastructure in the GBA.
✓ • Developed a range of energy-saving solutions and smart energy services for CLP's customers, including the Hong Kong's first zero-carbon chiller system project at Nina Tower.

Background

Increasing integrity on climate-related disclosure

COP27 was themed, "Together for Implementation", and one of the key discussions was how to ensure credibility in net-zero pledges. To further enhance corporate understanding of climate actions, standards on climate-related disclosures continue to evolve to support effective adoption and implementation.

To maximise interoperability of the international and jurisdictional sustainability-related standards and the alignment of key climate disclosures, the International Sustainability Standards Board (ISSB) of the International Financial Reporting Standards (IFRS) Foundation is working with the European Commission and European Financial Reporting Advisory Group (EFRAG) toward a shared objective to agree on a disclosure framework. The ISSB also announced at COP27 that CDP, which runs the global environmental disclosure platform for corporations and investors, will incorporate the once-finalised *IFRS S2 Climate-related Disclosures* requirements into its disclosure platform. This will see CDP's voluntary users, of which CLP is one, disclose data structured to the new reporting standard in the 2024 disclosure cycle.

CLP's disclosure

As an early supporter of the TCFD recommendations, CLP is committed to communicating with its investors on its decarbonisation progress, and highlighting the risks and opportunities that arise from the energy transition.

To provide transparent, reliable and consistent climate-related information to its stakeholders, in 2021 CLP published its first standalone Climate-related Disclosures Report aligned with recommendations from the TCFD and the *ISSB Climate-related Disclosures Prototype* published in November 2021. This year's disclosure of the Report is further enhanced with reference to the *IFRS S2 Climate-related Disclosure Exposure Draft* released in March 2022 and feedback CLP received from its investors and other stakeholders. When preparing this Report, reference was also made to TCFD's publications.

With a strong governance and risk management framework already in place, CLP's focus has been on enhancing climate-related risk assessments and developing bespoke climate scenarios for the markets where the Group is present. Over the years, CLP has made several notable achievements in illustrating its commitment to climate action, such as:

- Committing to achieve net-zero emissions by 2050 across the Group. This is supported by interim targets, including a SBTi-verified target for 2030, and a transparent decarbonisation plan;
- Benchmarking its decarbonisation approach against industry standards. For instance, the trajectory of the greenhouse gas (GHG) intensity of the Group's electricity sold was compared with the science-based target's well-below 2°C and 1.5°C pathways, to understand the expected extent of reductions;
- Continuing investments in non-carbon generation assets and other transition enablers, such aslarge-scale energy and hydrogen storage, transmission and distribution systems;
- Reviewing business plans, including the asset retirement plan and electricity sent-out plan for each generation asset;
- Continuing thorough assessments and climate change scenario analysis across the Group considering climate-related physical and transition risks and opportunities and the resilience of its assets against extreme weather events; and
- Developing a model to indicate the quantitative financial impacts that different climate-related physical and transition risks may have on CLP.

Building on its previous engagement in 2019 at the World Business Council for Sustainable Development (WBCSD) TCFD Electric Utilities Preparer Forum, CLP continues to work with industry peers to advance the sector's and its own climate-related financial disclosures. In 2021, CLP focused on improving its climate risk assessment and reporting, as well as scenario analysis, through the WBCSD Sustainable Energy Supply Project, including the publication of *Evaluating climate-related financial impacts on power utilities (November 2021)*, and the Reference Scenarios Energy Forum.

Governance

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

The diagram below shows how sustainability is integrated into CLP's corporate governance structure throughout the Group.

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

To ensure CLP Board Directors are kept updated with the latest trends in climate change and equipped with core competencies to oversee the management of climate-related issues, regular training and information sessions on sustainability-related topics are provided.

The **Sustainability Committee** is chaired by the CEO, who is also a member of the Board. The CEO has a primary role in overseeing the management of the Group's sustainability issues. The Committee's responsibilities are to review, endorse and report to the Board on CLP's sustainability standards, priorities and goals. It also oversees CLP Group-level strategies, policies and practices on sustainability matters to attain those standards and goals.

In 2022, the Sustainability Committee conducted the following activities:

- The Sustainability Committee received a briefing from Lord Adair Turner (Chair of the Energy Transitions Commission) on the impact of the energy crisis on climate change. Key topics covered in the discussion included: the forecast total system generation costs in zero-carbon power systems; the forecast demand for hydrogen and the associated sources of supply and production costs; global energy transition investment by sector; and the Russia-Ukraine conflict and the possible alternatives to Russian gas.
- The Sustainability Committee had the benefit of a briefing by another international climate change expert, Mr Dirk Forrister (CEO of the International Emissions Trading

Association), on the key developments at COP27, including the carbon market status and the role that both compliance and voluntary carbon markets are expected to play in achieving the goal of "net-zero".

In addition, CLP Holdings became a founding sponsoring partner of the Hong Kong chapter of the Climate Governance Initiative (CGI HK). It aims to drive increased focus on climate issues among company directors, building on the principles for effective climate governance set out by the World Economic Forum. Through engaging in the initiative's forums, training and other programmes, CLP is expected to further build capacity on climate governance issues while raising wider awareness. CGI HK is the first local chapter of the initiative in North Asia.

Read more from the Sustainability Committee Report

The **Audit & Risk Committee (ARC)** ensures adequate risk management and internal control systems are in place and followed and, where deficiencies are found, appropriate remedial actions are taken in a timely manner. The ARC receives and reviews management's periodic internal control reports and the Group's quarterly risk management reports, which includes climate-related risks. The Risk Management Report in the CLP 2022 Annual Report outlines this process in detail.

The ARC retains oversight of material risks and reviews and makes sure the assurance of the ESG data in the CLP Sustainability Report is appropriate. This includes CLP's GHG profiles and the carbon intensities of its portfolio, all of which track the Group's progress towards its decarbonisation targets. Read more in the Metrics and Targets section below.

The **Sustainability Executive Committee (SEC)** has the strategic responsibility to assess and manage sustainability issues at the Group level. It convened five times in 2022. The discussion items directly related to climate included:

- Monitoring emerging stakeholder expectations on climate actions. This included increased transparency of a company's commitments with the Paris Agreement, low-carbon transition plans, and exposures to climate-related risks and the implications to its business strategy;
- Reviewing the climate benefits of different energy services. Specifically, the carbon reduction potential of CLP's new energy services offerings, and their commercial potential;
- Providing direction to CLP's Climate Vision 2050 review, in light of the developments mentioned above;
- Monitoring the latest development of voluntary carbon markets and their implications for CLP. This included: reviewing CLP's response to the public consultation, conducted by the Integrity Council for the Voluntary Carbon Market (IC-VCM), on the draft principles for voluntary carbon credit standards; and monitoring the Voluntary Carbon Markets Integrity (VCMI) Initiative, which is developing guidance on the credible use of carbon credits;
- Reviewing and endorsing the Group's environmental targets, covering air emissions, waste and water use. CLP's roadmap in reducing its environmental footprints are linked to its low-carbon transition plan;
- Maintaining oversight of CLP's public disclosures on sustainability issues, including the CLP Annual and Sustainability Reports, and the CLP Climate-related Disclosures Report; and
- Providing direction to the Group's response to the various ESG and climate change disclosures standards, including the Exposure Draft IFRS S1 General Requirements for Disclosure of Sustainability-related Financial Information and Exposure Draft IFRS S2 Climate-related Disclosures.

Read more in the 2022 Sustainability Report - Sustainability Governance

The SEC is supported by the Director-led **Group Sustainability Department**. Among other commitments, the department manages the Group's climate change strategy, including: reviewing and reporting on progress on CLP's Climate Vision 2050; TCFD implementation; climate scenario analysis; reviewing climate benefits of different energy services; monitoring changes in climate change regulatory landscapes; and assessing the implications of evolving stakeholder expectations related to climate change 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 linked to CLP's business and sustainability strategy, including climate risk stewardship.

Read more from the Human Resources & Remuneration Committee Report

Strategy

CLP's Climate Vision 2050

SASB reference: IF-EU-110a.3; GRI reference: 305-5

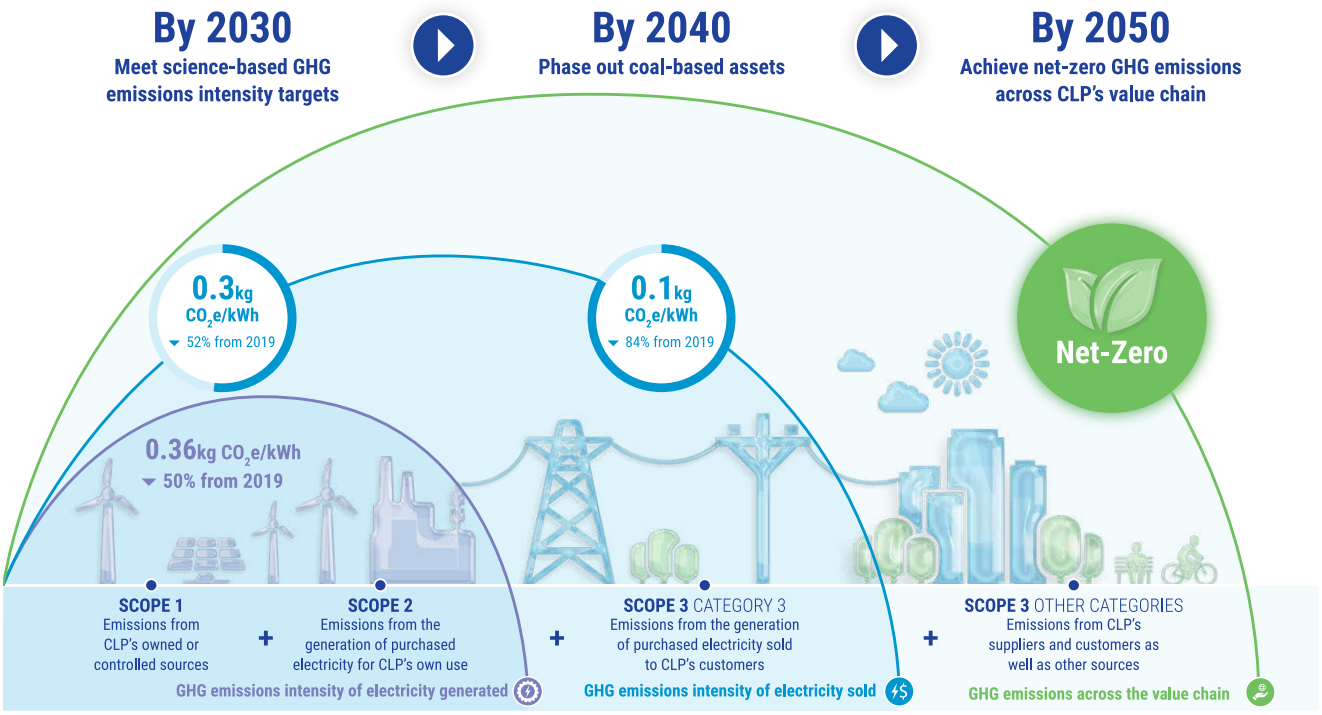
Commitment to reach net-zero emissions by 2050

First launched in 2007, CLP's Climate Vision 2050 covers key considerations around climate adaptation, scenario analysis and asset management, guiding the Group in managing climate-related risks as well as opportunities.

Over the years, CLP's commitments have continually been realigned to meet current climate science and industry best practice, as well as the growing expectations of stakeholders. The latest version of CLP's Climate Vision 2050 was released in late 2021. To further accelerate CLP's transition to low-carbon power supply, a review of the current Climate Vision 2050 targets is already underway with the aim to set 1.5°C-aligned targets.

Download CLP's Climate Vision 2050: A Net-Zero Future

CLP's key targets and commitments under Climate Vision 2050



The commitments under the latest Climate Vision 2050 released in 2021 are:

- **Setting science-based targets for 2030** – CLP has set interim targets for 2030 to align with the Paris Agreement goal of limiting global warming to well below 2°C above pre-industrial levels.
- Using 2019 emissions as a base line, CLP is committed to:
  - A 52% reduction in the Group's Scope 1, 2 and 3 greenhouse gas (GHG) emissions intensity of electricity sold. The new target of 0.3kg CO_2e/kWh has been considerably strengthened relative to the previous 0.5kg CO_2/kWh.
  - A 50% reduction in Scope 1 and 2 GHG emissions intensity of electricity generated to 0.36kg CO_2e/kWh.

  - A 28% reduction in absolute Scope 3 GHG emissions from the combustion of natural gas supplied to customers in line with the Science Based Targets initiative's (SBTi) requirements.
- **Strengthening interim targets for 2040** – CLP has also strengthened its 2040 interim target to lower its Scope 1, 2 and 3 GHG emissions intensity of electricity sold to 0.1kg CO_2e/kWh, greatly reduced from the previous 0.34kg CO_2/kWh.

CLP will also progressively phase out its coal-based assets before 2040 – a decade earlier than previously pledged. The transition will be accelerated where market conditions allow, with CLP acting responsibly and taking a considered approach that limits adverse effects on its communities and on power supply reliability, system security and affordability.

