CLP 中電

120 years 同行望遠 of shared vision

2021
Sustainability Report

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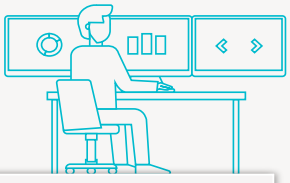
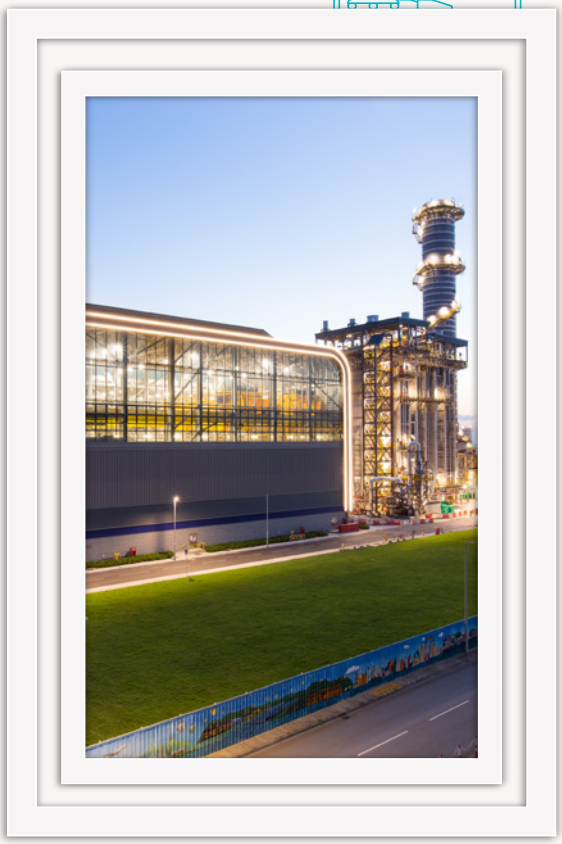
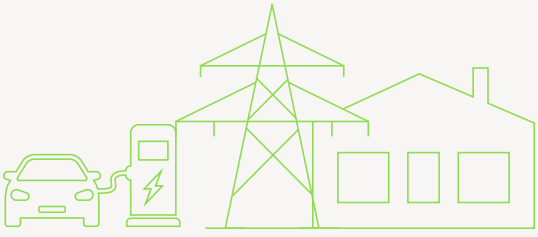




120 years of shared vision



Environment and climate change

Overview

Reducing greenhouse gas (GHG) emissions by replacing thermal generation with clean energy infrastructure is the key means by which CLP will mitigate its impact on climate change.

Climate is not the sole benefactor. Replacing fossil fuel consumption offers other benefits, including the reduced use of resources such as water for cooling in thermal plants, fuel and associated fuel consumption in its extraction and transport. Production of other pollutants such as airborne particulate matter is also reduced. All bring immediate benefit to communities through reduced waste and better air quality.

Investment in clean electricity infrastructure also benefits the economy by helping establish new industries and decarbonisation opportunities in relation to biodiversity and land use.

Stringent environmental management systems are already in place on CLP generation assets throughout the asset's life cycle, from environmental impact assessment before construction, emissions control during operations, to waste management and site rehabilitation when a plant is decommissioned. Effective management of these issues is embedded in CLP guidelines that dictate day-to-day operations and are fundamental to maintaining a licence to operate.

Key stakeholders

- Government and regulators, Communities, the Environment

Relevant material topics

- Shaping and executing the transition to net-zero
- Investing in clean electricity infrastructure

Environmental management

Management approach

CLP's Group-wide environmental management efforts align with the CLP Group Health, Safety and Environment Management System (HSEMS), which is driven by the new integrated Group HSE Policy.

GRI reference: 2-23

Strategies and procedures

The CLP Group HSEMS provides a framework used to identify and manage significant environmental issues arising from its operations. The HSEMS requires the environmental risks associated with a project's operational life cycle to be appropriately managed.

The environmental processes covered in the HSEMS include:

- Environmental impact assessments;
- Environmental monitoring;
- Environmental Management System (EMS) development;
- Environmental due diligence; and
- Data management systems.

Learn more about CLP's HSEMS →

These processes are key elements in support of the "Ensuring Environmental Sustainability" pillar of CLP Group's HSE Improvement Strategy for effective environmental management. The strategy aims to uplift environmental performance across all operations. Key initiatives and actions in 2021 are discussed in the following subsections.

As part of CLP's Pre-investment Environmental Risk Assessment, environmental due diligence is conducted at the project planning stage, followed by a more detailed environmental impact assessment (EIA) if needed. Assessments of key environmental impacts such as air quality and biodiversity are conducted at the EIA stage where applicable.

CLP takes great care in conducting all EIAs and has processes in place to fulfil the requirements and recommendations stipulated in EIA reports and local regulations. Planning procedures extend beyond compliance in countries where regulations are not as stringent. For instance, CLP mandates an EIA for all major generation projects in India, even though

it is not a statutory requirement for renewable energy projects in the country.

Read about how environmental aspects are considered in new projects

CLP is continuously refreshing its HSE Management System and its EMS. A refresh is currently underway. It will include specific environmental operational controls designed to systematically and continually improve the environmental performance of assets. During the transition to the refreshed HSE Management System, certain environmental standards and guidelines from the existing EMS will continue to support daily operations.

Under the HSE Management System, all power generation assets of which CLP has operational control are required to achieve third-party certification to the international standard, ISO 14001 Environmental Management Systems, within two years from commencement of operation or acquisition. In 2021, all assets in this category have successfully certified their EMS to the ISO 14001: 2015 standard.

Download the environmental management systems of CLP's assets

Monitoring and follow-up

CLP recognises that the development of goals and targets helps monitor progress and drive improvements in the efficient use of environmental resources. To this end, the Group has been developing internal environmental targets for emission, waste and several water-related parameters.

An environmental monitoring process, currently applied at project level, has also been developed. It specifies how environmental conditions should be assessed and assists with the design and implementation of suitable measures.

Environmental regulations and compliance

Management approach

It is fundamental that CLP fully complies with applicable environmental laws and regulations in the jurisdictions in which it operates.

Established processes are in place to review relevant environmental laws and regulations for new investments, or other updates to existing regulations. If an incident occurs at an asset under CLP's operational control, it is classified and recorded in a timely manner. Incidents managed through this process include notifications of any fines or prosecution from local authorities.

Year in review

In the year ending 31 December 2021, there were a total of nine environmental regulatory non-compliances, but none resulted in fines or prosecution.

SASB reference: IF-EU-140a.2; GRI reference: 306-3 (2016), 307-1

A table outlining the Company's environmental regulatory performance is featured below.

Environmental regulatory non-compliance and licence exceedances

Environmental compliance	2021	2020	2019	2018	2017
Environmental regulatory non-compliances resulting in fines or prosecutions (number)[1]	**0**	0	0	0	0
Environmental licence limit exceedances & other non-compliances (number)[1]	**9**	4	10	2	13

1 Numbers include operating assets where CLP has operational control during the calendar year. Paguthan Power Station, the power purchase agreements of which expired in December 2018, was not included in the 2019-2021 numbers.

Jhajjar Power Station is one of the few plants with flue gas desulphurisation equipment installed in the northern National Capital Region in India, which enabled Jhajjar to meet the new and more stringent sulphur dioxide (SO_2) emission limit introduced in February 2019. In 2021, it had four minor licence limit exceedances for SO_2 due to equipment failure or malfunction. However, the units remained operational as requested by local authorities because of high electricity demand. The issues were rectified at the earliest opportunity and none of the exceedances resulted in any action by local authorities.

There were two licence limit exceedances at Mount Piper Power Station in Australia, related to total particulates emissions and surface water turbidity respectively. The New South Wales Environment Protection Authority (EPA) was notified, and corrective actions have been taken to prevent a repeat of these incidents. There were also two licence non-compliances at Mount Piper. One related to the loss of five days of environmental data associated with continuous air emissions monitoring following an equipment malfunction. After being notified, the EPA was satisfied and had no further enquiries. The other case was related to localised damage to the liner of a brine pond. The damage was detected in an adjacent monitoring bore that is used to ensure integrity of the pond liner. Given the liner is a core element to prevent water pollution, the EPA was notified as a precautionary approach and there has been no further action. Corrective actions, such as a review of equipment efficiency and updates to the station's environmental management plan, have been made to prevent a repeat of these incidents.

The EPA Victoria informed EnergyAustralia in February 2022 that it considered a dust complaint against the Yallourn mine in October 2021 to be a licence non-compliance. EnergyAustralia is of the view that it has met relevant obligations as the incident took place on an extremely windy and dry day while all of its operational control measures were in use at the time to minimise fugitive dust emissions. EnergyAustralia is currently liaising with the EPA for a review of the case.