- **Reaching net-zero emissions by 2050 across the CLP value chain** – Where CLP is unable to reduce emissions by the year 2050, any residual GHG emissions attributable to the CLP Group, covering Scope 1, 2 and 3 emissions, will be addressed through the purchase of verified carbon offset units. The relevant guidance, expected to be released in 2023 by the Integrity Council for Voluntary Carbon Markets (IC-VCM) and the Voluntary Carbon Market Integrity (VCMI) Initiative, are expected to provide clarity in terms of how carbon offset units could reasonably be applied within the context of a net-zero corporate strategy. Once this process is complete, CLP will provide additional detail on its net-zero 2050 target.

The foundation of these targets is the trajectory of the Group's carbon intensity, which is in line with its current business plan and long-term decarbonisation strategy. It is demonstrative of CLP's credible approach in target-setting, which is accompanied by a clear roadmap and action plan.

Review of CLP's Climate Vision 2050

To support the review of CLP's commitments under Climate Vision 2050, the Group has undertaken the following:

- Benchmarked CLP's approach against industry standards. For instance, the trajectory of the GHG intensity of the Group's electricity sold has been compared with the science-based target's well- below 2°C and 1.5°C pathways, to understand the expected extent of reductions;
- Reviewed business planning assumptions, including an asset retirement plan and electricity sent-out plan from each generation asset;
- Conducted a climate change scenario analysis considering climate-related physical and transition risks and opportunities; and
- Identified strengths and opportunities in its efforts to reduce GHG emissions.

CLP will continue to look for opportunities to accelerate the decarbonisation of its portfolio and review its targets. Reviews will include the latest climate science, policy drivers, technological advancement, industry trends and community expectations. The Group will follow international standards and industry practices to realign its net-zero target with a 1.5°C trajectory and other norms of net-zero best practice.

Decarbonising CLP's electricity

To achieve CLP's Climate Vision 2050 commitments requires a multi-pronged approach.

CLP is taking a planned and orderly approach in shifting its portfolio away from thermal generation towards zero-carbon energy while ensuring a just transition in the process. When making decisions to phase out its coal assets, a major focus at CLP is to manage the pace of change to strike a balance between financial sustainability, environmental best practice and social responsibility while taking market needs and regulatory changes into account.

The phase-out of fossil fuel generation assets has the greatest decarbonisation benefit, but this process must be managed carefully to ensure stable power supply and electricity tariffs, and to sustain employment opportunities for workers and the community. This requires close collaboration with a wide range of partners to ensure a smooth, and just, transition.

EnergyAustralia's Yallourn Power Station has provided faithful service to the people of Victoria, Australia since 1974. Announced in 2021, its closure in 2028 will be four years ahead of the original schedule, yet EnergyAustralia remains confident that this allows for sufficient time to execute a carefully planned transition. Similarly, in Hong Kong, a plan is being implemented by CLP Power to progressively phase out its coal-fired Castle Peak Power Station, after the new gas-fired generation units at Black Point Power Station are in full operation.

Many of CLP's thermal assets in urban areas, however, cannot be retired in the short- to medium-term, where the Group takes the view that **divestment is a viable option** to decarbonise the portfolio. These assets often play a critical role in the stable energy supply of the community they serve and may not be easily replaced by zero-carbon energy sources. In addition, they are often relatively new, equipped with advanced generation and air emission control equipment, and running with high efficiency.

CLP selects its partners carefully to ensure these plants will continue to be operated efficiently and responsibly, giving consideration to community impacts and employment conditions. These transactions will also provide CLP with capital to accelerate investment in clean energy projects.

For example, CLP's recent divestment of its interest in the Fangchenggang Power Station was decided following a thorough review of possible exit strategies. Fangchenggang is one of the most efficient and lowest emitting coal-fired plants in China, providing much-needed energy to the country as well as jobs to many. CLP took the view that transferring the Group's interest in the plant to a state-owned enterprise supported continued power supply reliability in the community as well as an efficient and orderly transition in line with China's decarbonisation policy.

Apraava Energy (formerly known as CLP India) became a wholly-owned subsidiary of CLP in 2002. In 2018, Caisse de dépôt et placement du Québec (CDPQ) became a strategic shareholder of the Indian business, strengthening Apraava's ability to pursue new low-carbon investment opportunities. Since 2018, Apraava Energy has successfully undertaken a number of energy transition-related investments. Its gross renewable energy capacity has increased from 1,094MW in 2018 to 1,174MW in 2022, with another 251MW to be commissioned in 2023, which represents around 30% growth in gross capacity compared with 2018.

As of 20 December 2022, CDPQ has increased its equity stake in Apraava Energy, making the company a 50:50 joint venture between CDPQ and CLP. Apraava Energy maintains its pledge to power India in an affordable and sustainable manner.

One advantage of thermal generation assets over renewable energy is that they can be deployed when needed, for instance, to meet the peak load demand. In many markets, centralised generation will continue to play an essential role in the electricity supply. In the interim, **CLP will seek to convert these assets to utilise cleaner fuels** such as natural gas, and pave the way to switch to zero-carbon fuels such as green hydrogen when they become commercially viable.

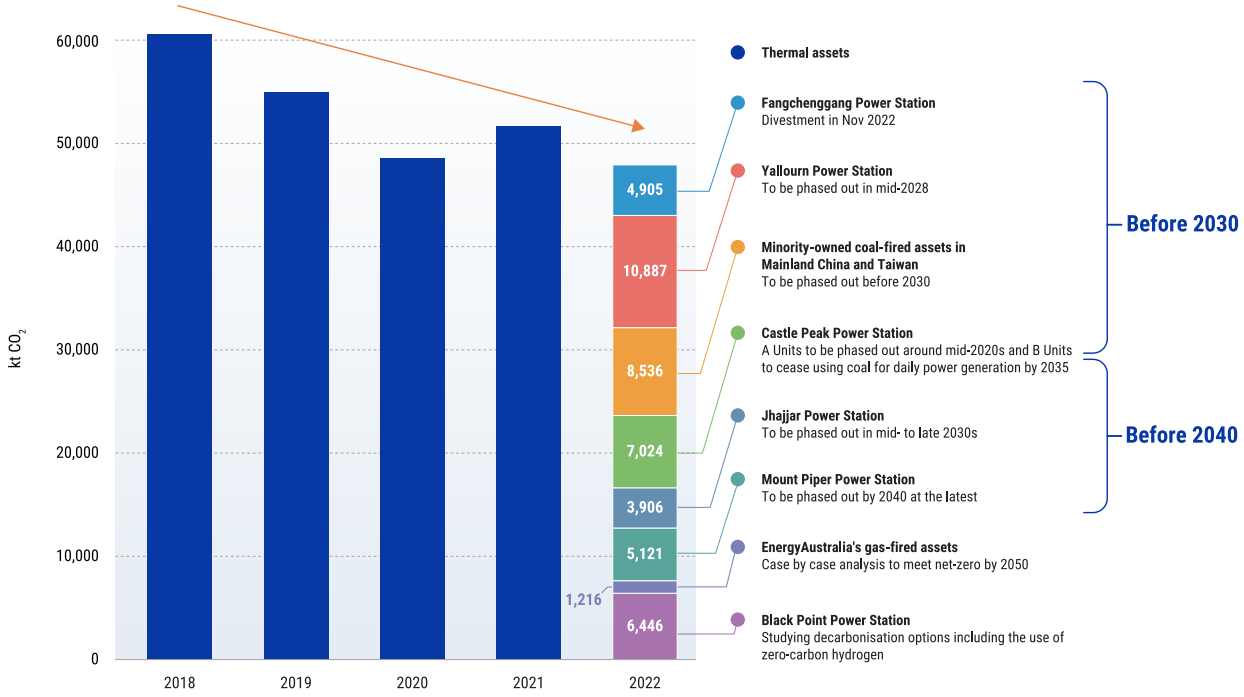
CLP Power Hong Kong is exploring a pilot project for using hydrogen in combination with natural gas at Black Point Power Station within the next five years. The gas-fired Tallawarra B Power Station in Australia will also plan to use hydrogen to decarbonise electricity supply further when green hydrogen becomes commercially viable.

To accelerate the use and production of hydrogen, CLP is supporting H2Zero, a global initiative launched by the World Business Council for Sustainable Development (WBCSD) and The Sustainable Markets Initiative launched in 2021. H2Zero aims to increase market confidence in the growth of decarbonised hydrgoen by 2030 and accelerate the use and production of hydrogen as an essential part of the future net-zero energy system. The initiative now has 34 members from companies around the world. CLP is also exploring a possible pilot project with Hydro X, an Israeli company with an innovative hydrogen storage technology.

The below chart shows CLP's Scope 1 GHG emissions from its thermal generation assets.

Considering the changes in the portfolio as described above, the exit from Fangchenggang Power Station in Mainland China and the change in equity in Apraava Energy together will contribute around a 10% reduction in CLP's Scope 1 emissions, based on 2022 levels. The early exit from Fangchenggang Power Station also represents an abatement of an estimated total of 30,000kt CO_2e in CLP's portfolio before 2030, when compared with its projected decarbonisation trajectory in 2021.

CLP's Thermal Generation Assets: Absolute Scope 1 and Scope 2 emissions and phase-out schedule (on an equity plus long-term capacity and energy purchase basis)



Case study

Ensuring a just transition for Yallourn

In its transition to a low-carbon economy, CLP recognises the importance of putting people at the centre of its climate agenda and addressing the potential social impacts that the net-zero transition could entail for its different operating regions.

Yallourn Power Station is Australia's oldest coal-fired power station located in the state of Victoria. It was originally built in 1921. Since the commissioning of the current power station in 1974, Yallourn currently supplies about 20% of Victoria's electricity demand, and about 5% of Australia's National Electricity Market – enough to power around two million homes. It also contributes over 15% of the state's emissions.

In March 2021, EnergyAustralia announced its plans to retire Yallourn Power Station in 2028. Its closure is expected to reduce EnergyAustralia's direct CO_2 emissions by 60%, thereby accelerating its decarbonisation progress.

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.

Coupled with the seven years' advance notice for the plant's retirement, EnergyAustralia also committed a A$10 million Power Your Future programme to support its people in planning, training, and reskilling for their future post-closure. A partnership with a local offshore wind farm in the Gippsland region has also been set up to enable redeployment of employees whose skills may be transferable to wind farms.This project is expected to provide a boost to the local economy through job creation, by maximising the role of suppliers in the Latrobe Valley and the broader Gippsland region, while also helping to secure Victoria's energy supply with more renewable energy before Yallourn exits the system. An agreement with the Victorian Government was also reached to build the new 350MW Wooreen utility-scale battery, located at Jeeralang Power Station, by 2026.

EnergyAustralia is committed to continue engaging its workforce and local communities impacted by the closure. This will be in the format of regular forums and meetings with local groups and unions, as well as through community investments. Work is underway to plan for the rehabilitation of Yallourn, seeking to stabilise the site through the formation of a lake.

Yallourn Power Station

Progress in 2022

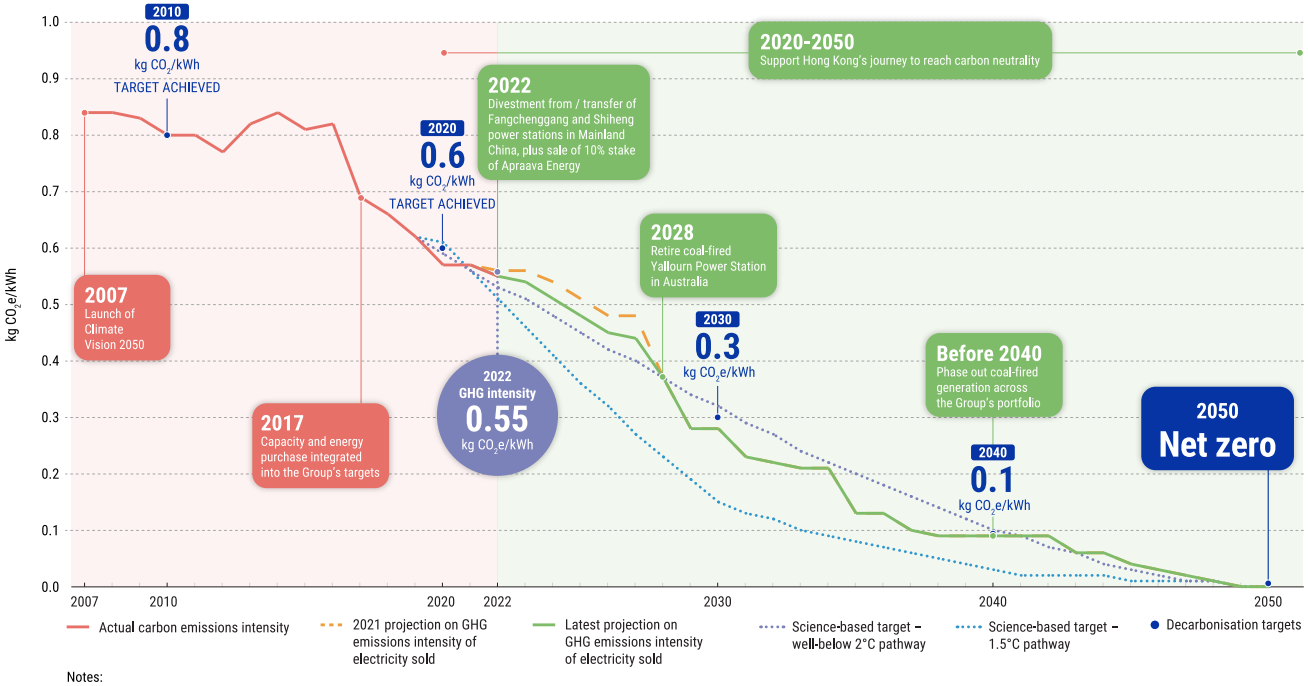
Accelerating the transition to net-zero

CLP has been actively pursuing its Climate Vision 2050 targets, and where possible, has made efforts to further accelerate its decarbonisation plan.

CLP Group's GHG intensity reached 0.55kg CO_2e/kWh in 2022, in line with the decarbonisation trajectory in its Climate Vision 2050. The Group has also updated its projection based on the latest business developments, bringing the GHG trajectory more aligned to the SBTi's Sectoral Decarbonisation Approach of staying well below 2°C. This is summarised in the diagram below.

For other metrics related to the Climate Vision 2050, please refer to the Metrics and Targets section

CLP's past and projected GHG emissions intensities



Notes:
[1] CLP's trajectory from 2007 to 2020 is 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.

CLP's accelerated decarbonisation has been made possible due to key operational and portfolio changes that took place or were confirmed in 2022, including an updated business plan that projects more ambitious assumptions for renewable asset growth across the Group. The key changes are listed below:

- In Mainland China, the Shiheng Power Stations was transferred back to the local partner on 1 January 2022, in accordance with the cooperative joint venture arrangement. CLP owned a 29.4% stake, equivalent to 370MW, in the coal-fired power plant.
- CLP sold its entire 70% interest in the Fanchanggang Power Station in Mainland China in November 2022.
- The sale of an additional 10% stake in Apraava Energy from CLP to CDPQ, starting from 20 December 2022.
- In Hong Kong, a 350MW unit at the Castle Peak A Power Station was put in reserve to run only in an emergency situation after it reached the end of its asset life in May 2022. In addition, completion of the turbine upgrade at Black Point Power Station has improved the plant's efficiency.

- The Qian'an III wind project in Mainland China began commercial operations in 2022 and other renewable energy projects, including the Xundian II and Bobai Wind Farms, Yangzhou Gongdao and Guangdong Mazhang solar plants, have made good progress. The 150MW Bobai Wind Farm in the Guangxi Zhuang Autonomous Region is expected to go into operation in the second quarter of 2024.

The above changes are in addition to the following plans previously announced:

- The remaining units at Castle Peak A Power Station will be progressively retired in the next few years, and daily coal-fired power generation in Castle Peak B Power Station will be ceased by 2035.
- Retirement of the coal-fired Yallourn Power Station in Australia in mid-2028, with the >300MW Tallawarra B Power Station to be operational in 2023. Tallawarra B Power Station will be capable of using a blend of green hydrogen and natural gas, with all its direct GHG emissions offset over its operational life.

CLP will continue to look for opportunities to accelerate the decarbonisation of its portfolio. A review of its current Climate Vision 2050 targets is underway with the aim to set 1.5°C-aligned targets. Progress in Hong Kong is in part contingent on the finalisation of CLP Power's Development Plan for 2024–2028, which is under discussion with the Hong Kong Government.

Pursuing opportunities

The call to address climate change by transitioning to a low-carbon economy presents the opportunity to make energy systems more efficient and resilient – by decoupling generation and distribution from extractive, non-renewable and polluting fossil fuels, and by providing low-carbon electricity to the customers.

Developing decentralised energy solutions creates the opportunity for CLP to expand into new business lines and diversify revenue streams, while deploying digital technologies opens up previously unavailable opportunities in system management.

CLP's strategy in becoming a Utility of the Future is set against such a backdrop. On the one hand, Climate Vision 2050 sets a roadmap for the decarbonisation of CLP's generation business. On the other hand, CLP pursues opportunities presented by electrification and digitalisation. Opportunities arise from increased electricity demand, investment in low-carbon electricity to meet growing demand, and other infrastructures required for grid balancing.

The following table presents a summary of these opportunities.

Opportunity	Relevant CLP Markets	Timeframe	Implications for CLP	Actions taken
Demand for low-carbon electricity Low-carbon electricity generation to meet the growing demand from electrification and replace carbon-intensive sources of power generation.	Hong Kong, Mainland China, Australia, India	Short- to medium-term	Opportunities arise from increased corporate customer demand for renewable power purchase agreements. Gas-fired generation – and later using hydrogen – as well as 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. In 2022, the portion of CLP's operating earnings from non-carbon energy sources (including renewables and nuclear) accounted for 28% of total earnings (by asset type), up from 23% in 2021; in contrast, earnings from coal and gas has reduced consistently in the past few years.	The short- to medium-term focus will be to expand existing technologies including wind and solar energy, and to bring more renewable energy to market through enhanced or expanded transmission system and the use of energy storage. In 2022, CLP has increased its investment in renewable energy assets steadily. The amount in 2022 more than doubled that of 2021, reaching $1,785M. Wind assets have been a focused growth area.
Demand for energy storage As more renewable energy is integrated into the grid, its intermittent nature is addressed by energy storage solutions. They provide backup power that can be deployed quickly. Pumped hydro storage is not new, but utility-scale battery storage has strong growth potential as it has less geographical constraints. Whether standalone or integrated with renewables, it offers opportunities to CLP.	Hong Kong, Mainland China, Australia, India	Short- to medium-term	Increased use of energy storage creates economic opportunities in its manufacturing and installation, as well as providing 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.	EnergyAustralia has been a forerunner in adopting utility-scale battery storage. To date, it has committed offtake agreements underpinning the first two utility-scale battery storage projects, with a combined capacity of 55MW in the state of Victoria, and similarly underpinned the 250MW Kidston pumped-hydro electricity storage project, currently under construction. Three other projects with a total of 1,275MW capacity in New South Wales and Victoria are being planned. In Hong Kong, battery storage is being deployed to reduce the use of diesel mobile generators. CLP Power has taken the lead in promoting Battery Energy Storage System (BESS) across the construction industry, by working with partners and developing practical guidance on the installation, application, and maintenance of BESS to help construction sites reduce emissions.

Opportunity	Relevant CLP Markets	Timeframe	Implications for CLP	Actions taken
Demand for transmission and distribution infrastructure The need to meet growing low-carbon electricity demand requires the construction of new, updated and more efficient transmission and distribution systems.	Hong Kong, India	Short- to medium-term	CLP could leverage its expertise to expand the transmission network in growing renewable generation zones or low-carbon energy interconnector imports, in particular on transmission networks in India and interconnection in Hong Kong. This would allow CLP to diversify and grow its non-generation business. There will be implications on *capital investment* and *revenue* generated in the long term.	CLP Power is making progress in the work to enhance the Clean Energy Transmission System to allow for the import of more zero-carbon energy from Mainland China to Hong Kong. It is expected to be completed by 2025. Apraava Energy entered the power transmission sector during FY 2019-20 with a vision of becoming a sustainable end-to-end power provider. As of 31 December 2022, its portfolio of intrastate 400kV power transmission lines span 494 km in Madhya Pradesh, and across Assam, Nagaland and Manipur.
Demand for electric vehicle (EV) infrastructure Technology development in EV is driving down costs and increasing their competitiveness against incumbent, fossil fuel-based technologies. Infrastructure that supports EV development is in high demand, including EV chargers, energy services, and facilities for the EV transition of commercial fleets.	Hong Kong, Mainland China (Greater Bay Area)	Short- to medium-term	CLP has a proven track record in charging infrastructure planning and design in Hong Kong. As of 2022, there are already over 5,000 public charging facilities in Hong Kong. This is achieved ahead of the 2025 target as set out in the Hong Kong SAR Government's Roadmap on Popularisation of Electric Vehicles. The city is in progress to install 150,000 private charging facilities by 2025, evidence of a high potential for growth. Although electrifying commercial fleets is more challenging, the cost for electric taxis, light buses and buses is becoming commercially viable, presenting additional opportunities to power companies and energy services providers such as CLP.	CLP Power will continue to expand and enhance the EV charging network in Hong Kong for its customers. CLP*e* is also exploring opportunities in charging-as-a-service. Leveraging on its customer-centric approach, there are opportunities to expand into charging-as-a-service. The corporate fleet segment is considered to offer the most potential as a larger fleet could achieve more cost-savings and efficiency gains for the customers. To seize the opportunities in the Greater Bay Area, CLP and Qingdao TGOOD Electric Company Limited established a joint venture in Mainland China to invest in charging infrastructure networks. CLP*e*, a CLP wholly-owned subsidiary, will provide RMB 300 million, which is 60% of the new joint venture's initial registered capital. It may make additional investments in the future depending on the pace of growth of the partnership.
Higher demand for cooling due to increased extreme heat events Extreme heat events and gradual increases in average annual temperature may increase the demand for electric cooling in spring and summer, particularly in sub-tropical climates. In more temperate climates, cooling demand could increase in warm months, but heating demand may also decrease in winter.	Hong Kong, Mainland China, Australia, India	Medium- to long-term	Temperature changes may result in higher peak demand for electricity to power cooling. If an electricity service provider is able to increase its power supply from generation or storage solutions flexibly while prices spike, overall *revenue* would increase. However, additional *capital investment* may also be required to install new cooling infrastructure to meet the higher peak demand. Conversely, as discussed under physical risks, extreme heat events could also lead to heatwaves and increased risks of wildfire, which can have a broad range of effects on the community and economy. Opportunities for new *revenue* streams abound for providing cooling-as-a-service (CaaS), which is more energy-efficient, especially for commercial buildings. This also provides long-term partnership opportunities for the Group. *Capital investment* would be required for installation of equipment as well as operating expenditure for the provision of services and maintenance during the course of each contract period.	In early 2023, CLP*e* partnered with Shui On Group for the first CaaS project in Hong Kong. As a 15-year agreement under a Build-Operate-Transfer model, CLP*e* will fund, design, construct, operate, and maintain three freshwater-cooled chillers with an artificial intelligence (AI) management system to provide an air conditioning service for the building. CLP*e* also signed a Build-Own-Operate-Transfer (BOOT) agreement with Chinachem Group. Under the 20-year agreement, CLP*e* will provide funding, design and engineering work to convert the existing air conditioning into an energy efficient water-cooled system. The electricity consumed by the chiller plants at Nina Tower will be matched by an equal amount of Green Electricity Certificates (GECs) linked to a renewable energy project of CLP Holdings, making it Hong Kong's first zero-carbon chiller system.

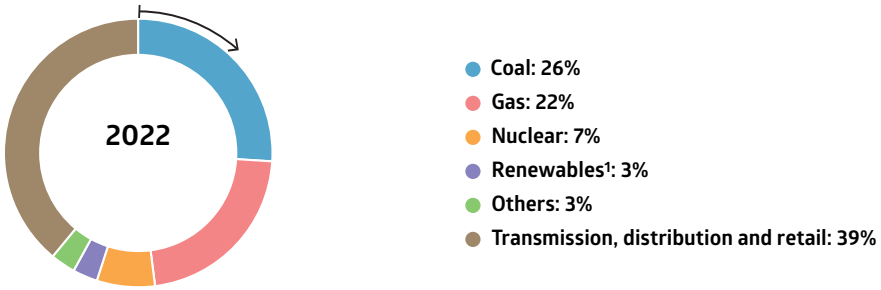
Allocating resources to support decarbonisation

CLP's Climate Vision 2050 has been instrumental in informing CLP's business strategy and guiding its investment decision-making. Decarbonising and diversifying CLP's asset portfolio are key approaches to lowering the Group's GHG emissions and reducing reliance on revenue from fossil fuel-based generation. Investing in smart energy systems also presents new opportunities.

The following charts demonstrate how CLP allocates resources to invest in different asset types, and how its generation portfolio has diversified. As a result, its operating earnings are now derived from a broad range of fuel types and non-generation business activities.

Revenue by asset type

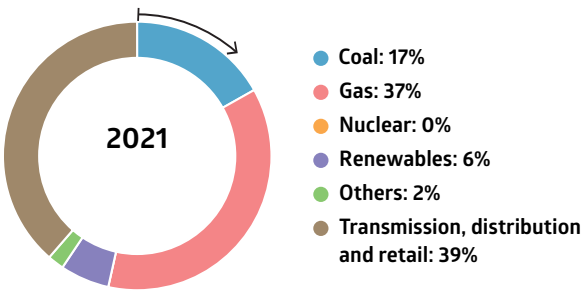
The revenue from non-carbon generation assets was HK$ 10,440M in 2022, representing 10% of total revenue. The revenue from transmission, distribution and retail-related activity was HK$ 39,169M, representing almost 40% of total revenue.



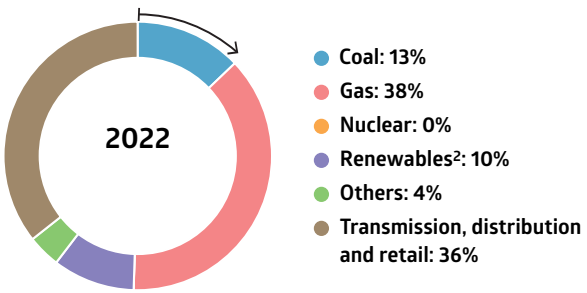
1 Renewables include wind, hydro, solar and waste-to-energy. The revenue percentage of wind, hydro, solar and waste-to-energy are 2%, 1%, 1% and 0% respectively.