Key emerging environmental regulations

Developments in environmental regulatory requirements continue to be closely monitored. A summary of the key upcoming environmental regulations that could affect business units are listed below. Emerging policy changes related to GHG emissions are also discussed in the Climate-related Disclosures Report.

Hong Kong	· The emission allowances of CLP's power plants have been progressively tightened over time. Since 2021, there has been a new set of emission caps requiring CLP power plants to further reduce emissions by 4%, to reach a 7% reduction compared with the 2020 level. CLP Power has fully complied with these targets. · In 2021, CLP Power concluded discussions with the Hong Kong Government on a new set of emission caps for the power stations, commencing 2026. Under the new Technical Memorandum (TM), the allowances for air emissions of sulphur dioxide (SO_2), nitrogen oxides (NO_x), and Respiratory Suspended Particulates (RSP) in 2026 and afterwards will be reduced by 92%, 69% and 68% respectively compared with 2010 levels.
Mainland China	· In July 2021, China's National Carbon Emissions Trading Scheme officially launched. Power generation is the first sector covered by the scheme. In October 2021, it was announced that China will put in place a "1+N" policy framework. This means it will set up one top-level policy framework and guidance, supported by various supporting measures ("N"s) in key areas and sectors. The framework will provide guidance on how to achieve its carbon peak (by 2030) and neutrality (by 2060) targets.
Australia	· The EPA Victoria finalised the new licence for Yallourn Power Station in March 2021. The licence covers various environmental matters, including tightened emission limits and monitoring requirements. Yallourn is implementing measures and controls to ensure compliance with its new licence. · In Victoria, new environmental legislation for environmental risk prevention came into effect on 1 July 2021. In compliance with the changes, a risk management and monitoring plan is required for Yallourn, Newport and Jeeralang Power Stations. Preparation is underway to complete all three plans in the first quarter of 2022. · The Victorian Government has announced interim GHG emissions reduction targets as part of its Climate Change Strategy in May 2021. In line with the Government's plan to transition to net-zero by 2050, EnergyAustralia also announced its Climate Change Statement in September 2021 to highlight its targets and key steps to reduce emissions.

Air emissions

Management approach

Air quality remains a challenge in many of the geographies in which CLP operates. Air pollutant emissions will reduce as CLP expands its renewable and nuclear energy portfolio. Nonetheless, further emission reductions from existing thermal power stations remain high on the Group's agenda.

Strategies and procedures

CLP's Power Plant Air Emissions Standard stipulates that any fossil fuel-based power plant developed after October 2018, when the Standard became effective, is required to operate within CLP's prescribed limits on sulphur dioxide (SO_2), nitrogen oxides (NO_x) and total particulate matter (total PM), or they must fully comply with local regulations, whichever is more stringent.

In addition to incorporating state-of-the-art air emissions mitigation measures into plant management processes, CLP also designs new gas-fired power stations with advanced generation technologies. These new technologies produce electricity more efficiently, and assist in further lowering air pollutant emissions and greenhouse gases.

Monitoring and follow-up

The Company monitors air emissions (SO_2, NO_x, total PM) from facilities under its operational control using a continuous emissions monitoring system and/or stack sampling and mass-balance calculation methodologies. CLP is also cognizant of the increasing focus on mercury emissions from coal-fired power plants. For this report, CLP has estimated mercury quantities following local authority requirements where available. Otherwise, the quantities were estimated using acceptable methods. Jhajjar was not included in 2021 due to limited sampling size.

Year in review

CLP's total air emissions (SO_2, NO_x and total PM) have increased by approximately 8% to 106kt in 2021. This is a result of increased generation from coal-fired generators to meet higher electricity demands in different markets, and increased emissions from Jhajjar and Mount Piper Power Stations. In 2021, CLP experienced a 7% increase in electricity sent out.

SASB reference: If-EU-120a.1; GRI reference: 305-7

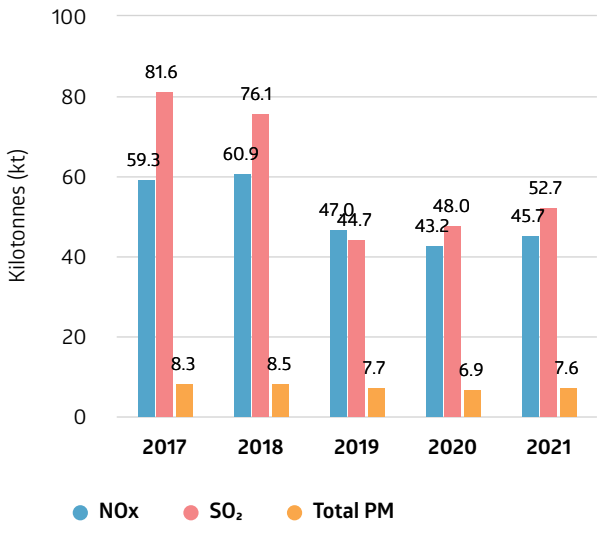
CLP has implemented different types of emission control measures in its thermal plants which are a part of normal operations. Since 1990, electricity demand in CLP Power's service area in Hong Kong has grown by over 80%, yet during the same period the Company achieved more than a 90% reduction in SO_2, NO_x and RSP emissions. These falls are a result of various emission reduction efforts. The selective catalytic reduction system introduced to the new 550MW gas-fired generation unit at Black Point Power Station has helped lower NO_x emissions. Going forward, the same technology will be deployed in another unit of similar capacity, and will further reduce emissions after its commission, planned for 2023.

The emission control equipment for SO_2 and NO_x in Fangchenggang Power Station, and the installation of flue gas desulphurisation units in Jhajjar Power Station, which were fully implemented in 2019, have achieved up to a 90% reduction in SO_2 emissions since 2017.

In Australia, Yallourn and Mount Piper Power Stations are implementing environmental measures including, for Yallourn, the upgrade of its continuous emissions monitoring system (CEMS) to ensure compliance with tightened emission limits and monitoring requirements under its new licence. The CEMS will enable improved control of NO_x and SO_2 emissions at Yallourn. For Mount Piper, its CEMS upgrade will enable improved control of particulate emissions.

Group-level air emissions

There was an increase in total emissions in 2021 which was mainly due to increased coal-fired generation, and increased emission at Jhajjar Power Station and Mount Piper Power Station.



Waste

Management approach

CLP endeavours to reduce both the hazardous and non-hazardous waste it produces, and works with qualified parties and partners to reuse or recycle whenever possible.

Strategies and procedures

All wastes are managed according to a waste management hierarchy (i.e. prevent, reduce, reuse, recycle, replace, treat and dispose). CLP seeks to avoid the use of hazardous materials and replace them with alternatives wherever possible. All hazardous and non-hazardous wastes are managed in accordance with local regulations, collected by licensed collectors, or sold for recycling.

At CLP's coal-fired power stations, coal ash from coal combustion and gypsum from the flue gas desulphurisation process constitutes the majority of generation by-products. The aim is to use them as a resource for construction and other applications in line with local regulations and practices rather than dispose of them. While the volume of solid and liquid waste generated by CLP operations is relatively small, projects involving demolition and construction increased the amount of non-hazardous solid waste.

Monitoring and follow-up

CLP monitors its waste generation monthly by tracking the solid and liquid forms of hazardous and non-hazardous waste produced and recycled at its facilities.

Year in review

CLP's non-hazardous solid waste increased to 24,481 tonnes in 2021, compared to 17,901 tonnes in 2020. The increase was mainly due to the plant facility enhancement projects at Castle Peak Power Station and Black Point Power Station in Hong Kong.

SASB reference: IF-EU-150a.1;GRI reference: 301-2, 306-1, 306-2, 306-3, 306-4, 306-5

Generation of hazardous solid waste remained comparable with 2020 while hazardous liquid waste decreased slightly in 2021, as a result of different plant maintenance activities and other remediation projects across the Group. CLP continued to recycle its hazardous and non-hazardous solid and liquid waste and, where feasible, sell by-products, such as ash and gypsum, for use in other industries.

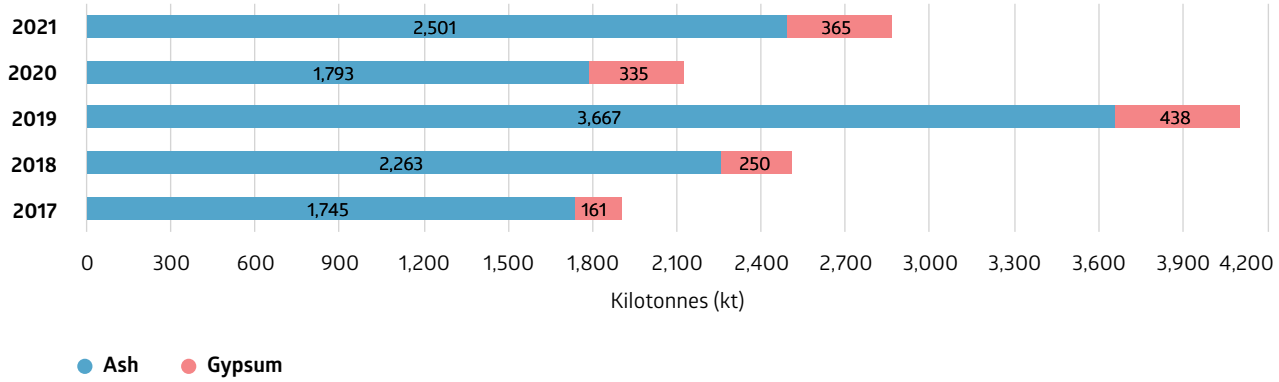
The Group's power stations run different programmes to manage waste, and learnings are shared internally and with contractors to raise awareness and build capacity.

Key programmes in 2021 include:

- **Jhajjar Power Station:** Apraava Energy achieved a 100% utilisation rate of ash generated in 2021. Apart from its enhanced ash handling systems, Jhajjar ensured that ash utilisation contracts were in place with cement manufacturers, construction industries and various traders. Apraava also actively pursued opportunities such as using ash for brick manufacturing, as well as road construction projects.
- **Jinchang Solar Power Station:** The station continued the initiative for returning any damaged panels to solar panel manufacturers for their recycling. The aluminium frames, which account for a large part of the waste, are reused and other components such as silicon and silver embedded in the panels are recovered. Since 2017, over 2,000 solar panels have been returned for recycling.
- **CLP Power Hong Kong:** CLP actively encouraged employees to recycle and reuse. In 2021, CLP rolled out a new programme to collect additional types of plastic bottles and beverage cartons. Over 2,000 plastic bottles and 5,000 pieces of beverage cartons were collected and sent to local recyclers. Reuse of coffee grounds was also promoted, and colleagues can now collect the used coffee grounds from the pantries of CLP offices for reuse.

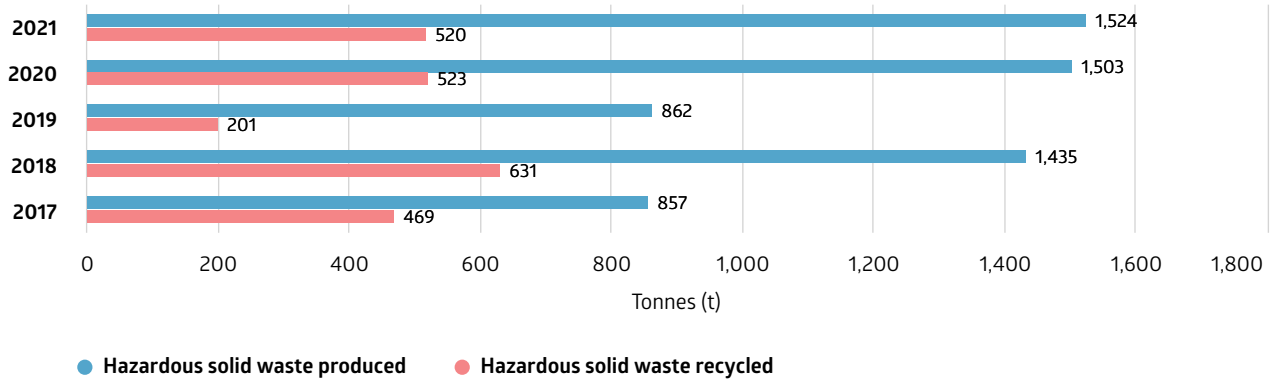
Ash and gypsum by-products recycled or sold

Power generation at the coal-fired Jhajjar Power Station in India increased in 2021, resulting in an increase in the total amount of ash and gypsum by-product recycled or sold. The percentage of by-products recycled or sold also increased.



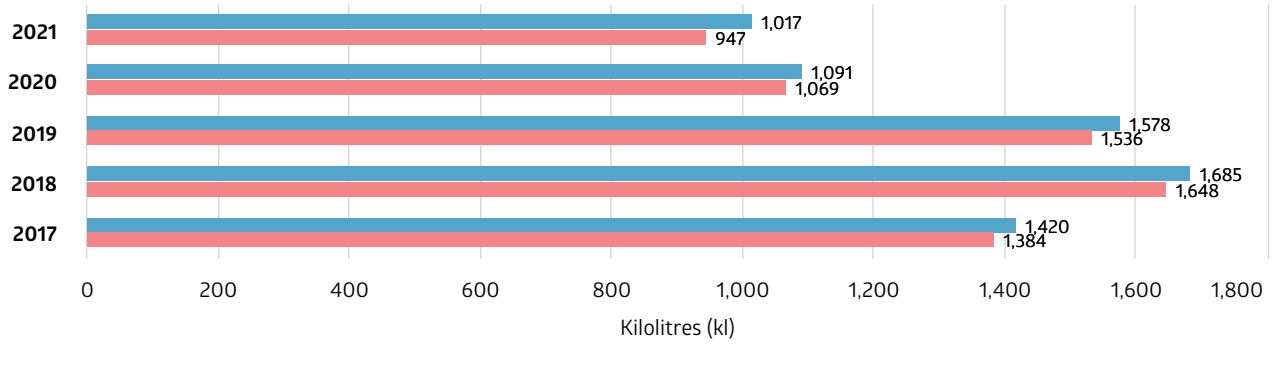
Hazardous solid waste produced and recycled

The amount of total hazardous solid waste produced and recycled in 2021 remained comparable with 2020, and was a result of different maintenance activities and other remediation projects across the Group.



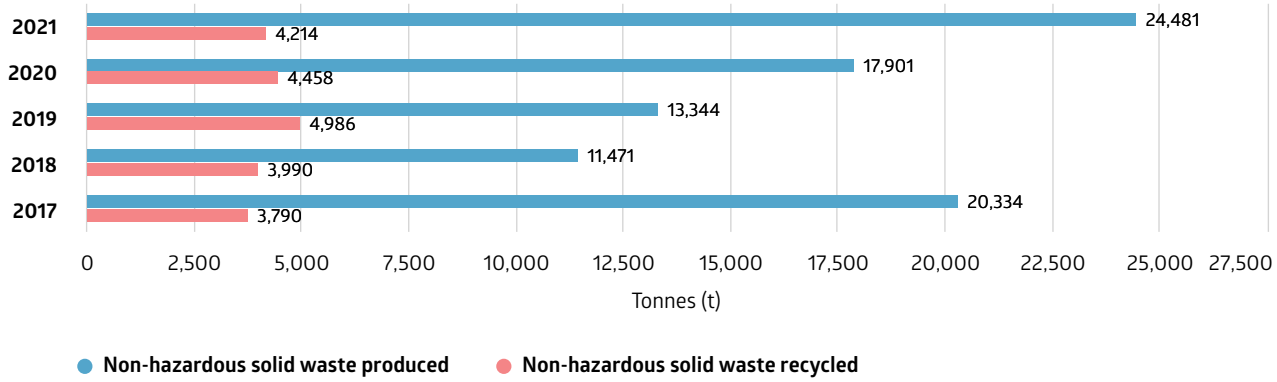
Hazardous liquid waste produced and recycled

Hazardous liquid waste is mainly produced from maintenance activities. The amount produced in 2021 slightly reduced, in line with maintenance activities at each site during the year.



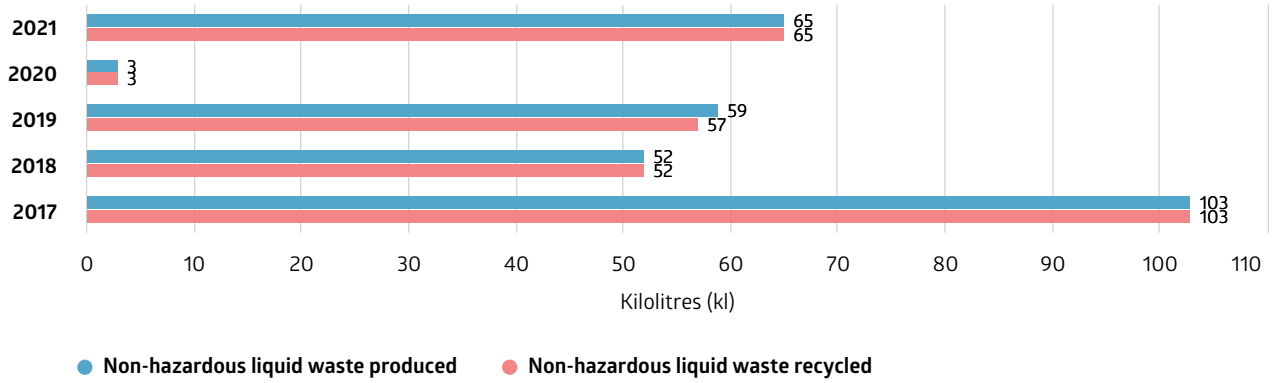
Non-hazardous solid waste produced and recycled

Plant facility enhancements at Castle Peak Power Station and Black Point Power Station in Hong Kong produced more construction waste, leading to an overall increase in non-hazardous solid waste produced in the last two years.