Capital investment (on accrual basis) incurred by asset type

Capital investments in coal assets continued to decrease down to HK$ 2,280M (13%) in 2022, which includes maintenance, upgrades and efficiency improvements only. Capital investment in gas assets increased to HK$ 6,713M in 2022, compared to HK$ 5,639M in 2021, representing a 19% increment in absolute terms. This supports the low-carbon energy transition in Hong Kong and Australia.



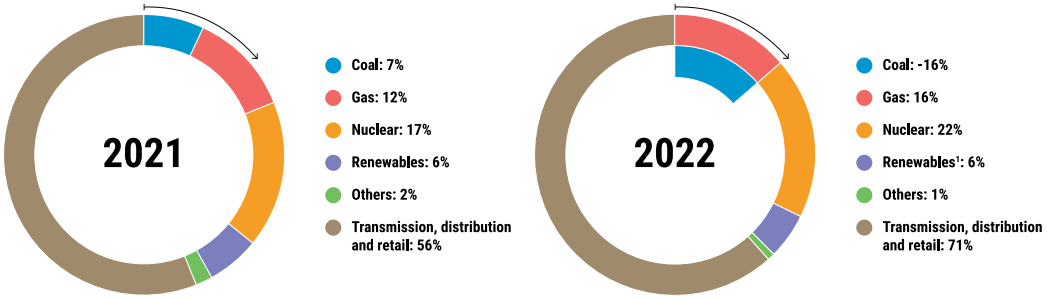
1 Numbers have been subject to rounding. Any discrepancies between the total shown and the sum of the amounts listed are due to rounding.



1 Numbers have been subject to rounding. Any discrepancies between the total shown and the sum of the amounts listed are due to rounding.
2 Renewables include wind, hydro, solar and waste-to-energy. The Capital investment percentage of wind, hydro, solar and waste-to-energy are 10%, 0%, 0% and 0% respectively.

Operating earnings (before unallocated expenses) by asset type

The portion of operating earnings from non-carbon generation assets increased to 28% and that from transmission, distribution and retail-related activity increased to 72% in 2022.



1 Renewables include wind, hydro,solar and waste-to-energy. The operating earnings percentage of wind, hydro, solar and waste-to-energy are 5%, 1%, 0% and 0% respectively.

Climate Action Finance Framework

Adequate resources are required to support CLP's strategy, in particular in decarbonising its portfolio, as this often involves capital-intensive infrastructure projects.

CLP's Climate Action Finance Framework (CAFF) was first published in 2017 and further enhanced in 2020. It lays out the Company's 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 its Climate Vision 2050.

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

- **New Energy Finance Transactions** whose use of proceeds is to develop renewable energy, energy efficiency and low-emissions transportation infrastructure projects; and
- **Energy Transition Finance Transactions** whose use of proceeds is to fund projects that are supported by the governments to deliver valid and significant emission reductions.

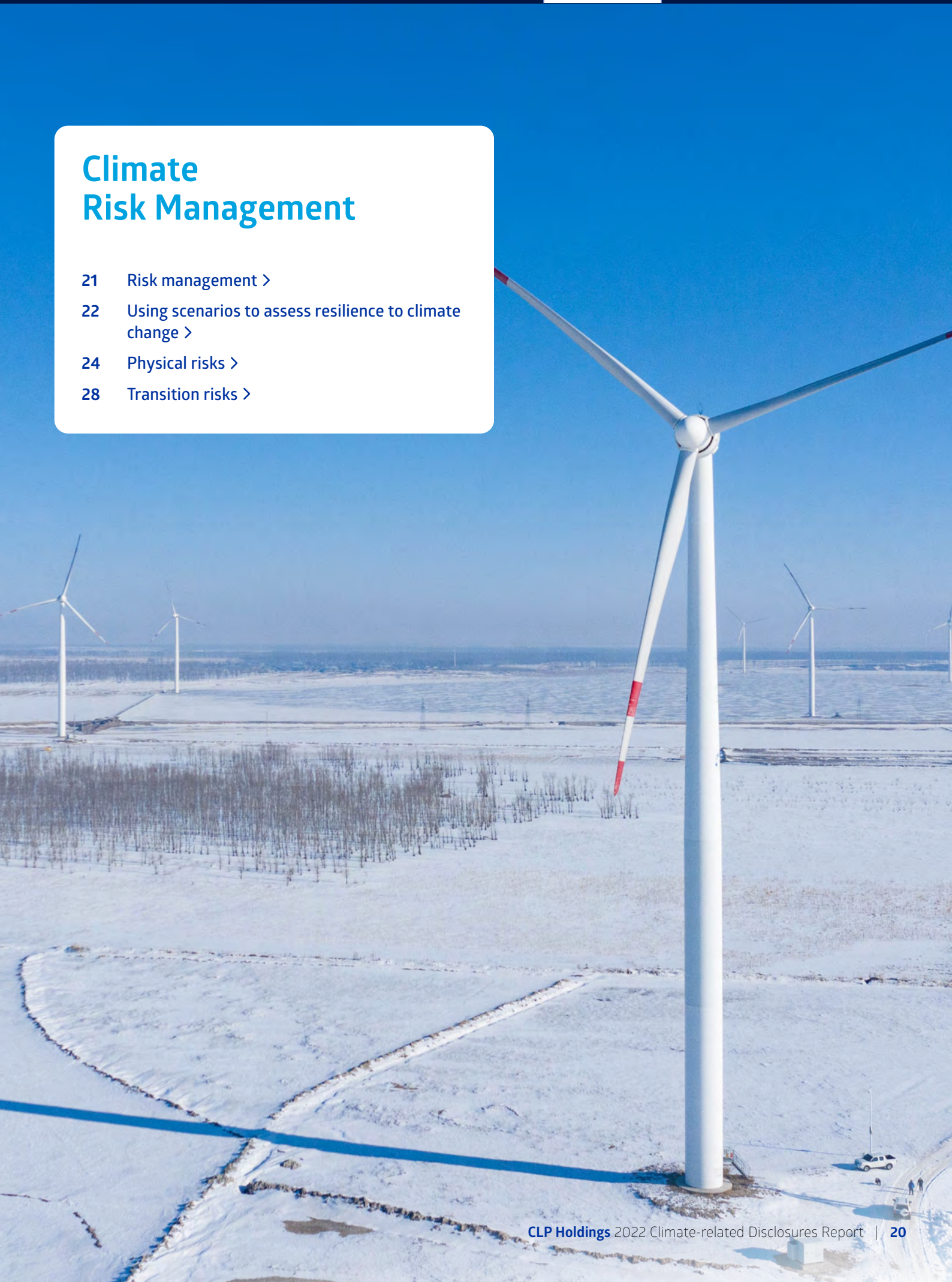
Governance of the CAFF aligns with the *Green Bond Principles*, a set of voluntary guidelines issued by the International Capital Markets Association that recommend transparency and disclosure, and promote integrity in the development of the international green bond market. The four pillars under the 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 engaging in the electricity generation business in Hong Kong, has entered into a series of Climate Action Finance Transactions since the establishment of CAFF in 2017. These include a total of HK$18 billion of Energy Transition Finance Transactions to finance/refinance the construction of the two additional new combined-cycle gas turbine (CCGT) generation units at Black Point Power Station, and the construction of an offshore liquefied natural gas (LNG) receiving terminal in Hong Kong waters and its associated subsea pipeline and gas receiving station, and a HK$170 million New Energy Bond to fund the construction of a landfill gas renewable energy generation project at West New Territories Landfill. In 2021, CLP Power Hong Kong Limited (CLP Power) also issued a US$100 million New Energy Bond to finance the rollout of smart meters for its customers in Hong Kong.

In addition to the arrangement of various Climate Action Finance Transactions to support decarbonisation, CLP also further expanded its sustainable financing portfolio for its Scheme of Control businesses since 2021 to include sustainability elements in bank facilities which link to the air emissions level within a reducing annual maximum output level. As of December 2022, CLP Power and CAPCO arranged in total HK$10.2 billion emission reduction-linked bank facilities with multiple tenors, of which HK$1 billion (JPY15 billion) was syndicated to Japan-based regional and city banks with a sustainability-linked derivative to swap the full Japanese yen loan proceeds to Hong Kong dollars. The sustainability-linked derivative was reportedly among the first of its type arranged for a corporate in Hong Kong.

Read more on the CAFF and download the 2022 Climate Action Finance Report

Climate Risk Management



Risk management

Proactive and effective risk management is part of good corporate governance and one of the foundations of long-term growth and success of the Group. Risk management is therefore integrated into all CLP business and decision-making processes including strategy formulation, business development, business planning, capital allocation, investment decisions, internal control, and day-to-day operations.

As climate change is one of the most impactful issues for electric utilities, management of the risks it presents is embedded in CLP's risk management process and risk register. Climate change risks are managed across the Group according to CLP's risk governance structure and risk management process, with management oversight and assurance provided to the Board. CLP identifies, assesses, and manages climate change risks alongside all other types of risk as an integral part of its group-wide risk management framework and adopts the same set of risk profiling criteria in assessing climate change risks. The risk management framework at CLP comprises four key elements: risk management philosophy, risk appetite, risk governance structure and risk management process.

Recognising the wide-ranging implications of climate change, CLP considers climate change risks as a combination of cross-cutting risk drivers of other Group top-tier risks as well as standalone risks categorised under regulatory risk and operational risk. This approach supports the Group's risk management objectives:

- At a **strategic level**, CLP focuses on identifying and managing material risks inherently associated with the pursuit of the Group's strategic and business objectives. In pursuing growth and transformational opportunities, CLP aims to optimise risk and return decisions as defined and quantified through diligent and independent review and challenge processes.
- At an **operational level**, CLP aims to identify, analyse, evaluate, and mitigate operational hazards and threats while enhancing and capturing opportunities for operational improvement where appropriate. Doing so creates a safe, healthy, efficient, and environmentally friendly workplace for employees and contractors while ensuring public safety and health, minimising environmental impact, as well as securing asset integrity and adequate insurance.

Read more from the 2022 Risk Management Report

Through the risk management process, supported by deep-dive discussions with representatives from each business unit, CLP has identified the tailored climate-related risks and opportunities relevant to its assets and services across key markets. They are summarised in the table below. This exercise referenced third-party energy and climate models to understand the scenarios under which these risks and opportunities may be most significant.

	Risks	Opportunities
Short term (0–1 year)	• Extreme weather events compromising the integrity of CLP's assets or that of the power system	• Developing new business models including Energy-as-a-Service and customer-facing solutions • Increased demand for transition enablers, including energy storage, and transmission and distribution systems
Medium term (1–5 years)	• Government implementation of low-carbon policies for the power sector, including carbon pricing, or tightened emission standards	• Creating new earning streams as other sectors electrify, for example, the development of electric vehicles (EVs) infrastructure
Medium to long term (5+ years)	• Potential stranded fossil fuel assets • Changes in climate pattern affecting the performance of renewable assets	• Growing the non-carbon portfolio to meet increased demand for low-carbon electricity

Using scenarios to assess resilience to climate change

Developing scenarios for analysis

In 2020, the TCFD published the *Guidance on Scenario Analysis for Non-Financial Companies*, which guides CLP's approach. The TCFD recommendations call for businesses to consider their strategic plans against two or more climate scenarios. These scenarios offer differing views of the future over a typical time horizon of 20 to 30 years. Transition and physical risks impact a company differently, especially over the course of time. CLP has taken steps to consider the physical and transition risks it is exposed to under the different climate-related scenarios, outlined below.

Scenario 1	A slow, weak transition – Warming of 3 to 4°C by 2100
Reference	Based on the International Energy Agency's (IEA) Stated Policies Scenario (2020), the *Representative Concentration Pathway* (RCP) 8.5, and the *Australian Energy Market Operator Integrated System Plan* 2020 Central Scenario for Australia
Description	This scenario is used to assess physical risks, which are the highest under this scenario and increase over time. It assumes the implementation of climate-related policies already announced by key governments, thus transition risks under this scenario are lower and opportunities are fewer. However, it also leads to decarbonisation not being pursued with enough speed and government enforcement to align with the objectives of the Paris Agreement. While the development and deployment of low-carbon technologies is maintained, unabated fossil fuels continue to play a significant role in the power sector across Asia. Physical risks intensify as atmospheric CO_2 and global temperatures rise.
Example trends[1]	• Emissions continue to rise, peaking after 2040. • In Australia, the highest monthly rainfall over a 10-year period decreases by 0.7mm by 2050 compared to historic averages.[2] • In India, the number of extreme hot days with temperatures above 40°C increases by 23 days per year by 2050 compared to historic averages. • Renewables have a 47% share of global electricity generation by 2040. • Carbon pricing reaches US$43 per tCO_2 by 2040.[3]

1 Physical climate event figures averaged across the CLP markets of Hong Kong, Mainland China, Australia and India.
2 Historical average references years 1986 to 2005.
3 Mainland China only. Based on the Net Zero by 2050 scenario in IEA's Global Energy and Climate (GEC) Model.