Non-hazardous liquid waste produced and recycled

The total amount of non-hazardous liquid waste produced and recycled increased in 2021 as Mount Piper Power Station recycled its liquid waste left over from the 2020 outage.



Water

Management approach

The CLP Group uses seawater cooling or water re-circulation processes in its plants to minimise water consumption and environmental impacts.

SASB reference: IF-EU-140a.3; GRI reference: 303-1, 303-2

Strategies and procedures

The quantity of water withdrawal and discharge in CLP's operations is dominated by thermal plants using once-through seawater cooling. In this process, large quantities of seawater are used for cooling and returned to the sea with only a slight increase in water temperature. The total volume of water withdrawal and discharge is dependent on the total electricity generated.

Where freshwater is withdrawn for operations, CLP strives to reduce water use and reduce the freshwater intensity of the electricity generated. CLP's power stations carry out a range of water conservation initiatives depending on site conditions, operational situation and age. The amount of water which can be recycled depends on factors such as location, power station design, and regulatory requirements.

Monitoring and follow-up

Water concern to CLP is two-fold. On one hand, water use in its power plants may impact local water quality and scarcity. To address this concern, impact assessments are carried out at the planning stage of development projects, in accordance with local requirements. This is to ensure that any impacts associated with project construction and plant operation are managed and mitigated to an acceptable level.

On the other hand, water security is a key risk to be managed for CLP's thermal and hydropower generation assets. Four out of seven of CLP's thermal plants use seawater for cooling. As a result, CLP's risk exposure to water availability is limited, while solar farms also use water for the cleaning of solar panels, the amount required is comparatively small.

CLP assesses water risks for new projects through systematic environmental due diligence, and annually thereafter using globally recognised tools such as WRI Aqueduct. The assessment covers parameters such as water availability, water sensitivity, water stress mapping, potential competing use with other stakeholders, and the management strategies in place in each of the regions. Where a water supply risk is identified, the Company proactively engages with local stakeholders to understand their needs and with local water suppliers to mitigate or resolve the issue. The 2021 assessments across the Group indicate that current water supply regimes are stable, and the overall risk of substantive impact is minimal.

The quality of water discharges must also meet licensing and regulatory standards while maintaining CLP's licence to operate. All of the Company's generation assets have established an environmental management system (EMS), which is regularly audited and renewed. Under the EMS, all significant environmental aspects with potentially adverse impacts are identified, monitored, and controlled under programs which are reviewed on a regular basis. Specific emergency response plans have also been developed to prevent and address the spillage or leakage of pollutants. As a result of the water treatment processes put in place, none of CLP's operations significantly impact their respective water receiving bodies.

To monitor efficiency of water use, CLP tracks freshwater withdrawal, discharge, and water intensity (based on electricity sent out). Internal targets are set each year to encourage continuous improvement in water management practices. CLP also participates in the CDP Water Survey to disclose and benchmark its practices with industry peers in relation to water resource management.

Year in review

The total water intensity of the Group's power generation process increased slightly to 0.83m³/MWh in 2021, as compared to 0.78m³/MWh in 2020. This is mainly due to operational needs at Mount Piper Power Station.

SASB reference: IF-EU-140a.1; GRI reference: 303-3, 303-4, 303-5

CLP encourages its power stations to track their total water recycling and report this for indicative purposes. Considerable emphasis is placed on sharing initiatives across the Group to maximise the benefit of an individual power station's efforts.

Out of CLP's seven thermal plants, four use seawater for cooling. Mount Piper, Jhajjar and Fangchenggang power plants operate on a zero liquid discharge basis. The water is treated internally and recycled or reused in other parts of the power generation process, or for dust control or horticulture.

Examples of how water use is managed are summarised below:

- **Hong Kong:** The main power stations in Hong Kong are primarily reliant on seawater and process freshwater from municipal supply for cooling. The municipal water supply from the government is currently stable. Castle Peak Power Station continues to enhance monitoring and

search methods for detecting leakages in its pipe network, such as the use of portable ultrasonic cameras.

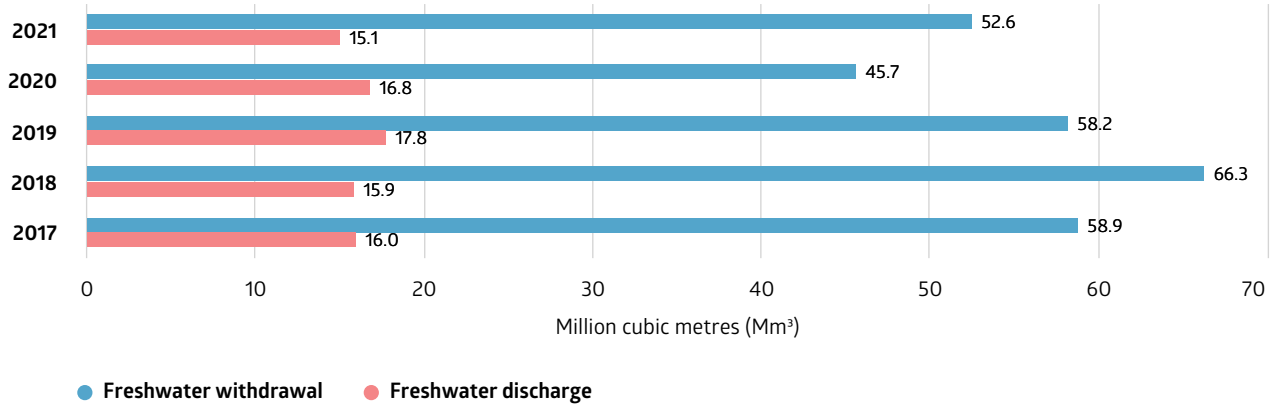
- **Mainland China:** Fangchenggang Power Station uses seawater in its cooling process and is located in an area of low water stress. It also continues to reuse its treated wastewater (up to 57% of total wastewater volume in 2021) for flue gas desulphurisation, dust suppression and irrigation for greening within the power station. Each day, about 900 m^3 of freshwater is saved. For hydropower plants, the risk of water diversion away from the plants is low as the sector is considered a high priority by the government.
- **Australia:** EnergyAustralia works with the local water authorities through their water supply schemes to guarantee water supply to the Mount Piper Power Station. Strategies to reduce the station's need to take water from local water sources and catchments include the development of the Springvale Water Treatment Plant in collaboration with the Springvale Mine. The plant now supplies about 80% of daily water needs at the station.
- **India:** Jhajjar Power Station in India is designed with a water re-circulation process. Although it uses river water, it has zero liquid discharge and requires only a small quantity of water to be topped up, to make up for evaporation loss. Periodic reduction in water supply to Jhajjar was experienced in the past and the Company continues to explore the possibility of building an additional reservoir to enhance future water resilience. The local government is continuously engaged to plan for capacity enhancement of the Jawahar Lal Nehru Feeder Canal to cater for increasing water demand.

Other water reduction or conservation initiatives continue to be put in place, including the implementation of robotic cleaning of solar panels at the Sihong Solar and Huai'an Solar Farms, both in Mainland China. The Jiangbian Hydro Power Station completed its modification of wastewater treatment facilities to reuse treated domestic wastewater for irrigation at the site, making it another zero liquid discharge site. This initiative saves about 20,000 m^3 of freshwater annually.

At the Yallourn Mine, following heavy rainfall in June 2021, EnergyAustralia received approval from the EPA in Victoria for the temporary discharge of water from the Township Field pond into the Latrobe River. The environmental risk assessment and water quality monitoring of the discharge was completed by independent experts. They concluded that there was no risk to the downstream environment of the Latrobe River.