Scenario 2	An immediate, strong transition – Warming of 1.5 to 2°C by 2100
Reference	Based on the IEA Sustainable Development Scenario (SDS) (2020) and RCP4.5
Description	This scenario assumes significant changes in government policy begin immediately, aligned with the objectives of the Paris Agreement. This scenario is used to assess transition risks. The resulting surge in clean energy policies and investment leads to a significant and immediate deviation from the 2020 base case and a rapid but planned transition towards net-zero emission economies across Asia by 2070. As a result, significant transition risks and opportunities arise from rapid electrification of energy consumption, stronger low-carbon policies, and changing markets. Physical risks under this scenario are in comparison lower, but still likely to be significant.
Example trends[1]	• Emissions decline from 33Gt in 2020 to less than 10Gt by 2050. • In Australia, the highest monthly rainfall over a 10-year period increases by 10mm by 2050 compared to historic averages. • In India, the number of extreme hot days with temperatures above 40°C increases by 16 days per year by 2050 compared to historic averages. • Renewables have a 72% share of global electricity generation by 2040. • Carbon pricing reaches US$85 to US$205 per tCO_2 by 2040.[2]

1 Physical climate event figures averaged across the CLP markets of Hong Kong, Mainland China, Australia and India.
2 Based on the Net Zero by 2050 scenario in IEA's GEC Model.

Scenario 3	A deferred, disruptive transition – A late or deferred transition from the 3 to 4°C pathway to the 1.5 to 2°C pathway occurs, resulting in a warming of 2°C by 2100
Reference	Bespoke for each of CLP's markets, drawing on references used by institutional investors (e.g. the UN Principles for Responsible Investment's (PRI) *Inevitable Policy Response*) and central banks (e.g. the Network for Greening the Financial System's (NGFS) *Climate Scenarios 2020*). Each of CLP's business units were consulted during the development of this scenario, with each providing a plausible decarbonisation pathway based on the most relevant and credible local sources.
Description	This scenario assumes deferral of the most significant policy changes until the effects of climate change become more disruptive, forcing governments to urgently revise their climate policies and mandate the adoption of low-carbon technologies. This leads to a much more sudden and disruptive transition toward the goals of the Paris Agreement during the 2030s and a greater need for negative emissions technologies after 2050. In the short term, transition risks and opportunities are similar to Scenario 1. The main risks are associated with policy uncertainty and the unpredictable actions of other participants in the market. In the late 2020s to early 2030s, rapid policy changes to mandate sharper emissions reductions lead to far higher transition risks. The greenhouse gas (GHG) emissions trajectory follows the "slow, weak transition", but with a much deeper and sharper reduction as abrupt policy changes come into place. A similar physical risk profile to Scenario 1 is experienced until 2050, moderating towards the risk profile of Scenario 2 after mid-century.
Example trends[1]	• Governments are forced to urgently revise their climate policies. Changes are expected to be more abrupt. • Technology advances in areas such as battery storage and EVs play an important role in managing the energy system as intermittent supply from renewable sources is more widely adopted. • Government policies may hasten the update of technologies known to accelerate decarbonisation, potentially disrupting the energy system. • Such a scenario could be expected to have disruptive impacts on the operational landscape, making it particularly important to include business resilience testing.

1 Physical climate event figures averaged across the CLP markets of Hong Kong, Mainland China, Australia and India.

Assessing risk exposures under different climate scenarios

Focusing on the prioritised material physical and transition risks drivers, CLP has developed a financial model to help understand the financial impacts of these risks on the Group in different time horizons until 2050. The assessment takes into account different climate patterns, speeds of policy changes, the Group's decarbonisation plan, and draws reference from past events.

Each risk driver may lead to many different risk events, which could have wide-ranging consequences depending on the severity and frequency of such an event, as well as the time and location where the event happens.

CLP's business units have conducted climate risk reviews specific to their assets and operations. This bottom-up approach is complementary to the Group-level, top-down evaluation.

The discussion below provides an indication of the financial impact the different climate-related physical and transition risks may have on CLP.

Physical risks

Understanding physical risks

Physical climate risks have the potential to compromise the integrity of CLP's assets or disrupt service delivery. In the last few years, CLP has experienced multiple large-scale extreme weather events, including super typhoons, forest fires, flooding and landslides across its different geographies. Such events are expected to occur more frequently because of climate change, with impacts increasing over time.

Weather pattern changes will not be experienced uniformly around the world. Even within the same country, considerable variance is present especially for geographically large countries such as Mainland China, India and Australia. The relevance of different extreme weather events also differs. It is therefore important to assess physical climate risk asset-by-asset.

Evidence suggests that, under the rise in average global temperature of 1.2°C recorded to date, significant climate-related risks are already emerging. In a business-as-usual scenario with a projected average global temperature rise of around 3 to 4°C (i.e. Scenario 1), physical risks will become more impactful and predominant when compared to other scenarios.

Some extreme weather event risks such as super typhoons could have an acute impact, directly damaging physical assets. Meanwhile, the risk of chronic changes in climate patterns may increase the risks of other natural disasters including forest fires, which have broader impacts upon the communities where CLP operates.

The table below summarises the physical risks prioritised for CLP, considering its assets and geographical presence. They are closely linked to the material topic, *Reinforcing resilience in a changing operating environment*, and are also highlighted in the 2022 Annual and Sustainability Reports.

Physical risk	Trend	Relevant CLP markets and asset types	Urgency	Implications for CLP
Flooding Fluvial (river) flooding can result from heavy rainfall on an already waterlogged catchment. Coastal flooding occurs under tidal surges, resulting from a combination of high tides and stormy conditions.	**Increasing** Heavy rainfall and prolonged rain events are projected to occur more frequently or with increased intensity in the long term, especially when combined with a rising sea level. The likelihood of fluvial or coastal flooding events also increases as a result.	Hong Kong, Mainland China, Australia, India	Acute; Short-term	Coal and gas generation plants requiring water for cooling are most susceptible to flooding as they are located on the coast or near rivers. They are exposed to: • Health and safety risks to personnel • Increased *capital investment* as a result of site flooding and water damage to and repair of equipment and infrastructure (including turbines, cooling towers, pipelines or buildings) • Increased *operating expenditure* as a result of additional fuel, labour, liability and insurance costs • Disruptions to commodity supply due to flooding of access routes • Potential reduction in revenue caused by site downtime Out of those impacts, *capital investment* is anticipated to be most significant. For instance, in Hong Kong, under the extreme case with multiple damages to critical infrastructure and equipment of the power plants and T&D assets, the incurred repair and replacement costs could reach HK$200 million.

Physical risk	Trend	Relevant CLP markets and asset types	Urgency	Implications for CLP
Tropical Storm Tropical storms, including cyclones and typhoons, occur across a significant area of CLP's operating regions and drive some of the most impactful climate hazards. This hazard is measured by maximum windspeed.	**Increasing** Wind speeds during severe weather events are expected to increase under the climate projections of Scenario 1.	Hong Kong, Mainland China, India	Acute; Short-term	One of the significant consequences of tropical storms is an increased occurrence of landfall, damaging infrastructure and properties at the coastlines, where several CLP's thermal power plants are located. Transmission and distribution assets are also prone to tropical storms due to their large area coverage. The following potential effects of tropical storms include: • Safety risks to personnel • Direct damage to infrastructure, or indirectly through falling trees, towers and poles, resulting in additional *capital investment* implications associated with 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 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 the resilience measure in place, the actual property damage from the severe typhoon Mangkhut in 2018 was below HK $10 million.
Landslides Landslides can result from heavy rainfall, earthquakes, volcanic activity, or human activity. Only those resulting from heavy rainfall are considered to be climate-related.	**Increasing** The occurrence of landslides is often secondary to heavy rainfall, thus its frequency may increase under Scenario 1, as a result of more frequent, prolonged rainfall.	Mainland China, Hong Kong	Acute; Short-term	Areas with landslide hazards are avoided when selecting sites for solar and wind farms. However, landslide risks are at times unavoidable at hydropower sites and transmission lines. These risks include: • Health and safety risks to personnel • Damaged infrastructure including overhead lines, dams, reservoirs, water turbines and buildings, resulting in possible *capital investment* • *Operating expenditure* caused by additional labour, liability and insurance costs • Reduction in *revenue* caused by site down time
Change in wind speeds impacting wind assets The performance of renewable generation is highly influenced by weather patterns. Anomalous patterns in annual wind variability, or a longer-term shift of wind pattern, may adversely impact the availability and performance of wind turbines.	**Variable, uncertain** Surface wind speeds have been decreasing in Asia, but there is a large geographical variance. The outlook for the future trend is also uncertain.	Mainland China, India	Chronic; Medium- to long-term	Changes in wind speed will affect the performance of wind turbines. Reduced wind speeds, an ongoing trend in some territories over recent years, may result in reduced load factors and generation sent out. On the other hand, increased wind speeds could improve their performance. The changing wind pattern is introducing uncertainty when planning for future investments. It should be noted that output from wind turbines does not necessarily correlate with revenue directly. Revenue is affected by factors such as the electricity demand and supply at a specific point in time and the contractual agreement of each wind farm. Using 2022 figures as an example, where operating earnings from renewable assets was HK $553M, if this is influenced by a 5% downside, the financial impact would be roughly HK $28M. Given the decentralised nature of CLP's renewable energy and its diversification into technologies, CLP's portfolio revenue risk is lowered as not all assets will be affected by changes in wind speed.

Natural gas | Coal | Wind power | Hydro power | Transmission

Managing physical risks to build resilience

Over the years, a range of measures have been implemented in CLP's value chain to help the Group prepare for climate events. Tailored to different geographies, measures consider the asset type and location. CLP incorporates climate adaptation measures into its plant design for new build projects, and ensures its systems are resilient to withstand extreme conditions, thereby minimising disruption and facilitating faster recovery for affected communities.

Some of these measures are summarised in the table below.

Relevant part of the value chain	Protection measures
Supply chain	Diversify fuel supply. For instance, Hong Kong's offshore liquefied natural gas terminal would assist CLP Power in diversifying the natural gas supply. Read more in this case study.
Generation	**To address extreme heat and increased temperature:** • Maintain cooling equipment in good condition. • Refurbish cooling towers to improve efficiency. **To address water shortage and drought for thermal plants:** • Use sea water or recycled water for cooling to mitigate risks from freshwater shortage. • Where possible, work with local authorities to construct water transfer pipelines from nearby sources and water treatment facilities to secure water supply. **To address flooding:** • Ensure protection walls for coal yards and run-off water storage are in place. • Deploy asset-specific anti-flooding measures, including water pumps and piping for water discharge, ground-level drainage systems, sea walls along power station shorelines, flood gates and flood barriers. • Implement additional coverage via tarps, grass and tree planting and drainage works to avoid soil erosion. • For assets downstream of dams, continually control and monitor river rate flow. Maintain regular communications with local authorities on flood discharge schedule and flowrate. **To address changing weather patterns:** • Commissioned a climate model to estimate the future performance of wind farm projects. The data collected can be used to support investment decisions. • For CLP-operated wind farms, conduct regular wind resource forecasts based on the latest wind plant performance data • Maintain a Bushfire Mitigation Plan in Australia. **To address tropical storms:** • Critical structural assessment against typhoons of 360km/h three-second wind gust at a height of 500m was conducted. • The continuous ship and grab unloaders will be anchored by tie downs during a hit of super typhoon.
Transmission and distribution	**To address extreme heat and increased temperature:** • Have operational guidelines in place that consider operations under high temperatures (of up to 45°C) **To address flooding:** • Continue flooding assessment and mitigation measures for new and existing substations. **To address tropical storms:** • Continue reinforcement of transmission overhead line tower structures. • Strengthen foundations of transmission towers, and stabilisation of nearby slopes. • Enhance automatic detection and isolation of faulty sections of distribution overhead line circuits and use smart meter supply interruption data to proactively contact customers and prioritise recovery. • Implement predictive vegetation management to minimise risk from overgrown vegetation.

Relevant part of the value chain	Protection measures
Retail	• Provide necessary support to customers directly impacted by extreme weather events through business continuity planning. • Through engagement events, inform customers of initiatives already undertaken to increase system resilience.
Condition monitoring and service recovery	• Install online condition monitoring systems for switchgear and transformers to allow real-time monitoring and detection of incipient fault conditions. • Enact emergency management procedures and response plans across all operations, and conduct regular drills. • Establish a typhoon response protocol and coordination system. Conduct regular drills and post-typhoon reviews to ensure smooth execution of contingency plans. • Utilise the CLP System Control Centre, providing round-the-clock surveillance of network status, enabling prompt mobilisation during power outages. • Utilise the emergency restoration system, enabling rapid construction of temporary masts to expedite restoration of 400kV overhead line circuits. • Enhance the communication capacity of customer services; in particular, post-incident customer communication for energy transmission outage. • Establish in-house unmanned aerial vehicle teams for post-typhoon surveillance inspection. • Reserve capacity, fuel switching or power import in case of emergency via the CLP Business Continuity Plan.

Case study

Climate-proofing generation and network assets

CLP has undertaken physical climate change risk assessments and climate change adaptation work across the Group for over a decade. It has developed advanced tools for climate hazard screening and identifying adaptation measures.

These studies make use of updated climate science and industry-leading datasets, and are designed to align with international best practices, including alignment with the recommendations from TCFD.

Following the update of its climate change risk assessment in 2021, CLP Power completed a multi-year climate change risk assessment, to focus on specific events and implications to its generation and network assets. This led to the establishment of a new Asset Management Standard on Climate Change Adaptation in 2022.