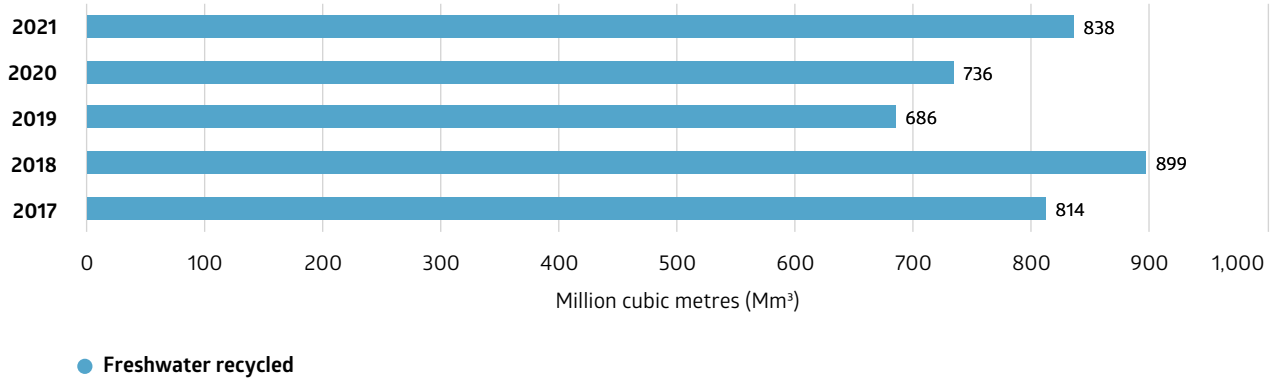
Freshwater withdrawal and discharge

Total water withdrawal and discharge (including water for cooling) increased in 2021 primarily as a result of increased water withdrawal at Jhajjar Power Station and Mount Piper Power Station.



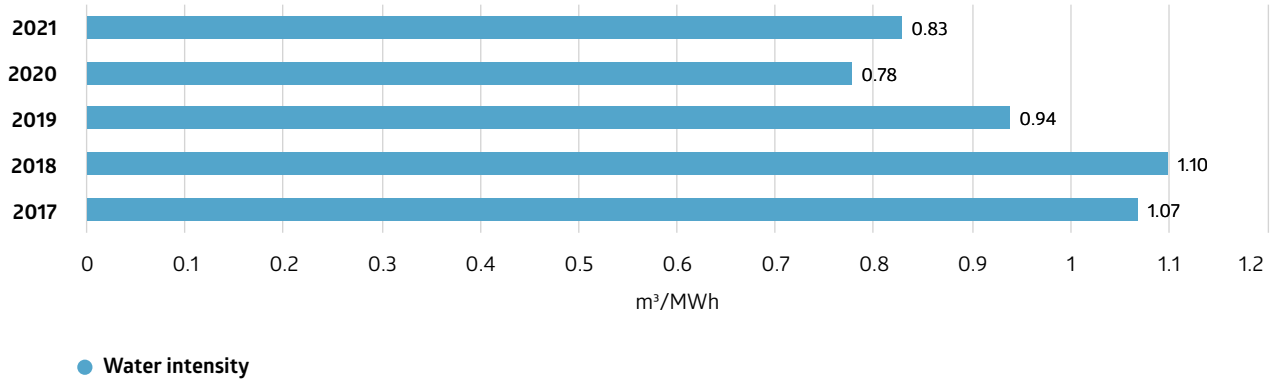
Freshwater recycled volume

There was an increase in the volume of freshwater recycled in 2021, mainly due to water recycled at Jhajjar and Mount Piper Power Stations.



Water intensity of CLP's power generation process

Water intensity (freshwater withdrawal for cooling and non-cooling purposes) increased slightly in 2021 mainly due to operational needs at Mount Piper Power Station.



CASE STUDY

Water conservation efforts in a water-stressed area in India

In India, water scarcity is one of the key business continuity risks for Jhajjar Power Station, which has experienced periodic water shortages in the past.

To further optimise and reduce the plant's freshwater consumption, Jhajjar implemented the following water conservation initiatives:

- Conducted water audits to develop and plan for short-term and long-term water conservation programmes; and
- Installed water meters and digitalised monitoring data to identify gaps and water-saving opportunities.

These initiatives have resulted in Jhajjar achieving a water intensity of 2.22 m³/MWh in 2021, which is well below the statutory limit of 3.50 m³/MWh set by the Central Pollution Control Board.

Jhajjar was announced the winner of the "Within the Fence" category of the 15th edition of the CII-National Awards for Excellence in Water Management in 2021. The award recognises Jhajjar's efforts and achievement with respect to improving water use efficiencies and its integrated approach to wastewater management which includes the recycling, recovery and reuse of industrial effluents.

Biodiversity and land use

Management approach

There is no one-size-fits-all approach to managing biodiversity impacts. CLP operations interact with local ecosystems in different ways, depending on factors such as location, the level of development in the vicinity and the surrounding environment.

GRI reference: 304-1, 304-2, 304-4

Goals and targets

The Group's goal is "no net loss of biodiversity". Targets are site-specific and depend on the different levels of regulatory controls on biodiversity, from assessment requirements through to ecological compensation. For example, in Australia, the Yallourn Mine strives for a net gain in biodiversity by offsetting disturbed areas and improving the habitat quality outside the mine perimeter in accordance with relevant local regulatory requirements.

Strategies and procedures

CLP's internal Environmental Impact Assessment (EIA) standard mandates an environmental assessment for all new projects. During the EIA stage, CLP partners with qualified personnel to conduct a biodiversity impact assessment in accordance with the CLP Biodiversity Impact Assessment Guideline. The Guideline applies to power generation, transmission and distribution, mines and other power-related projects, and provides a framework for a more systemic assessment of biodiversity impacts.

The Guideline takes into consideration the IUCN Red List of Threatened Species and national conservation lists of threatened species, and provides guidance on managing biodiversity risks. Any new operations that could affect the IUCN Red List of Threatened Species and a country's national conservation list of threatened species are flagged well ahead of any investment decision.

The biodiversity impact assessment observes local legislative requirements and references the International Finance Corporation Sustainability Framework. It describes the baseline conditions, evaluates the magnitude and significance of project impacts, and investigates options for mitigation. The assessment only contemplates offsets after considering options relating to avoidance, minimisation, and restoration or rehabilitation.

See CLP's holistic approach to assessing new investments

Year in review

CLP continued its ongoing efforts in biodiversity conservation and land remediation in 2021.

GRI reference: 304-3, EU13

Biodiversity

Much of the biodiversity work across the Group is continuous. It includes activities such as vegetation management along transmission lines in Hong Kong, and the tree management work undertaken by the Jhajjar Power Station in India.

In Hong Kong, CLP soft launched an IT system, the Predictive Vegetation Management System, for its transmission and distribution network in November. Developed by CLP, the system monitors the growth and condition of trees and vegetation that may affect overhead line operations. To further enhance its predictive ability, CLP continues a research project with the Education University of Hong Kong to develop an algorithm of vegetation growth prediction to integrate into the system. In addition, in continuing its support of the government strategy of "Right Tree in the Right Place", any trees identified as hazardous are replaced by CLP with native species to support local biodiversity.

The Marine Conservation Enhancement Fund (MCEF) and the Fisheries Enhancement Fund (FEF) were set up by the Hong Kong Offshore LNG Terminal Project in Hong Kong. Respectively, the funds have granted approximately HK$18.4M to support 14 projects and HK$8.6M to support five projects since grant applications opened in October 2020. The funded projects under MCEF relate to marine conservation, habitat restoration and rehabilitation, as well as education and ecotourism. For the FEF, the funded initiatives relate to fisheries education and tourism, enhancement of fisheries resources, and sustainable fishery development.

In Mainland China, the Xicun Solar Power Station has successfully integrated the farming of honeysuckle plants, a crop for traditional Chinese medicinal use, in its operation. This initiative has transformed the previously desert-like sandy area into cultivated farmlands and brings benefits to local farmers.

In India, the Jhajjar Power Station continues its annual effort to augment the green belt area on site. In 2021, around 10,000 saplings of native species were planted. In 2021, Apraava Energy became a member of the India Business & Biodiversity Initiative which aims to mainstream biodiversity in Indian businesses. The initiative is conceptualised by the

Ministry of Environment, Forests and Climate Change, and the CII-ITC Centre of Excellence for Sustainable Development. As a pilot site under the initiative, Jhajjar will carry out a baseline biodiversity survey and assessment to identify opportunities and plan actions to improve biodiversity at the site.

In Australia, the Yallourn Mine continues to implement its Progressive Rehabilitation Plan and a Conservation Management Plan to oversee final rehabilitation. In 2021, approximately 35 hectares of progressive rehabilitation area was completed. The rehabilitation work reduces erosion and promotes water infiltration, and through seeding provides grass and native vegetation habitats. Close to 15,800 native tube stock seedlings were planted within the conservation areas at the mine site.

Land remediation

In Australia, at the Jeeralang Power Station and Newport Power Station, the remediation plan for per- and polyfluoroalkyl substances (PFAS) was finalised in 2021. PFAS are man-made chemicals found in many consumer products including firefighting equipment. The plan will guide the clean-up strategy to be deployed in 2022. Site investigation work for PFAS was also undertaken at the Tallawarra Power Station in 2021 with a monitoring programme in place, at the request of the local authority, to gather more site information.

Climate change

Management approach

Climate change is one of the most important topics affecting the energy sector. CLP's Climate Vision 2050 sets out the blueprint of the Group's transition to net-zero greenhouse gas emissions leading up to mid-century.

CLP is a staunch supporter of the United Nations Sustainable Development Goals (SDGs). In line with SDG 7 – Affordable and Clean Energy and SDG 13 – Climate Action, the Company recognises its responsibility as an energy company to address the risks of climate change by reducing its GHG emissions.

Launched in 2007 with a focus on the ambition to mitigate CLP's climate impact, Climate Vision 2050 has been instrumental in informing CLP's business strategy and guiding its investment decision-making. It is also an integral part of CLP's broader climate strategy, which covers key considerations around climate adaptation and scenario analysis, among others. This vision will underpin CLP's long-term success as a business.

Download CLP's Climate Vision 2050: A net-zero future

CEO of CLP Holdings Limited introduces the Climate Vision 2050.

Watch CLP Group's CEO introduce the Climate Vision 2050

In 2021, CLP has published a standalone Climate-related Disclosures Report, which follows the recommendations from the TCFD and the International Sustainability Standards Board (ISSB) Climate-related Disclosures Prototype. It covers detailed discussion on CLP's governance, strategy, risk management and metrics in relation to climate change.

Download CLP's 2021 Climate-related Disclosures Report

Greenhouse gas emissions

Management approach

Greenhouse gas (GHG) emissions are one of the key metrics to track the Group's progress in decarbonisation.

GRI reference: 302-2, 305-1, 305-2, 305-3

Greenhouse gas reporting guidelines

A Group-wide GHG Reporting Guideline was first developed in 2007 to specify the collection and compilation methodology of the Group's GHG data. The Guideline was developed with reference to the following international standards and guidelines:

- The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (Revised Edition) of the World Business Council for Sustainable Development (WBCSD) and the World Resources Institute (WRI);
- The Greenhouse Gas Protocol: Corporate Value Chain (Scope 3) Accounting and Reporting Standard;
- The Greenhouse Gas Protocol: Technical Guidance for Calculating Scope 3 Emissions (Version 1);
- The 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories;
- The IPCC 5th Assessment Report 2014;
- The International Standard for GHG Emissions ISO 14064-1: Greenhouse Gases; and
- Methodologies agreed with local authorities.

The CLP GHG Reporting Guideline is reviewed in accordance with CLP internal practices and updated with the latest references at least once every three years. The current Guideline was last updated in 2020.

Of note in 2021, the Fangchenggang Power Station successfully obtained the ISO 14064-1:2018 GHG Verification Statement in March, becoming the first CLP asset in Mainland China to achieve this GHG qualification and reporting standard. Also during the year, CLP Power Hong Kong updated its quantification and reporting of GHG emission inventory to follow this latest 2018 ISO standard.

CLP's GHG emissions inventory covers six GHGs specified in the Kyoto Protocol, including carbon-dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), and sulphur hexafluoride (SF_6). Perfluorocarbons (PFCs) are also included but not used in CLP's operations. Nitrogen trifluoride (NF_3), the seventh mandatory gas added under the second Kyoto Protocol, was also considered for inclusion, but after evaluation was deemed immaterial to CLP's operations. The GHG reporting scope definitions for GHG emissions are available here.

Focus has been given to sulphur hexafluoride (SF_6), an insulating gas commonly used in switchgears and transmission lines. CLP is aware of its high global warming potential and therefore is vigilant in controlling SF_6 leakage throughout the life cycle of electrical equipment, and actively exploring ways to reduce the use of SF_6 in its business. For example, in Hong Kong, a trial on non-SF_6 gas switchgears at distribution level has started and the readiness for use in equipment at transmission level will be further studied.

Compilation bases

CLP reports the GHG emissions of its generation and energy storage portfolio on three consolidation bases to provide a comprehensive overview of its carbon footprint and progress in decarbonisation efforts. The three bases are:

- **Equity basis**: This includes the electricity generated by CLP's assets. It accounts for the Scope 1 and Scope 2 GHG emissions according to CLP's equity share in the portfolio. The equity basis reflects economic interest, indicating the extent of GHG risks and opportunities CLP has from assets in which it holds a majority or minority share.
- **Equity and long-term capacity and energy purchases**: This includes both electricity generated by CLP's assets as well as the electricity purchased through capacity and energy purchase agreements. It allows stakeholders to better understand the GHG intensity of the electricity CLP delivers to customers. In addition to the GHG emissions from the equity basis, it also includes the direct GHG emissions from the generation of purchased electricity.

  Purchase agreements help the Group meet local market needs and usually entail significant investment. To qualify for inclusion in this metric, these long-term capacity and energy purchase agreements must have a duration of at least five years and the equivalent capacity of 10MW or more.
- **Operational control**: This represents the total GHG emissions from generation assets where CLP has direct influence and control on operational matters. CLP has been disclosing the combined total Scope 1 and Scope 2 GHG emissions on this basis for over a decade, and will continue to demonstrate its long-term progress.

Conscious of emissions along the value chain, in 2019, the Company conducted a review of its Scope 3 emissions and started to disclose Scope 3 emissions to present a more comprehensive picture of its footprint along the value chain. Scope 3 emissions typically represent less than 40% of CLP's GHG emissions.

Calculation methodologies

Scope 1 & Scope 2 GHG emissions

The Scope 1 emissions and location-based Scope 2 emissions are calculated in accordance with CLP's GHG Reporting Guideline outlined above.

Annually, CLP obtains emission factors from each business unit's local government and authority in their respective jurisdictions. In cases where local emission factors are not available, other recognised sources are referenced.

Scope 3 GHG emissions

The table below summaries the Scope 3 categories that were identified as relevant to CLP, and how their emissions are calculated.

Scope 3 GHG emissions categories relevant to CLP

Scope 3 category	Relevance to CLP	Calculation and emission factors
1: Purchased goods and services Emissions from the extraction, production and transportation of goods and services purchased or acquired.	a) Products-related emissions relate to the upstream emissions of EnergyAustralia's natural gas retail business, including the emissions from upstream gas production and transmission, and distribution leakage in the State pipeline systems.	· Assessed using the average-data method. The quantities of natural gas supplied are multiplied by State-based upstream emission factors to calculate the emissions. · Emission factors source: Australia National Greenhouse Accounts Report 2021.
	b) Non-products-related emissions relate to the upstream emissions of CLP's purchased goods and services other than natural gas for retail business.	· Assessed using the spend-based method. Country-based World Input-Output Database (WIOD) factors are applied to the financial spend on the purchase of non-product-related goods and services. · Emission factors source: WIOD Release 2016.
2: Capital goods Emissions from the extraction, production and transportation of capital goods purchased or acquired.	Relates to the upstream emissions of CLP's purchased capital goods, mainly for infrastructure construction and facility upgrades.	· Assessed using the spend-based method. Country-based WIOD factors are applied to the financial spend on the purchase of capital goods. · Emission factors source: WIOD Release 2016.
3: Fuel- and energy-related activities Emissions related to the extraction, production and transportation of fuels and energy purchased or acquired.	Includes the upstream emissions of purchased fuels and electricity for CLP's power generation.	· Assessed using the average-data method. · Upstream emissions (Well-to-tank, WTT) of purchased fuels and electricity are calculated by using volumes of purchased fuels and electricity and country-based WTT emission factors, where available. Where such volumes are not available, the ratio of the WTT emission factor to direct emission factor for each fuel type is applied to the Scope 1 and Scope 2 emissions of the generation assets. · Emission factors source: Australia National Greenhouse Accounts Report 2021, 2021 UK Government GHG Conversion Factors for Company Reporting.
	Includes the direct emissions from the generation of purchased electricity that is sold to CLP's customers. Includes the upstream emissions from the generation of purchased electricity that is sold to CLP's customers.	· Direct emissions and upstream emissions from the generation of purchased electricity that is sold to CLP's customers are assessed using the supplier-specific method. This involves using emissions data of generation assets whose capacity and energy are purchased by CLP to meet customer demand. The calculation multiplies the percentages of capacity and energy purchased by CLP with direct emissions and upstream emissions (WTT) of the generation assets. · Emissions from the generation of purchased electricity that is sold to CLP's customers also include the emissions from the net electricity purchased by EnergyAustralia from the Australian Energy Market Operator (AEMO). This is assessed using the average-data method, which involves estimating emissions by using grid average emission factors, and is calculated through multiplying the net electricity purchased from AEMO with State-based emission factors. · Emission factors source: Australia National Greenhouse Accounts Report 2021, 2021 UK Government GHG Conversion Factors for Company Reporting.