This Standard will serve as a master assessment methodology for its generation assets, as well as transmission and distribution network across Hong Kong. It defines the selection criteria of assets, climate data, climate change impacts, and the risk assessment approach for conducting a climate change risk assessment. It also suggests the approach to setting specific time horizons for effective deployment of mitigation measures.

Transition risks

GRI reference: EU5

Understanding transition risks

Policy and regulatory changes as well as technology are amongst the strongest drivers – and enablers – for decarbonisation.

Given the long asset life of electric utilities, it is critical for CLP to continually engage with stakeholders and understand their expectations with respect to adopting these drivers. Doing so ensures its transition plans keep up with, or even surpass, the pace of markets where CLP operates, be it related to regulatory changes, market structures, technological developments or public sentiment. Failure to do so would present significant transition risks to the Group.

The table below summarises some of the most material transition risks to CLP. They are closely aligned with the material sub-topic *Responding to evolving regulatory landscapes* outlined in the 2022 Annual and Sustainability Reports.

Transition risk	Trend	Relevant CLP markets and asset types	Urgency	Implications for CLP
Carbon Pricing Carbon pricing is a government policy instrument designed to curb GHG emissions. This could be in the form of carbon taxes or a cap-and-trade system. Amongst CLP's markets, at the moment only Mainland China has a mandatory National Carbon Emissions Trading Scheme (ETS). The compliance assessment of emissions for 2022 has yet to be carried out and is expected to be completed by the end of 2023.	**Increasing** Carbon pricing is gaining popularity as a policy instrument to facilitate low-carbon investment and lower energy use. An increasing number of countries are enacting carbon pricing hence the risk is considered to be in an upward trend.	Mainland China	Short- to medium-term	According to the UNEP Emission Gap Report 2022, the global average price is currently at US$6 per ton of CO_2. The IEA suggested that the global average carbon price should reach at least US$85 per ton of CO_2 by 2040 to align with the 1.5°C decarbonisation pathway. With decarbonisation in line with CLP's Climate Vision 2050, such a high carbon price would still translate to an unrealistic annual operational expenditure of at least HK$1,500 million, based on a simplistic estimation. However, in reality, the impact of carbon pricing is subject to other regulatory measures such as applicability in different jurisdictions, or shielding of certain industries through allocation of emission allowances or tax exemptions. Regardless, this remains a strong signal that CLP needs to accelerate the adoption of alternative zero-carbon fuels such as hydrogen. Amongst CLP's markets, only Mainland China has a mandatory National Carbon ETS which commenced in July 2021. Read more in the case study following this table.
Decrease in generation output for fossil fuel generation As renewables become more competitive, their growth has significantly reduced the share of electricity coming from fossil fuel power plants.	**Increasing**	Hong Kong, Mainland China, Australia, India	Short- to medium-term	In 2021, global electricity generation from all renewable sources reached an all-time high of 30% of total electricity. Combined with nuclear power, low-carbon sources of generation have exceeded the 2021 output from the world's coal plants. Coupled with other policies that bolster deployment of renewable energy and flexible capacity assets, or add costs to fossil fuel output, *revenue* – and overall output –from coal plants is likely to reduce.

Transition risk	Trend	Relevant CLP markets and asset types	Urgency	Implications for CLP
Emission standards for generation assets with emission intensities above a certain threshold In some markets, thermal plants continue to serve as base load. In such cases, shifting to gas and/or hydrogen is one potential pathway to reduce carbon intensity.	**Increasing**	Hong Kong	Medium- to long-term	Coal plants, or aged gas plants that cannot be economically retrofitted with hydrogen-compatible equipment, may be forced to be decommissioned earlier, resulting in additional *capital investment* implications. Continuing to operate these plants, on the other hand, exposes the Group to disciplinary action and damages to enterprise reputation. Although hydrogen prices are reducing, it is unlikely to be commercially viable in the short- to medium-term. Unless price parity is reached compared with gas generation, there would be implications on *operating expenditure*.
Potential stranded fossil fuel assets More governments are accelerating the retirement of fossil fuel assets, and many investors are divesting from fossil fuel assets. The declining demand for electricity generated from these assets may see some become "stranded assets" that will not be fully utilised.	**Increasing**	Hong Kong, Mainland China, Australia, India	Long-term	Over time, stranded fossil fuel assets will lose their asset value. Compared to gas, 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.
Disruption from new market entrants leading to barriers to maintaining market share for generation and electricity retail The increasing demand for clean energy presents opportunities for investment. The entry barrier for distributed renewable generation and virtual power plants is lower than traditional asset intensive utility investments, encouraging many new market entrants. There is a risk that CLP will be unable to capture these opportunities amidst keen competition	**Increasing**	Mainland China, Australia, India	Medium- to long-term	Increased competition in the electricity market may include revenue loss for CLP due to an inability to capture opportunities for additional renewable generation, and a loss of customers. Especially for the retail market, i.e. in Hong Kong and Australia, customers are seeking value-added services from their energy providers. EnergyAustralia is responding by providing different service plans catering to customers different needs. CLP Power in Hong Kong is also providing a range of digital solutions to help customers conserve energy or improve efficiency. See the *Customers* section in the 2022 Sustainability Report for details.

Natural gas Coal Renewables

Case study

Supporting energy transition through market mechanism

Market mechanisms, including the trading of carbon credits and energy attribute certificates (EACs), are important means to help finance the low-carbon transition.

Countries or entities can accelerate toward meeting their carbon reduction targets by funding GHG reduction projects outside of their jurisdiction or operations by purchasing carbon credits or EACs.

CLP has a dual role as a supplier and user of these instruments. On the supply side, CLP offers a range of carbon credits and EACs to suit customers' varying decarbonisation objectives:

- CLP has been issuing carbon credits through its renewable assets in India since 2013. These renewable assets include wind farms and solar farms which were commissioned between 2007 to 2011 and in 2018 respectively. Carbon credits are issued under the Verified Carbon Standard by Verra and the Certified Emission Reduction scheme under UNFCCC's Clean Development Mechanism. The majority of CLP's carbon credits originate from Apraava Energy's renewable assets in India, which amounted to 1.2 million credits in 2022.
- In Hong Kong, CLP Power's Renewable Energy Certificates (RECs) allows customers to support local renewable energy development. The RECs represent the environmental attributes of electricity produced by local renewable energy sources, generated by CLP Power or purchased by CLP Power through the Feed-in Tariffs (FiT) Scheme.
- CLP China's renewable assets issue Green Electricity Certificates (GECs) which are the only officially recognised renewable energy certificates in Mainland China. They can be used to meet obligations under China's mandatory Renewable Energy Portfolio Standard, or to support voluntary green power trading. GECs are emerging as a robust instrument and both demand for and recognition of them are on the rise. Green power from CLP China's new renewable projects that have reached grid-parity are bundled with corresponding GECs automatically, meaning project developers own the green attributes of these projects, which serves as an additional financing tool.

From the user perspective, CLP may deploy carbon credits or EACs to provide customers with zero-carbon energy services:

- Under the Go Neutral offer, EnergyAustralia purchases vetted carbon credits to offset the emissions associated with the gas and electricity used of subscribed customers.
- The Tallawarra B Power Station will come into service in 2023–24. After its completion of comissioning, it will be Australia's first peaking power station to be powered by a blend of gas and green hydrogen. The Power Station's GHG emissions will also be fully offset over its operational life through Australian Carbon Credit Units registered with the Commonwealth's Clean Energy Regulator, with some flexibility after 2030 to use other credible offsets that may emerge.
- CLP*e* complements its energy services with appropriate EACs including long-term REC contracts in Hong Kong or GECs in Mainland China to support customers in achieving their environmental goals.

At COP26 in 2021 a cornerstone moment for the carbon market ocurred when an agreement was reached on how international carbon credits should be exchanged under Article 6 of the Paris Agreement. While progress on operationalising Article 6 was limited at COP27, a myriad of standards and frameworks are in place for the voluntary carbon markets to grow. Yet, the credibility of these voluntary market instruments remain a contested issue.

Governance initiatives, including the Integrity Council for the Voluntary Carbon Market and the Voluntary Carbon Markets Integrity Initiative, aim to address credibility concerns regarding the issuance and usage of carbon credits respectively. Following the consultations launched in 2022 for their key principles, both standards will be updated in 2023. CLP contributed to these two consultations and will assess how the finalised guidances will impact its ability to generate and sell carbon credits going forward, while taking into account the growing potential of natural climate solutions, in supporting CLP's decarbonisation strategy.

Monitoring regulatory developments in different markets

CLP is closely monitoring the climate change policy landscape across the markets where it operates. The government policy updates listed below are expected to impact on the operating environment in the near term.

Hong Kong	The Hong Kong's Climate Action Plan 2050 published in 2021 sets out the overall strategies and targets to realise the Hong Kong SAR Government's pledge of achieving carbon neutrality before 2050. Some targets will have a direct implication on CLP Power. These include: • Ceasing coal use for daily electricity generation by 2035; • Trialing new energy and closer cooperation with neighbouring areas to increase the supply of zero-carbon electricity to between 60% to 70% by 2035; • Driving public and private sectors to develop renewable energy portfolios to increase its share to a target of between 7.5% to 10% by 2035, and an increase to 15% in subsequent years; and • Achieving net-zero carbon emissions in electricity generation before 2050. In the 2022 Policy Address, the Chief Executive further announced various decarbonisation plans, such as the expedition of energy-efficient infrastructure in the New Development Areas of Hong Kong and the roadmap for promoting the electrification of public transport and commercial vehicles. CLP Power fully supports the Government's acceleration of decarbonisation efforts and continue its decarbonisation projects, including the Feed-in Tariff Scheme, waste-to-energy generation in West New Territories Landfill, as well as the completion of the gas-fired generation units upgrade in Black Point Power Station. It will also work with the Government and community and apply its expertise to deliver a stable and reliable electricity supply solution for the city. Read CLP Power's response here.
Mainland China	After announcing the dual carbon targets of reaching carbon peak in 2030 and carbon neutrality in 2060, Mainland China laid down the "1+N" policy framework in 2021 which leads efforts across regions and sectors for a gradual transition to carbon neutrality. Key measures to build a clean, low-carbon and efficient energy system include establishing a carbon emission control system, reducing coal consumption, and developing renewable energy systems, amongst others. In addition, the Ministry of Ecology and Environment and 16 other state agencies released a new national climate change adaptation strategy. It aims at building a "climate-resilient society" by 2035 through developing a nationwide system to monitor climate change-related risks and to prevent and control damages from natural disasters. Financial policies that support climate change adaptation measures will also be established. In July 2021, the National Carbon ETS began trading, and in November 2022, the draft allowance allocation plan for the second compliance cycle (2021–2022) was released for public consultation. It proposed tighter benchmark values for approximately 2,000 thermal plants covered by the scheme. CLP China's Fangchenggang Power Station has fulfilled its requirements and obligations under the first compliance cycle of the national ETS, and the process of compliance for the second compliance cycle is targeted to be completed by end of 2023.
Australia	In October 2021, the Federal Government formally committed Australia to a 2050 net-zero target. It imposed stronger actions on climate change and increased support for the energy market transition in 2022 with notable outcomes as follows: • Legislated commitments to reduce Australia's GHG emissions by 43% below 2005 levels by 2030 and reach net-zero emissions by 2050; • Introduction of the Rewiring the Nation Fund which will provide A$20 billion to modernise and rebuild the Australian power grid; and • Consultations to develop national plans to improve energy efficiency, to introduce a new environmental regulator, and to legislate minimum vehicle fuel standards and support increased uptake of electric vehicles.

Australia (continued)	State Governments also increased their energy and climate change aspirations in 2022. Key announcements included: • Victorian emissions reduction targets of between 75% to 80% by 2035 and net zero by 2045; renewable energy production targets of 65% by 2030 and 95% by 2035; electricity storage targets of 2.6GW by 2030 and 6.3GW by 2035; and offshore wind capacity of 9GW by 2040; • Queensland renewable energy targets of 50% by 2030, 70% by 2032 and 80% by 2035 along with a 90% reduction in electricity emissions by 2035; and • Government auctions for the New South Wales Electricity Infrastructure Roadmap to deliver 12GW of renewable energy and 2GW of long duration storage by 2030. EnergyAustralia is committed to transitioning to net-zero emissions and published its Climate Change Statement to highlight its targets and practical steps of emissions reduction. The Climate Change Statement will be regularly updated to reflect the progress it is making. Download EnergyAustralia's Climate Change Statement here.
India	The clean energy transition in India is well underway. By 2022, it has already met 40% of its power capacity from non-fossil fuels. The share of solar and wind in India's energy mix has also grown significantly. The Energy Conservation (Amendment) Bill introduced in 2022 highlighted the key decarbonisation measures. They included: • A voluntary carbon credit trading scheme; • An obligation on the usage of non-fossil fuel sources of energy; • Energy conservation codes for buildings; • Standards for vehicles and vessels (equipment and appliances which consume, generate, transmit or supply energy); and • The composition of the governing council of the Bureau of Energy Efficiency. In addition, the amendment bill that followed the stakeholder consultation of the first draft National Carbon Market policy was published in July 2022 to set out the framework of a voluntary carbon credit trading scheme in India. Apraava Energy is eagerly working towards increasing its clean energy portfolio to contribute to India's energy transition. It has also committed to the Science Based Targets intiative's (SBTi) Business Ambition and has developed a measurable science-based emissions reduction target under a 1.5°C scenario, which is currently under validation by SBTi.

Managing transition risks to build resilience

Against the backdrop of evolving geopolitical, regulatory, and operating environments, CLP continues to assess its exposure to climate transition risks while identifying opportunities to adapt its business model to the net-zero agenda.

As previously pledged, an update of CLP's Climate Vision 2050 is currently underway to accelerate decarbonisation and achieve more aggressive growth in renewables and transition enablers, as explained in the Strategy section of this report.

Furthermore, in consideration of the transformation enabled by decentralisation and digitalisation in the utility sector, CLP continues to seek investment opportunities and partnerships to expand its energy service offerings and innovations. This includes an investment of over HK$780 million in venture capital funds since 2017 and new partnerships established in areas including hydrogen, carbon capture, battery storage, electric vehicle charging and renewable power purchase contracts.

With emissions trading gaining focus in key climate discussions, CLP China established a carbon management governance framework and set up a dedicated taskforce to coordinate carbon management matters while strengthening communication with joint ventures on carbon-related issues and performance.

CLP will continue to engage governments and relevant stakeholders with the aim of building resilience and advocating CLP's position on regulatory and market changes. For details, please refer to the Partners – Public Policy section in the 2022 Sustainability Report.

Metrics and Targets

Performance against the Climate Vision 2050 targets

Greenhouse gas intensities of electricity sold

SASB reference: IF-EU-110a.3, IF-EU-000.D; GRI reference: 305-4, 305-5, EU2, EU10

CLP tracks progress against its Climate Vision 2050 commitments using the carbon intensity of electricity sold – representing the Group's efforts in decarbonising electricity sold to its customers.

CLP is committed to grow its renewable portfolio by investing in, and directly constructing, new projects primarily in Mainland China and India. It has made significant capacity purchases of renewable energy and will continue to explore such opportunities to provide a low-carbon option to customers. Inclusion of purchased electricity, by using an equity plus long-term capacity and energy purchase basis, serves to better represent the Group's investments and decarbonisation efforts.

This approach follows the Science Based Targets initiative (SBTi) guidance for electric utilities, Setting 1.5°C-aligned science-based targets: Quick start guide for Electric Utilities. The guidance outlines how to calculate emissions intensity targets covering all sold electricity by using the sum of emissions from both electricity generation in the organisational boundary and electricity purchased and sold to customers. This means that in addition to its own direct emissions from generation (on an equity basis), CLP's targets also include emissions from electricity purchased and sold to its customers (Scope 3 Category 3). Performance on an equity basis continues to be disclosed for comparison.

The Group's greenhouse gas (GHG) emissions intensity of electricity sold reduced to 0.55kg CO_2e/kWh in 2022 from 0.57kg CO_2e/kWh in 2021. This is achieved through a lowered proportion of electricity sent out from coal, which was replaced by natural gas and nuclear.

Climate Vision 2050	2022	2021	2020	2019	2018
CLP Group – GHG emissions intensity of generation and energy storage portfolio[1,2,3,4]					
On an equity plus long-term capacity and energy purchase basis (kg CO_2e/kWh)[5,6]	**0.55**	0.57	0.57	0.63	0.66
On an equity basis (kg CO_2e/kWh)[7]	**0.63**	0.65	0.66	0.71	0.74

1 The 2019-2022 numbers refer to the GHG emissions intensity (kg CO_2e/kWh), in line with the updated Climate Vision 2050 targets. Numbers prior to 2019 refer to carbon emissions intensity (kg CO_2/kWh), as reported in the past.
2 Starting from 2020, the portfolio includes energy storage assets and generation assets. Energy storage assets include pumped storage and battery storage. In previous years, the portfolio included generation assets only.
3 Paguthan Power Station, the power purchase agreements of which expired in December 2018, was not included in the 2019-2022 numbers.
4 In accordance with the Greenhouse Gas Protocol, WE Station, 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 in the Asset Performance Statistics. Its non-CO_2 GHG emissions (i.e. CH_4 and N_2O) are included in CLP's Scope 1 CO_2e emissions.
5 Numbers include assets with majority and minority shareholdings, and those under "long-term capacity and energy purchase" arrangements with CLP. Starting from 2018, "long-term capacity and energy purchase" has been defined as a purchase agreement with a duration of at least five years, and capacity or energy purchased being no less than 10MW.
6 Numbers include Scope 1, Scope 2 and Scope 3 Category 3 emissions (direct emissions from generation of purchased electricity that is sold to CLP's customers).
7 Numbers include Scope 1 and Scope 2 emissions.

In CLP's home market in Hong Kong, CLP Power's energy sent out from Castle Peak coal-fired Power Station and Black Point gas-fired Power Station remained stable, resulting in the same GHG emissions intensity of 0.39kg CO_2e/kWh for CLP Power as in 2021.

CLP Power Hong Kong – GHG emissions intensity of electricity sold[1,2]	2022	2021	2020	2019	2018
CO_2e emissions intensity of electricity sold by CLP Power Hong Kong (kg CO_2e/kWh)	**0.39**	0.39	0.37	0.50	0.51
CO_2 emissions intensity of electricity sold by CLP Power Hong Kong (kg CO_2/kWh)	**0.39**	0.39	0.37	0.49	0.51

1 In accordance with the Greenhouse Gas Protocol, WE Station, 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 in the Asset Performance Statistics. Its non-CO_2 GHG emissions (i.e. CH_4 and N_2O) are included in CLP's Scope 1 CO_2e emissions.
2 "Electricity sold" is the total electricity energy sold to CLP Power Hong Kong's customers before the adjustment of Renewable Energy Certificates.

Electricity generation by fuel type

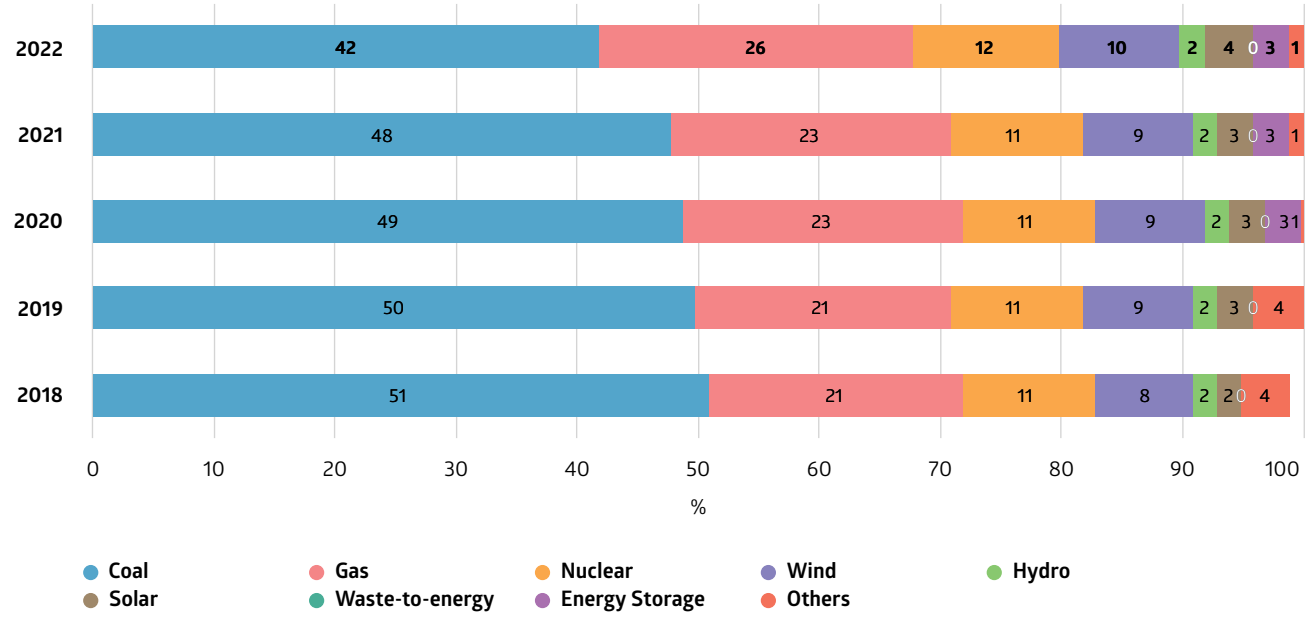
As of end-2022, CLP's coal-fired generation capacity decreased to 9,719MW (vs 12,027MW in 2021), while the renewable generation capacity in operation and under construction remained relatively stable at 3,611MW (vs. 3,624MW in 2021). Even though CLP added additional renewable capacity to its asset base in 2022, the slight decrease in capacity is due to CLP's 10% equity reduction in Apraava Energy.

On a project basis, CLP's generation capacity continued to diversify with the addition of the 100MW capacity of Qian'an III Wind Farm in Mainland China in 2022 and the 251MW capacity of Sidhpur Wind Farm in Gujarat state in India due to be commissioned in the first half of 2023. Further plans to increase the renewable portfolio includes the Xundian II Wind Farm in Yunnan province scheduled to go into operation in the first quarter of 2023 and the Bobai Wind Farm in Guangxi Zhuang Autonomous Region (expected operation in 2024). In 2022, CLP's renewable portfolio accounted for 16% of total generation capacity (vs 14% in 2021).

The portfolio percentages of different asset types are shown in the graph below.

Generation capacity by asset type[1] (%) (on an equity plus long-term capacity and energy purchase basis)

CLP's generation capacity from all asset types decreased to 23,068MW in 2022 compared to 25,108MW in 2021.



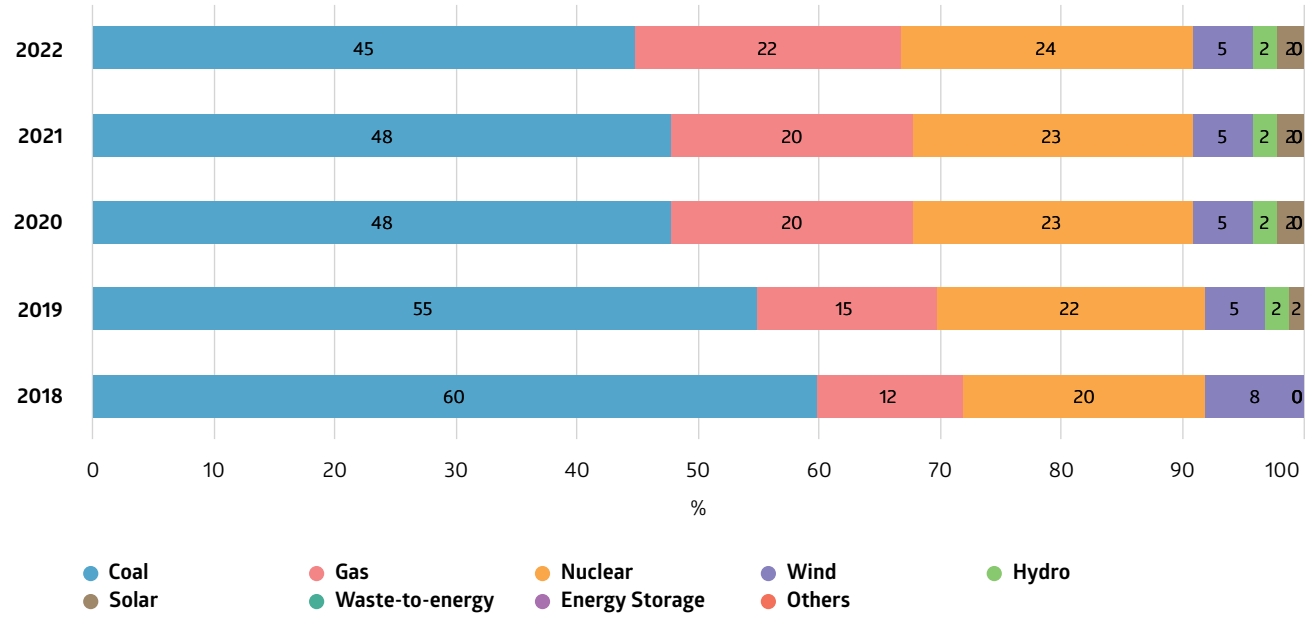
1 Numbers have been subject to rounding. Any discrepancies between the total shown and the sum of the amounts listed are due to rounding.

Generation capacity (MW)	2022	2021	2020	2019	2018
Coal	**9,719**	12,027	11,997	11,997	11,997
Gas	**6,089**	5,813	5,717	5,139	5,084
Nuclear	**2,685**	2,685	2,685	2,685	2,685
Wind	**2,264**	2,331	2,105	2,049	1,982
Hydro	**489**	489	489	489	489
Solar	**848**	793	793	745	558
Waste-to-energy	**10**	10	10	10	10
Energy Storage[1]	**665**	660	655	N/A	N/A
Others	**300**	300	300	900	900
Total	**23,068**	25,108	24,752	24,015	23,705

1 Energy storage was categorised under Others prior to 2020.

Energy sent out by asset type[1] (on an equity plus long-term capacity and energy purchase basis)

CLP's energy sent out from all asset types decreased to 87,360GWh in 2022 compared to 91,183GWh in 2021. High fuel prices due to the global energy crisis reduced energy sent out from coal assets to 45% and increased the energy sent out from the gas (22%) and non-carbon energy portfolio (33%). In addition, a 350MW unit at the coal-fired Castle Peak A Power Station was put in reserve which further reduced energy sent out from coal assets.