Scope 3 category	Relevance to CLP	Calculation and emission factors
5: Waste generated in operations Emissions from the disposal and treatment of waste generated.	Emissions from fuel ash and gypsum as both represent the most significant waste material generated.	· Assessed using the waste-type specific method based on waste produced by type. · Calculated through applying emission factors to quantities of fuel ash and gypsum generated at CLP's coal-fired power stations, considering the disposal method. · Emission factors source: 2021 UK Government GHG Conversion Factors for Company Reporting.
6: Business travel Emissions from the transportation of employees for business-related activities.	Air travel is the most material source of emissions from business travel. While CLP offsets the emissions from air travel, the emissions continue to be included in the GHG profile.	· Assessed using the distance-based method. · Air travel emissions for CLP's operations in Hong Kong and Australia are directly calculated using flight distance by travel classes multiplied by corresponding emission factors. Emissions from the other regions of operations are calculated through extrapolation based on CLP's financial spend on business travel. · Emission factors source: 2021 UK Government GHG Conversion Factors for Company Reporting.
7: Employee commuting Emissions from the transportation of employees between their homes and their worksites.	Relates to the emissions of CLP's employees in commuting to offices and worksites. This typically includes emissions from automobile travel, bus travel, etc.	· Calculated through the number of CLP's employees, estimated travel mode and average distance travelled by region. · Emission factors source: 2021 UK Government GHG Conversion Factors for Company Reporting.
11: Use of sold products Emissions from the end-use of products sold.	Relates to the downstream emissions of EnergyAustralia's natural gas retail business, including the emissions from the combustion of natural gas supplied to customers.	· Calculated through multiplying the quantities of natural gas supplied to customers by State-based emission factors. · Emission factors source: Australia National Greenhouse Accounts Report 2021.

The following categories were identified as not relevant to CLP, and hence not included in the Scope 3 emissions profile for reporting.

Scope 3 categories that are not considered relevant to CLP

Scope 3 category	Explanation
4: Upstream transportation and distribution Emissions from the transportation and distribution of purchased goods and services.	The emissions are covered in Category 1 as the financial spend on transportation and distribution is embedded in the financial spend on purchased goods and services.
8: Upstream leased assets Emissions from the operation of assets leased by the reporting company, i.e. lessee.	CLP does not operate leased generation assets. The emissions of leased offices are included in CLP's Scope 2 emissions.
9: Downstream transportation and distribution Emissions from the transportation and distribution of products sold between operations and the end consumer, in vehicles and facilities not owned or controlled or paid for by the reporting company.	Electricity and gas are the main products of CLP. Transportation and distribution of the products does not involve vehicles and facilities not owned or controlled by the Group.
10: Processing of sold products Emissions from the processing of intermediate products sold by downstream companies, e.g. manufacturers.	With electricity and gas being CLP's main products, they are end products without further processing requirement.
12: End-of-life treatment of sold products Emissions from the disposal and treatment of products sold at the end of their life.	With electricity and gas being CLP's main products, there is no end-of-life treatment requirement.
13: Downstream leased assets Emissions from the operation of assets owned by the reporting company (lessor) and leased to other entities.	Leasing is not a main business for CLP.
14: Franchises Emissions from the operation of franchises.	CLP does not have any franchising business.
15: Investments Emissions from the operation of investments.	CLP reports Scope 3 emissions on an equity basis. This category applies to CLP only when an operational control basis is adopted and therefore does not apply.

Environment and climate change data

GRI reference: 305-1, 305-2, 305-3, 305-4

Environmental regulations and compliance

Environmental compliance	2021	2020	2019	2018	2017
Environmental regulatory non-compliances resulting in fines or prosecutions (number)[1]	**0**	0	0	0	0
Environmental licence limit exceedances & other non-compliances (number)[1]	**9**	4	10	2	13

1 Numbers include operating assets where CLP has operational control during the calendar year. Paguthan Power Station, the power purchase agreements of which expired in December 2018, was not included in the 2019-2021 numbers.

Air emissions

Air pollutants	2021	2020	2019	2018	2017
Nitrogen oxides emissions (NO_x) (kt)[1,2]	**45.7**	43.2	47.0	60.9	59.3
Sulphur dioxide emissions (SO_2) (kt)[1,2]	**52.7**	48.0	44.7	76.1	81.6
Particulates emissions (kt)[1,2]	**7.6**	6.9	7.7	8.5	8.3
Sulphur hexafluoride (SF_6) (kt)[1,2]	**0.004**	0.003	N/A	N/A	N/A
Mercury (kg)[1,2,3]	**311**	N/A	N/A	N/A	N/A

1 Numbers include operating assets where CLP has operational control during the calendar year. Paguthan Power Station, the power purchase agreements of which expired in December 2018, was not included in the 2019-2021 numbers.
2 Since 2019, numbers at asset level have been aggregated and then rounded.
3 Mercury emission quantity is based on direct measurement or by calculation, as required by the local authority or by internal requirements using acceptable methods. Jhajjar was not included because of the limited sampling size in 2021.

Waste

Waste produced and recycled	2021	2020	2019	2018	2017
Non-hazardous liquid waste (kl)[1,2,3]					
Produced	**65**	3	59	52	103
Recycled	**65**	3	57	52	103
Non-hazardous solid waste (t)[1,2,3]					
Produced	**24,481**	17,901	13,344	11,471	20,334
Recycled	**4,214**	4,458	4,986	3,990	3,790
Hazardous liquid waste (kl)[1,2,3]					
Produced	**1,017**	1,091	1,578	1,685	1,420
Recycled	**947**	1,069	1,536	1,648	1,384
Hazardous solid waste (t)[1,2,3]					
Produced	**1,524**	1,503	862	1,435	857
Recycled	**520**	523	201	631	469

1 Numbers include operating assets where CLP has operational control during the calendar year. Paguthan Power Station, the power purchase agreements of which expired in December 2018, was not included in the 2019-2021 numbers.
2 Since 2019, numbers at asset level have been aggregated and then rounded.
3 Waste categorised in accordance with local regulations.

By-products	2021	2020	2019	2018	2017
Ash produced (kt)[1,2]	**3,403**	2,624	3,032	3,419	3,005
Ash recycled / sold (kt)[1,2]	**2,501**	1,793	3,667	2,263	1,745
Gypsum produced (kt)[1,2]	**367**	334	441	253	156
Gypsum recycled / sold (kt)[1,2]	**365**	335	438	250	161

1 Numbers include operating assets where CLP has operational control during the calendar year. Paguthan Power Station, the power purchase agreements of which expired in December 2018, was not included in the 2019-2021 numbers.
2 Since 2019, numbers at asset level have been aggregated and then rounded.

Water

Water usage	2021	2020	2019	2018	2017
Total water withdrawal (Mm^3)[1,2,3]	**5,160.0**	5,162.7[4]	5,219.9[4]	5,153.6	4,480.6
For cooling purpose					
Water withdrawal from freshwater resources	**42.5**	35.1	45.7	53.3	47.6
Water withdrawal from marine water resources	**5,107.4**	5,117.0[4]	5,161.7[4]	5,087.3	4,421.7
For non-cooling purposes					
Water withdrawal from freshwater resources	**5.3**	5.7	5.8	6.0	4.9
Water withdrawal from municipal sources	**4.8**	4.9	6.7	7.0	6.4
Total water discharge (Mm^3)[1,2,3,5]	**5,122.5**	5,133.8[4]	5,179.6[4]	5,103.2	4,437.7
From cooling process					
Treated wastewater to freshwater bodies	**0**	0	0	0	0
Water discharge to marine water bodies	**5,107.4**	5,117.0[4]	5,161.7[4]	5,087.3	4,421.7
Wastewater to other destinations	**0**	0	0	0.02	0.05
From non-cooling processes					
Treated wastewater to freshwater bodies	**11.9**	13.7	14.4	12.3	12.3
Treated wastewater to marine water bodies	**1.3**	1.5	1.7	1.6	1.6
Wastewater to other destinations	**1.9**	1.6	1.7	1.9	2.0
Wastewater to sewerage	**0.03**	0.03	0.03	0.03	0.02
Total freshwater consumption (Mm^3)	**52.6**	N/A	N/A	N/A	N/A
Total water withdrawal from water stressed areas (Mm^3)	**16.5**	N/A	N/A	N/A	N/A
Total freshwater consumption from water stressed areas (Mm^3)	**16.4**	N/A	N/A	N/A	N/A

1 Numbers include operating assets where CLP has operational control during the calendar year. Paguthan Power Station, the power purchase agreements of which expired in December 2018, was not included in the 2019-2021 numbers.
2 Numbers have been subject to rounding. Any discrepancies between the total shown and the sum of the amounts listed are due to rounding.
3 Since 2019, numbers at asset level have been aggregated and then rounded.
4 Restated as per updated data for Newport Power Station in Australia.
5 Starting from 2019, Yallourn Power Station's "water discharged to third-parties", which was previously reported under "wastewater to sewerage", has been reported under "wastewater to other destinations".