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

Energy sent out (GWh)[1]	2022	2021	2020	2019
Coal	**39,027**	43,995	41,118	48,512
Gas	**19,507**	18,461	17,157	13,073
Nuclear	**20,836**	20,962	19,923	19,400
Wind	**4,709**	4,611	4,445	4,474
Hydro	**1,835**	1,668	1,879	1,758
Solar	**1,472**	1,524	1,522	1,467
Waste-to-energy	**42**	38	22	0
Energy Storage[2]	**-69**	-75	-118	N/A
Others	**2**	1	1	-109
Total	**87,360**	91,183	85,949	88,573

1 2018 data are not presented as they were provided only as percentage.
2 Energy storage was categorised under Others prior to 2020.

CLP's GHG profile

Absolute GHG emissions

In 2022, CLP's total Scope 1, 2 and 3 GHG emissions decreased to 60,223 kilotonnes of carbon dioxide equivalent (kt CO_2e) on an equity basis, compared to 65,017 kt CO_2e in 2021. Details leading to this emission reduction can be found in the Strategy section *Progress in 2022* of this report.

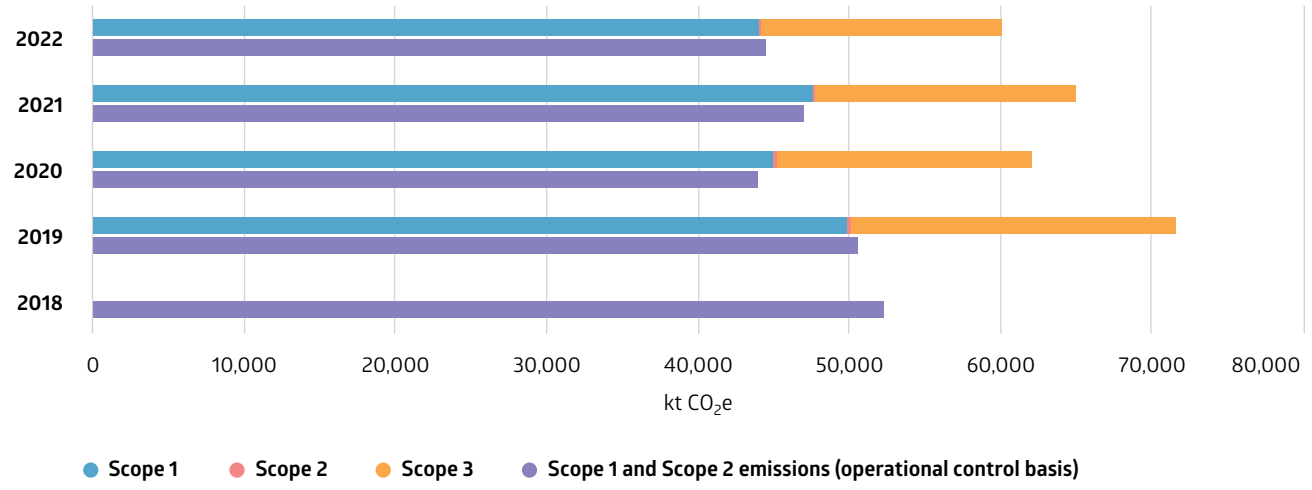
SASB reference: IF-EU-110a.1; GRI reference: 305-1, 305-2, 305-3

CLP's Scope 1 and Scope 2 GHG emissions are reported on two bases – operational control, and equity plus long-term capacity and energy purchases – to provide a transparent overview of decarbonisation efforts and progress. The five-year trend is shown in the chart below.

Find out how CLP's GHG profile is compiled

GHG emissions (equity and operational control bases)

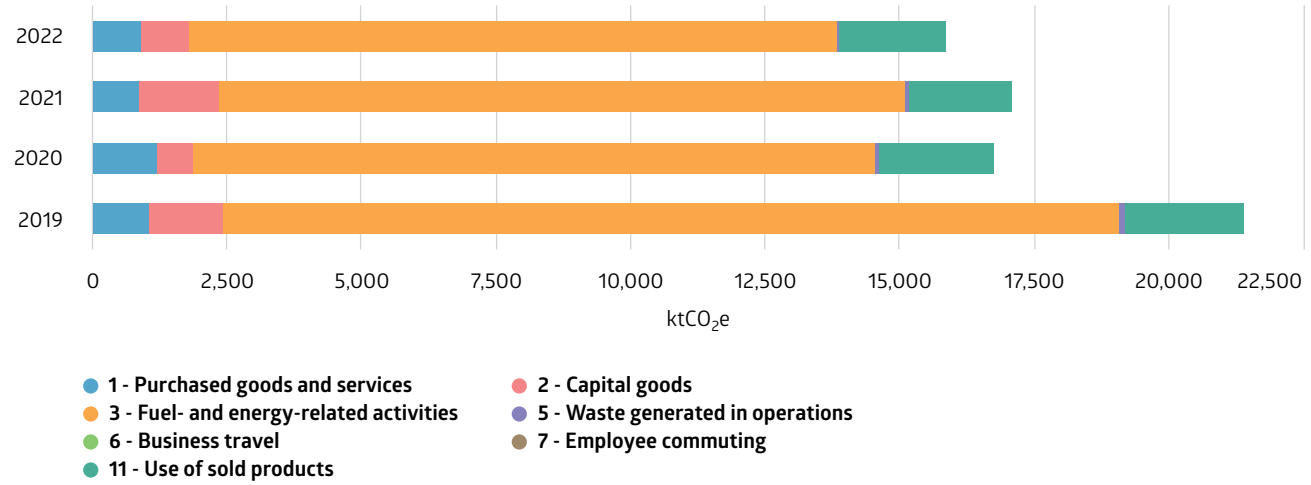
CLP's total GHG emission is reducing steadily. In 2022, its total Scope 1, 2 and 3 emission on an equity basis has reduced by 7% compared with 2021.



GHG emissions (kt CO_2e)	2022	2021	2020	2019	2018
Total emissions (equity basis)	**60,223**	65,017	62,138	71,720	N/A
Scope 1	**44,141**	47,690	45,105	50,047	N/A
Scope 2	**220**	236	244	250	N/A
Scope 3	**15,861**	17,091	16,790	21,424	N/A
Scope 1 and Scope 2 emissions (operational control basis)	**44,571**	47,090	44,023	50,676	52,306

Scope 3 GHG emissions by category

CLP's Scope 3 GHG emissions also reduced significantly to 15,861kt CO2e, which is mainly due to fewer capital goods purchased and less coal consumption, leading to lowered associated emissions from their extraction, production and transportation (Category 2 – Capital goods and Category 3 – Fuel- and energy-related activities).



Scope 3 GHG emissions by category (kt CO_2e)	2022	2021	2020	2019
1 – Purchased goods and services	**912**	901	1,210	1,093
2 – Capital goods	**902**	1,488	685	1,347
3 – Fuel- and energy-related activities	**12,046**	12,733	12,690	16,671
5 – Waste generated in operations	**56**	80	63	101
6 – Business travel	**2**	1	1	8
7 – Employee commuting	**5**	4	2	4
11 – Use of sold products	**1,939**	1,884	2,138	2,200
Total	**15,861**	**17,091**	**16,790**	**21,424**

Transition enablers

Decarbonisation of the generation portfolio cannot be achieved by replacing fossil fuel sources with non-carbon sources alone. A range of transition enablers is required to transform the energy system, including energy storage, advanced transmission and distribution systems and zero-carbon fuels such as green hydrogen. Other examples that enable broader economy-wide electrification include decentralised generation and smart energy services, and electric vehicle charging facilities. Digital technologies also provide new tools for customers to interface with the energy system.

As CLP expands into these new business lines, it is seeking to understand the broader climate impact these offerings have enabled for the wider economy through avoided emissions.

In 2022, the Group has undertaken a study to establish the methodologies to estimate avoided emissions from seven key product categories, including e-mobility services and energy efficiency improvement projects. CLP plans to incorporate the climate impact assessment into future business development.

The table below summarises CLP's progress in expanding its investment in these enablers. To unlock the growth opportunities presented by the energy transition, the Group is also providing a range of customer-facing energy solutions and Energy-as-a-Service solutions to meet new consumer demands for more customised energy solutions, as detailed in the Customers section in the 2022 Sustainability Report.

Smart meters	• In Hong Kong, the seven-year smart meter rollout plan was approved by the Hong Kong Government in 2018. By the end of 2022, more than 1.78 million smart meters had been connected, covering 63% of the meters in CLP Power's service area. More details on the mass rollout plan are available here. • In Australia, over 0.61 million smart meters were connected for customers in 2022.
Decentralised generation	• Since the Feed-in Tariff (FiT) Scheme's commencement in mid-2018, and as at the end of 2022, CLP Power has received over 22,400 applications. Around 93% of the applications, representing a total capacity of around 336MW, have been approved. About 16,800 applications have been completed and connected to the grid to enjoy FiT. • EnergyAustralia has over 278,000 business and residential customer accounts with solar panels installed. • Following a successful trial of its Solar Plus Plan in 2020, EnergyAustralia launched the Solar Home Bundle as a scale product in September 2021 to Australian customers based in New South Wales. Under the Solar Plus Plan, customers of EnergyAustralia can install solar panels, an inverter and a battery on a seven-year plan basis without any upfront cost. As of 2022, EnergyAustralia had 332 customers who purchased the Solar Home Bundle (and former Solar Plus Plan) product.
Electric vehicle (EV) development	• In 2019, CLP was the first Hong Kong company to join the global EV100 initiative run by the international non-profit organisation, The Climate Group. CLP will provide over 360 charging points in various CLP premises in Hong Kong to support greater EV adoption across CLP operations. The Group has been investing in 193 EVs for its fleet and installing 379 EV chargers across 94 parking bays since joining EV100 initiative. • Since the Eco Charge 2.0 service was launched in November 2020, CLP Power has completed preliminary power supply capacity assessments for more than 500 applications, covering over 126,000 parking bays, from private building owners and estate managers in Hong Kong. These assessments supported the applicants in seeking government subsidies for the provision of EV-charging facilities. • EnergyAustralia has outlined plans to support the electrification of the transport sector by working with EV manufacturers, fleet operators and their customers to plan and build the infrastructure required to charge their fleets.

Demand response programmes	• In Hong Kong, peak power demand was reduced by over 130MW because of the activation of CLP Power's demand response programmes on 25 July 2022, when electricity demand reached a new peak of 7,720MW. More than 405,000 of CLP Power's commercial, industrial and residential customers were incentivised as part of the programme. • EnergyAustralia's demand response contracted capacity now stands at over 246.4MW. This includes around 340,000 household customers in the EnergyAustralia PowerResponse Programme. • These demand response programmes help smooth the transition by lowering peak demand across the energy system, reducing the need to construct additional generation assets.
Customer solution sales	• CLP expanded its range of smart technologies and helped more businesses achieve energy efficiency improvements through the CLP Smart Energy Connect digital platform, where sales of smart energy technologies increased by 45% year-on-year, enabling more businesses and organisations to achieve impressive energy efficiency improvements.
Transmission and distribution infrastructure	• In December 2021, Apraava Energy successfully received regulatory approvals under India's new foreign investment rules for it to complete its acquisition of a 49% stake in Kohima-Mariani Transmission Limited, the owner of an interstate transmission project which began operations in northeast India in 2020. This is Apraava Energy's second transmission asset, following its acquisition of Satpura Transco Private Limited in 2019. • Enhancement to the Clean Energy Transmission System connecting the CLP Power's grid in Hong Kong to Guangdong is expected to be completed by 2025. The system will improve accessibility to zero carbon-energy resources and help further reduce fossil fuel use in Hong Kong.
Large scale storage	• EnergyAustralia is a forerunner in large-scale storage systems, which play critical roles in addressing the intermittent nature of renewable energy, and in providing peak energy demand and ancillary services. The key projects are listed below: – The Ballarat and Gannawarra battery storage facilities in Victoria have a combined capacity of 55MW. They have been operating since the summer of 2018–19. – The Kidston pumped hydroelectricity storage facility has a capacity of 250MW. In 2020, EnergyAustralia executed a binding 30-year long-term storage agreement with Genex Power to underpin the project. With 7.5 hours of storage, it will be a key project for EnergyAustralia to lead the integration of renewable energy into the grid. Main construction works commenced at the start of 2022 and completion is on track for 2024. EnergyAustralia controls the market operations of the facility and holds a right to acquire equity in the project. – EnergyAustralia has also entered into new agreements for market control of the co-located Riverina and Darlington Point battery energy storage systems which have a capacity of 65MW and 25MW respectively. EnergyAustralia will have market control of the projects once construction is completed in 2023 or 2024. – The 350MW Wooreen utility scale battery is located at the Jeeralang Power Station in the Latrobe Valley. Construction is in progress and the facility is expected to come into operation before 2026. – EnergyAustralia is also conducting a geotechnical and environmental analysis to support the feasibility review of a pumped hydro project of up to 335MW at Lake Lyell in New South Wales near the Mount Piper Power Station. This study will complete in 2024, before final investment is made.

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