Water intensity	2021	2020	2019	2018	2017
Water intensity of CLP's power generation process (m^3/MWh)[1]	**0.83**	0.78	0.94	1.10	1.07

1 Numbers include operating assets where CLP has operational control during the calendar year. Paguthan Power Station, the power purchase agreements of which expired in December 2018, was not included in the 2019-2021 numbers.

Freshwater reused/recycled	2021	2020	2019	2018	2017
Freshwater reused/recycled volume (Mm^3)[1]	**838**	736	686	899	814

1 Numbers include operating assets where CLP has operational control during the calendar year. Paguthan Power Station, the power purchase agreements of which expired in December 2018, was not included in the 2019-2021 numbers.

Greenhouse gas emissions

Greenhouse gas emissions	2021	2020	2019	2018	2017
CLP Group[1]					
Total CO_2e emissions – on an equity basis (kt)[2,3]	**65,017**	62,138	71,720	N/A	N/A
Scope 1 (kt)[4]	**47,690**	45,105	50,047	N/A	N/A
Scope 2 (kt)	**236**	244	250	N/A	N/A
Scope 3 (kt)	**17,091**	16,790	21,424	N/A	N/A
Category 1: Purchased goods and services	**901**	1,210	1,093	N/A	N/A
Category 2: Capital goods	**1,488**	685	1,347	N/A	N/A
Category 3: Fuel- and energy-related activities	**12,733**	12,690	16,671	N/A	N/A
Category 5: Waste generated in operations	**80**	63	101	N/A	N/A
Category 6: Business travel	**1**	1	8	N/A	N/A
Category 7: Employee commuting	**4**	2	4	N/A	N/A
Category 11: Use of sold products	**1,884**	2,138	2,200	N/A	N/A
CLP Group's generation and energy storage portfolio[3,4,5]					
CO_2 – on an equity basis (kt)[6]	**47,574**	44,987	N/A	N/A	N/A
CO_2e – on an equity basis (kt)[6]	**47,813**	N/A	N/A	N/A	N/A
CO_2 – on an equity plus long-term capacity and energy purchase basis (kt)[7,8]	**51,674**	48,621	N/A	N/A	N/A
CO_2e – on an equity plus long-term capacity and energy purchase basis (kt)[7,8]	**51,941**	N/A	N/A	N/A	N/A
CO_2 – on an operational control basis (kt)[6]	**46,842**	43,808	50,412	52,052	47,921[9]
CO_2e – on an operational control basis (kt)[6]	**47,090**	44,023	50,676	52,306	48,082

1 Refers to a range of businesses, including generation and energy storage portfolio, transmission and distribution, retail and others.
2 Numbers have been subject to rounding. Any discrepancies between the total shown and the sum of the amounts listed are due to rounding.
3 Paguthan Power Station, the power purchase agreements of which expired in December 2018, was not included in the 2019-2021 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 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.
6 Numbers include Scope 1 and Scope 2 emissions..
7 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.
8 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).
9 CO_2e emissions of Yallourn and Hallet Power Stations were used to calculate CO_2emissions metrics in 2017 due to limited data availability.

Climate Vision 2050	2021	2020	2019	2018	2017
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]	**0.57**	0.57	0.63	0.66	0.69[7]
On an equity basis (kg CO_2e/kWh)[8]	**0.65**	0.66	0.71	0.74	0.80[7]

1 The 2019-2021 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 2019-2021 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.
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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 CO_2e emissions of Yallourn and Hallet Power Stations were used to calculate CO_2emissions metrics in 2017 due to limited data availability.
8 Numbers include Scope 1 and Scope 2 emissions.

CLP Power Hong Kong – GHG emissions intensity of electricity sold[1,2]	2021	2020	2019	2018	2017
CO_2e emissions intensity of electricity sold by CLP Power Hong Kong (kg CO_2e/kWh)	**0.39**	0.37	0.50	0.51	0.51
CO_2 emissions intensity of electricity sold by CLP Power Hong Kong (kg CO_2/kWh)	**0.39**	0.37	0.49	0.51	0.50

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.

Climate-related financial information

Capital investments	2021	2020	2019	2018	2017
Total capital investment incurred by asset type (HK$M(%))[1,2,3]	**15,411 (100%)**	13,022 (100%)	12,028 (100%)	12,851 (100%)	N/A
Transmission, distribution and retail	**5,957 (39%)**	4,810 (37%)	5,229 (43%)	4,953 (39%)	N/A
Coal	**2,628 (17%)**	3,638 (28%)	2,473 (21%)	3,040 (24%)	N/A
Gas	**5,639 (37%)**	3,445 (26%)	3,146 (26%)	4,098 (32%)	N/A
Nuclear	**0 (0%)**	0 (0%)	352 (3%)	0 (0%)	N/A
Renewables[4]	**860 (6%)**	462 (4%)	580 (5%)	714 (5%)	N/A
Others	**327 (2%)**	667 (5%)	248 (2%)	46 (0%)	N/A

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 Capital investment includes additions to fixed assets, right-of-use assets, investment property, intangible assets, investments in and advances to joint ventures and associates, and acquisition of business/asset.
3 On an accrual basis.
4 Renewables include wind, hydro, solar and waste-to-energy. Waste-to-energy is not considered as non-carbon emitting energy. Numbers of waste-to-energy included in renewables since 2019 are as follows: 2019 - HK$123 million; 2020 - HK$7 million; 2021 - HK$18 million.

Operating earnings	2021	2020	2019	2018	2017
Total operating earnings by asset type (HK$M(%))[1]	**10,638 (100%)**	12,374 (100%)	12,138 (100%)	15,145 (100%)	14,189 (100%)
Transmission, distribution and retail	**5,612 (53%)**	5,751 (46%)	5,131 (42%)	7,427 (49%)	8,392 (59%)
Coal[2]	**1,020 (10%)**	2,871 (23%)	2,503 (21%)	3,370 (22%)	3,994 (28%)
Gas[2]	**1,326 (12%)**	1,510 (12%)	1,735 (14%)	1,533 (10%)	
Nuclear	**1,908 (18%)**	1,594 (13%)	1,688 (14%)	1,720 (11%)	913 (7%)
Renewables[3]	**519 (5%)**	575 (5%)	1,016 (8%)	924 (7%)	629 (4%)
Others	**253 (2%)**	73 (1%)	65 (1%)	171 (1%)	261 (2%)

1 Before unallocated expenses.
2 Starting from 2018, operating earnings of coal and gas have been reported separately.
3 Renewables include wind, hydro, solar and waste-to-energy. Waste-to-energy is not considered as non-carbon emitting energy. Numbers of waste-to-energy included in renewables since 2019 are as follows: 2019 - HK$5 million; 2020 - HK$8 million; 2021 - HK$10 million.

2021 data shaded in orange has been independently verified by PricewaterhouseCoopers. The assurance scope of past years' data can be found in previous Sustainability Reports.

Asset management

Overview

Asset management refers to how CLP manages and utilises its assets to provide reliable, affordable and sustainable electricity services to customers and communities.

Interruptions of this service could significantly impact a region's economy and the communities where CLP operates. The Company understands the important role it plays in providing and maintaining critical energy infrastructure.

A multi-pronged approach is taken to achieve effective asset management. Asset integrity must be optimised in its life cycle. Utilisation of different assets must be optimised in response to fluctuating demand, fuel prices and, increasingly, significant electricity supply from renewable sources. It is also critical to safeguard operational technology (OT) and information technology (IT) systems from cyber threats. IT security is particularly important to employees and customers to ensure personal information and data privacy is adequately protected.

Key stakeholders

- Customers, Suppliers, Communities, Employees

Related material topics

- Reinforcing resilience in a changing operating environment
- Reinforcing cyber resilience and data protection

Asset management system

Management approach

The Asset Management System (AMS) Standard is a framework of standardised practices across the Group which manage assets across their entire lifecycle, from the planning stage to decommissioning.

Strategies and procedures

CLP's AMS Standard was developed in 2016 to standardise essential practices in managing assets across the Group and ensure best practice. It accords with the ISO 55000 series of standards for asset management systems, as well as the ISO 31000 standards for risk management.

The AMS Standard is integrated into CLP's Health, Safety and Environment (HSE) Management System and the Project Management Governance System (PMGS) Standards to manage the complete lifecycle of an asset.

The AMS contains five key stages and 10 asset management elements, as illustrated in the diagram below.